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SPACE-BASED INTERCEPTOR (SBI)

AUGUST 1987

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
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This Environmental Assessment documents the results of an assessment of the potential for the magnitude of impacts from Demonstration/Validation activities of the Space-Based Interceptor (SBI), August 1987.

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Cover Sheet

Responsible Agency: Strategic Defense Initiative Organization

Proposed Action: Conduct Demonstration/Validation tests of the Space-Based Interceptor (SBI) technology.

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Abstract: The Strategic Defense Initiative Organization (SDIO) and its proponents (the U.S. Army and the U.S. Air Force) plan to conduct Demonstration/Validation tests of the SBI technology. These tests will demonstrate the ability of the technology to perform the required tasks, and validate a future decision on whether to proceed with Full-Scale Development. Demonstration/Validation tests would be conducted at Eglin Air Force Base, Edwards Air Force Base, U.S. Army Kwajalein Atoll, National Test Facility, and contractor facilities. Tests would include analyses, simulations, component/assembly tests, and flight tests. This document addresses the potential environmental consequences of the Demonstration/Validation testing of the SBI technology.

Available to the Public: August 1987

EXECUTIVE SUMMARY

INTRODUCTION

The National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 CFR 1500-1508), and the Department of Defense (DoD) Directive 6050.1 which supplements these regulations, direct that DoD officials take into account environmental consequences when authorizing or approving major Federal actions in the United States. Accordingly, this Environmental Assessment analyzes the potential environmental consequences of a proposed transition from Concept Exploration to Demonstration/Validation of the Space-Based Interceptor (SBI), one of the technologies being considered in the Strategic Defense Initiative program. The tests and evaluations associated with Demonstration/Validation will be in accordance with the Antiballistic Missile Treaty and are currently structured to conform to the restrictive interpretation of the Treaty. The decision to proceed to Demonstration/Validation for SBI would not preclude other technologies, nor would it mandate the eventual Full-Scale Development or Production/Deployment of SBI.

BACKGROUND

The President's announcement of a Strategic Defense Initiative on March 23, 1983, initiated an extensive research program to determine the feasibility of developing an effective ballistic missile defense system to protect the United States and its allies from enemy missile attack. The Strategic Defense Initiative Organization was established to plan, organize, coordinate, direct, and enhance the research and testing of technologies applicable to strategic defense. Future implementation of a Strategic Defense System would be based on the Strategic Defense Initiative research program.

Many technologies currently are being investigated. Among the technologies being considered for Demonstration/Validation are space-based technologies:

- o Boost Surveillance and Tracking System (BSTS)
- o Space-based Surveillance and Tracking System (SSTS)
- o Space-Based Interceptor (SBI)

and ground-based technologies:

- o Exoatmospheric Reentry Vehicle Interception System (ERIS)
- o Ground-based Surveillance and Tracking System (GSTS)
- o Battle Management/Command and Control, and Communications (BM/C^3).

DoD Directive 5000.1 calls for a staged approach to the DoD acquisition process. In keeping with that mandate, DoD's major system acquisition process consists of four distinct stages: Concept Exploration, Demonstration/Validation, Full-Scale Development, and Production/Deployment. These four stages are separated by three major decision points (Milestones I, II, and III). Prior to Milestone I, the Defense Acquisition Board will review the results of Concept Exploration and decide whether the subject technology will be carried forward into Demonstration/Validation or remain in the Concept

Exploration stage. The SBI Strategic Defense Initiative technology is approaching the end of Concept Exploration and is preparing for Demonstration/ Validation.

PURPOSE AND NEED

The purpose of the Demonstration/Validation program for SBI is to determine the ability of the technology to perform its intended function, and to provide the information necessary to make an informed decision whether to proceed with Full-Scale Development. These activities are the first steps needed to support a decision to develop, produce, and deploy the SBI technology, which is integral to an effective strategic defense.

The function of SBI would be to use the kinetic energy of a space-based interceptor rocket as the mechanism for destroying the enemy's intercontinental and submarine-launched ballistic missiles in the powered and unpowered portion of their flight trajectories. The SBI would provide a necessary element of one alternative architecture of the proposed Strategic Defense System.

PROPOSED ACTION

The proposed action is the Demonstration/Validation program for the SBI technology. This program would demonstrate whether the system can meet its specific performance requirements and would provide the information necessary for the Defense Acquisition Board to recommend a Milestone II decision to proceed into Full-Scale Development.

Demonstration/Validation of SBI would require tests of the SBI homing subsystem and space platform. A system simulator would be used to evaluate the interface between all the subcomponents and to predict overall performance. Component/assembly testing would be conducted in existing facilities. Flight testing of the limited capability SBI homing subsystem would use new launch facilities constructed for another program at an existing missile test range.

Demonstration/Validation testing is needed to address the following technological issues:

- Homing Subsystem: Verify that the weight of the homing subsystem can be reduced significantly; verify that the data processing circuitry can be hardened against space and nuclear environments.

- Platform: Verify that the platform can protect itself against hostile threats; verify that the data processing circuitry can be hardened against space and nuclear environments.

The Demonstration/Validation testing activities for the SBI program fall into four categories: analyses, simulations, component/assembly tests, and flight tests. The tests and their proposed locations are provided in Table S-1.

NO-ACTION ALTERNATIVE

The no-action alternative is to continue with Concept Exploration activities without progressing to the Demonstration/Validation stage at this time.

ENVIRONMENTAL SETTING

The test activities of the SBI Demonstration/Validation program would be carried out at contractor facilities that have not yet been identified and at four government facilities. The government facilities would be Eglin Air Force Base, Edwards Air Force Base, U.S. Army Kwajalein Atoll, and the National Test Facility. The attributes of each of these government facilities as they relate to the proposed testing activities follow:

Eglin Air Force Base is located in northwest Florida, about 45 miles east of Pensacola. The Air Force Armaments Laboratory conducts analyses and simulations using a flight table, scene generator, and computers. Testing is currently ongoing at the facility 24 hours per day and involves about 25 people.

Edwards Air Force Base is located about 100 miles north of Los Angeles, California. The Air Force Astronautics Laboratory conducts range tests on sensors and thrusters. This type of range testing is conducted 10 to 15 times a year and involves 10 to 15 government and contractor staff. The test takes 3 to 5 days to set up and calibrate and about 20 seconds to run (28, 29).

U.S. Army Kwajalein Atoll is located on Kwajalein Atoll within the Ralik Chain in the Marshall Islands, east-southeast of Guam. The U.S. Army Kwajalein Atoll has facilities on 11 of the approximately 100 islands in the atoll. The primary mission of the U.S. Army Kwajalein Atoll is to conduct missile flight testing in support of U.S. Army research and development efforts. Meck and Roi-Namur Islands have existing launch structures from previous launch programs.

The **National Test Facility** will be constructed at Falcon Air Force Station in Colorado. An interim facility will be operated out of the Consolidated Space Operations Center, also located at Falcon Air Force Station, until construction is complete.

ENVIRONMENTAL CONSEQUENCES

Many of the tests for the SBI Demonstration/Validation program would be conducted at contractor facilities. These contractors would be selected through the DoD procurement process. The contractors would be required to meet all Federal, State, and local environmental laws and regulations necessary for facility operations. If the procurement process required a contractor to use Federal funds to conduct activities with a potential for significant environmental consequences, an environmental analysis of the consequences of such activities would also be required of the contractor. This analysis would be utilized by DoD in completing an environmental assessment or environmental impact statement, as appropriate.

TABLE S-1.
DEMONSTRATION/VALIDATION TESTING FOR THE SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine optimum number and orbits of platforms and	X	X			Contractor facilities[2]
homing subsystem to ascertain SBI architecture	X	X			National Test Facility[3]
Determine ability of computers to function onboard in a hostile space environment	X	X	Space Chamber		Contractor facilities[2]
Ability of computer to accurately and rapidly function in space for an extended duration	X	X			Contractor facilities[2]
Evaluate platform dynamics, including attitude control,	X	X			Contractor facilities[2]
deployment speed, and survivability	X	X			National Test Facility[3]
Assess homing ability of the sensors and thrusters	X	X			Contractor facilities[2]
	X	X			Eglin Air Force Base
				X	U.S. Army Kwajalein Atoll[3]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).

TABLE S-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Sensor ability to identify and guide to targets	X	X	Scene Generator/ Flight Table		Eglin Air Force Base
			Movable Target and Safety Net		Edwards Air Force Base
				X	U.S. Army Kwajalein Atoll[3]
Response of sensors and thrusters to guidance and control signals		X	Flight Table		Eglin Air Force Base
Ability of thrusters to divert from target	X	X	Flight Table		Eglin Air Force Base
			Movable Target and Safety Net		Edwards Air Force Base
				X	U.S. Army Kwajalein Atoll[3]
Ability of sensors and thrusters components to survive hostile environment	X	X	Radiation Acoustic, Thermal, Vacuum, Radar Cross-Section Chambers		Contractor facilities[2]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).

TABLE S-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine ability of hardware and software to detect and intercept target				X	U.S. Army Kwajalein Atoll[3]
Analysis and storage of flight test data	X				National Test Facility[3]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).

To assess the potential for and the magnitude of impacts from Demonstration/ Validation at each government facility, a two-step methodology was utilized. The first step was the application of assessment criteria to identify activities with no potential for significant environmental consequences. Activities were deemed to present no potential for significant environmental consequences if they met all of the following criteria (i.e., all "yes" answers):

1. Are the facility and its infrastructure adequate for the proposed activity (i.e., can the tests be conducted without new construction, excluding minor modifications)?

2. Is current staffing at the facility adequate to conduct the test, excluding minor staff level adjustments?

3. Does the facility comply with existing environmental standards?

4. Are the resources of the surrounding community adequate to accommodate the proposed testing?

If a proposed test was determined to present a potential for impact (i.e., a "no" answer to any of the above questions), the second step was to evaluate the activity in the context of the following environmental considerations: air quality, water quality, biological resources, infrastructure, hazardous waste, land use, visual resources, cultural resources, noise, and socioeconomics. As a result of that evaluation, consequences were assigned to one of three categories: insignificant, mitigable, or potentially significant.

Environmental consequences were determined to be **insignificant** if, in the judgment of the analysts or as concluded in existing environmental documentation, no potential for significant environmental impacts exists. Consequences were deemed **mitigable** if concerns exist but it was determined that all potential consequences could be readily mitigated through standard procedures, or by measures recommended in existing environmental documentation. If serious consequences exist that could not be readily mitigated, the activity was determined to represent **potentially significant** environmental impacts.

Environmental consequences of SBI test activities at **Eglin Air Force Base** would be **insignificant.** Although some new equipment would be purchased, it would be installed in existing facilities. Also, since the existing staff at the base would be used to conduct the tests, both the base infrastructure and the resources of the surrounding community would be adequate. Although the base has a problem with its existing wastewater treatment process, SBI would not require additional personnel and would not generate additional wastes; SBI activities would not impact the treatment system.

Test activities at **Edwards Air Force Base** are expected to be **insignificant.** Static tests and tethered flight tests would be conducted at existing facilities by the current staff; these types of tests are normally conducted at the base. Since facilities and staff already exist at Edwards, base infrastructure and community resources are judged to be adequate for SBI tests. In addition, Edwards Air Force Base is in compliance with all appropriate regulatory standards.

Environmental consequences at the **U.S. Army Kwajalein Atoll** may be **potentially significant**. Launch facilities that would be constructed on Meck Island would be used by SBI. This construction is addressed in a record of environmental consideration and the resulting Categorical Exclusion #7. Additional support personnel would be required, which in turn would necessitate new housing and infrastructure. New housing requirements have been identified for Kwajalein and Roi-Namur Islands. The "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases, Kwajalein Island, Kwajalein Missile Range, Kwajalein Atoll, Marshall Islands" addresses the impacts of housing construction on Kwajalein Island. Those impacts were deemed mitigable and not significant. Impacts associated with housing construction on Roi-Namur Island are also anticipated to be readily mitigable and insignificant. Increased infrastructure requirements would be met with the following planned construction: expansion of the power plant and a new desalinization facility on Kwajalein Island; a sewage treatment plant and a water storage tank on Roi-Namur Island. An environmental assessment has been prepared for the construction and operation of the expanded power plant. The environmental assessment concluded that all potential impacts are mitigable and that the action does not constitute a major Federal action with potential for significant impacts on the environment.

Activities associated with SBI Demonstration/Validation at U.S. Army Kwajalein Atoll are expected to result in an increase of 5 percent over the most recent available population figure (2,432 persons on 30 June 1986) in staff and their dependents residing at the facility. The total population would be below the highest population figure of nearly 6,000 people in 1972. Such an increase may result in environmental impacts. Specific areas of consideration are:

- Air Quality: The 1979 estimates of emissions from the Kwajalein Island power plant showed emissions reaching the limits of Environmental Protection Agency standards for nitrogen oxide. The planned power plant expansion would be required to meet emission limitations. The environmental assessment for the expanded power plant concluded that with the implementation of mitigation measures emissions standards would be met.

- Water Quality: Available data from 1976 indicated that water quality was being degraded as a result of toxic metal leaching from a solid waste disposal site at Kwajalein Island used by U.S. Army Kwajalein Atoll. Subsequently a wall was constructed. Although the wall was installed on the ocean side of the landfill, visual inspection indicated direct seepage to the ocean was occurring. The source of the leachate was considered to be waste oil or sewage tank pumpage. The landfill is currently used only for disposal of construction materials, and SBI activities are expected to continue this use. The potential change in rate of seepage as a result of construction waste is unknown. Water quality in the lagoon may be degraded by the dumping of untreated sewage in the lagoon of Roi-Namur Island. A planned sewage treatment plant on Roi-Namur Island or operational mitigation initiated by the U.S. Army Kwajalein Atoll Commander are expected to mitigate all anticipated impacts. Indirect water quality impacts have not been evaluated in previous documents.

- Biological Resources: Beaches on Roi-Namur Island have been judged suitable for nesting of the endangered Hawksbill Turtle and the threatened Green Sea Turtle. Launching activities that take place on the island should consider possible impacts to the potential nesting beaches. Dredging of coral, if used in construction, could result in degradation of the marine environment. However, the harvesting can be accomplished in a manner that will ensure that critical habitats of marine biota are not degraded. Indirect impacts on biological resources have not been evaluated in previous documents.

- Infrastructure:

  -- Electricity demands associated with the 5 percent facility population increase would require increased power plant generating capacity. One concern is the nitrogen oxide emissions, which are mitigable.

  -- Solid waste demands associated with the increase in facility population would be accommodated by the existing waste disposal system.

  -- Sewage treatment demands from increased facility population may result in a slight increase in sewage treatment requirements but are not expected to exceed present capacity. Sewage treatment demands on Roi-Namur Island are anticipated to be met if the planned sewage treatment facility is constructed or if operational mitigation measures are initiated by the U.S. Army Kwajalein Atoll Commander.

  -- Water supply demands would be increased; the planned construction of a desalinization facility on Kwajalein Island and a water storage tank on Roi-Namur are projected to ensure sufficient potable water without degrading groundwater resources.

  -- Transportation demands may require additional ferry service to Kwajalein Island from Ebeye for increased Marshallese staff.

- Hazardous Waste: Hazardous waste produced is not expected to significantly impact treatment, storage, and disposal provisions as described in the Hazardous Waste Management Plan.

- Socioeconomics: The economy of Ebeye Island relies heavily on the people residing at the U.S. Army Kwajalein Atoll. Because of this dependence, changes in facility population could have socioeconomic consequences at Ebeye Island. An increase of approximately 125 persons (5.1 percent) associated with SBI Demonstration/ Validation is expected, for a period of 1 year. Such an increase is expected to have a noticeable positive direct effect on the Marshallese economy, in terms of new jobs, which should be complemented by the Job Corps Program recently implemented by the U.S. Army Kwajalein Atoll. Due to the small size and duration of the population increase, this growth in employment is not expected to be significant. However, there may be indirect socioeconomic consequences of

increases in U.S. Army Kwajalein Atoll population, as a result of Marshallese migrating from other islands to Ebeye in response to reported availability of relatively high-paying jobs. The consequences of migration could be serious--adding to Ebeye's already dense population, providing increased pressure on its inadequate public facilities and housing, and causing public health to fall further below currently unsatisfactory levels. Increased activity at the missile range would also increase Marshallese economic dependence on Department of Defense expenditures. The U.S. Army Kwajalein Atoll currently has a policy limiting the number of Marshallese employed which may minimize the influx of people to Ebeye Island.

No significant impacts at U.S. Army Kwajalein Atoll are anticipated upon land use, visual resources, cultural resources, or noise because the proposed tests are similar to current activities that have no significant impacts on these resource areas.

In recognition of the need to avoid, minimize, and mitigate any potential adverse impacts on the environment of Kwajalein Atoll, the U.S. Army will prepare a comprehensive environmental impact statement addressing the continuing operations at the U.S. Army Kwajalein Atoll, which include the proposed Demonstration/Validation activities. The environmental impact statement will address the environmental concerns recognized in this Environmental Assessment and will identify appropriate mitigations.

The environmental consequences of constructing and operating the **National Test Facility** at Falcon Air Force Station are deemed to be **mitigable.** The consequences have been analyzed in "National Test Facility Environmental Assessment," which also identifies the necessary mitigation measures. The National Test Facility would employ 2,300 workers in a new facility. Until the facility is constructed, workers would be located in existing facilities at Falcon Air Force Station. Air quality, infrastructure, and land use impacts from construction and operation will be mitigable through the use of standard control and conservation practices. No significant impacts are expected on water quality, biological resources, hazardous waste, visual and cultural resources, noise, or socioeconomics.

If the no-action alternative is selected, no significant environmental impacts are anticipated as current Concept Exploration activities would continue with utilization of current staffing and facilities.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Development of SBI through the Demonstration/Validation stage would result in irreversible and irretrievable commitment of resources such as electronic components, various metallic and nonmetallic structural materials, fuel, and labor. This commitment of resources is not different from those necessary for many other aerospace research and development programs; it is similar to the activities that have been carried out in previous aerospace programs over the past several years.

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The National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (40 CFR 1500-1508), and the Department of Defense (DoD) Directive 6050.1 which supplements these regulations, direct that DoD officials take into account environmental consequences when authorizing or approving major Federal actions in the United States. Accordingly, this Environmental Assessment analyzes the potential environmental consequences of a proposed transition from Concept Exploration to Demonstration/Validation of the Space-Based Interceptor (SBI), one of the technologies being considered in the Strategic Defense Initiative program. The tests and evaluations associated with Demonstration/Validation will be in accordance with the Antiballistic Missile Treaty and are currently structured to conform to the restrictive interpretation of the Treaty. The decision to proceed to Demonstration/Validation for SBI would not preclude other technologies, nor would it mandate the eventual Full-Scale Development or Production/Deployment of SBI.

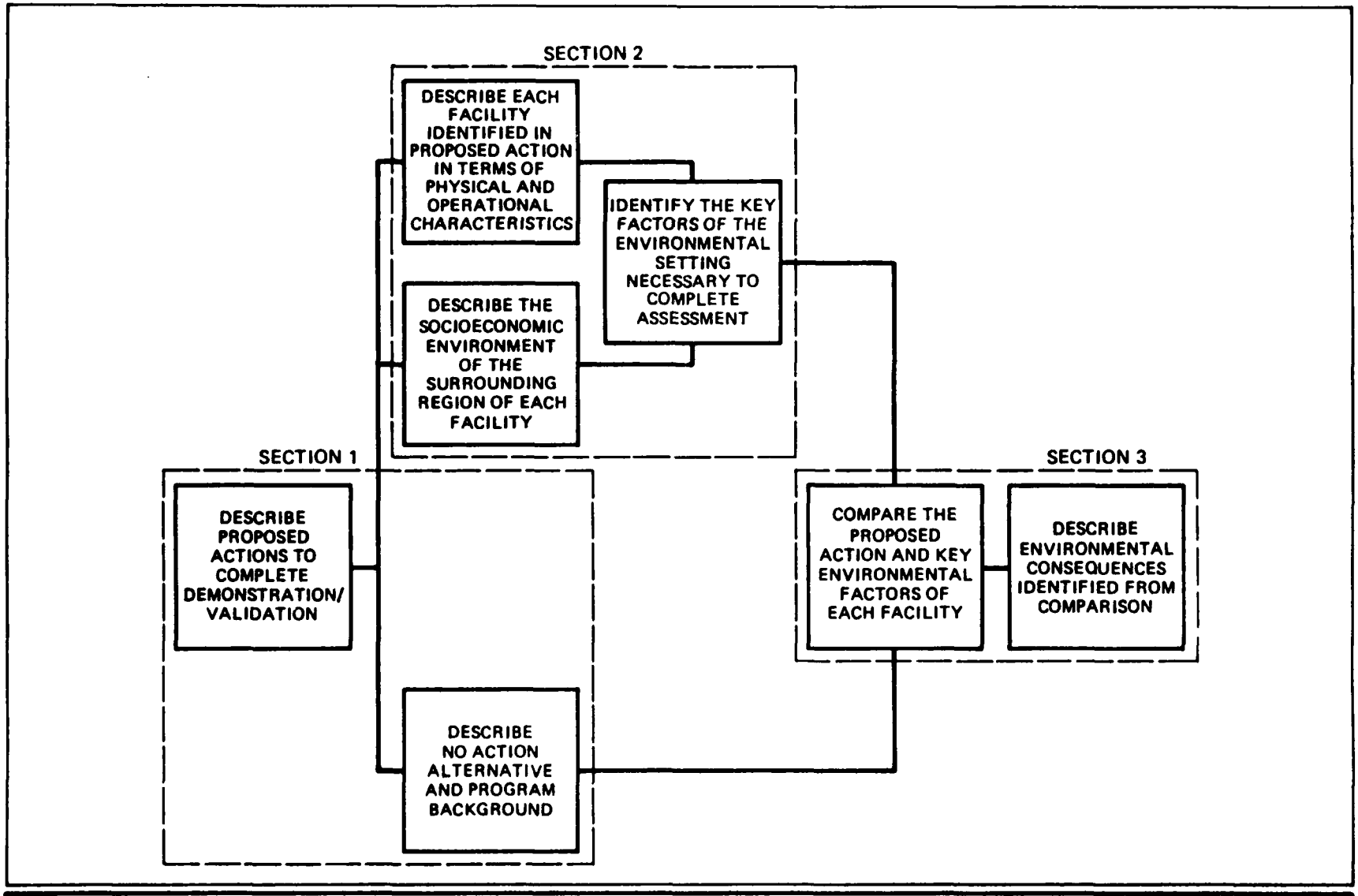
The approach followed to complete this assessment is presented in Figure 1-1. This section describes the test and evaluation activities that would be completed for SBI and identifies the contractor and government facilities where the activities would be carried out. Section 2 characterizes those facilities and the surrounding communities and Section 3 assesses the potential environmental consequences of the activities.

Demonstration/Validation of the SBI technology would consist of a number of tests. Descriptions of these tests were developed from documentation describing the SBI Demonstration/Validation program and interviews with program personnel who developed the documentation. Section 1.3 describes the types of tests and their locations. Also, where possible, other factors related to the tests, such as work force or hazardous materials requirements, have been described.

The remainder of this section briefly describes the background of the Strategic Defense Initiative program, the purpose of and need for the SBI technology, the proposed action, and the no-action alternative.

1.1 BACKGROUND

The President's announcement of a Strategic Defense Initiative on March 23, 1983, initiated an extensive research program to determine the feasibility of developing an effective ballistic missile defense system to protect the United States and its allies from enemy missile attack. The Strategic Defense Initiative Organization was established to plan, organize, coordinate, direct, and enhance the research and testing of technologies applicable to strategic defense. Future implementation of a Strategic Defense System would be based on the Strategic Defense Initiative research program.



GENERAL APPROACH TO COMPLETE ENVIRONMENTAL ASSESSMENT

FIGURE 1-1

1.1.1 Classes of Architecture

The Strategic Defense Initiative has produced several candidate architecture options and has promoted advanced technology concepts to support these architectures. The term "architecture" refers to the function and interrelationship of individual elements or subsystems within a possible system. To date, three classes of possible architecture have been defined (50):

- Combined space-based and ground-based sensors and weapons to counter long-range ballistic missiles
- Ground-based weapons to counter long-range ballistic missiles
- Airborne sensors and ground-based weapons to counter shorter-range tactical ballistic missiles.

The combined space- and ground-based architectures would employ a series of satellites to sense, track, and destroy the threatening missiles and reentry vehicles (i.e., warheads) in the boost, post-boost, or midcourse phase of their trajectory. A ground-based system, which would back up the satellites, would intercept warheads in the latter part of their flight. Early evolving systems for both space- and ground-based architectures would use kinetic-energy weapons; later systems may use directed-energy weapons (lasers or particle beams).

As currently envisioned, the ground-based architecture could meet an offensive missile in the midcourse and reentry phases, although boost-phase intercept capability (by use of ground-based directed-energy weapons) is currently being investigated. A series of satellites would provide early warning, and ground-based intercept vehicles would then destroy the incoming warhead.

The third architecture would use airborne sensors to track shorter-range tactical ballistic missiles and ground-based weapons for target destruction. The shorter flight times of tactical ballistic missiles would require fast identification, tracking, discrimination, and reaction, which in turn would require greater sensor sensitivity and faster data processing.

Many technologies currently are being investigated to support the three architectures described above. Among the technologies being considered for Demonstration/Validation are space-based technologies:

- Boost Surveillance and Tracking System (BSTS)
- Space-based Surveillance and Tracking System (SSTS)
- Space-Based Interceptor (SBI)

and ground-based technologies:

- Exoatmospheric Reentry Vehicle Interception System (ERIS)
- Ground-based Surveillance and Tracking System (GSTS)
- Battle Management/Command and Control, and Communications (BM/C^3).

Among the space-based technologies, the SBI system would consist of weapon-carrying satellites capable of identifying and tracking the targets, predicting trajectories, and destroying warheads in the boost, post-boost, and midcourse phases. If deployed, the SBI would consist of multiple space vehicles, each containing a weapon platform housing multiple rocket-propelled interceptors. The SBI weapon platform would contain an attitude control system, a communications system, and a computer system. The computer system of the platform would be linked to the individual computer subsystems in the interceptors; this linkage would enable target location data to be transferred from the platform to the interceptor. The interceptor would contain a homing subsystem that would have the ability to seek out and home in on a target. The homing subsystem would provide the homing capability through sensor, computer, propulsion, and communications subsystem.

This Environmental Assessment addresses the SBI technology. Separate Environmental Assessments have been prepared for the other technologies being considered for Demonstration/Validation. The potential cumulative environmental effects of testing several technologies at the same facility are addressed in the Strategic Defense Initiative Demonstration/Validation Program Environmental Assessments Summary.

The Defense Acquisition Board will decide whether the SBI technology is ready to proceed to Demonstration/Validation based on examination of cost, schedule, readiness objectives, affordability, initial operational capability, conceptual soundness, and environmental consequences.

1.1.2 Stages of Strategic Defense Initiative Development

DoD Directive 5000.1 calls for a staged approach to the DoD acquisition process. In keeping with that mandate, DoD's major system acquisition process consists of four distinct stages: Concept Exploration, Demonstration/Validation, Full-Scale Development, and Production/Deployment. These four stages are separated by three major decision points (Milestones I, II, and III). Prior to Milestone I, the Defense Acquisition Board will review the results of Concept Exploration and decide whether the subject technology will be carried forward into Demonstration/Validation or remain in the Concept Exploration stage. The SBI Strategic Defense Initiative technology is approaching the end of Concept Exploration and preparing for Demonstration/Validation.

In Demonstration/Validation, the SBI technology is tested to demonstrate its ability to perform the task. The Demonstration/Validation stage for the SBI technology includes the following test techniques:

1. Analyses: Examining and evaluating data to define or refine the current knowledge of a technology

2. Simulations: The use of software models representing both the test article and the environment to determine performance abilities

3. Component/Assembly Tests: Demonstrating performance of components and assemblies under simulated conditions such as space or battle environments

4. Flight Tests: The use of flight-qualified device and assemblies in real flight environments to verify performance.

Some SBI Demonstration/Validation activities may require modifications or additions to existing government facilities. Should this occur, the need for supplemental environmental evaluation would be determined in conformance with Council on Environmental Quality and DoD regulations.

1.2 PURPOSE AND NEED

The purpose of the Demonstration/Validation program for SBI is to determine the ability of the technology to perform its intended function, and to provide the information necessary to make an informed decision whether to proceed with Full-Scale Development. These activities are the first steps needed to support a decision to develop, produce, and deploy the SBI technology, which is integral to an effective strategic defense.

The function of SBI would be to use the kinetic energy of a space-based interceptor rocket as the mechanism for destroying the enemy's assets in the powered and unpowered flight portion of intercontinental and submarine-launched ballistic missile trajectories (Figure 1-2). The SBI would provide a necessary element of one alternative architecture of the proposed Strategic Defense System.

1.3 PROPOSED ACTION

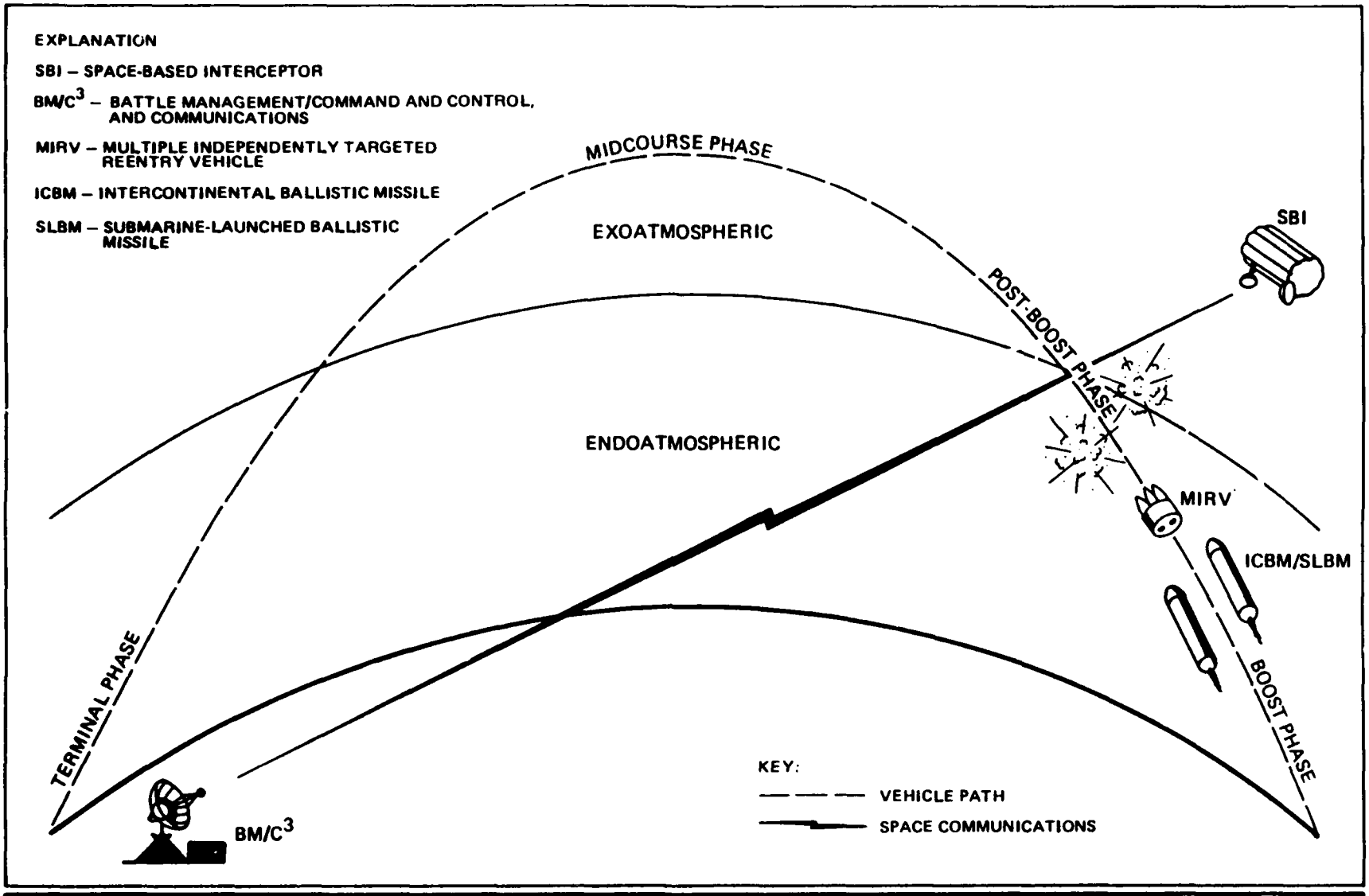
The proposed action is the Demonstration/Validation program for the SBI technology. This program would demonstrate whether the system can meet its specific performance requirements and would provide the information necessary for the Defense Acquisition Board to recommend a Milestone II decision to proceed into Full-Scale Development.

Demonstration/Validation of SBI would require analyses, simulations, component/assembly tests, and flight tests of the SBI homing subsystem and space platform. A system simulator would be used to evaluate the interface between all the subcomponents and to predict overall performance. Component/assembly testing would be conducted in existing facilities. Flight tests of the homing subsystem would use of new launch facilities constructed for another program at an existing missile test range.

Demonstration/Validation testing is needed to address the following technical issues:

- Homing Subsystem: Verify that the weight of the weapon can be reduced significantly; verify that the data processing circuitry can be hardened against space and nuclear environments.

- Platform: Verify that the platform can protect itself against hostile threats; verify that the data processing circuitry can be hardened against space and nuclear environments.



FUNCTIONAL CONCEPT OF
SPACE-BASED INTERCEPTOR

FIGURE 1-2

The Demonstration/Validation test activities for the SBI program are divided into analyses, simulations, component/assembly tests, and flight tests. Each of these categories and the subcategories specific to SBI are described in greater detail in Appendix A. The SBI test activities and their locations are summarized in Table 1-1. The following paragraphs provide additional descriptions of the test activities where such descriptions are appropriate. Figure 1-3 presents the locations of the test facilities.

1.3.1 Analyses

Analyses would be conducted to optimize the SBI configuration in terms of the number of orbiting platforms and the number of homing subsystems per platform. Some of the issues that are factors in this optimization are the efficiency of the homing subsystems in destroying a target (number of shots necessary to ensure a kill), and the number of platforms needed to maintain continuous coverage even if some platforms are disabled.

Onboard computers (general processor hardware) would be analyzed for required data processing capacity, ability to function in a hostile environment (hardening), and capability of recovering from upsets of memory status (fault tolerance). Platform dynamics, including attitude control, behavior during deployment (initialization), deployment speed, and survivability would be studied.

The above analyses would be conducted at existing contractor facilities which have not yet been identified, and the National Test Facility (see Table 1-1). Other studies would address the behavior of the homing subsystem in flight.

Analyses would be conducted to characterize the performance of the homing subsystem Threat Object Map. The analyses of homing ability and development of Threat Object Maps would be accomplished at existing facilities at Eglin Air Force Base.

1.3.2 Simulations

Simulations create a digital representation of the physical world using specially developed computer software. Each simulation assigns a specific value to all physical parameters in the simulated system; these values are changed in subsequent simulations to determine: (1) how each parameter affects the simulated system, and (2) the optimal value for each parameter for maximum system efficiency.

The performance of the homing subsystem would be simulated to ascertain its response to guidance and control signals from the onboard computer, as well as its ability to find a target based on a Threat Object Map. The ability of the weapon to respond to an order to divert from a target would also be simulated. These simulations would be performed in existing facilities at Eglin Air Force Base. Other simulations would take place at contractor facilities.

TABLE 1-1.
DEMONSTRATION/VALIDATION TESTING FOR THE SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine optimum number and orbits of platforms and homing subsystems to ascertain SBI architecture	X	X			Contractor facilities[2]
	X	X			National Test Facility[3]
Determine ability of computers to function onboard in a hostile space environment	X	X	Space Chamber		Contractor facilities[2]
Ability of computer to accurately and rapidly function in space for an extended duration	X	X			Contractor facilities[2]
Evaluate platform dynamics, including attitude control, deployment speed, and survivability	X	X			Contractor facilities[2]
	X	X			National Test Facility[3]
Assess homing ability of the sensors and thrusters	X	X			Contractor facilities[2]
	X	X			Eglin Air Force Base
				X	U.S. Army Kwajalein Atoll[3]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).

TABLE 1-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Sensor ability to identify and guide to targets	X	X	Scene Generator/ Flight Table		Eglin Air Force Base
			Movable Target and Safety Net		Edwards Air Force Base
				X	U.S. Army Kwajalein Atoll[3]
Response of sensors and thrusters to guidance and control signals	X	X	Flight Table		Eglin Air Force Base
Ability of thrusters to divert from target	X	X	Flight Table		Eglin Air Force Base
			Movable Target and Safety Net		Edwards Air Force Base
				X	U.S. Army Kwajalein Atoll[3]
Ability of sensors and thrusters components to survive hostile space environment	X	X	Radiation Acoustic, Thermal Vacuum, Radar Cross-section Chambers		Contractor facilities[2]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).

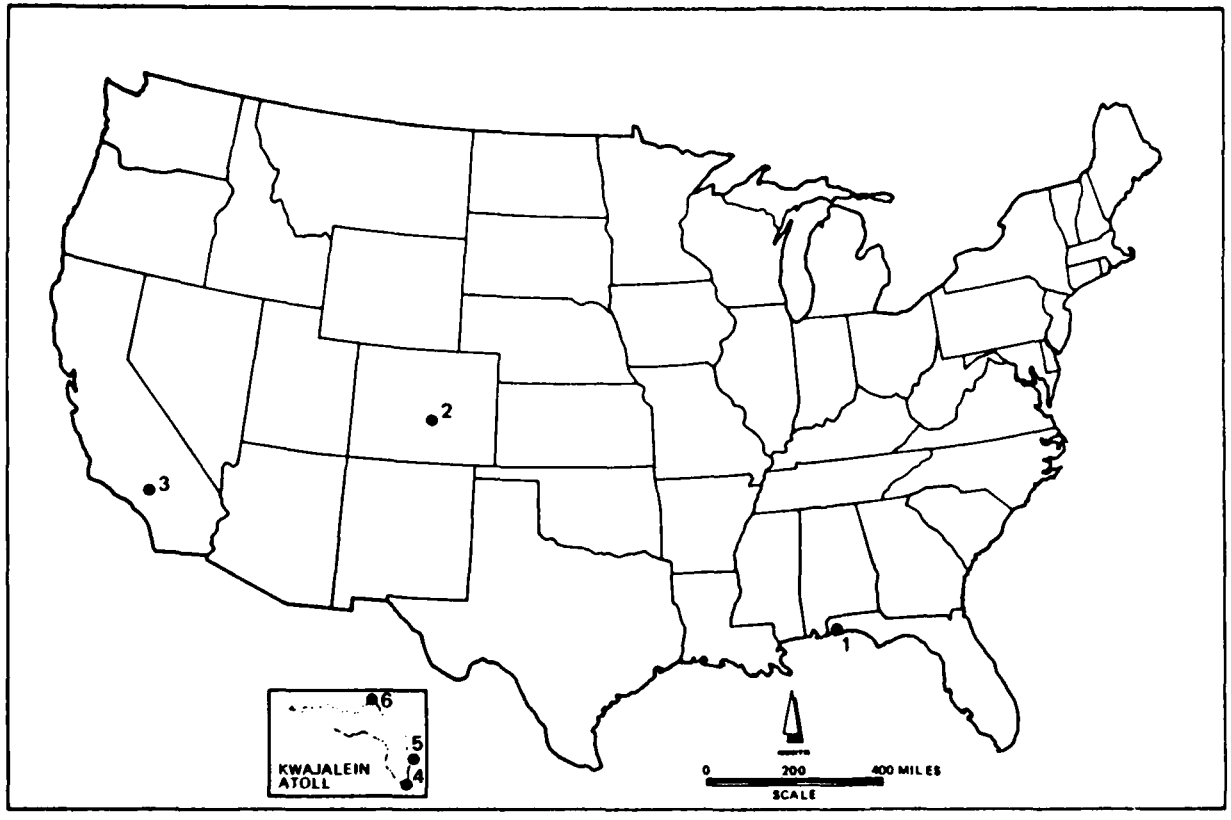
TABLE 1-1 (Continued).
DEMONSTRATION/VALIDATION TESTING FOR THE
SPACE-BASED INTERCEPTOR

TEST ACTIVITIES	TEST TECHNIQUES				LOCATIONS[1]
	Analyses	Simulation	Component/ Assembly	Flight	
Determine ability of hardware and software to detect and intercept target				X	U.S. Army Kwajalein Atoll[3]
Analysis and storage of flight test data	X				National Test Facility[3]

[1] Adequate facilities exist unless otherwise noted.

[2] The selected contractor will certify compliance with all Federal, State, and local environmental laws and regulations.

[3] Facility construction or modification required (excluding minor modification).



SPACE-BASED INTERCEPTOR
DEMONSTRATION/VALIDATION FACILITIES

FIGURE 1-3

1.3.3 Component/Assembly Tests

The objective of component/assembly testing is to control some particular aspect of the physical environment surrounding a hardware component being developed. During the test, data are collected on the environment and the performance of the hardware component being tested. A chamber generally represents the environment; the hardware component is subjected to the environment and the response of the hardware is recorded and analyzed for future modifications.

Hardware-in-the-loop testing substitutes the actual component for portions of the computer models. Hardware-in-the-loop testing of SBI sensors would be conducted at Eglin Air Force Base in an existing building. The sensor would be strapped to a table with three degrees of freedom and a monitor screen would show an image of a target to the sensor.

The performance of the SBI platform's digital processor in a nuclear environment would be evaluated in a nuclear radiation chamber at contractor facilities.

SBI components would be tested in environmental chambers simulating the space operational environment, exposing them to a vacuum, solar radiation, and radiation cooling. System parameters, such as radar cross-section, would also be tested in a chamber. The radiation and environmental chamber tests would be conducted at contractor facilities chosen for their operational parameters.

Testing pursuant to the development of the SBI booster would occur at the Air Force Astronautics Laboratory at Edwards Air Force Base. Testing of boosters would be conducted on a stationary pad. The motors would be checked, and the thrusters would be fired and measured for propellant force. Divert maneuvers consisting of hover tests of small liquid fuel rockets would be performed. These tests are intended to determine the ability of the homing subsystem boosters to maneuver the homing subsystem. The homing subsystem would be tested to determine if the side thrusters could enable it to keep up with a target. The homing subsystem would be enclosed by a safety cage during these tests.

Existing or slightly modified facilities at Edwards Air Force Base would be used for static test firings of the homing subsystem propulsion system and tethered flight tests of the homing subsystem against a movable target with a safety net.

1.3.4 Flight Testing

Flight tests are conducted within a missile range that generally consists of a launch area with launch pads or silos, associated control and support facilities, a safety area around the launch area, and a controlled land/sea/air area for flight and impact.

Two suborbital flight tests would be conducted at the U.S. Army Kwajalein Atoll to evaluate the homing subsystem homing performance, guidance and control systems, and divert maneuver. Two missiles would be launched--a target

missile from Roi-Namur Island and the SBI homing subsystem from Meck Island--within a few minutes of each other. The object of the test would be for the homing subsystem to hit the target missile.

The SBI homing subsystem would be launched with an Aries booster, which consists of the second and third stages of the Minuteman I missile. The target would be a STRYPI, which is composed of a Casper IV, an Antares III, and a Star 27 target-sounding rocket developed by Sandia National Laboratories. The missiles would be shipped to U.S. Army Kwajalein Atoll 60 days prior to a scheduled launch. Assembly would commence 30 days prior to the launch with completion scheduled for 1 week prior to the test date (31). The launch would take two to three hours (31).

After the launch, personnel at Vandenberg Air Force Base would decode and store the flight test data since Vandenberg serves as the Test and Evaluation Operations Manager (31). Flight tests would occur before 1992 and would take place within a 6-month period (31).

After flight testing, the National Test Facility would interface with all contractors and government facilities and would coordinate the use and analysis of data resulting from the project tests.

1.4 NO-ACTION ALTERNATIVE

The no-action alternative is to continue with Concept Exploration activities without progressing to the Demonstration/Validation stage at this time.

2. ENVIRONMENTAL SETTING

The test activities of the SBI Demonstration/Validation program are identified in Table 1-1. Some of the tests would be conducted at contractor facilities that have not yet been identified. Tests would also be conducted at government facilities at Eglin Air Force Base, Edwards Air Force Base, U.S. Army Kwajalein Atoll, and National Test Facility. This section describes the environmental setting of each government facility in terms of physical and operational characteristics, permit status, and previous environmental documentation. Specific physical characteristics include facility size, base facilities and test facilities, natural resources, visual resources, special environmental conditions, and noise. Operational characteristics include the socioeconomic parameters of staffing, payroll, and housing, and the infrastructure characteristics of electricity, solid waste, sewage treatment, transportation, and water supply.

Permits described are those that relate to air quality, water quality, and hazardous waste. Previous environmental documentation includes environmental compliance plans, base master plans, environmental assessments, and environmental impact statements. The socioeconomic characteristics of the counties and communities surrounding each facility are also presented.

The data for each planned test facility provide general information and additional descriptions of special environmental concerns such as threatened and endangered species or areas presenting unique project/site characteristics. The level of detail reflects the anticipated program consequences and the availability of pertinent program and facility information.

Many of the tests for the Demonstration/Validation program would be completed at contractor facilities. SBI contractors have yet to be selected through the DoD procurement process. The selected contractor would be required to meet all Federal, State, and local environmental laws and regulations necessary for facility operations.

The methodology used in developing the descriptions of the government facilities that would be used in the program involved identifying and acquiring available literature, such as environmental assessments, environmental impact statements, and base master plans. The literature was reviewed and data gaps, (i.e., questions that could not be answered from the literature) were identified. To fill the data gaps, facility personnel were interviewed by telephone. Where this report utilizes information collected through telephone interviews, appropriate references are presented in the List of References, Section 6; primary contacts for each facility are listed in Section 5. The following subsections describe the environmental setting of each of the government facilities where Demonstration/Validation activities are planned.

Ten areas of environmental consideration are addressed: (1) air quality; (2) water quality; (3) biological resources; (4) infrastructure: electricity, solid waste, sewage treatment, water supply, transportation; (5) hazardous

waste; (6) land use; (7) visual resources; (8) cultural resources; (9) noise; and (10) socioeconomics.

Several of the resource areas, specifically air quality and water quality, are regulated by federally mandated standards. The treatment, storage, and disposal of hazardous wastes are also regulated by Federal standards. Where federally mandated standards do not exist, qualitative evaluations were made. A discussion of each resource area is provided below.

Air Quality

Air quality concerns at each facility were evaluated in terms of the National Ambient Air Quality Standards and the location of the facility in an attainment or nonattainment area. For existing air emissions sources, the facility was evaluated for the emissions standards contained in the associated State Implementation Plan. Possible air emissions sources, such as expansion of facilities and new construction, were evaluated using the New Source Review requirements.

Water Quality

Water quality concerns at each location were identified and the facility's record of compliance with permits is presented.

Biological Resources

The Endangered Species Act protects plants and animals threatened with extinction. A review of the environmental documentation of the geographic area surrounding the facility was conducted to determine the documented presence of threatened and endangered species.

Infrastructure

Electricity, solid waste, sewage treatment, water supply, and transportation are infrastructure requirements that ultimately limit the capacity for growth. Capacity and current demand are described for each facility.

Hazardous Waste

The Resource Conservation Recovery Act regulates how a facility can dispose of its hazardous waste. The record of compliance was reviewed to determine the facility's capability to handle any additional wastes and to determine any potential disposal problems.

Land Use

Base master plans, environmental management plans, and other documentation were reviewed to determine any current conflicts between the facility and local standards, and to evaluate the probability of conflict resulting from any planned expansions.

Visual Resources

Existing environmental documentation was reviewed to determine if aesthetic concerns were an issue at any of the facilities.

Cultural Resources

Existing environmental documentation was reviewed to determine if any significant cultural resources in proximity to the facilities would be affected by test activities.

Noise

Existing environmental documentation was reviewed to determine if noise concerns were an issue at any of the facilities.

Socioeconomics

Key socioeconomic indicators (population, housing, employment, and income data) for the supporting region of each facility were examined to evaluate the potential consequences of increased population, expenditures, and employment.

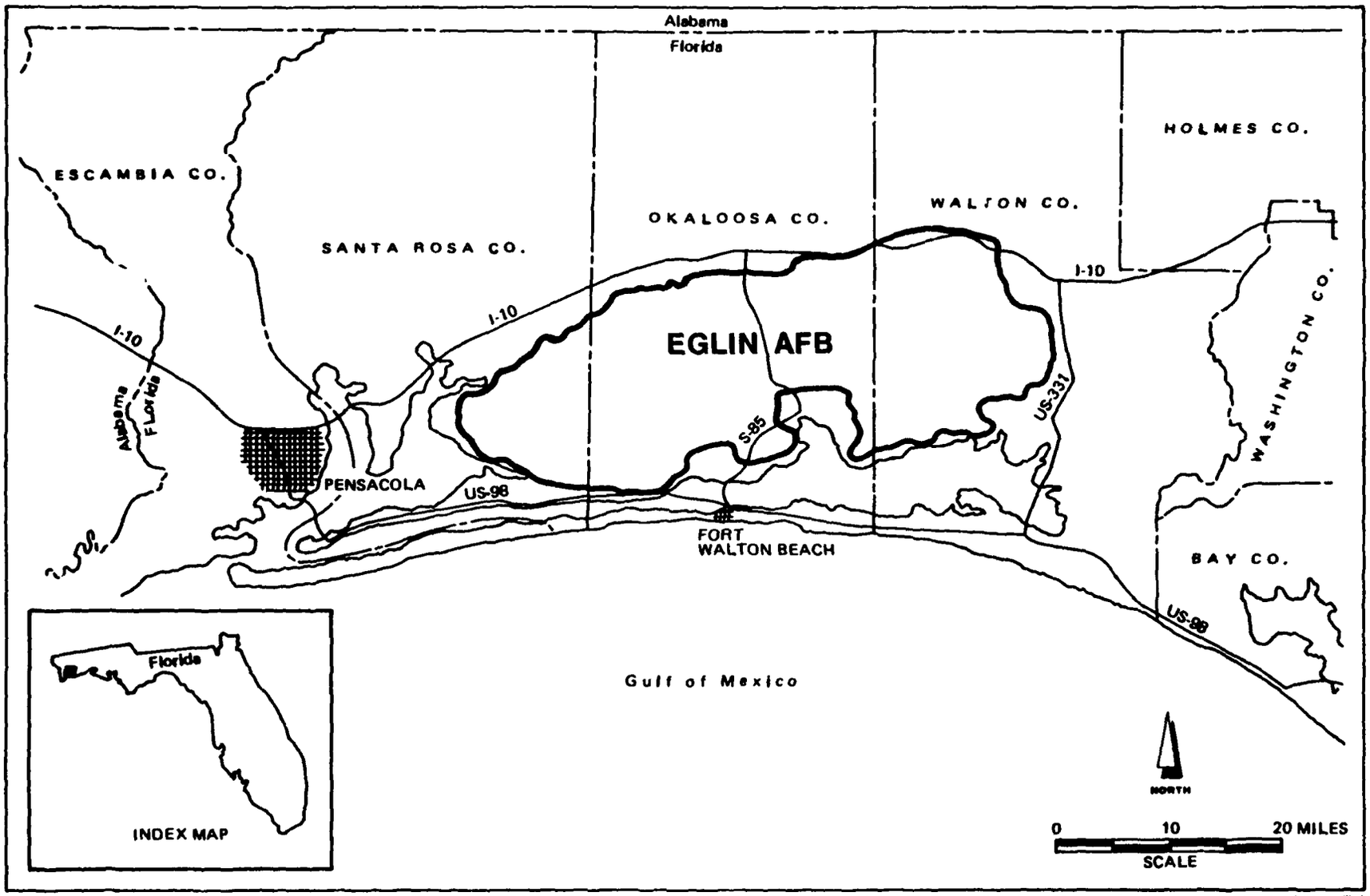
2.1 EGLIN AIR FORCE BASE

Eglin Air Force Base is located in northwest Florida, approximately 5 miles north of Fort Walton Beach and 45 miles east of Pensacola (Figure 2-1). The complex consists of nearly 465,000 acres of land located in Santa Rosa, Okaloosa, and Walton Counties, and approximately 44,000 square miles in the Gulf of Mexico (52). Eglin Air Force Base contains 28 individual ranges which are used for research, development, and testing of non-nuclear munitions, selected ground- and air-launch missiles, delivery techniques and munitions, electronic countermeasure systems, and aircraft/operator maintenance interface equipment (52). A description of the facility and its environment is presented in Table 2-1.

The Analysis and Strategic Defense Division of the Air Force Armaments Laboratory at Eglin Air Force Base conducts analyses and simulations to assess the performance requirements of sensor-containing weapons using a flight table, a scene generator, and computers. This type of testing is currently ongoing 24 hours per day with a staff of about 25 people (27).

For socioeconomic purposes, the supporting region for this facility is defined as the surrounding Okaloosa, Santa Rosa, and Walton Counties, and the community of Pensacola to the west. Table 2-2 contains selected socioeconomic data for these areas.

Based on available data, Eglin Air Force Base is in compliance with Federal standards for air quality and hazardous waste (22). Three of the five operating wastewater plants on Eglin Air Force Base have permits pending denial for inadequate operations and maintenance manuals, and for potential groundwater contamination (15). Environmental documentation has been prepared for Eglin Air Force Base (Environmental Narrative, September 1978) (5). Environmental documentation for operations at the Air Force Armaments Laboratory is prepared for each individual activity (5).



LOCATION MAP OF EGLIN AFB, FLORIDA

FIGURE 2-1

TABLE 2-1
SELECTED ENVIRONMENTAL CHARACTERISTICS
EGLIN AIR FORCE BASE

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	464,980 acres on land	52
		BASE FACILITIES	28 ranges used for research, development, and testing; additional 44,000 square miles in the Gulf of Mexico used in range activities	52
		TEST FACILITIES	50,000-foot-long speed test track, Radar Target Scatter facility, Central Inertial Guidance Test Facility, Armament Development Test Facility	13
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Eglin AFB Natural Resources Management Progam harvests and markets forest products; interest in possible oil reserves on base, but currently no development.	36
		VISUAL RESOURCES	Location is characterized by gently rolling terrain that is heavily wooded and interspersed by many lakes and streams; natural features include coastal plains and sand hills.	36
		SPECIAL STATUS	Approximately 300 archaeological sites on base; none listed on National Register of Historical Places, but 34 sites have been nominated. Two federally listed endangered species, the Okaloosa Darter and Red-Cockaded Woodpecker, and one threatened species, the Eastern Indigo Snake, inhabit the Eglin area. Additional threatened or endangered species which may be permanent or migratory inhabitants include the Peregrine Falcon, Bald Eagle, Brown Pelican, Wood Stork, Florida Everglade Kite, and Bachman's Warbler.	36
		NOISE	No community annoyance problems are known to exist; aircraft traffic runways designed to comply with Air Force directives.	36
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Military = 10,972, civilian = 3,982, contractor = 1,378 (1987)	13
		PAYROLL	$382 Million (1987)	13
		HOUSING	Officer = 263, NCO = 2,072, Transient = 88, trailer spaces = 227, (1987)	13

TABLE 2-1 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
EGLIN AIR FORCE BASE

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	System 1984 peak demand = 1,400 MW; capacity = 1,900 MW. Supplied by Gulf Power System, which serves Florida Panhandle.	36
		SOLID WASTE	Volume generated in 1986 was 24,057 tons Class I waste, and 50,770 tons Class II (construction debris). Disposal is offbase at a county facility.	23
		SEWAGE TREATMENT	Sewage generated by Eglin Air Force Base is treated by six municipal facilities; total capacity of six facilities = 3.2 million gallons/day; current use = 2.7 million gallons/day.	36
		TRANS-PORTATION	Four main east-west routes and three north-south routes access the base. State Highway 85 is the main road to the base and is currently being widened. Mainline railroad service operates on northern border of base.	36
		WATER SUPPLY	Potable water supply capacity = 8.8 million gallons/day. Average daily demand = 4.6 million gallons/day.	36
PERMIT STATUS		AIR	Located within Air Quality control Region No. 5, and is in attainment of air quality standards; two PSD permits, one for the asphalt plant, one for incinerator.	22, 36
		WASTE WATER	Five operating wastewater plants, three have permits pending denial for having an inadequate operations and maintenance manual and groundwater contamination.	15, 52
		HAZARDOUS WASTE	Have RCRA Part B permit, no compliance problems; disposal at out-of-state facilities; no commercial facilities exist in Florida.	22, 36
ADDITIONAL ENVIRONMENTAL INFORMATION	Master Plan is out of date, but a revised version is currently in progress. Recent Environmental Assessment for 1986 Bold Eagle Exercise; nearly same data as for 1984 Bold Eagle Exercise Environmental Assessment. Additional Environmental Assessments prepared for construction and road easements.			23
COMMENTS	Proposed SDI work requires no additional staffing or construction of facilities.			27

TABLE 2-2.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
EGLIN AIR FORCE BASE

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
Okaloosa County					
Population	88,187	109,920	127,523	2.23	3.78
Year-Round Housing	27,218	42,834	N/A	4.64	N/A
Vacancy Rate (%)	8.5	12.4	N/A	--	--
Civilian Labor Force	23,250	40,838	49,261	5.79	4.80
Unemployment (%)	6.5	8.4	6.1	--	--
Per Capita Income ($)[1]	2,623	6,422	9,114	--	--
Median Family Income ($)[1]	7,873	16, 955	N/A	--	--
Santa Rosa County					
Population	37,741	55,988	63,300	4.02	1.24
Year-Round Housing	12,079	20,208	N/A	5.28	N/A
Vacancy Rate (%)	10.2	8.0	N/A	--	--
Civilian Labor Force	11,743	21,961	27,310	6.46	5.60
Unemployment (%)	3.9	7.8	7.4	--	--
Per Capita Income ($)[1]	2,443	6,057	8,557	--	--
Median Family Income ($)[1]	7,706	16,774	N/A	--	--
Walton County					
Population	16,087	21,300	24,675	2.85	3.75
Year-Round Housing	6,025	10,413	N/A	5.62	N/A
Vacancy Rate (%)	12.5	22.8	N/A	--	--
Civilian Labor Force	5,072	7,434	8,977	3.90	4.83
Unemployment (%)	3.3	5.9	6.7	--	--
Per Capita Income ($)[1]	2,048	5,218	6,957	--	--
Median Family Income ($)[1]	5,827	12,748	N/A	--	--

References: 1, 43, 44, 45, 46, 48

[1] Income figures refer to preceding year

TABLE 2-2 (Continued).
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
EGLIN AIR FORCE BASE

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
Pensacola					
Population	59,507	57,619	61,995	-0.32	1.85
Year-Round Housing	21,047	23,289	N/A	1.02	N/A
Vacancy Rate (%)	8.2	7.1	N/A	--	--
Civilian Labor Force	21,962	24,024	28,334	0.90	4.12
Unemployment (%)	5.2	7.0	5.3	--	--
Per Capita Income ($)[1]	2,765	6,881	9,432	--	--
Median Family Income ($)[1]	8,305	17,587	N/A	--	--

References: 1, 43, 44, 45, 46, 48

[1] Income figures refer to preceding year

2.2 EDWARDS AIR FORCE BASE

Edwards Air Force Base is located on the western edge of the Mojave Desert, approximately 100 miles north of Los Angeles, California. The base occupies over 301,000 acres within Los Angeles, Kern, and San Bernardino Counties (Figure 2-2). The activities at Edwards Air Force Base support the engineering, testing, and evaluation of aircraft and aeronautical weapons systems. A description of the facility and its environment is presented in Table 2-3.

The Air Force Astronautics Laboratory is responsible for developing rocket propulsion technology for the Air Force in support of ballistic, air-launched, and space missile systems. The facility hosts laboratories for research and technology work on rocket motor components, basic combustion processes, propellants, and electric and solar propulsion (4). The Air Force Astronautics Laboratory completes range tests on sensors and thrusters. This type of testing is routinely conducted 10 to 15 times per year (28). The testing generally takes between 3 and 5 days to set up and calibrate (29) and 20 seconds to run the test (28). Between 10 and 15 people from regular government and contractor staff are involved in these tests (28).

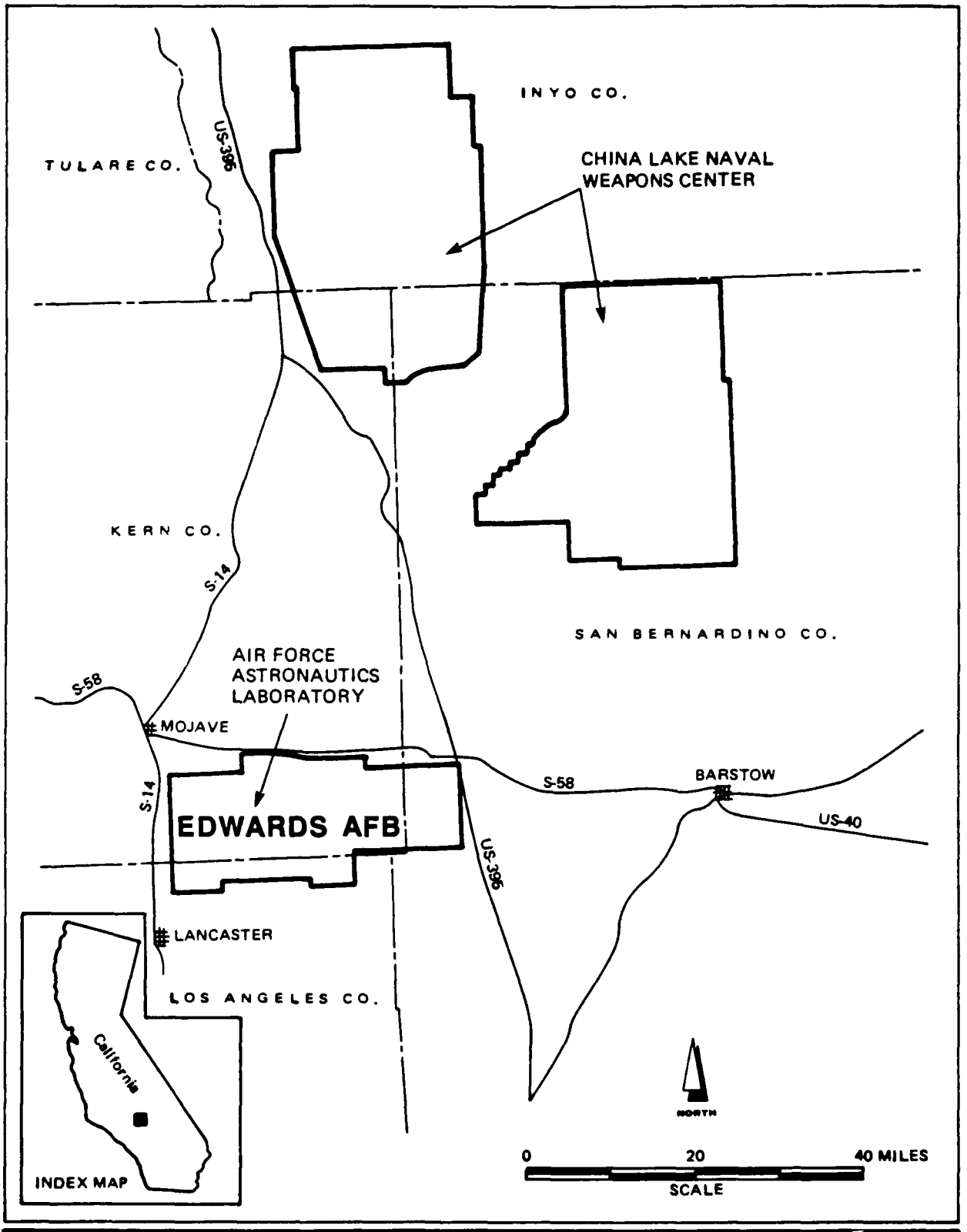
For socioeconomic purposes the supporting region for this facility is defined as surrounding Kern County and the nearby community of Lancaster. Table 2-4 contains selected socioeconomic data for these areas.

Based on available data, Edwards Air Force Base is in compliance with all applicable environmental regulations (6, 33). A recent environmental assessment was prepared for the Air Force Space Division Beryllium Propellant Facility (30). Environmental documentation is prepared as needed on an individual basis.

2.3 U.S. ARMY KWAJALEIN ATOLL

Kwajalein Atoll is a northern atoll within the Ralik Chain of the Republic of the Marshall Islands, located east-southeast of Guam (Figure 2-3). The Marshall Islands were previously administered by the United States under a strategic trust established by the United Nations (24). The Compact of Free Association prepared by the government of the United States, the Marshall Islands, the Federated States of Micronesia, and Palua in 1980 established a sovereign Marshall Islands government (24). The Compact was approved by the United Nations in 1986.

Kwajalein Atoll consists of a very large interior lagoon (839 square miles) surrounded by approximately 100 component islets (24, 37). The U.S Army Kwajalein Atoll encompasses the Kwajalein Atoll and includes facilities on the islands of Kwajalein, Roi-Namur, Ennylabegan, Meck, Ennugarret, Gagan, Gellinam, Omeleck, Eniwetak, Legan, and Illeginni (49). United States resident populations are located on Kwajalein and Roi-Namur. A description of the facility and its environment is presented in Table 2-5 .



LOCATION MAP OF EDWARDS AFB, CALIFORNIA

FIGURE 2-2

TABLE 2-3
SELECTED ENVIRONMENTAL CHARACTERISTICS
EDWARDS AIR FORCE BASE

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	301,000 acres	13
		BASE FACILITIES	Landing site for Air Force Flight Test Center missions on Roger Dry Lake, high altitude flight corridor which traverses Base, USAF Test Pilot School	13
		TEST FACILITIES	Rocket propulsion laboratory, avionics and weapons test facilities	13
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Mining activity in the surrounding desert region, but none on Edwards Air Force Base	33
		VISUAL RESOURCES	The base is located in a remote desert area characterized by gently undulating alluvial fans, dry lake beds, and prominent high features, such as ridges, hills, and buttes.	33
		SPECIAL STATUS	Special status plants and animals found in the vicinity of Edwards Air Force Base which are candidates for Federal protection include: Desert Cymopterus, Mojave Spine Flower, Desert Tortoise, and Mojave Ground Squirrel. Approximately 400 prehistoric archaeological sites on base.	33
		NOISE	Ground-based and airborne sources affect the ambient noise levels which are typical of the rural area of Edwards Air Force Base. Frequent flight testing adds intermittent, single event noises. Noise sources, sound propagation, and community acceptance not problems.	33, 36
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Government and contractor civilians = 8,281, military = 4,859 (1987; for Edwards Air Force Base)	13
		PAYROLL	$304 million (1987; for Edwards Air Force Base)	13
		HOUSING	Officer = 534, NCO = 3241, Transient = 218, Mobile home units = 164 (1987; for Edwards Air Force Base)	13

TABLE 2-3 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
EDWARDS AIR FORCE BASE

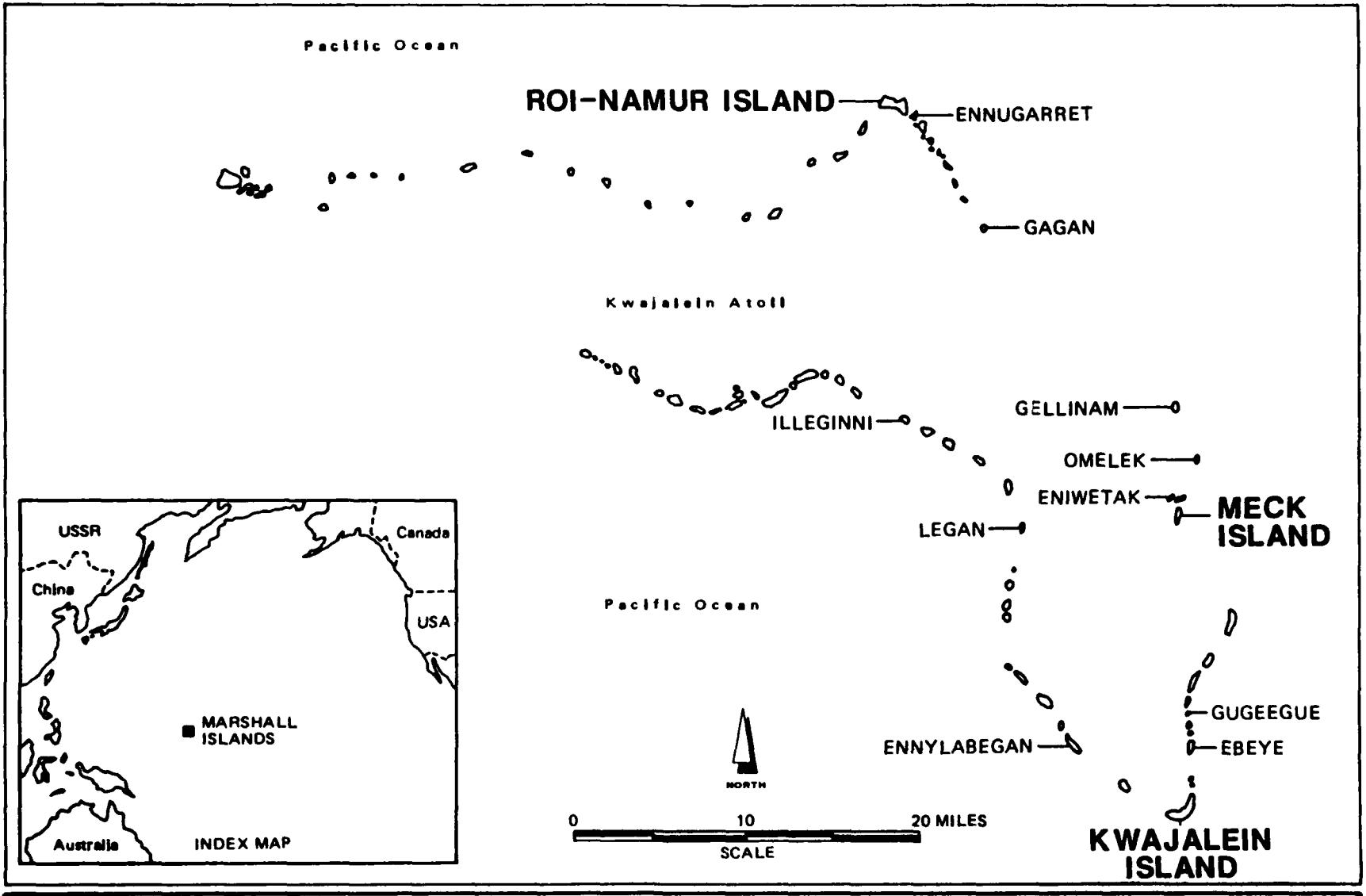
				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	1984 average daily demand = 41 kWh. Yearly consumption represents 56% of substation capacity. Supplied by Southern California Edison and the Western Area Power Administration	36
		SOLID WASTE	Onbase landfill disposal space is being rapidly exhausted. Only inhouse domestic trash is disposed onbase; contractor waste is disposed offbase; future inhouse domestic trash will be disposed offbase or in new facility onbase.	10
		SEWAGE TREATMENT	Onbase facility capacity = 1.25 million gallons/day. Rocket Propulsion Laboratory has a separate wastewater treatment and sewage system. Maximum sewage flow = 1.1 million gallons/day for the peak summer season.	36
		TRANS-PORTATION	Access to Edwards Air Force Base via SR 14, SR 58, and US 395. Mainline railroad service to north and west of base.	33
		WATER SUPPLY	Demand for potable water is 4.5 million gallons/day; supplied by nine wells with a capacity of 12.5 million gallons/day.	33, 36
PERMIT STATUS		AIR	Located within the Southeast Desert Air Basin; Kern County portion is unclassified or in attainment for all pollutants; San Bernardino County portion is in non-attainment for ozone, unclassified for total suspended particles, and in attainment for other pollutants.	33
		WASTE WATER	Wastewater is discharged into holding ponds; no existing NPDFS permits.	6
		HAZARDOUS WASTE	Disposal at licensed commercial facilities in central California	33
ADDITIONAL ENVIRONMENTAL INFORMATION			Environmental Assessment for construction and operation of Beryllium Propellant Facility, 1987; Environmental Impact Statement, Small Intercontinental Ballistic Missile Program, 1986; Environmental Assessment for SDI work at the Air Force Astronautics Lab in progress	28
COMMENTS			The Air Force Astronautics Laboratory is located on Edwards Air Force Base. Data derived is for Edwards Air Force Base. SDI testing to be conducted at Air Force Astronautics Laboratory will not use any propellants or facilities that have not been used in the past.	29

TABLE 2-4.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
EDWARDS AIR FORCE BASE

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
Kern County					
Population	330,234	403,089	462,371	2.01	3.49
Year-Round Housing	109,815	154,321	N/A	3.46	N/A
Vacancy Rate (%)	7.4	9.4	N/A	--	--
Civilian Labor Force	117,390	175,679	216,544	4.11	5.37
Unemployment (%)	6.7	7.7	12.2	--	--
Per Capita Income ($)[1]	2,820	6,990	8,806	--	--
Median Family Income ($)[1]	8,936	18,780	N/A	--	--
Lancaster					
Population	N/A	48,027	54,921	N/A	3.41
Year-Round Housing	N/A	18,120	N/A	N/A	N/A
Vacancy Rate (%)	N/A	4.5	N/A	--	--
Civilian Labor Force	N/A	22,227	23,037	N/A	0.90
Unemployment (%)	N/A	6.7	8.7	--	--
Per Capita Income ($)[1]	N/A	8,097	10,421	--	--
Median Family Income ($)[1]	N/A	22,551	N/A	--	--

References: 1, 44, 45, 46, 48

[1] Income figures refer to preceding year



LOCATION MAP OF U.S. ARMY KWAJALEIN ATOLL
REPUBLIC OF MARSHALL ISLANDS, MICRONESIA

FIGURE 2-3

TABLE 2-5
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	Approximately 100 component islands in Kwajalein Atoll, total land area = 3,584 acres; Kwajalein Island = 768 acres, Roi-Namur = 419 acres, Meck Island = 55 acres; lagoon = 75 x 15 miles	24, 37, 49
		BASE FACILITIES	Marine terminal facilities, storage warehouses, power plants, underground power distribution system, 6,800 x 250 foot runway, air terminal, deepwater fuel pier, fuel farm, mechanical and electrical repair shops, administrative office space, barracks and dormitory, hospital, schools	49
		TEST FACILITIES	Tracking radar, optical instrumentation, telemetry facilities, multiple launch facilities	49
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	Coconut harvest and operation of fisheries. Mineral deposits of limited quantity within the Marshall Islands, but non-existent on Kwajalein Atoll.	24, 26
		VISUAL RESOURCES	Most of the islands are elongated in shape, flat, and rise no more than 15 feet above sea level. Original surface features of Meck Island have been completely altered.	37, 39
		SPECIAL STATUS	One endangered species, the Hawksbill Turtle and one threatened species, the Green Sea Turtle, may nest on the following islands under U.S. Army control or partial control: Roi-Namur, Legos, Ningi, Ennylabegan, Ennugarret, and Omelek. Turtles have been observed at southwestern end of Kwajalein Island, feeding off food-wastes dumped daily into oceans. No forest preserves established; existing parks and sanctuaries either privately owned or operated by the local state authorities. The entire islands of Kwajalein and Roi-Namur are listed as historical battlefields on the National Register. All actions (i.e., construction) must conform to Army Regulation 420-40, which considers the National Historical Preservation Act.	17, 24, 37, 39
		NOISE	No data available on noise levels for U.S. Army Kwajalein Atoll activities	
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	There are approximately 2,600 total non-indigenous persons residing at U.S. Army Kwajalein Atoll facilities (2,350 on Kwajalein Island and 250 on Roi-Namur).	9, 38, 55
		PAYROLL	Data not available	
		HOUSING	519 Family Housing Units (Permanent & Trailer); 1,202 Barracks & Dormitory Beds; 150 Transient (1984; note that additional housing construction is currently underway)	9, 38

TABLE 2-5 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURE	ELECTRICITY	Electricity on Kwajalein supplied by diesel generators; Peak load: Kwajalein = 9960 kW; Ennylabegan = 350 kW; Roi-Namur = 5300 kW. Capacity: Kwajalein = 5.2 million kWh; Ennylabegan = 217,000 kWh; Roi-Namur = 2.7 million kWh; Meck 795 kW.	37, 38
		SOLID WASTE	Metal wastes transported by barge to authorized dumping site 21 miles west of the Kwajalein Atoll. Other wastes incinerated within EPA standards or placed in sanitary landfills. Wet waste dumped into ocean off Kwajalein Island. Past problem with seepage from landfill into the shorewaters.	16, 18, 37, 55
		SEWAGE TREATMENT	Sewage treatment plant on Kwajalein Island is designed to treat an average design flow of 0.45 mg/liter and remove 85% to 90% of suspended solid and 75% to 85% biochemical oxygen demand. After 90% of solids are removed, the total effluent is 450,000 gallons/day. Roi Namur has five pumping stations served by a septic tank and a leach field on the island's east side. No sewage treatment facilities exist on the west side of Roi-Namur. Untreated sewage is currently collected from the bachelor's quarters and dining facilities and pumped via a 12-inch main directly into the Kwajalein Atoll Lagoon. Residents are restricted from using these areas for health concerns and there is a potential for contamination of the island's freshwater supply.	37, 38, 55
		TRANSPORTATION	Sea transportation network provides inter-island movement of cargo and passengers, and logistical support from the major governemental centers to all inhabited outer islands. On Kwajalein Island, there are 13 miles of paved road, 300 vehicles; no vehicular congestion. Workers from Ebeye are brought over by ferry. Air transportation available on Kwajalein Island.	19, 24, 38, 49
PERMIT STATUS		WATER SUPPLY	Inhabited islands have rainwater catchment systems, none of which supplies enough potable water for the area's needs. Salt water is used in sewers and for fire fighting. Underground lenses of fresh water can provide in excess of 50 million gallons per year on Kwajalein Island, and 8 million gallons per year on Roi-Namur. Groundwater resources on other islands unknown. Water consumption from all sources on Kwajalein Island = 272,580 gallons/day, Roi-Namur = 25,309 gallons/day, Ennylabegan = 2,629 gallons/day. Portable desalination units are being brought to the U.S. Army Kwajalein Atoll to cover needs until desalination plant is built on Kwajalein in FY 1991. Droughts in recent years have resulted in inadequate water supply for the existing populations on Kwajalein and Roi Namur Islands. In emergency situations, water from Kwajalein Island is barged to Roi-Namur.	19, 37, 38, 55
		AIR	Air pollution currently not a problem due to the constant tradewinds, the island's low profile, and lack of constraining factors. Air pollutants are generated from transportation, range operations, power plant generators, dust, and waste incineration. Power plant generators are the major source for particulates, sulphur, oxides, and nitrogen oxides. 1979 estimates of power plant emissions showed emissions approaching the limits of EPA standards for nitrogen oxide.	18, 24, 37

TABLE 2-5 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
U.S. ARMY KWAJALEIN ATOLL

			REFERENCE NO.
PERMIT STATUS (Continued)	WASTE WATER	Water quality standards may be violated as a result of toxic metal leaching from a solid waste disposal site used by U.S. Army Kwajalein Atoll operations.	16, 17, 37
	HAZARDOUS WASTE	Known hazardous wastes on Kwajalein: PCBs, solvents, asbestos, hydrazine fuel. When hydrazine fuel is used, someone is brought in specifically to handle the associated problems; no known violations; has a hazardous waste management plan implemented to comply with Army Regulation 420-47. All toxic metals are returned to the United States for disposal.	17, 18, 55
ADDITIONAL ENVIRONMENTAL INFORMATION		EIA, Internal Operations, 1974; EIA, Kwajalein Missile Range Operations, 1980; EA, Family Housing Dwellings, 1986; EA, Missile Impacts, Illegini Island, 1977 Environmental Consideration, ERIS, Meck Island, 1986; Environmental Consideration, HEDI, Meck Island, 1986; Environmental Consideration, AOA, 1985; Environmental 124 Consideration, TIR, 1987; EA Power Plant upgrade, Kwajalein Island, 1987	3, 9, 11, 20, 21, 37, 39
COMMENTS		- U.S. operations on the Kwajalein Atoll must comply with all NEPA standards. However, there is no formal permitting procedure or monitoring. It is the responsibility of the user agency to make sure standards are met.	17, 18
		- Any reentry debris from Western Test Range activities that land in the Kwajalein Lagoon are required to be removed in compliance with the "clean bottom" policy.	2

Technical facilities present on the U.S. Army Kwajalein Atoll include multiple launch facilities, and numerous supporting elements such as tracking radars, optical instrumentation, and telemetry stations (49). Support services include airports, warehouses, and maintenance buildings (49). During the last decade U.S. Army Kwajalein Atoll has served an important role in research related to exoatmospheric ballistic missile defense, development of the MX missile system, and support of other advanced DoD research (49). Radars, optical instrumentation, and telemetry facilities were installed on Meck Island during this time (49). Also, major facilities have been established on Roi-Namur by the Defense Advanced Research Projects Agency. Since 1976, ballistic missile defense activities have been limited to research and technology demonstration programs (49).

For socioeconomic purposes, the supporting region for the U.S. Army Kwajalein Atoll is defined as the islet of Ebeye. This is the main concentration of Marshallese at Kwajalein Atoll; although no missile range staff or dependents reside on Ebeye, the economy of this community relies almost exclusively on the range facility (37). Selected information on staffing and housing, and the payroll for the facility itself is contained in Table 2-5. Additional data on the socioeconomic background of Ebeye, including information on population, housing, and employment, are provided in Table 2-6.

Based on available data, it has been determined that U.S. Army Kwajalein Atoll facilities are in compliance with all applicable environmental permitting requirements except for water quality (17, 18, 37). One endangered species, the Hawksbill Turtle, and one threatened species, the Green Sea Turtle, may nest on several islands under U.S. Army Kwajalein Atoll control: Roi-Namur, Lagos, Ningi, Ennylabegan, Ennugarret, and Omeleck. Both species have been observed off the southwestern end of Kwajalein Island (18, 24, 37, 49).

Operations at U.S. Army Kwajalein Atoll were evaluated by the U.S. Army in "Environmental Impact Assessment of Kwajalein Missile Range Operations, Kwajalein Atoll, Marshall Islands, Revision No. 1," dated August 1980 (37). That document concluded that range operations:

- Had not resulted in significant adverse, direct effects on the physical or human environment at that time
- Had created significant direct, short-term social and economic benefits
- Had resulted in long-term cumulative constraints to future uses of the islands by the native Marshallese
- Had resulted in controversial, long-term, indirect effects on Marshallese society.

Construction of new housing units for the families of personnel working on Strategic Defense Initiative programs has been addressed in a 1986 U.S. Army study, "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases, Kwajalein Island" (40). Construction of launch facilities on Meck Island has been addressed in two record of environmental consideration documents prepared by the U.S. Army in December 1986 (3). Construction and operation of a power plant expansion on Kwajalein Island has been addressed in

TABLE 2-6.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
U.S. ARMY KWAJALEIN ATOLL (EBEYE)

POPULATION

Total Persons		Density per sq. mi. (Area = 76 acres)
1967:	3,540	29,810
1973:	5,469	46,055
1980:	6,169	51,949
1985:	7,875	66,316

(For comparison, population density in Washington D.C. is about 12,000 persons per sq. mi.)

Percent of Marshallese residents on Ebeye born on Ebeye, 1973 = 48%

Median Age

1967:	16 years
1973:	15 years
1980:	14 years

HOUSING

Total Units		Median Persons Per Household	
1967:	308	1967:	7
1980:	602	1980:	9

Vacancy Rate

1980: 1.6%

EMPLOYMENT

1982: 996 employed full time

62% USAKA
28% RMI public service
10% Local economy
(sales of goods to population)

References: 25, 41, 42, 49, 51

"Environmental Assessment for Upgrade of Power Plant No. 1, Kwajalein Island, Marshall Islands, May 1986: (12).

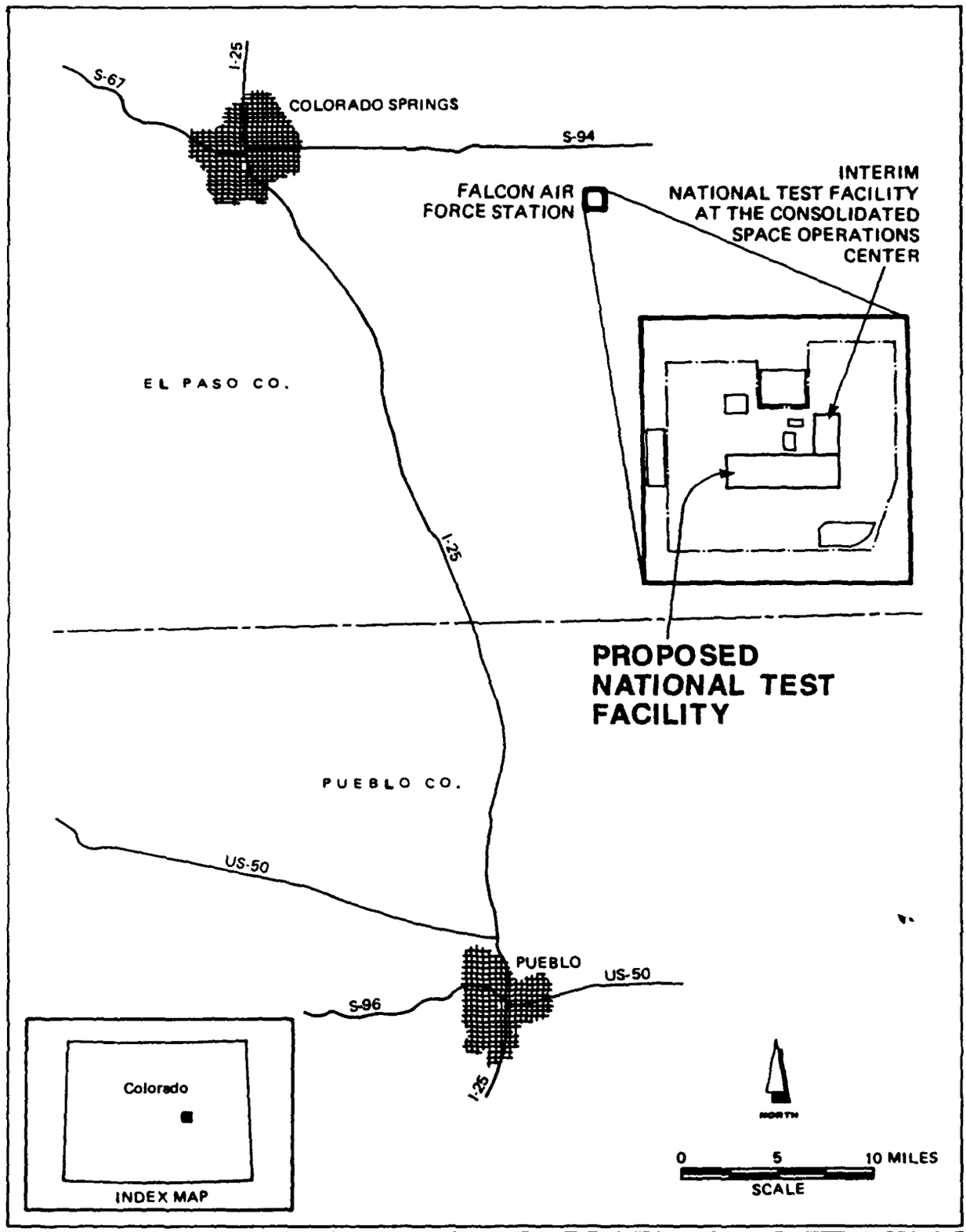
2.4 NATIONAL TEST FACILITY

The National Test Facility will be constructed at Falcon Air Force Station (34). An interim facility will be operated out of the existing Consolidated Space Operations Center, also located at Falcon Air Force Station. This facility is in El Paso County, Colorado, about 12 miles east of Colorado Springs (Figure 2-4). The present mission of the Consolidated Space Operations Center is to provide support for military space operations through communications centralization and data link operations. The facility and its environmental characteristics are described in Table 2-7.

The Consolidated Space Operations Center was built to house two mission elements: the Satellite Operations Center and the Space Shuttle Operations Center (32). The former performs command, control, and communications service functions for orbiting spacecraft. The latter was to conduct DoD Shuttle flight planning, readiness, and control functions. The interim National Test Facility could be located at the Consolidated Space Operations Center because adequate support facilities are available (35).

For the purpose of socioeconomic assessment, the supporting region for this facility is defined as the surrounding El Paso County and the nearby community of Colorado Springs. Selected socioeconomic data for these areas are contained in Table 2-8.

Based on available data, the Falcon Air Force Station, including the Consolidated Space Operations Center and the proposed location of the National Test Facility, is in compliance with Federal standards for air quality, water quality, and hazardous waste. Environmental documentation has been prepared for both the National Test Facility (National Test Facility Environmental Assessment) (34) and for the interim National Test Facility at the Consolidated Space Operations Center (Categorical Exclusion, control number AFSPC 86-1) (35).



LOCATION MAP OF NATIONAL TEST FACILITY AT FALCON AFS, COLORADO

FIGURE 2-4

TABLE 2-7
SELECTED ENVIRONMENTAL CHARACTERISTICS
NATIONAL TEST FACILITY

				REFERENCE NO.
PHYSICAL CHARACTERISTICS	FACILITIES	SIZE	640 acres	1
		BASE FACILITIES	Administrative offices, communications network	34
		TEST FACILITIES	Advanced communications network capabilities	34
	ENVIRONMENTAL CONDITIONS	NATURAL RESOURCES	None on facility	8
		VISUAL RESOURCES	Region consists of gently rolling plains characterized by semiarid grasslands used for agricultural grazing; Falcon Air Force Station is considered developed, as high-technology buildings and support facilities dominate the landscape.	34
		SPECIAL STATUS	None on facility	8
		NOISE	Current ambient noise level is 40 L_{dn}, which is below acceptable limits.	7
OPERATIONAL CHARACTERISTICS	SOCIOECONOMICS	STAFFING	Military = 895, Active Duty; Civilian = 2,088 (1987, at Falcon Air Force Station)	13
		PAYROLL	$0.9 Million (1987; Civilian payroll, at Falcon Air Force Station)	13, 53
		HOUSING	Officer = 106; NCO = 384; Transient = 130; (1987; at Peterson Air Force Base, no known housing at Falcon Air Force Station)	13

TABLE 2-7 (Continued)
SELECTED ENVIRONMENTAL CHARACTERISTICS
NATIONAL TEST FACILITY

				REFERENCE NO.
OPERATIONAL CHARACTERISTICS (Continued)	INFRASTRUCTURES	ELECTRICITY	Peak daily demand = 6,100 kWh for Consolidated Space Operations Center; Capacity = 15,000 kW; can be expanded to 25,000 kW	34
		SOLID WASTE	Disposed offsite at licensed landfill by private contractor	7
		SEWAGE TREATMENT	Design capacity = 0.069 millon gallons/day; designed to support 2,300 Base personnel	34
		TRANS-PORTATION	Access to Falcon AFS provided by State Highway 94 and Enoch Road. Current traffic at Enoch Road = 1,550 vehicles/day, capacity 11,300 vehicles/day. Current traffic at SH 94 = 3,500 vehicles/day, capacity 16,000 vehicles/day.	34
		WATER SUPPLY	The Cherokee Water District contract with Falcon Air Force Station limits delivery of water to 0.479 million gallons per day. Existing peak water demands at the installation are estimated at 0.409 million gallons per day.	34
PERMIT STATUS		AIR	Attainment by Colorado standards (Falcon AFS is located outside the Colorado Springs non-attainment areas for carbon monoxide and total suspended particulates)	7
		WASTE WATER	NPDES Permit is in place for wastewater that is discharged offbase into lagoons.	7
		HAZARDOUS WASTE	Potential Hazardous Wastes: electrolytes, sodium hydroxide, sodium sulphide, dichlorodiflouromethane, sulfur dioxide, SSP-55 all in very small amounts; offsite disposal by Defense Reutilization Management Office	7, 9
ADDITIONAL ENVIRONMENTAL INFORMATION	No environmental compliance plan available. The Base Master Plan is being developed and is expected to be completed in June 1988; there are no land use or zoning conflict issues. Current EA: National Test Bed Program, 1987; Final Environmental Impact Statement, Consolidated Space Operations Center, January, 1981			8, 34
COMMENTS	National Test Facility has categorical exclusion as stated in document 813 (control # AFSPC 86-1) dated 8-12-86. Data is for Falcon Air Force Station, unless otherwise noted.			35, 57

TABLE 2-8.
SELECTED SOCIOECONOMIC INDICATORS FOR THE SUPPORTING REGION
NATIONAL TEST FACILITY

Area/Indicator	1970	1980	1984	Annual Change 1970-1980 (%)	Annual Change 1980-1984 (%)
El Paso County					
Population	235,972	309,424	349,066	2.75	3.06
Year-Round Housing	72,913	116,770	N/A	4.82	N/A
Vacancy Rate (%)	7.3	7.7	N/A	--	--
Civilian Labor Force	71,085	130 297	163,883	6.25	5.90
Unemployment (%)	5.5	/.6	5.4	--	--
Per Capita Income($)[1]	2,920	7,027	9,812	--	--
Median Family Income ($)[1]	8,974	18,729	N/A	--	--
Colorado Springs					
Population	140,512	215,105	247,739	4.35	3.59
Year-Round Housing	46,502	88,189	N/A	6.61	N/A
Vacancy Rate (%)	7.7	7.9	N/A	--	--
Civilian Labor Force	46,414	98,140	123,504	7.78	5.92
Unemployment (%)	5.7	7.4	5.3	--	--
Per Capita Income ($)[1]	3,001	7,404	10,292	--	--
Median Family Income ($)[1]	9,089	18,987	N/A	--	--

References: 1, 44, 45, 46, 48

[1] Income figures refer to preceding year

3. ENVIRONMENTAL CONSEQUENCES

This section assesses the potential environmental consequences of the SBI tests. It is based on a comparison of the tests described in Section 1 and the facilities to be utilized at proposed test locations as described in Section 2. Any identified environmental documentation that addresses the types of activities proposed for the facilities is incorporated by reference.

Many of the tests for the SBI Demonstration/Validation program would be conducted at contractor facilities that have not been identified. The selected contractor would be required to certify compliance with all Federal, State, and local environmental laws and regulations necessary for facility operations, modifications, or construction. If the procurement process required a selected contractor to use Federal funds to conduct an activity with a potential for significant environmental consequences, an environmental analysis of the consequences of such activities would also be required of the contractor. That analysis would be utilized by DoD in completing an environmental assessment or environmental impact statement, as appropriate.

The approach used to complete the Environmental Assessment of the SBI Demonstration/Validation program was described in Section 1. To assess the potential for and the magnitude of impacts from Demonstration/Validation at each government facility, a two-step methodology was utilized (Figure 3-1). The first step was the application of assessment criteria to identify activities with no potential for significant environmental consequences. Activities were deemed to present no potential for significant environmental consequences if they met all of the following criteria (i.e., all "yes" answers):

1. Are the facility and its infrastructure adequate for the proposed activity (i.e., can the tests be conducted without new construction, excluding minor modifications)?

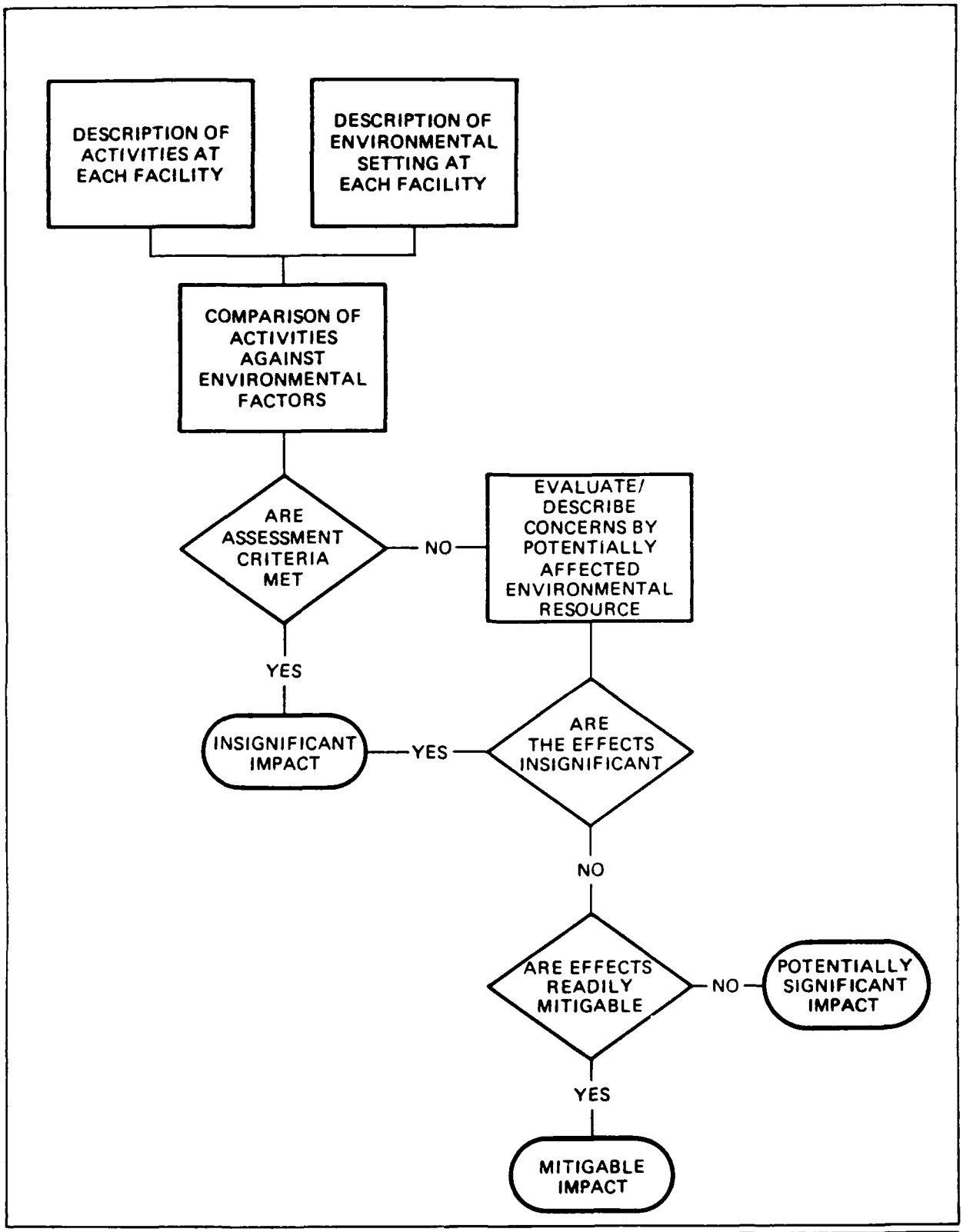
2. Is current staffing at the facility adequate to conduct the test, excluding minor staff level adjustments?

3. Does the facility comply with existing environmental standards?

4. Are the resources of the surrounding community adequate to accommodate the proposed testing?

If a proposed test was determined to present a potential for impact (i.e., a "no" answer to any of the above questions), the second step was to evaluate the activity in the context of the following environmental considerations: air quality, water quality, biological resources, infrastructure, hazardous waste, land use, visual resources, cultural resources, noise, and socioeconomics. As a result of that evaluation, consequences were assigned to one of three categories: insignificant, mitigable, or potentially significant.

Environmental consequences were determined to be **insignificant** if, in the judgment of the analysts or as concluded in existing environmental documentation, no potential for significant environmental impacts exists. Consequences



METHOD FOR ASSESSING
POTENTIAL ENVIRONMENTAL CONSEQUENCES

FIGURE 3-1

were deemed **mitigable** if concerns exist but it was determined that all potential consequences could be readily mitigated through standard procedures, or by measures recommended in existing environmental documentation. If serious consequences exist that could not be readily mitigated, the activity was determined to represent **potentially significant** environmental impacts.

The remainder of this section provides discussions of the potential environmental consequences for each location proposed for the SBI Demonstration/Validation program. The impacts of the no-action alternative and irreversible and irretrievable commitments of resources that would accompany SBI Demonstration/Validation are described at the end of this section.

3.1 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

3.1.1 Eglin Air Force Base

The Analysis and Strategic Defense Division of the Air Force Armaments Laboratory at Eglin Air Force Base would conduct analyses and simulations to assess the SBI homing subsystem performance requirements. The Division is currently conducting similar testing for another Air Force weapons project.

New equipment, including flight tables and scene generators, would be required at Eglin Air Force Base to accommodate the SBI analyses and simulations (27). The additional equipment would be housed in an already converted bay of an existing building (27). Staffing levels are not expected to increase for SBI test activities (27), and as a consequence no socioeconomic impacts are anticipated.

Since no additional staff would be required, existing infrastructure is deemed sufficient to support SBI test activities at Eglin Air Force Base. Testing would not increase electrical demand, and there would be no increase in waste generation rates (27).

Eglin Air Force Base is in compliance with regulatory standards for air quality, water quality, and hazardous waste. The facility currently has numerous operating wastewater treatment plants, two of which discharge to groundwater. Sampling has indicated potential exceedances of established standards (15). However, staff additions would not be required for SBI Demonstration/Validation activities and those activities would not generate additional wastewater. Therefore, the potential for environmental consequences associated with SBI Demonstration/Validation activities at Eglin Air Force Base are anticipated to be insignificant.

3.1.2 Edwards Air Force Base

The Air Force Astronautics Laboratory at Edwards Air Force Base would host two types of tests on the SBI homing subsystem: static tests to verify the control logic of the guidance system and motors, and tethered flight tests against movable or simulated targets. These types of tests are routinely performed at Edwards Air Force Base (28). SBI test activities would not require construction of new facilities, only the addition of computers and interior construction and modification of the facility. The exact location of these tests on

the Edwards Air Force Base has not been decided; the test facility would be either a small room or a shielded area covered with a safety net that would shield the test from wind and aid in the recovery of parts (29). Staffing levels are not expected to increase for SBI testing activities (28), and as a consequence no socioeconomic impacts are anticipated.

Since there would be no additional staff required and similar testing is currently in progress, existing infrastructure for Edwards Air Force Base is deemed sufficient to support the SBI test activities, and exceedances of applicable environmental regulations are not anticipated (28, 29).

Edwards Air Force Base is in compliance with the regulatory standards for air quality, water quality, and hazardous waste. The resources of the surrounding community are deemed adequate to accomplish the testing because it is within the scope of ongoing activities. The environmental consequences associated with SBI Demonstration/Validation activities at Edwards Air Force Base are anticipated to be insignificant. The staff at Edwards has initiated procedures to determine if Air Force regulations require any environmental analysis of the proposed activity (30).

3.1.3 U.S. Army Kwajalein Atoll

Flight testing of SBI would be performed at U.S. Army Kwajalein Atoll. This use of U.S. Army Kwajalein Atoll facilities is consistent with the current missions and operations of those facilities. However, upgrading existing facilities and constructing new facilities would be necessary at Meck, Roi-Namur, and Kwajalein Islands.

On Meck Island, a new missile assembly building, launch pad, and launch equipment rooms are planned for another program (3). It is anticipated that SBI would use these new facilities (31). Communication cables would be installed across the lagoon separating Meck and Roi-Namur Islands to allow synchronization of SBI launches (31).

The potential environmental consequences of refurbishment and construction of launch facilities on Meck Island have been addressed in separate environmental analyses. The U.S. Army Corps of Engineers, Pacific Ocean Division, has prepared a record of environmental consideration for constructing a new missile assembly building, a launch pad, and launch equipment rooms on Meck Island (3). The result of the record of environmental consideration was Categorical Exclusion #7, as defined in Appendix A to Army Regulation 200-2 (3). This exclusion applies to "construction that does not significantly alter land use, provided the operation of the project when completed would not of itself have a significant environmental impact." Projects that fall into this category do not require additional environmental documentation. Copies of the record of environmental consideration are available from the Public Affairs Office, U.S. Army Strategic Defense Command, Huntsville, Alabama.

Existing facilities on Roi-Namur Island would be utilized for SBI target launches. The launch complex and missile assembly building currently at the proposed site would be suitable for supporting such a mission. It is anticipated that no significant modifications of the Roi-Namur launching facilities would be necessary to support SBI test activities. Construction of additional housing, a sewage treatment plant, and a water storage facility are planned by

the U.S. Army to support continuing operations on the island (55). This construction is needed to upgrade existing deficiencies and will occur regardless of the Strategic Defense Initiative Demonstration/Validation decision. Environmental consequences of these proposed construction activities on Roi-Namur Island have not been evaluated in previous documents.

Additional support personnel would be housed primarily at Kwajalein Island, which in turn would require support services and new housing. Current estimates call for an increase in facility population of approximately 5 percent beyond the most recent available population figures (2,432 persons on 30 June 1986) (38) for the U.S. Army Kwajalein Atoll (14). The total population would be below the highest population figure of nearly 6,000 people in 1972 (49).

Housing requirements associated with SBI flight testing include 5 permanent family houses, 111 bachelor quarters, and 20 transient quarters on Kwajalein Island; and 34 permanent bachelor quarters on Roi-Namur Island (12). The environmental consequences of housing construction on the island of Kwajalein to support the SBI program have been analyzed in "Environmental Assessment for Family Housing Dwellings, FY 1987-1989 Phases" prepared by the U.S. Army Strategic Defense Command in 1986 (40). That study, which included evaluations of housing needs to support all Strategic Defense Initiative programs planned or proposed for U.S. Army Kwajalein Atoll, concluded that the proposed construction does not constitute a major Federal action having a significant effect on the quality of the human environment. Copies of the aforementioned Environmental Assessment for Family Housing may be obtained from the Public Affairs Office of the U.S. Army Strategic Defense Command in Huntsville, Alabama.

In addition to new housing, the following new construction on Kwajalein Island is planned: expansion of an existing power plant and a new desalinization facility. An Environmental Assessment was prepared on the construction and operation of the proposed power plant expansion, "Environmental Assessment for Upgrade of Power Plant No. 1, Kwajalein Island, Marshall Islands, May, 1986" (11). That environmental assessment concluded that the proposed action will not constitute a major Federal action with potential for significant impact on the environment (11). Copies of this documentation are available from the Public Affairs Office listed above.

Approximately 4 miles north of Kwajalein Island lies Ebeye Island, the main concentration of Marshallese in Kwajalein Atoll, and for assessment purposes it is defined as the "surrounding community" for the military facility. Ebeye Island has the second-highest population of any island in the Republic of the Marshall Islands, approximately 8,000 people (a density of 66,316 people per square mile), many having migrated there from other islands in search of jobs at the U.S. Army Kwajalein Atoll installation. As a means of reducing population density, a causeway connecting Ebeye Island with adjacent habitable islands is planned (26). Until this anticipated redistribution of population occurs, the dense population of Ebeye Island will continue to place heavy demands upon both manmade and natural resources of the island.

The application of the assessment criteria indicate a potential for environmental impacts related to SBI activities at U.S. Army Kwajalein Atoll. There are proposed facility modifications, additional staff requirements, and a lack of resources in the surrounding community. Thus, a more detailed assessment

addressing each of the environmental considerations was completed. The results of the assessment of each of the environmental considerations are presented below.

Air Quality

Currently, the U.S. Army Kwajalein Atoll has good ambient air quality attributable to strong tradewinds (37). However, 1979 estimates of emissions, especially from the power plant on Kwajalein Island, showed emissions approaching the limits of Federal standards for nitrogen oxide (NOx) (17). Increased staff would require increases in power generating capacity. The expanded power plant would have to meet major stationary source performance standards or obtain a waiver from the Marshall Islands government (17). The environmental assessment prepared for the power plant expansion concluded that mitigation measures would be required (11). Possible mitigation measures include raising the stack height, increasing the velocity of the emissions to increase dispersion, using low-NOx engine design, combustion air cooling, fuel injection recharge, or engines designed to meet the Environmental Protection Agency's proposed New Source Performance Requirements (11). The proposed power plant expansion "can meet all National Ambient Air Quality Standards as well as nitrogen oxide if low NOx combustion and/or enhanced dispersion techniques are employed to reduce ambient impact by 28 percent " (11). Thus, this air quality concern is considered mitigable.

Water Quality

Available data from 1976 indicated that water quality was being degraded as a result of toxic metals leaching from a solid waste disposal site on Kwajalein Island used by U.S. Army Kwajalein Atoll operations (37). Subsequently a wall was constructed. The 1980 "Environmental Impact Assessment of U.S. Army Kwajalein Atoll Operations" noted that although the wall was installed on the ocean side of the Kwajalein Island landfill, a visual inspection in 1978 indicated direct leachate seepage to the ocean was occurring (37). The source of the leachate was considered to be waste oil or sewage tank pumpage that was dumped on the landfill. The landfill is currently used only for disposal of construction waste, and Demonstration/Validation activities associated with SBI are expected to continue this use. The composition of the leachate and the potential change in rate of seepage as a result of the disposal of construction wastes are unknown.

Currently, sewage collected from facilities on the west side of Roi-Namur Island is pumped untreated through a pipe into Kwajalein Atoll Lagoon (37, 55). The discharge of raw sewage into the lagoon has the potential to significantly impact water quality and is in violation of Clean Water Act standards (37, 55). Unless mitigated by avoidance actions by the U.S. Army Kwajalein Atoll commander and the range users the increase in staffing on Roi-Namur Island because of SBI activities would contribute additional untreated sewage to the lagoon. A wastewater treatment facility to provide secondary treatment before discharge is planned (55). Until this treatment facility is operational, impacts to water quality in the lagoon will continue and would be increased by any unmitigated SBI activities that began prior to the operation of the treatment plant. In addition, consequences on water quality from potential increased population on Ebeye Island have not been evaluated in previous documents.

Without mitigating actions, impacts to water quality caused by SBI activities are potentially significant. Continued presence of leachate seepage from the Kwajalein Island landfill and potential mitigations, if any, are not documented. Water quality impacts from sewage discharges from Roi-Namur Island are mitigable if the planned sewage treatment plant is constructed or if the U.S. Army Kwajalein Atoll commander initiates operational mitigation. These and other potential impacts will be addressed in an environmental impact statement to be prepared by the U.S. Army for all continuing operations at Kwajalein Atoll prior to any SBI Demonstration/Validation flight test activities.

Biological Resources

Concrete used in housing and other facility construction may employ coral dredged from surrounding reefs. The construction needed to support activities associated with SBI testing could constitute an increase in the harvesting of coral from surrounding reefs, if coral is used as a construction material as in the past. Extensive reef harvesting could result in degradation of the marine habitat (37). Coral harvesting can be accomplished in a manner that will ensure that critical habitats of marine biota are not degraded. Additional data collection and analysis will be required to identify positive and negative impacts of this activity at U.S. Army Kwajalein Atoll through the environmental impact statement investigations.

Several islands of U.S. Army Kwajalein Atoll, including Roi-Namur Island, have beaches suitable for nesting sites of the endangered Hawksbill Turtle and the threatened Green Sea Turtle. No beaches suitable for turtle nesting have been identified on Kwajalein or Meck Islands (37). Construction and operation activities that take place on Roi-Namur Island should consider possible impacts to these potential nesting beaches. Degradation of marine water quality as discussed in the previous section could adversely impact marine biota. Consequences on biological resources from potential increased population on Ebeye Island have not been addressed in previous documents. Those potential impacts on biological resources will be addressed in the aforementioned environmental impact statement.

Infrastructure

The increased staffing and project activities associated with SBI Demonstration/Validation are expected to increase the demands on infrastructure on Kwajalein and Roi-Namur Islands. Specific areas of consideration include electricity, solid waste, sewage treatment, water supply, and transportation. The aforementioned environmental impact statement will address appropriate mitigations for impacts from increased infrastructure requirements.

- Electricity demands associated with the SBI-related population increase on Kwajalein Island would require increased generating capacity. A concern is the control of nitrogen oxide emissions from the power plant, which is mitigable, as discussed earlier. The planned expansion of the power plant (11, 55) should meet any increased electricity demands.

- Solid waste is currently disposed of by (1) burning combustible material, (2) dumping wet (biodegradable) waste and metal waste in

the ocean, and (3) landfilling (37, 18). Additional staff required for SBI activities would increase the volume of solid waste, but this waste would be disposed of in onbase facilities with adequate capacity.

- Sewage treatment demands at U.S. Army Kwajalein Atoll are expected to increase as a result of the 5 percent increase in inhabitants that would accompany SBI testing. Such an increase in sewage treatment demands at Kwajalein Island is not expected to exceed the plant's existing capacity. However, untreated sewage on the west side of Roi-Namur Island is currently pumped directly into the lagoon (37, 55). Additional staff associated with SBI would increase the volume of untreated sewage. A new sewage treatment facility is planned at Roi-Namur Island (55), which would be designed to provide secondary treatment and have adequate capacity to meet all anticipated needs. The aforementioned environmental impact statement will identify interim mitigation options until a planned treatment facility is constructed.

- Potable water is a limited resource on the islands of the Kwajalein Atoll (40). Water supplies on Kwajalein Island come from rainwater catchment and storage systems and groundwater lenses, although much of the groundwater is brackish. It is possible that increased demand resulting from SBI activities could increase withdrawal of groundwater. Overdraft of groundwater could potentially result in saltwater intrusion and long-term degradation of the available groundwater resources. Kwajalein is unique in that the command has total control over all lens wells and monitors the groundwater level. This complete control with feedback minimizes the possibility of overdrawing the groundwater. Before groundwater depletion were allowed to occur, water rationing would be implemented or alternate sources of water would be utilized, such as importation. The increased demands for potable water that would result from SBI activities would be accommodated through the planned construction of a desalinization system on Kwajalein Island, and construction of a holding tank on Roi-Namur Island (55). These planned mitigation measures are projected to be adequate to ensure sufficient potable water without degrading groundwater resources.

- Transportation on Kwajalein Island is predominantly by means other than automobiles. In 1986 there were only 300 cars for 13 miles of paved road (38). Transportation of employees to Kwajalein and Meck Islands from Ebeye Island is by ferry (19, 49). Increases in the number of Marshallese employees may necessitate increases in ferry capacity.

Hazardous Waste

The U.S. Army Kwajalein Atoll is preparing a Hazardous Waste Management Plan to comply with Army Regulation 420-47 (18). An increase in U.S. Army Kwajalein Atoll operations for the SBI program may increase the volume of hazardous waste produced. The treatment, storage, and disposal of additional hazardous waste must be in compliance with the Hazardous Waste Management Plan.

Land Use

The islands that make up U.S. Army Kwajalein Atoll are dedicated for use as a military installation. The use of this facility for launching missiles and monitoring flight tests is a continuation of an established land use. The long-term impacts on land use from continuing operations at U.S. Army Kwajalein Atoll will be addressed in the aforementioned environmental impact statement.

Visual Resources

The presence of U.S. Army Kwajalein Atoll has significantly altered the visual resources of the islands by extensive development. The current visual resources would continue to be altered by the facility upgrades for SBI activities. Those alterations are anticipated to have an insignificant impact on visual resources.

Cultural Resources

Both Kwajalein and Roi-Namur Islands are considered historically significant sites due to the activities which took place on the atoll during World War II. In addition, potential prehistoric sites have been discovered very recently on Kwajalein Island, some possibly as old as 2,000 years (18). As any excavation during construction activities has the potential for permanently destroying such cultural resources, those activities could have a potential impact. An archaeological survey would be conducted and appropriate mitigations developed during the preparation of the aforementioned environmental impact statement.

Noise

No data are available on noise levels associated with U.S. Army Kwajalein Atoll operations. Based on the distance between launching facilities on Meck Island and the nearest community (more than 10 miles), no significant noise impacts are anticipated from launches at Meck Island. Similarly, the launching of STRYPI target missiles from Roi-Namur Island are not expected to have significant noise impacts.

Socioeconomics

The economy of Ebeye Island relies heavily upon the people residing at U.S. Army Kwajalein Atoll. Because of this dependence, changes in facility population associated with SBI Demonstration/Validation activities could potentially have significant beneficial and adverse socioeconomic consequences at Ebeye Island. An increase of approximately 125 staff and dependents (5.1 percent) living at U.S. Army Kwajalein Atoll is expected, lasting for a period of 1 year (14). Such an increase is expected to have a noticeable direct positive effect on the economy of Ebeye Island in terms of new jobs, which should be complemented by the Job Corps Program recently implemented by the U.S. Army Kwajalein Atoll. Due to the relative size and duration of the population increase this growth in employment is not expected to be significant. There may be indirect socioeconomic consequences of such an increase in U.S. Army Kwajalein Atoll population as well. These indirect effects would take the form of Marshallese migrating from other islands to Ebeye Island as they have before in search of relatively high-paying (guaranteed U.S. minimum

wage) jobs associated with the increases in facility population and activities (37, 49). The consequences of such renewed migration could be serious, adding people to the already dense population of Ebeye Island, and leading to: increased pressure on inadequate housing and public infrastructure; a further decline in public health, below currently unsatisfactory levels; an increase in Marshallese unemployment; further disruption of the economic and socio-cultural mechanisms underlying Marshallese society, both on Ebeye Island and on the islands from which the migrants originated; and increased reliance of the Marshallese on Department of Defense expenditures. At present it is impossible to predict with certainty how many Marshallese would migrate to the area in response to the anticipated increase in SBI-related population and activities at the U.S. Army Kwajalein Atoll. The U.S. Army Kwajalein Atoll currently has a policy limiting the number of Marshallese they employ which may minimize the amount of influx of people to Ebeye Island.

As a result of the analysis of each environmental consideration, potentially significant impacts were identified at U.S. Army Kwajalein Atoll. In recognition of the need to avoid, minimize, and mitigate any potential adverse impacts on the environment of Kwajalein Atoll, the U.S. Army will prepare a comprehensive environmental impact statement addressing the continuing operations at the U.S. Army Kwajalein Atoll, which include the proposed Demonstration/Validation activities (56). The environmental impact statement will address the environmental concerns recognized in this environmental assessment and will identify appropriate mitigations.

3.1.4 National Test Facility

The National Test Facility would be used for analysis and application of data from flight tests of the SBI in simulation exercises. The functions of the National Test Facility in the SBI tests are within the scope of its design. Environmental effects of construction and operation of the National Test Facility are presented in the "National Test Facility Environmental Assessment" (34). This environmental assessment estimated that minor erosion during construction and minor impacts on air quality, ecology, groundwater supply, and vehicular traffic during operation would occur. It concluded that with the implementation of proposed mitigation measures, no significant impacts are anticipated. Copies of the Environmental Assessment may be obtained from the Public Affairs Office at Falcon Air Force Station.

Until the National Test Facility is constructed, the staff necessary to complete the SBI tests would be located at existing facilities at Falcon Air Force Station. The environmental consequences of the proposed use of these existing facilities were addressed in a "Request for Environmental Impact Analysis," control number AFSPC 86-1 (35). The result of this request was an assessment that the interim National Test Facility qualified as a categorical exclusion in accordance with U.S. Air Force Categorical Exclusion 2x. This categorical exclusion states, "This is an administrative action utilizing interior space for personnel and computer equipment." Thus, no further environmental documentation is necessary. This categorical exclusion refers to the environmental impact statement for the Consolidated Space Operations Center (32). Copies of this document may be obtained from the Public Affairs Office at Falcon Air Force Station.

Operation of the National Test Facility would require a significant increase in the staff at Falcon Air Force Station. The previously completed "National Test Facility Environmental Assessment" (34) predicted the creation of approximately 2,300 permanent onsite jobs, as well as a daily average of 400 visitors (because each visit is likely to last several days, visitors were counted as equivalent to employees). Including the visitors, the total maximum daily population would thus be increased by 2,700. On the assumption that only 10 percent of the daily population would be drawn from the local area, it was predicted that more than 2,400 families would relocate to the area. No estimates of the portion of the staffing specific to SBI have been made. While it can be assumed that only a portion of the total staffing is relevant to SBI, the consequences of complete staffing are included as a worst-case analysis.

Applying the four assessment criteria against the test activities and the facility construction they would require shows the potential for environmental effects related to the construction and operation of the National Test Facility, the proposed staffing requirements of the facility, and the resulting socioeconomic presence in surrounding communities. The assessment criteria for compliance with permits are met by the existing facilities. The results of the environmental analysis conducted for the National Test Facility are summarized below.

Air Quality

Current operations at Falcon Air Force Station are in attainment by Colorado standards. Once the National Test Facility is constructed, operations are predicted to add to an existing violation of the 1-hour and 8-hour carbon monoxide Federal standard from automobiles at the intersection of Petersen Boulevard and Highway 94 outside the base (34). This addition can be mitigated through the use of van pools and other conservation measures.

Water Quality

All discharges are in compliance with current permits (7). The environmental assessment for the National Test Facility predicts no significant impact on groundwater or surface water quality (34).

Biological Resources

No threatened or endangered species are identified in the vicinity of the National Test Facility (34). Impacts to biological resources were predicted to be insignificant (34).

Infrastructure

Evaluation of the effects on each of the infrastructure components is as follows:

- The electrical substation can be expanded to 25,000 kW with additional cooling equipment. The National Test Facility will require the addition of 13,000 kW, which could be accommodated by expansion of the substation (34).

- Solid waste is disposed of offsite in a licensed landfill. The amount of solid waste that would be generated by the National Test Facility has not been estimated, but it is anticipated to be a relatively small volume (7).

- Sewage treatment capacity is currently adequate but the construction of the National Test Facility requires an expansion of the capacity of the sewage treatment plant by 0.124 million gallons/day (34). The expansion could encroach on a flood plain. All impacts are anticipated to be mitigable (34).

- Construction and operation of the National Test Facility are projected to increase water requirements from 0.37 million gallons/day to 1.0 million gallons/day (34). Mitigation measures such as conservation, reuse, and drought-tolerant landscaping would reduce the projected water requirements to 0.5 million gallons/day (34). Additional mitigation measures would have to be implemented to prevent exceeding water supply.

- Transportation system capacity exceeds current traffic demands. The addition of the National Test Facility would create significant increases in vehicular traffic, but would be below design capacity; however, increased delays would occur at some intersections (34).

Hazardous Waste

Any hazardous waste would be disposed of in accordance with current applicable regulations (7, 9).

Land Use

There are no current land use or zoning conflicts (8). No conflicts are anticipated for the development and operation of the National Test Facility (34). Expansion of the sewage treatment plant could encroach on a flood plain. This impact can be mitigated through the use of standard flood control measures.

Visual Resources

The current visual landscape is a rolling agricultural grassland (34). The National Test Facility will have an insignificant additional impact on the visual resources because it will be adjacent to an existing building (34).

Cultural Resources

No cultural resources have been identified on the facility; therefore, impacts are anticipated to be insignificant.

Noise

Due to the administrative and industrial nature of the existing facilities on Falcon Air Force Station, impacts from construction and operation are anticipated to be insignificant (34).

Socioeconomics

Unemployment in El Paso County of 5.4 percent (8,800 persons) in 1984, and an adequate availability of housing indicate that the socioeconomic impacts of the growth resulting from construction and operation of the National Test Facility would be insignificant.

The environmental consequences associated with the construction and operation of the National Test Facility are mitigable by the measures described in the "National Test Facility Environmental Assessment" (34). No significant environmental consequences have been identified associated with the operation of the interim National Test Facility based on the "Request for Environmental Impact Analysis," control number AFSPC 86-1 (35).

3.2 ENVIRONMENTAL CONSEQUENCES OF NO ACTION

If the no-action alternative is selected, no additional environmental consequences are anticipated. Concept Exploration would continue at currently staffed facilities with no changes in operations.

3.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Development of the SBI through the Demonstration/Validation stage would result in irreversible and irretrievable commitment of resources such as electronic components, various metallic and non-metallic structural materials, fuel, and labor. This commitment of resources is not different from those necessary for many other aerospace research and development programs; it is similar to the activities that have been carried out in previous aerospace programs over the past several years.

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APPENDIX A
TEST ACTIVITY DESCRIPTIONS

The Demonstration/Validation test activities have been divided into four categories: analyses, simulations, component/assembly tests, and flight tests. This Appendix describes in greater detail the simulations, component/assembly tests, and flight tests identified in Section 1.3.

SIMULATION TESTING

Simulation testing of a physical entity (machine, system component, etc.) is accomplished by developing a computer model of that entity. The model then interacts with data representing physical stimuli to assess the entity's capabilities in real-world conditions. A simulation involves writing and running computer programs, with possible interfaces to other systems or system elements. No impacts on the physical environment are involved other than the commitment of manpower and electrical energy involved in computer operations.

COMPONENT/ASSEMBLY TESTING

The basic concept of component/assembly testing is to control the physical conditions in which the hardware item is tested. Tests are typically conducted in specialized environments, and data are collected regarding the performance of the hardware item in that environment. The scope of the tests may range from single microchip components up to major subassemblies. This section describes those special environments and the tests to be performed.

Space Environment Chamber

A space environment chamber combines the characteristics of various test chambers (thermal, vacuum, radiation, etc.) in order to closely emulate the total space environment in which the test object is designed to operate.

Thermal Chambers

There are two types of thermal chambers. One type uses electrical resistance heaters to increase the internal temperature of the chamber over the external ambient temperature. For large assemblies the energy requirements can be more than 5 kilowatts. Waste heat at the end of a test run is exhausted using low-power fans, or is allowed to radiate into the surrounding building. Normal building air conditioning is designed to accommodate the heat load.

The second type of thermal chamber is designed to lower the temperature of the chamber below ambient levels. For chambers designed to produce earth-surface temperature ranges the design is quite similar to a meat market cold room. Standard air conditioning systems are used to simulate Arctic temperatures. Normally, resistance heaters are use to bring the temperature back up to normal. Typical test programs will last several days. Typical power consumption is on the order of 1 kilowatt.

For extremely low temperatures (simulating space), cryogenic liquids such as liquid nitrogen are used to lower the temperatures. A thermal chamber designed to develop space-type temperatures will have the storage facilities, control systems, and safety systems in place to handle liquid nitrogen. Recovery of the liquid nitrogen is economic for large-scale low-temperature facilities.

In all of these chambers, the test object is placed in the chamber and either statically tested or operated to determine the effects of temperature on its structure or operation. Environmental impacts associated with operation of thermal chambers are limited to those associated with the energy consumption involved.

Vacuum Chamber

Vacuum chambers are used to simulate the airless environment of outer space. Tests are conducted by placing the test object in the chamber and evacuating nearly all the air from the chamber by use of suction pumps. Such chambers do not require large energy resources.

Nuclear Radiation Chambers

The object of a radiation chamber is to determine the detrimental effects of various types of radiation. Radiation testing (other than that involving nuclear explosions) can b~ accomplished by exposing materials to:

- Radiation from a research or test nuclear reactor
- A beta/gamma radioactive source, such as cobalt-60 or cesium-137, in an exposure chamber or pool
- Nuclear particles in an accelerator (Van de Graff, cyclotron, etc.) in a target room (requires very large power source)
- X rays from an x-ray machine (requires large power source).

The specific device used will depend on the type of radiation, energy, and intensity desired, the size of the object and the availability of the facility.

Scene Generator

A scene generator is an optical environment simulator. It is used to drive optical processing equipment (e.g., surveillance systems) in test environments. A sequence of images is produced on an image display device (e.g., television screen). These sequences correspond to scenarios that are commonly encountered in the operational environment or are idealizations designed for testing specific performance aspects. The optical sensor element "views" the images by focusing the images on a detector component. The detected image is then passed to an interpreter which interprets the image and responds according to the interpretation. The responses are recorded for subsequent analysis. Power requires are generally modest.

Rocket Engine Static Testbed

A rocket engine static testbed is designed to measure parameters of rocket engine performance. The engine is mounted on a rigid structure with the thrust aimed in the direction of a massive object (e.g., downward or at a mountain). Thrust, exhaust gas velocities, and temperatures can be measured.

FLIGHT TESTING

The government normally establishes flight ranges to test specific type systems from a dedicated facility. For the purpose of the Strategic Defense Initiative, flight testing can include missiles in ballistic flight trajectories or tests with objects in orbit.

Missile Range

Missile ranges consist of a launch area with launch pads and associated control and support facilities, a safety area around the launch area, and a controlled land/sea/air/space area for flight and impact. A missile range comprises large areas of the earth's surface and include tracking, communications and recovery facilities.

FINDING OF NO SIGNIFICANT IMPACT

STRATEGIC DEFENSE INITIATIVE ORGANIZATION
U.S. DEPARTMENT OF DEFENSE

AGENCY: Department of Defense

ACTION: Decision to conduct Demonstration/Validation tests of the Space-Based Interceptor (SBI).

BACKGROUND: Pursuant to Council on Environmental Quality Regulations for implementing the procedural provisions of the National Environmental Policy Act of 40 CFR Parts 1500-1508, and Department of Defense (DoD) Directive on Environmental Effects in the United States of DoD Actions, the DoD has conducted an assessment of the potential environmental consequences of Demonstration/Validation testing of the Space-Based Interceptor developed by the Strategic Defense Initiative Organization.

SUMMARY: Demonstration/Validation would involve four types of tests: analyses, simulations, component/assembly tests, and flight tests. The locations of test activities for the Space-Based Interceptor are:

FACILITY	TEST TYPE
California	
Edwards Air Force Base	Component/Assembly Tests
Colorado	
National Test Facility, Falcon Air Force Station	Analyses, Simulations
Florida	
Eglin Air Force Base	Analyses, Simulations, Component/Assembly Tests
Republic of the Marshall Islands	
Kwajalein Missile Range	Flight Tests

To determine the potential for significant environmental impacts of the Demonstration/Validation of the Space-Based Interceptor, the magnitude and frequency of the tests that would be conducted at proposed test locations were compared to the current activities at those locations.

To assess impacts, the activity was evaluated in the context of the environmental considerations for air, water, biological resources, infrastructure, hazardous waste, land use, visual resources, cultural resources, noise, and socioeconomics. As a result of that evaluation, consequences were assigned to one of three categories: insignificant, mitigable, or potentially significant.

Environmental consequences were determined to be insignificant if no serious concerns existed regarding potential impacts of the potentially affected area. Consequences were deemed mitigable if concerns existed but it was determined that all of those concerns could be readily mitigated through standard procedures or by measures recommended in existing environmental documentation. If serious concerns were identified that could not be readily mitigated, the activity was determined to represent potentially significant consequences.

FINDING: No significant impacts would result from analyses, simulations and component/assembly testing of the Space-Based Interceptor. A potential for significant impacts resulting from flight testing was found at Kwajalein Missile Range in the Marshall Islands. In recognition of the need to avoid, minimize, and mitigate any potential adverse impacts on the environment of the Kwajalein Atoll, the U.S. Army will prepare a comprehensive environmental impact statement addressing the continuing operations at the U.S. Army Kwajalein Atoll, which include the proposed Demonstration/Validation activities. The environmental impact statement will address the environmental concerns recognized in this Environmental Assessment and will identify appropriate mitigations.

FURTHER
INFORMATION: A copy of

Space-Based Interceptor,
Demonstration/Validation Program,
Environmental Assessment,
July 1987

is available from

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Dated 31 July 1987

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