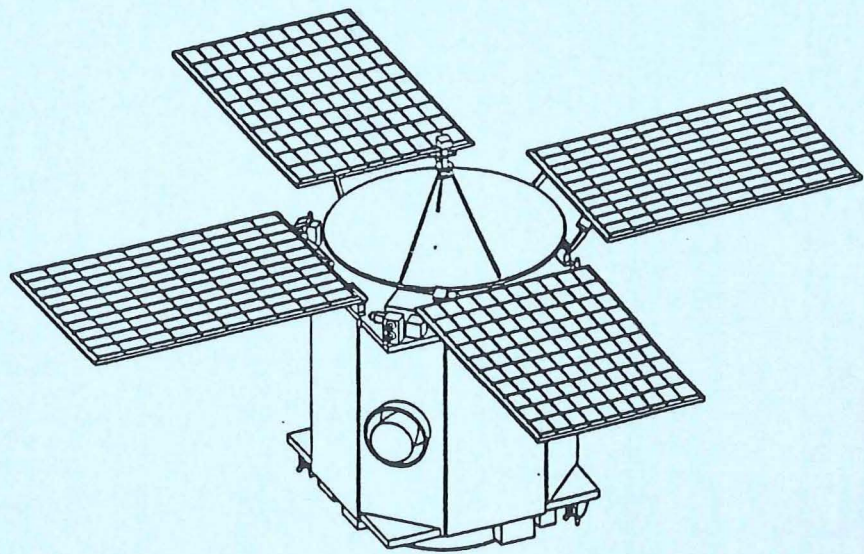


Near Earth Asteroid Rendezvous Mission

Environmental Assessment

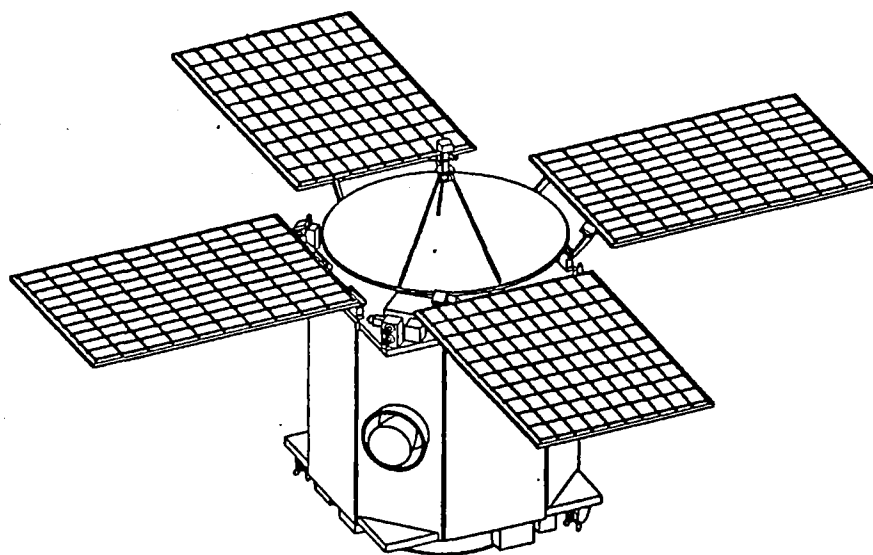


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National Aeronautics and Space Administration
Office of Space Science
Solar System Exploration Division
Washington, DC 20546-0001

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ACRONYMS AND ABBREVIATIONS

AL	Aluminum
AL ₂ O ₃	Aluminum Oxide
APL	Applied Physics Laboratory
BGO	Bismuth Germanate
CCAS	Cape Canaveral Air Station
CCD	Charge Coupled Device
CDR	Command Destruct Receiver
CDU	Command Detection Unit
CEQ	Council on Environmental Quality
Ca	Calcium
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
COMPLEX	Committee on Planetary and Lunar Exploration
ΔVEGA	Delta Velocity Gravity Assist
DOE	Department of Energy
DMCO	Delta Mission Checkout
DSN	Deep Space Network
EA	Environmental Assessment
EOD	Explosive Ordnance Disposal
ER	Eastern Range
FCREPA	Florida Commission on Rare and Endangered Plants and Animals
FDEP	Florida Department of Environmental Protection
Fe	Iron
FGFWFC	Florida Game and Fresh Water Fish Commission
fps	feet per second
FTS	Flight Termination System
FWS	U.S. Fish and Wildlife Service
GaAs	Gallium-Arsenide
Ge	Germanium
GEM	Graphite Epoxy Motor
GRS	Gamma Ray Spectrometer
HCl	Hydrogen Chloride
H ₂ O	Water
HGA	High Gain Antenna
HPF	Hazardous Processing Facility
HTPB	Hydroxyl-Terminated PolyButediene
IELV	Intermediate Expendable Launch Vehicle
JPL	Jet Propulsion Laboratory
KSC	Kennedy Space Center
LBS	Launch Base Support
LC-17	Launch Complex 17, CCAS
LEO	Low Earth Orbit
LGA	Low Gain Antenna

MAG	Magnetometer
MAC	Maximum Allowable Concentration
Mg	Magnesium
MIS	Multispectral Imaging System
MLV	Medium Launch Vehicle
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
m/s	meters per second
mph	miles per hour
MSPSP	Missile System Pre-Launch Safety Plan
MST	Mobile Service Tower
NaOH	Sodium Hydroxide
nT	Nano Tesla
N	Newton
N_2H_4	Hydrazine
NAAQS	National Ambient Air Quality Standard
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NEA	Near Earth Asteroid
NEAR	Near Earth Asteroid Rendezvous
NEPA	National Environmental Policy Act
NIS	NEAR Infrared Spectrograph
NHL	National Historic Landmark
NLR	NEAR Laser Receiver
NO_x	Nitrogen Oxides (generic)
NCS	Nutation Control System
NSI	NASA Standard Initiator
O_3	Ozone
OFW	Outstanding Florida Water
OSHA	Occupational Health and Safety Administration
PAFB	Patrick Air Force Base
PAM-D	Payload Assist Module-Delta
PEL	Permissible Exposure Limit
Pb	Lead
PLF	Payload Fairing
PM_{10}	Particulate Matter
ppm	parts per million
PSP	Project Safety Plan
RCRA	Resource Conservation and Recovery Act
S	Sulfur
Si	Silicon
SO_2	Sulfur Dioxide
S&A	Safe and Arm
SCS	Soil Conservation Service (of the U.S. Department of Agriculture)
SNC	Shergotty, Nakhla, and Chassigny (Meteorites)
SPCCP	Spills Prevention, Control and Countermeasures Plan

SRM	Solid Rocket Motor
SRMU	Solid Rocket Motor Upgrade
SRP	Safety Review Panel
SSE	Solar System Exploration
STP	Sewage Treatment Plant
STS	Space Transportation System
TCU	Telemetry Control Unit
TEL	Telecommunications Subsystem
TMU	Telemetry Modulation Unit
UT	Umbilical Tower
XGRS	X-Ray/Gamma Ray Spectrometer
XRF	X-Ray Fluorescence

EXECUTIVE SUMMARY

PROPOSED ACTION

This Environmental Assessment (EA) addresses the proposed action to assemble, integrate, and launch the Near Earth Asteroid Rendezvous (NEAR) spacecraft from Cape Canaveral Air Station (CCAS), Florida, in February 1996. The spacecraft and its upper stage would be assembled and integrated in facilities at the Kennedy Space Center (KSC) and CCAS, then transferred to Launch Complex 17 (LC-17) on CCAS.

The baseline launch vehicle, a Delta II 7925, would be assembled in facilities at CCAS before being transferred to LC-17. The Delta II 7925 consists of a liquid bipropellant main engine, a liquid bipropellant second stage engine, and nine graphite epoxy motor (GEM) strap-on solid rockets. While most of the checkout of the spacecraft and launch vehicle would be performed at individual integration buildings, operations completed at the launch site would include mounting the GEMs to the first stage, mating the spacecraft and upper stage with the launch vehicle, integrated systems tests and checkout, liquid propellant servicing, and installation of explosive actuators that operate remotely controlled events.

PURPOSE AND NEED FOR THE ACTION

The purpose of the NEAR mission is to conduct a study of the near-Earth asteroid (433) Eros. Near-Earth asteroids are of fundamental scientific importance. They may preserve clues to early solar system processes and to conditions during the formation and early evolution of the planets. Near-Earth asteroids represent bodies of a scale never before studied in detail. Surface processes such as the formation of soil from rocks and surface characteristics of these very low gravity bodies might differ in significant ways from those on larger, more massive objects.

The NEAR mission would be the first detailed, systematic exploration of an asteroid. The study of the asteroid Eros would provide data to characterize asteroid physical and geological properties and indicate elemental and mineralogical composition.

MISSION DESCRIPTION

Under the proposed action, the NEAR spacecraft would be launched from the Cape Canaveral Air Station (CCAS) Launch Complex 17 (LC-17) during a 14 day launch period starting February 16, 1996. Figure 1 shows an ecliptic-plane view of the trajectories of the Earth, Eros and NEAR. NEAR would be launched by a Delta II 7925 rocket into a 3-year duration "2-minus-ΔVEGA" trajectory. In July 1997, a 279 m/sec (915 ft/sec) deep space velocity correction would be performed in two separate firings. This would be followed by an Earth swingby in January, 1998 whereby the Earth's gravity bends the trajectory into Eros' orbital plane. This sets up the optimal geometry needed for the slow approach to EROS in early

January 1999. At that time a rendezvous maneuver would insert the spacecraft into orbit about EROS. This would allow intensive study of the asteroid for a period of up to one year.

ALTERNATIVES CONSIDERED

Alternatives to the proposed action that were considered included those that: (1) utilize an alternate launch vehicle/upper stage combination, or (2) eliminate the NEAR mission (the No-Action alternative).

Alternate Launch Vehicles

The most desirable launch vehicle for NEAR would meet but not greatly exceed the mission's minimum launch performance requirements. Other considerations in the selection of a launch vehicle include reliability, cost, and potential environmental impacts associated with the use of the vehicle. Of the several alternative US and foreign launch vehicles considered, the Delta II 7925 most closely matches NEAR's mission requirements:

- The mass performance of the Delta II 7925/Payload Assist Module-D (PAM-D) most closely matches the NEAR performance requirement.
- The Delta II 7925/PAM-D is the more reliable launch system of the alternative systems meeting the NEAR performance criteria.
- The Delta II 7925/PAM-D is the lower cost alternative launch system of those systems meeting the performance criteria.
- Of the reasonable alternative launch systems examined, all were approximately equal in their potential environmental impacts.

No-Action Alternative

The No-Action alternative would mean the NEAR mission would not be undertaken.

Any environmental impacts associated with the proposed mission would be eliminated. effects of the No-Action alternative would include disrupting the progress of NASA's inner solar system exploration program. The no action alternative would delay or eliminate the gathering of important data needed to study the origin and evolution of our solar system. Thus, this alternative would not satisfy the purpose and need.

SUMMARY OF ENVIRONMENTAL IMPACTS

The only anticipated environmental effects of the proposed action are associated with normal launch vehicle operation which have been previously evaluated and are summarized below.

Air Quality

In a normal launch, exhaust products from a Delta II launch are distributed along the launch vehicle's path. The quantities of exhaust are greatest at ground level and decrease continuously. The portion of the exhaust plume that persists longer than a few minutes (the ground cloud) is emitted during the first few seconds of flight and is concentrated near the launch pad area. The ground cloud resulting from a normal Delta II launch is predicted to have a radius of 20.3 meters (about 67 feet).

Hydrogen chloride (HCl) concentrations in the Delta II exhaust plume should not exceed 5 ppm beyond about 4.3 km (2.7 miles) in a downwind direction. The nearest area where the general public has uncontrolled access is about 4.8 km (3 miles) from LC-17. Appropriate safety measures will be taken to ensure that the permissible exposure limits defined by the Occupational Safety and Health Administration (5 ppm for an 8-hour time-weighted exposure limit) are not exceeded for personnel in the launch area.

To estimate the peak ground level concentrations of ground cloud pollutants, the US Air Force has extrapolated Delta II exhaust plume diffusion data from models developed for the Titan launch vehicle program. These Titan models are used to calculate peak ground level concentrations of various pollutants in ground clouds. Due to the similarity in propellant types, the Delta vehicle ground cloud will be similar in composition to that produced by the Titan. However, the size of the Delta ground cloud should be considerably smaller than that of the Titan because the Delta vehicle and solid rocket GEMs contain substantially less propellant, produce less vapor, and accelerate off the launch pad more quickly than the Titan.

Based upon these comparative studies, HCl concentrations are not expected to be high enough to be harmful to the general population. Although National Ambient Air Quality Standards (NAAQS) have not been adopted for HCl, the National Academy of Sciences (NAS) developed recommended limits for short-term exposure to HCl, ranging from 20 ppm for a 60-minute exposure to 100 ppm for a 10-minute exposure. Since the nearest area where the general public has uncontrolled access is approximately 4.8 km (3 miles) from LC-17, HCl concentrations are not expected to be high enough to be harmful should exhaust components persist at that distance. The maximum level of HCl expected to reach uncontrolled areas during preparation and launch of the Delta II would be well below the NAS recommended limits.

The same predictive modeling techniques used for HCl were also applied to carbon monoxide (CO) and aluminum oxide (Al₂O₃). CO concentrations are not expected to exceed the NAAQS of 35 ppm (1 hr average) beyond the immediate vicinity of the launch complex and are expected to rapidly oxidize to carbon dioxide (CO₂) in the atmosphere. For Titan launches, CO concentrations were predicted to be less than 9 ppm except for brief periods during actual lift-off. Concentrations resulting from a Delta launch should be considerably lower.

Al₂O₃ typically exists as a crystalline dust in solid rocket motor (SRM) exhaust clouds, but is quite inert chemically and is not toxic. The NAAQS for continuous emitters of particulate matter (PM₁₀), 150 µg/m³ (24-hour average), should not be exceeded by a Delta II launch due to the short nature of the launch event.

Nitrogen oxides may enter the atmosphere through propellant system venting; however air emission control devices (scrubbers) will be used to mitigate this small and infrequent pollutant source. First stage propellants will be carefully loaded using a system with redundant spill-prevention safeguards, and vapors from fueling will be treated, then disposed of by a certified hazardous waste contractor.

Space vehicles that use SRMs have been studied concerning potential contribution to ozone depletion because of their exhaust products, with the primary depleting component being HCl [USAF 1990]. Extrapolating from estimates made for the Titan IV solid rocket motor upgrade (SRMU) effects on ozone, it is safe to say that the effect on ozone from a Delta II launch would be negligible and indistinguishable from effects caused by other natural and human-made causes.

Since the ground cloud for a Delta II launch is very small (about 20.3 m or 67 ft) and concentrates around the launch pad, there should be no potential for substantial acid rain beyond the near-pad area.

Land Resources

Overall, launching a Delta II vehicle would not be expected to have substantial negative effects on the land forms surrounding Launch Complex 17. However, launch activities could have some small impacts near the launch pad associated with fire and acidic depositions. Minor brush fires are infrequent by-products of Delta launches, and are contained and limited to the ruderal vegetation within the launch complexes; past singeing has not permanently affected the vegetation near the pads. Wet deposition of hydrogen chloride (HCl) could damage or kill vegetation, but would not be expected to occur outside the pad fence perimeter. Adverse impacts from wet deposition of HCl in natural vegetation adjacent to LC-17 have not been observed or documented.

Local Hydrology and Water Quality

Water, supplied by municipal sources, is used at LC-17 for deluge, launch pad wash down and fire suppressant, and potable water. Starting approximately 5 minutes before liftoff, deluge water will be released to suppress acoustic levels and dissipate excess heat from the launch platform area. The deluge water will be collected in the flume located directly beneath the launch vehicle and will flow into a sealed concrete catchment basin, where it will then be disposed of in accordance with applicable Federal and state regulations and permit programs. An Industrial Waste water permit is in place for the deluge waste waters. A concrete exhaust flume on each pad deflects exhaust gases away from the pad to reduce the noise and shock wave that result from ignition of solid rockets and the first stage of the launch vehicle. Most of the wash down and fire suppressant water would also be collected in a concrete catchment basin, and any propellant release would occur within sealed trenches and should not contaminate runoff. If the catchment basin water meets federal discharge criteria, it would be discharged directly to grade at the launch site. If it fails to meet the criteria, it would be treated on site and disposed to grade or collected and disposed of by a certified contractor. [USAF 1988]

The primary surface water impacts from a normal Delta II launch involve HCl and Al₂O₃ deposition from the exhaust plume. The cloud will not persist or remain over any location for more than a few minutes. Depending on wind direction, most of the exhaust may drift over the Banana River or the Atlantic Ocean. A brief acidification of surface waters may result from HCl deposition. A normal Delta II launch will have no substantial impacts to the local water quality due to amount of water for dilution.

Ocean Environment

In a normal launch, the first and second stages and the SRMs would impact the ocean. The trajectories of spent stages and SRMs would be programmed to impact a safe distance from any US coastal area or other land mass. Toxic concentrations of metals would not be likely to occur due to the slow rate of corrosion in the deep ocean environment and the large quantity of water available for dilution.

Along with the spent stages would be relatively small amounts of propellant. Concentrations in excess of the maximum allowable concentration of these compounds for marine organisms would be limited to the immediate vicinity of the spent stage. No substantial impacts would be expected from the reentry and ocean impact of spent stages, due to the small amount of residual propellants and the large volume of water available for dilution.

Biotic Resources

A normal Delta II launch would not be expected to substantially impact CCAS terrestrial, wetland, or aquatic biota. The elevated noise levels of launch are of short duration and will not substantially affect wildlife populations. Wildlife encountering the launch-generated ground cloud could experience brief exposure to exhaust particles, but would not experience any substantial impacts. Aquatic biota could experience acidified precipitation, if the launch were to occur during a rain shower. This impact would be expected to be insignificant due to the brevity of the small ground cloud and the high buffering ability of the surrounding surface waters to rapidly neutralize excess acidity.

Threatened and Endangered Species

Any action that may affect Federally listed species or their critical habitats requires consultation with the US Federal Wildlife Service under Section 7 of the Endangered Species Act of 1973 (as amended). The US FWS has reviewed those actions which would be associated with a Delta II launch from LC-17 and has determined that those actions would have no effect on state or Federally listed threatened (or proposed for listing as threatened) or endangered species residing on CCAS and adjoining waters or critical habitats [USAF 1988].

Population and Socioeconomics

The NEAR mission would create negligible impact on local communities, since no additional permanent personnel would be expected beyond the current CCAS staff. Launch Complex 17 has been used exclusively for space launches since the late 1950s. The NEAR mission would cause no additional adverse impacts on community facilities, services, or existing land uses.

Safety and Noise Pollution

Normal operations at the CCAS includes preventative health measures for workers such as hearing protection, respiratory protection and exclusion zones to minimize or prevent exposure to harmful noise levels or hazardous areas or materials.

The engine noise and sonic booms from a Delta II launch are typical of routine CCAS operations. In the history of USAF space-launch vehicle operations at CCAS, there have been no problems reported as a result of sonic booms. To the surrounding community, the noise from this activity appears, at worst, to be an infrequent nuisance rather than a health hazard.

Archeological and Cultural Resources

Since no surface or subsurface areas would be disturbed, no archeological, historic, or cultural sites would be expected to be affected by launching the NEAR mission. LC-17 has been identified as a site that is eligible for listing in the National Register of Historic Places. Therefore, section 106 of the National Historic Preservation Act applies to the proposed action.

POTENTIAL LAUNCH ACCIDENTS

Liquid Propellant Spill

The potential for an accidental release of liquid propellants will be minimized by strict adherence to established safety procedures. Post-fueling spills from the launch vehicle will be channeled into a sealed concrete catchment basin and disposed of according to the appropriate state and federal regulations.

The most severe propellant spill accident scenario would be releasing the entire launch vehicle load of nitrogen tetra oxide (N₂O₄) at the launch pad while conducting propellant transfer operations. This scenario would have the greatest potential impact on local air quality. Airborne NO_x levels from this scenario are expected to be reduced to 5 ppm within about 150 m (about 500 ft) and to 1 ppm within 300 m (about 1,000 ft). Activating the launch pad water deluge system would substantially reduce the evaporation rate, thus keeping exposure concentrations in the vicinity of the spill below federally established standards. Propellant transfer personnel will be outfitted with protective clothing and breathing equipment. Personnel not involved in transfer operations will be excluded from the area.

Impacts

In the unlikely event of a launch vehicle destruction, either on the pad or in-flight, the liquid propellant tanks and SRM cases would rupture. Due to their hypergolic (ignite on contact) nature, a launch failure would result in a spontaneous burning of most of the liquid propellants, and a somewhat slower burning of SRM propellant fragments. Any such release of pollutants would have only a short-term impact on the environment near the pad.

Launch failure impacts on water quality would stem from unburned liquid propellant being released into CCAS surface waters. For most launch failures, propellant release into surface waters will be substantially less than the full fuel load, primarily due to the reliability of the vehicle destruct system. However, if there were an early flight termination and failure of the vehicle destruct system, it is remotely possible that the entire Stage II propellant quantity could be released to the ocean. Impacts to ocean biotic systems would be localized, transient in nature, and these systems would be expected to recover rapidly, due to the large amount of ocean water available for dilution.

SECTION 1

PURPOSE AND NEED

The National Aeronautics and Space Administration (NASA) has prepared this Environmental Assessment (EA) for completing the preparations for the Near Earth Asteroid Rendezvous (NEAR) mission, including final processing of the NEAR spacecraft at Kennedy Space Center (KSC) and Cape Canaveral Air Station (CCAS), and its launch from Launch Complex 17 (LC-17), CCAS in February 1996 (i.e., the "proposed action"). This EA discusses the mission's objectives as well as its potential environmental impacts. Possible alternatives to the proposed action are also examined. Among the possible effects considered are air and water quality impacts, local land area impacts, adverse health and safety impacts, the disturbance of biotic resources, socioeconomic impacts, and the occurrence of adverse effects in wetland areas and areas containing historical sites. This document was completed in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, et seq.), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500-1508), Executive Order 12114, and the NASA policy and procedures (14 CFR Subpart 1216.3).

There are distinct scientific, technological, economic, and political benefits associated with solar system exploration. The formation and evolution of the solar system has been of great interest to mankind for centuries. Techniques and theories arising from space exploration have greatly contributed to our understanding of the process. The NEAR mission will provide key information on the relationship of near Earth asteroids to the planetary system. Additionally, planetary exploration is one of the drivers of state-of-the-art technology development, such as the improved operating speed, greater reliability, and miniaturization of electronic components.

1.1 PURPOSE OF THE PROPOSED ACTION

The National Aeronautics and Space Act of 1958 (42 U.S.C. 2451 *et seq*) establishes a mandate to conduct activities in space that contribute substantially to the expansion of human knowledge, and to "the preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere." In response to this mandate, NASA, in coordination with the National Academy of Sciences, has developed a prioritized set of scientific objectives to be met through a long range program of planetary missions (i.e., the US Solar System Exploration Program). These missions, which include flybys and orbiters of the planets and study of comets and asteroids, are designed to be conducted in a sequence based on technological readiness, launch opportunities, timely data return, and a balanced representation of scientific disciplines. The Discovery Program, which is the NASA Solar System Exploration Division's new program for low cost planetary missions, provides an excellent opportunity to carry out the study of near Earth asteroids.

Near Earth asteroids include some of the most accessible space targets, and have never been explored by spacecraft. A rendezvous with an asteroid will provide answers to fundamental scientific questions, most particularly those dealing with the elemental composition of the asteroid, questions which cannot adequately be addressed by ground-based observations or by flybys.

A systematic exploration of primitive bodies close to the Earth will yield new insights into processes that governed the formation and evolution of the solar system. The NEAR mission will conduct the first scientific investigations of an asteroid from low altitude orbit. NEAR may reveal clues to the nature of the materials from which the terrestrial planets formed. The mission will obtain data that will allow fundamental questions to be addressed concerning the nature and composition of near-Earth asteroids and the relationships among asteroids, between asteroids and comets, and between asteroids and meteorites. Most meteorites are fragments of asteroids, but it is unclear whether the most common types of meteorites (the ordinary chondrites) are derived from the most common near Earth asteroids (NEAs) which are S-types, such as the NEAR target, 433 Eros. Moreover, some of the NEAs may be extinct or dormant comets. Results from NEAR should also greatly enhance the interpretation of remote sensing data acquired from other asteroids, either from Earth-based observations or from spacecraft flybys.

1.2 NEED FOR THE PROPOSED ACTION

At present, the orbits of about two hundred near Earth asteroids are tabulated. The smallest is about 6 m (19.7 ft) in diameter (1991BA), while the largest is some 40 km (24.84 mi.) in length (433 Eros). Most near Earth asteroids are relatively small, of the order of 1 km (0.62 mi.) in diameter. It is estimated that there could be 1000 near Earth asteroids larger than 1 km (0.62 mi.) in diameter. Populations in the 1m (3.28 ft) to 100m (328 ft) size range are still largely unknown. Most of the near Earth asteroids currently known belong to spectral class S. A continuing debate focuses on whether S-asteroids are the source of ordinary chondrites, the most common type of meteorites that fall to Earth.

A reconnaissance of these objects is an important element of the Solar System Exploration Program because a systematic scientific exploration of the near Earth asteroids will yield details of the processes that have governed the formation and evolution of our solar system as evidenced by cometary nuclei, asteroids, and meteorites. Specifically, the near Earth asteroids may preserve clues to the nature of the materials from which terrestrial planets were formed. They certainly are the source of most meteorites that strike the Earth. They are a very diverse class of objects, including primitive and evolved bodies. Some of the near Earth asteroids may be dormant or extinct comet nuclei.

Near Earth asteroids represent the primary source population of relatively large objects that strike the Earth, and which have influenced the evolution of the Earth's atmosphere and biosphere.

Near Earth asteroids may represent a potential source of raw materials for the future utilization and exploitation of space.

Their low gravity, combined with the possibility of abundant H₂O, make them realistic candidates for future sites to develop the techniques of human deep space exploration. The importance of asteroids in the overall study of the solar system and the scientific objectives of asteroid missions have been reviewed by several advisory committees during the past decade, including the Committee on Planetary and Lunar Exploration (COMPLEX) of the National Academy of Sciences' Space Science Board.

Successful completion of this mission will provide knowledge that is an essential component of the study of the creation and evolution of the solar system.

SECTION 2 PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

This section describes the proposed action of making the preparations for the Near Earth Asteroid Rendezvous mission, including integration of the Near spacecraft with the launcher and its launch from Cape Canaveral Air Station (CCAS), Launch Complex 17 (LC-17), in February 1996. Alternatives to this proposed action, including the No-Action alternative, are discussed in Section 2.2.

2.1.1 NEAR Mission Description [MDA 1994a]

The NEAR mission will be to determine the composition and physical properties of the near Earth asteroid 433 Eros. The proposed action would involve the launch of a single spacecraft by a 7925 Delta II Launch vehicle from Cape Canaveral Air Force Station, Florida in February 1996. The planned heliocentric orbit followed by NEAR from launch to rendezvous with Eros is shown in Figure 2-1. Following launch and injection into a heliocentric transfer orbit in February 1996, there is a velocity correction of approximately 240 m/sec (787 ft/sec) in February 1997, followed by an Earth swingby in January 1998 which will change the heliocentric orbital inclination by about 10 degrees to intercept the orbit of Eros. The spacecraft would arrive at the near-Earth asteroid 433 Eros in January 1999. The initial flyby of Eros is at a closest approach distance of 500 km (310 mi.) and speed of 5 m/sec (16.4 ft/sec), and will allow an initial reconnaissance of Eros by several instruments and an initial determination of mass and rotation state. Orbit insertion about Eros occurs a few days later into a circular 1000 km (621 mi.) orbit, followed a few weeks later by insertion into a circular 200 km (124.2 mi.) orbit face-on to the direction to Earth. The direction of orbital motion is nominally retrograde, that is, opposite to the direction of rotation of the asteroid. The orbit would then be lowered in stages, as the asteroid shape and gravity models are refined, until the nominal rendezvous orbit radius of 35 km (21.7 mi.) is attained. The total duration of science operations in all mapping orbits will be approximately one year.

2.1.2 NEAR Science Objectives

Development of the NEAR mission, the first in the Discovery series of planetary missions, was initiated in FY 1994. Discovery class missions are low-cost (\$150 Million [Government Fiscal Year '92 dollars] development cost cap), rapid development programs with highly focused science objectives. Thus, the NEAR mission would investigate the properties of a single asteroid, the rendezvous target, 433 Eros. This would be the first ever detailed investigation of an asteroid. NEAR would combine focused, but high-quality science goals and investigations, maximum technical

inheritance of spacecraft and instruments, cost-effective mission operations, and disciplined management to ensure that cost targets are attained.

NEAR is designed to orbit Eros for about one year and make measurements to carry out the following scientific investigations:

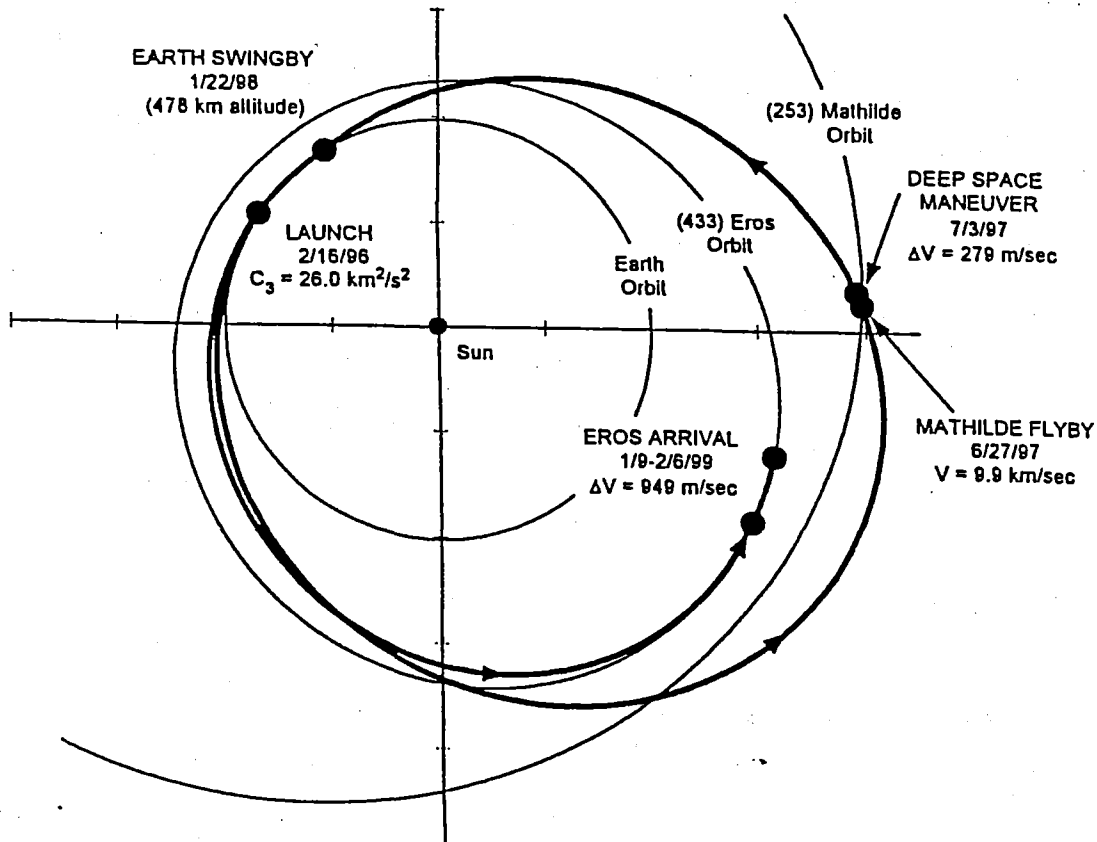


Figure 2-1. Heliocentric Trajectory for NEAR Mission to EROS

2.1.2.1 Primary Objectives

- Determine the asteroid's gross physical properties, including size, shape, mass, density, and spin state;
- Measure surface elemental and mineralogical composition with sufficient accuracy to enable comparisons with major meteorite type;
- Characterize the morphology [the study of the form of lands] of the asteroid surface;
- Determine regolith [surface material] properties and textures of the asteroid surface material.

2.1.2.2 Secondary objectives

- Search for intrinsic magnetization and constrain the nature of the solar wind interaction with the asteroid
- Search for evidence of cometary activity as indicated by gas or dust near the asteroid

2.1.3 Spacecraft Description

Figure 2-2 shows the proposed NEAR spacecraft in the deployed flight configuration. The spacecraft structure is composed of forward and aft aluminum honeycomb decks connected together with eight aluminum honeycomb side panels. Mounted on the outside of the forward deck is a 1.5 meter X-band dish high gain antenna and four fixed solar panels. The magnetometer mounts on top of the high gain antenna feed. Mounted on the inside of the top deck and the inside of the aft deck are the spacecraft electronics. The rest of the NEAR instruments are mounted on the outside of the aft deck. They are all fixed and point in a common direction. The interior of the spacecraft contains the propulsion module. It contains the propellant and oxidizer tanks, the large 450-N thruster and eleven small monopropellant thrusters.

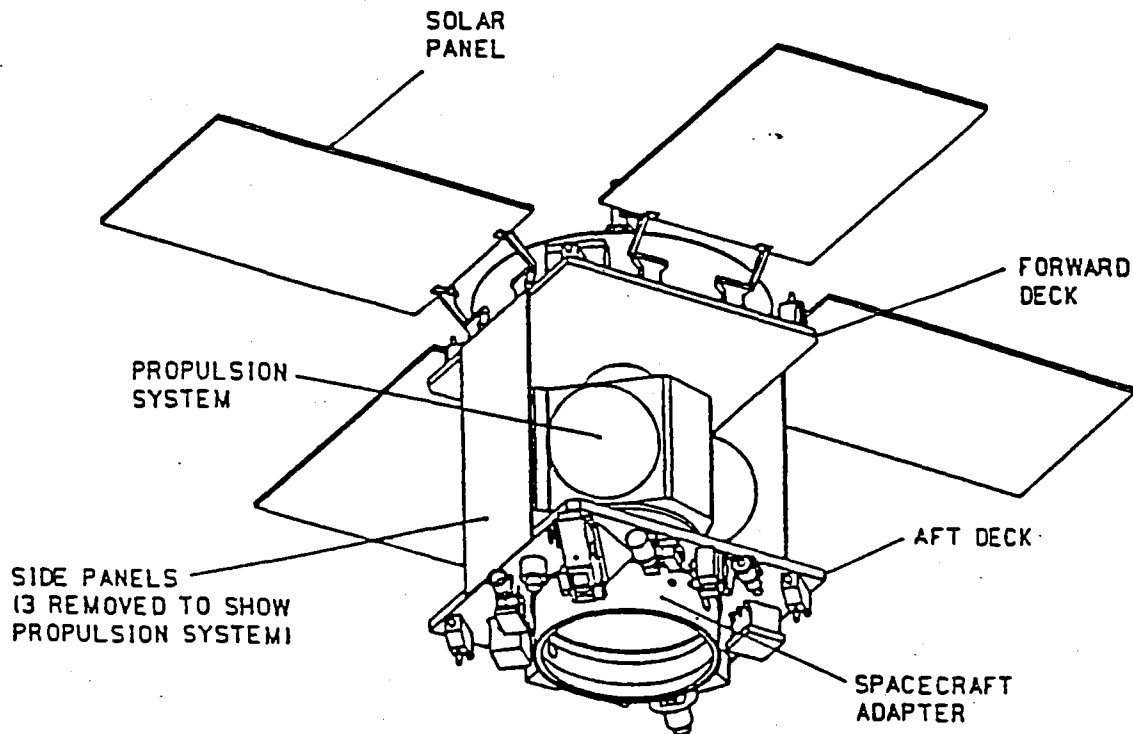


Figure 2-2. NEAR Spacecraft

2.1.3.1 Guidance and Control Subsystem

The spacecraft's attitude is normally controlled by four reaction wheels. Momentum is dumped from the wheels through use of the monopropellant thrusters. The wheels are mounted so that 3-axis control can be maintained with any three of the four wheels. Attitude determination uses inertial measurement units, a star camera and digital Sun sensors.

2.1.3.2 Telecommunications Subsystem

The telecommunications subsystem is an X-band system capable of simultaneously transmitting telemetry data, receiving spacecraft commands and providing a frequency coherent ranging capability. The downlink uses a power amplifier with an output level of 5 watts. Several antennas provide coverage throughout the mission. The primary antenna is a high gain 1.5 m (4.92 ft) paraboloid for high data rate communications. Two low gain antennas providing hemispherical coverage and a medium gain fan beam antenna are also provided.

2.1.3.3 Command and Data Handling Subsystem

The Command and Data Handling subsystem consists of two major units: the command and telemetry processor, which performs the primary functions of command execution, telemetry collection and time distribution; and the solid state recorder which is used for housekeeping data storage and for recording science data during asteroid science operations

2.1.3.4 Power Subsystem

The power subsystem consists of a gallium arsenide solar array and an advanced nickel cadmium battery. Each of the four solar panels is 1.2 m (3.93 ft) by 1.6 m (5.25 ft). The battery consists of 22 advanced nickel cadmium battery cells of nine ampere hour capacity. The main purpose of the battery is to provide power to the spacecraft during the launch phase.

2.1.3.5 Propulsion Subsystem

A regulated dual mode propulsion system was selected for the NEAR spacecraft. The bipropellant portion of the system carries 240 kg (528 lb.) of fuel and oxidizer. It is used for the large trajectory correction and for the asteroid orbit insertion. All of the bipropellant firings use one 450 Newton hydrazine/nitrogen tetroxide thruster. The monopropellant portion carries 80 kilograms of hydrazine and is composed of four 22 Newton thrusters and seven 5 Newton thrusters. The monopropellant portion is used to control spacecraft attitude during the large 450 Newton thruster burns, to manage the

spacecraft angular momentum, and provide rapid slewing and fine control during asteroid operations. The thruster arrangement provides redundancy, allowing any one thruster to fail without loss of system capability.

2.1.3.6 Spacecraft Pyrotechnic Devices

The NEAR spacecraft would use several types of pyrotechnic power cartridges. There would be a total of 4 pyrotechnic events; release of the cable despin system and removal of protective covers on three instruments. All pyrotechnics would be fired through redundant relays and initiators powered directly from the battery. When installed these pyrotechnics are classified as safety Category B, no injury potential.

2.1.4 Science Instrumentation

Scientific measurements would begin as the NEAR spacecraft approaches the asteroid and would continue through orbit insertion and orbital operations. The spacecraft would carry five instruments and the spacecraft radio system to accomplish these measurements.

2.1.4.1 Multispectral Imaging System (MIS)

The MIS would contribute to the determination of the asteroids shape, volume, and spin state during the first several months of the mission and will provide global coverage as well as detailed views, over the duration of the mission, of the asteroid at resolutions as high as 1-2 meters (50 to 100 times better than Galileo at Gaspra). These would reveal details of the geologic processes that have affected the evolution of the target asteroid.

The MIS is a frame transfer CCD camera with refractive optics and an eight-position filter wheel. Two schematic views of the MIS are shown in Figure 2-3.

2.1.4.2 X-Ray/Gamma Ray Spectrometer (XGRS)

The XGRS would provide a chemical analysis by measuring the abundance of several dozen key elements. This analysis would make it possible to relate the asteroid's composition to those of meteorites. The principal data gathering period for the XGRS would be during the low altitude phase of the mission. These data would enable an important comparison between the asteroid and meteorites and will establish whether the asteroid consists of primitive or differentiated material.

The XGRS combines two sensor systems that share a common data system. Drawings of each sensor system are shown in Figure 2-4. There are three identical gas proportional counters for measurements of K-shell x-ray fluorescence and a scintillator

gamma ray spectrometer to measure gamma ray line emissions. A solar x-ray monitor is included.

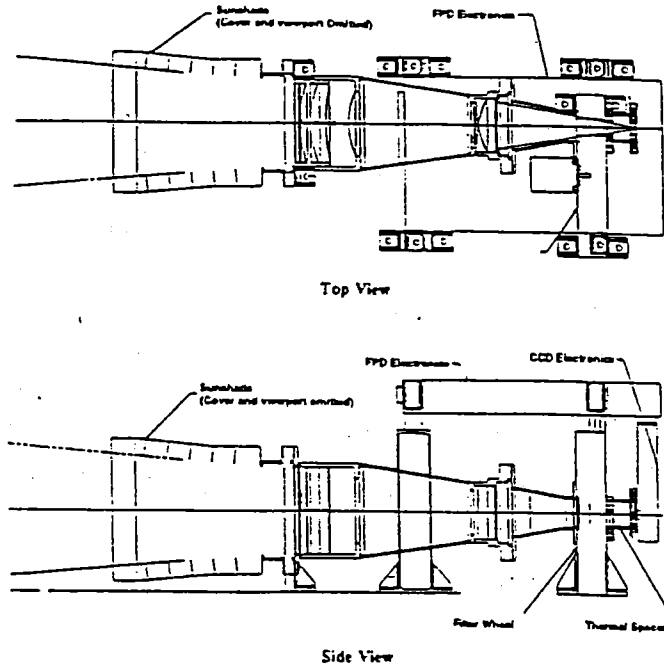


Figure 2-3. Top and Side Schematic Views of Multispectral Imaging System

The x-ray fluorescence (XRF) system would use three identical gas proportional counters with nominal area of 25 cm^2 (3.88 in^2) each. A balanced filter technique would be used to separate Al, Si, and Mg emissions, while Fe, S, and Ca lines can be resolved directly in each of the proportional counters. A mechanical collimator defines a 5° field of view. The filters cut off the very low energy spectrum. A radioactive calibration source can be rotated into or out of the field of view. This low level calibration source consists of three 10 micro curies of iron 55 isotope sources. The baseline solar monitor is a gas proportional counter with a pinhole, and it measures the solar spectrum from 1 to 10 keV.

The gamma-ray spectrometer (GRS) would be a $32 \times 95 \text{ mm}$ ($1.26 \times 3.74 \text{ in}$) NaI scintillator detector with a BGO (bismuth germanate) active shield to remove charged particle and spacecraft induced background. The GRS sensor is body-mounted and has a field of view of approximately 45° which is boresighted with the imager. The GRS is expected to be sensitive to material at a depth of approximately 10 cm (3.93 in) below the asteroid surface; the XRF is expected to be sensitive to surface material at less than 1 mm (0.04 in) depth.

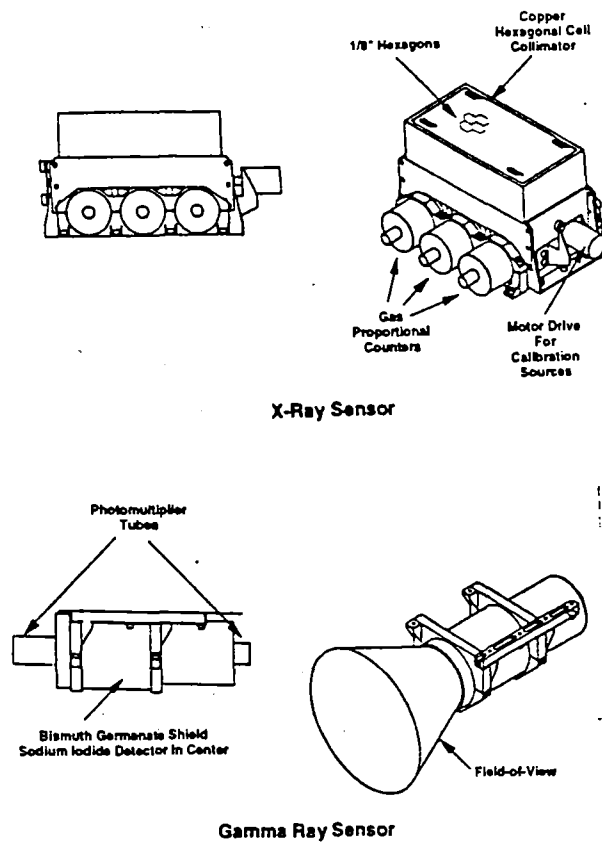


Figure 2-4. XGRS, showing X-Ray Fluorescence (XRF) and Gamma Ray Sensor (GRS) Systems

2.1.4.3 NEAR IR Spectrograph (NIS)

The surface mineralogy would be investigated with NIS, which would characterize the nature and distribution of mafic minerals and would carry out a search for other minerals. The initial flyby of Eros would provide the prime opportunity to obtain NIS observations of the entire illuminated surface at small phase angles. During the later rendezvous phase, the orbit would be maintained near the terminator plane. Investigations with the XGRS and NIS instruments may ascertain the heterogeneity of the asteroid, which would provide information on the nature of its parent body or bodies.

Figure 2-5 is a drawing of the NIS showing its principal components. It is a point spectrograph covering the wavelength range of approximately 0.8-2.6 μm (31.5-102.4 μin). The full spectrum of the surface within the field of view is dispersed by a grating onto two line array detectors that together cover this wavelength range (only one is shown in Figure 2-6). A Germanium (Ge) line array and an Indium-Gallium-Arsenide (InGaAs) line array are used as detectors. The NIS also includes a one-dimensional scan mirror that can swing the field of view through an arc of 140°, 110° in the anti-sun direction, and 30° in the sunward direction. The NIS field-of-view will be boresighted with the MIS field of view for a particular mirror position, or it can be scanned more than 90° away.

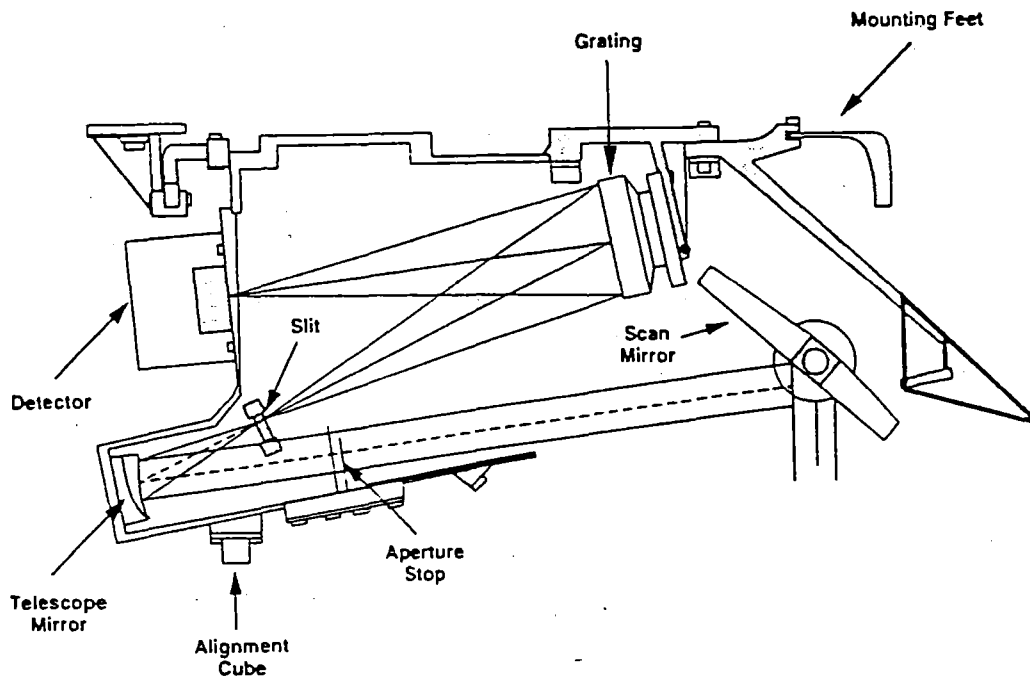


Figure 2-5. Side View of Near-Infrared Spectrograph (NIS)

2.1.4.4 Radio Science and Magnetometer

Radio science and magnetization measurements will provide data on the internal state of the asteroid and answer important questions such as: is the asteroid a coherent object? Is it a pile of collisionally produced rubble? Does it have a metallic core? These measurements will be especially accurate since they will be obtained from an orbital platform. In particular, they will yield the first-ever precise measurement of an asteroid's mean density. This quantity is a sensitive measure of the body's internal composition, which will compliment measurements of the asteroid's surface composition measured by the spectrometers.

2.1.4.4.1 Radio Science

The spacecraft telemetry system will include redundant X-band frequency-coherent NASA standard transponders and will allow two-way Doppler tracking of the spacecraft to an accuracy of approximately 0.1 mm/sec over a 10 sec integration. The coherent downlink carrier frequency is 8438.086418 MHz. The primary antenna is a high gain 1.5 m (4.9 ft) paraboloid that can be illuminated by either a right-hand or left-hand

circularly polarized signal. The use of a dual polarized paraboloid permits the coupling of the two independent transponders into a single antenna without significantly degrading system reliability. Figure 2-6 is a block diagram of the NEAR telecommunications system.

The high gain antenna mount is fixed so that antenna pointing is accomplished by the spacecraft attitude system. The spacecraft points at Earth and communicates through the high gain antenna during the entire rendezvous phase of the NEAR mission. The NEAR spacecraft will have reaction wheels for attitude control, which require only discrete desaturations, thus eliminating potential contamination of the Doppler data by nearly continuous non gravitational effects. To permit determinations of the gravity field, the spacecraft will be operated in orbit around Eros, without maneuvers, for periods to be determined, at a series of orbit radii ranging from 1000 km (621 mi.) down to a minimum radius of 35 km (21.7 mi.).

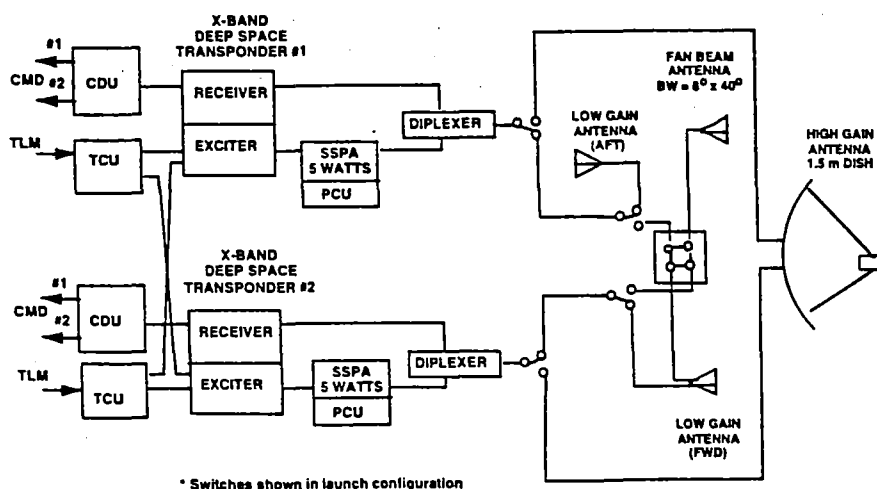


Figure 2-6. Telecommunications System Block Diagram

2.1.4.4.2 Magnetometer (MAG)

The magnetometer is expected to have the sensitivity to detect a 5 nano Tesla (nT) local field. This sensitivity corresponds to detection of a 40 nT global scale surface field on the asteroid while in nominal rendezvous orbit at approximately one body radius above the surface. The actual sensitivity of the MAG will be determined by the spacecraft residual magnetic field, which will be calibrated during the cruise phase of the mission. Furthermore, since the asteroid rotates under the spacecraft orbit, the asteroid magnetic field will be observed to be time varying, allowing it to be distinguished from the spacecraft residual magnetic field.

2.1.4.5 Laser Rangefinder (NLR)

The NLR will contribute to the determination of the asteroid's shape, volume, and spin state during the first few months of the mission and will be an invaluable navigation aid during the low orbit phase of the mission.

Figure 2-7 is a schematic view of the NLR transmitter and receiver. A conservative range accuracy of 6 m (19.7 ft) is specified and is based on several factors, including the accuracy of the clock and the properties of the asteroid surface. The NLR will be boresighted with the imager and will be operated continuously while the spacecraft is within range of the asteroid. The NLR measures range only and has no waveform analysis capability. The NLR range measurements will be continuously available to the spacecraft guidance and control processor and will be stored in the solid state recorder to be downlinked. The NLR has a pulse repetition rate commandable from 1 to 10 Hz. The single shot probability of a range measurement is greater than 99% at 50 km (31 mi.) range, assuming a 25° slope and an albedo of 0.2 at 1.064 μm . With incoherent averaging (unknown relative phase between transmitted and received pulses), range measurements can be obtained at greater range.

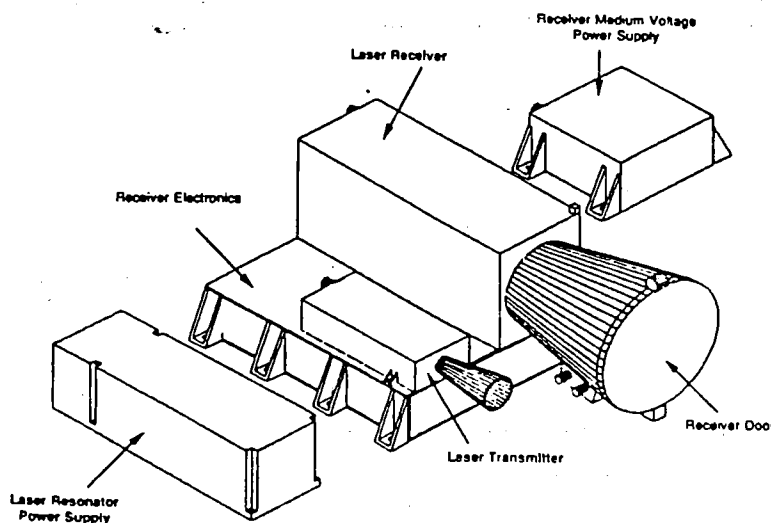


Figure 2-7. Schematic View of NLR Transmitter and Receiver

2.1.5 Launch Vehicle [MDSSC 1992]

The Delta II 7925 was proposed as the baseline launch vehicle for the mission. The Delta II launch vehicle (Figure 2-8) consists of a payload fairing (PLF), the Delta II first and second stage propulsion systems with nine graphite epoxy motors (GEMs) used as strap-on boosters to the first stage, and a Payload Assist Module-Delta (PAM-D) upper stage.

2.1.5.1 Payload Fairing

During launch ascent, the NEAR spacecraft/PAM-D upper stage combination would be protected from aerodynamic forces by a 2.4 m (8 ft) payload fairing. The PLF would be jettisoned from the launch vehicle during second stage powered flight at an altitude of at least 111 km (about 69 mi.).

2.1.5.2 Delta II First and Second Stage

The first stage of the Delta II is powered by a liquid bipropellant main engine and two vernier engines. The first stage propellant load consists of 96,243 kg (211,735 lb.) of RP-1 fuel (thermally stable kerosene) and liquid oxygen as an oxidizer. First stage thrust is augmented by nine GEMs, each fueled with 11,870 kg (26,114 lb.) of Hydroxyl-Terminated PolyButadiene (HTPB) solid propellant. The main engine, vernier engines, and six of the GEMs are ignited at liftoff. The remaining three GEMs are ignited in flight. The GEMs are jettisoned after burnout of the solid propellant.

The Delta II second stage propulsion system has a bipropellant engine that uses Aerozine 50 (a 50/50 mix of hydrazine and unsymmetrical dimethyl hydrazine) as fuel and nitrogen tetroxide as oxidizer. The second stage has a total propellant load of 6,019 kg (13,242 lb.).

2.1.5.3 PAM-D Upper Stage

The PAM-D is the third stage of the launch vehicle and provides the final velocity required to insert the NEAR spacecraft into the trajectory to Eros. The PAM-D upper stage (Figure 2-9) consists of (1) a spin table to support, rotate, and stabilize the NEAR spacecraft/PAM-D combination before separating from the second stage, (2) a Star 48B solid rocket motor for propulsion, (3) an active Nutation Control System (NCS) to provide stability after spin-up of the spacecraft/ PAM-D stack, and (4) a payload attach fitting to mount the Star 48B motor to the spacecraft. The Star 48B is fueled with 2,010 kg (4,422 lb.) of HTPB solid propellant. The payload attach fitting, spacecraft separation system, and cabling between the PAM-D and the spacecraft would not remain with the spacecraft after its separation from the upper stage.

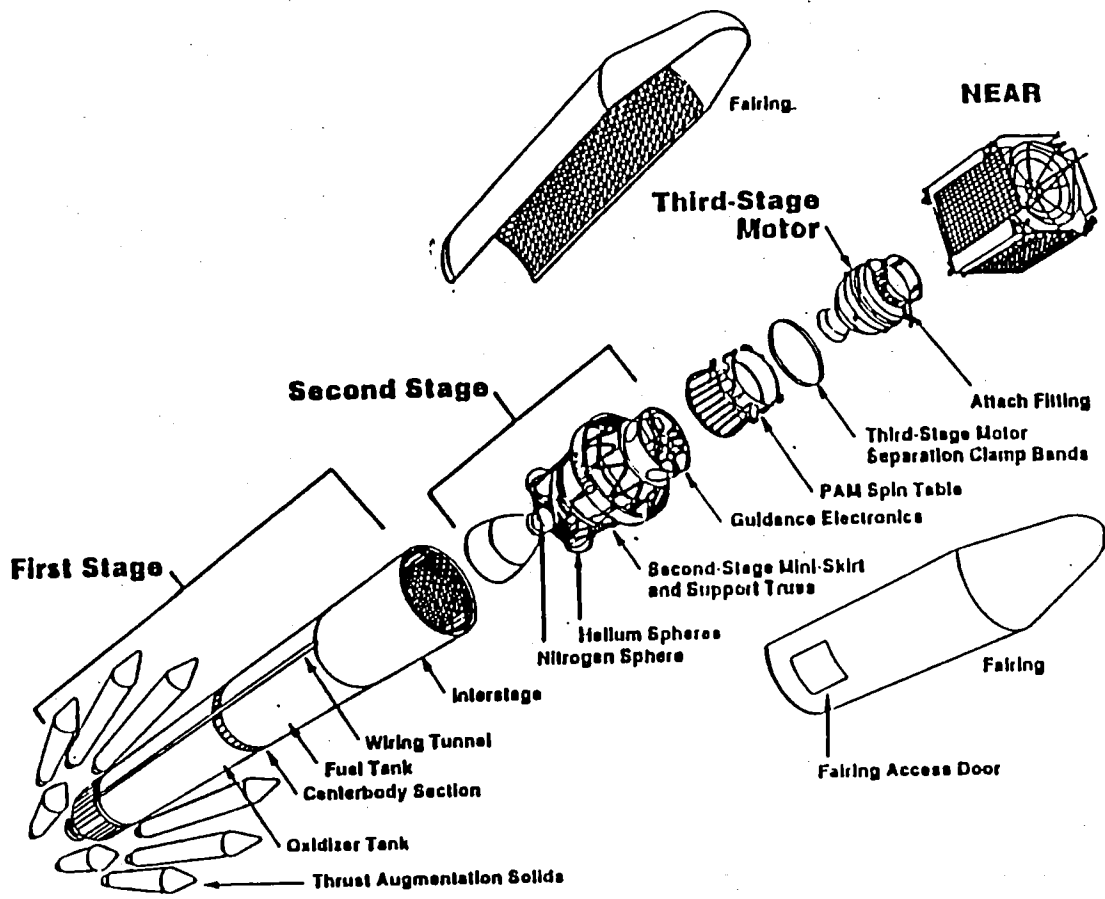


Figure 2-8. Delta II 7925 Launch Configuration (Exploded View)

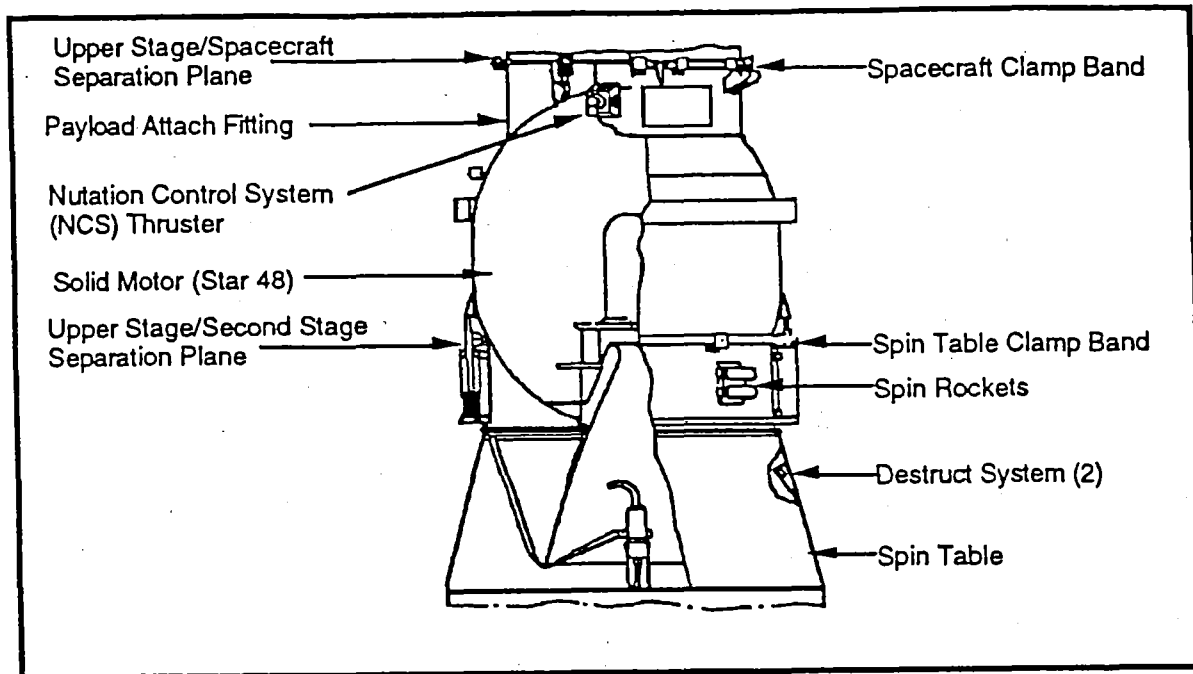


Figure 2-9. Payload Assist Module-Delta (PAM-D) Upper Stage

2.1.5.4 Flight Termination System

The Eastern Range (ER) Range Safety Office would establish flight safety limits for the trajectory of the NEAR launch vehicle. These limits are established to ensure that errant launch vehicles (or debris resulting from a launch failure), do not pose a danger to human life or property. These flight safety limits are pre-determined before launch for the range of possible flight azimuths using predicted values for winds, explosively produced fragment velocities, human reaction time, data delay time, and other pertinent data. During a launch, if the vehicle trajectory indicates that these limits would be exceeded, the ER Range Safety Officer can take appropriate action, including destruction of the vehicle [MMSLS 1991].

As specified by Range Safety requirements, the NEAR launch vehicle would be equipped with a Flight Termination System (FTS). This system would be capable of destroying the vehicle based on commands sent from the Range Safety Officer. In the event of an unplanned separation of the first and second stages the FTS would automatically issue a destruct command. This function would be activated when electrical paths between stages are interrupted and stage separation commands have not been issued by the flight computer.

An electromechanical Safe and Arm (S&A) device would be located on each of the first and second stages. Once the FTS was activated, either by a Range Safety destruct command or by sensing vehicle breakup, the S&A device would permit the power and sequence box to trigger the destruction of the vehicle. The first stage S&A device would be connected to several strands of explosive detonating cord attached to the propellant tanks. When activated, these detonations would rupture the tanks, initiating the rapid burning and dispersion of propellants before the vehicle impacts the ground. The second stage S&A device would be connected to a linear shape charge designed to sever the second stage propellant tanks. This device would also be designed to activate the PAM-D FTS by detonating a set of conical shape charges to rupture the motor and render it non-propulsive [MDSSC 1991].

2.1.5.5 Launch Vehicle Debris

Delta launch vehicles use containment devices to mitigate the spread of debris generated during staging. Once separated, the Delta II payload fairing, first stage, and GEMs will not achieve Earth orbit. During their brief sub-orbital trajectories, any excess first and second stage propellants will be released to avoid potential tank rupture and breakup from over-pressurization caused by solar heating. The NEAR second stage and the spacecraft/PAM-D upper stage will be "parked" in LEO for less than one hour before the spacecraft/upper stage departs on its trajectory to Eros. The second stage will be in orbit for a short time before reentering and burning up in the atmosphere. [MDA 1993][MDA 1994a]

2.1.6 Cape Canaveral Air Station Operations

More than 180 Delta launches have occurred from CCAS Launch Complex 17 since May of 1960. During this long period of federally sponsored activities, launch preparation procedures have been well documented, standardized, and continuously reviewed. NEAR launch personnel would be trained in following established procedures.

Safe hardware and support equipment would be used to ensure safety for both personnel and equipment during all phases of fabrication, test, and operation. A Project Safety Plan (PSP) and a Missile System Pre-Launch Safety Package (MSPSP) would be prepared in accordance with APL, Kennedy Space Center, and Air Force Eastern Range Safety Office requirements. A Safety Review Panel (SRP) High-Performance Work Team, as specified by Eastern Range Regulation (ERR) 127-1, would be convened and meet as required to review and guide the resolution of safety issues. The SRP would also provide recommended dispositions for the MSPSPs that would be submitted to the Air Force

2.1.6.1 Launch Vehicle Processing

The Delta II first and second stages are initially received, inspected, and stored at Hangar M (Figure 2-10). They are moved to the Delta Mission Checkout (DMCO) Building for hardware integration and systems testing. The first stage would then be transferred to the Horizontal Processing Facility for installation of the destruct ordnance package, and prepared for erection at the launch site. The second stage would depart the DMCO Building for the Area 55 Second Stage Checkout Building for verification of hydraulic and propulsion systems and destruct ordnance package installation. Both the first and second stages would then be transported to the launch pad for integration and testing. The GEM solid rocket motors would receive all pre launch processing in the Solid Motor Buildup Area 57 before being transported to the LC-17 launch pad and attached to the first stage.

2.1.6.2 Spacecraft Processing

2.1.6.2.1 Spacecraft Test Operations and Launch Vehicle Mating

The NEAR spacecraft would be transported to the Kennedy Space Center via air, arriving in December 1995. Post ship functional tests and final mechanical alignments and cleaning will be conducted in Hangar AE at CCAS. Propellants would be loaded into the fuel and oxidizer tanks, and the spacecraft would be mated with the PAM-D upper stage in SAEF-2 at KSC. In early February 1996, the spacecraft and upper stage combination would be mated with the Delta launch vehicle, and final integrated tests with the launch vehicle would be conducted in preparation for the planned February 16, 1996 launch.

2.1.6.2.2 Pad Activities

The spacecraft and upper stage would arrive at the base of the pad and would be hoisted to the top of the launch tower payload level and mated to the launch vehicle. Once mated to the launch vehicle, interface verifications with the launch vehicle, launch rehearsals, and power on/off stray voltage checks would be performed to verify spacecraft compatibility with the launch vehicle. Integrated operations at the pad would also include:

- Transporting the payload and upper stage from the HPF to the pad
- Erecting, uncanning, and mating payload and upper stage
- Cabling-up ground support equipment in the blockhouse to the payload
- Conducting spacecraft functional tests
- Installing the launch vehicle payload fairing

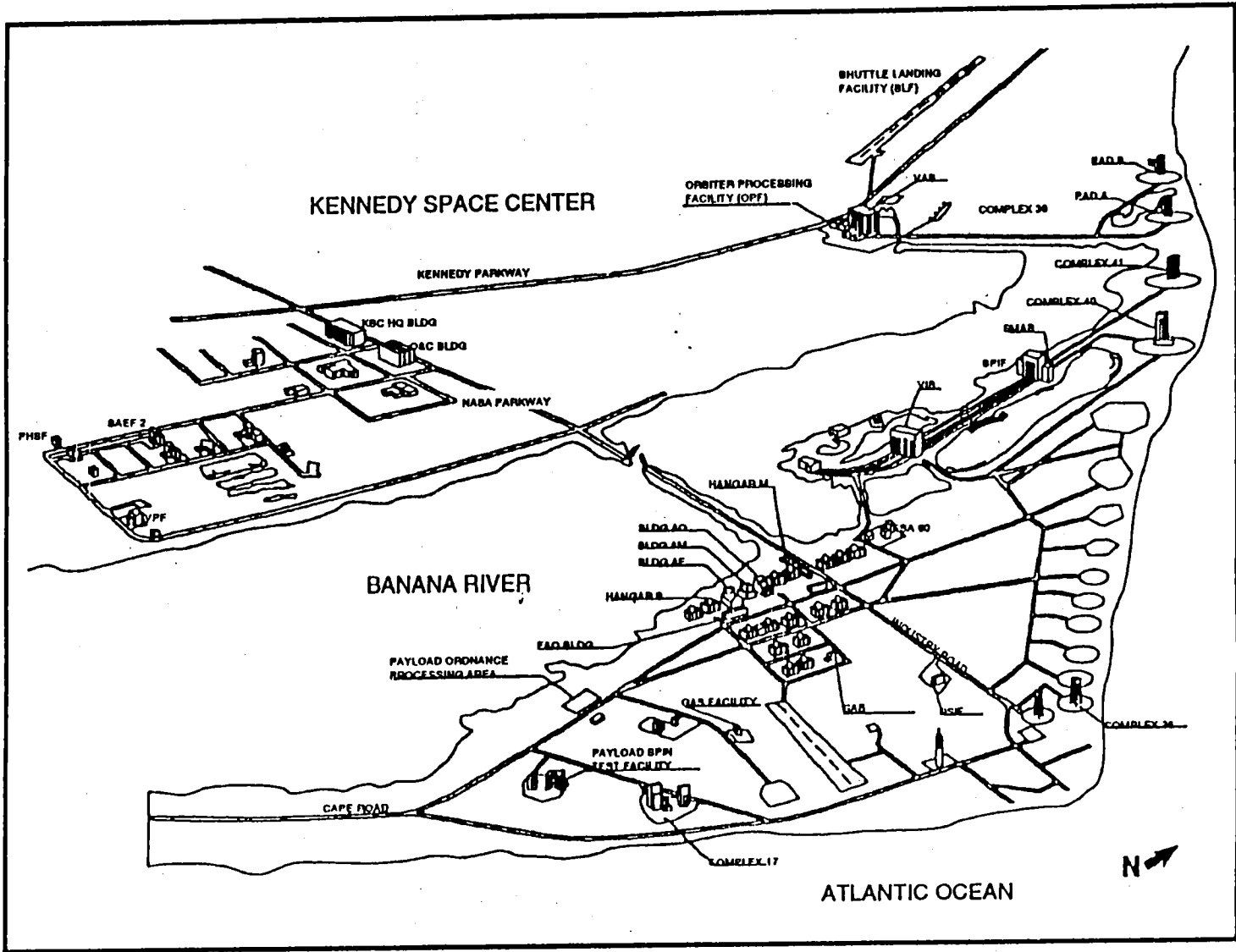


Figure 2-10. Launch Vehicle and Spacecraft Processing Areas, KSC/CCAS

2.2 ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed action that were considered include those that: (1) utilize an alternate launch vehicle/upper stage combination, and (2) cancel the NEAR mission (the No-Action alternative).

2.2.1 Alternate Launch Systems

2.2.1.1 Selection Criteria

Selecting a launch vehicle/upper stage combination (launch system) for a planetary mission largely depends on matching the payload mass and the energy required to achieve the desired trajectory to the capabilities of the prospective launch system. The more massive the payload and the more energy required to achieve the trajectory, the more powerful the launch system required. The most desirable launch system would meet, but would not greatly exceed, the mission's minimum launch performance requirements.

For the NEAR mission, constraints on launch system performance are the NEAR launch mass of approximately 805 kg (1,771 pounds) and an injection energy (C_3) of 22 km^2/s^2 .

Other considerations which must be addressed in selection of the launch system include reliability, cost, and potential environmental impacts associated with use of the launch system.

For its Environmental Assessment, Mars Pathfinder conducted an assessment of feasible alternate launch vehicles. The NEAR mission launch characteristics and spacecraft mass closely match those of the Mars Pathfinder mission, hence the conclusions and rationale apply to both missions [GSFC 1995]. For Pathfinder, and hence for NEAR, feasible alternative launch systems are potentially available from both foreign and domestic manufacturers. Potential alternative launch systems from foreign manufacturers include the European Space Agency (ESA) Ariane and the Russian Proton. Potential alternative US launch systems include the Space Transportation System (STS) and various Atlas, Delta, and Titan configurations [JPL 1993].

2.2.1.2 Foreign Launch Systems

Of the foreign launch systems that are potentially available for the NEAR mission, the ESA Ariane 44L and the Russian Proton most closely match the NEAR requirements for performance and injection energy. However, both of these vehicles exceed by a wide

margin the NEAR mission requirements, and there is not a clear environmental advantage in their use. Additionally, current US. government policy prohibits the launch of US. government-sponsored spacecraft on foreign launch systems. Therefore, these foreign launch systems are not considered to be reasonable alternatives.

2.2.1.3 US. Launch Systems

2.2.1.3.1 Space Transportation System

National policy and the Launch Services Purchase Act of 1990 require NASA to utilize ELVs. STS can only be utilized if its unique manned capabilities are required. NEAR does not require these capabilities. In addition, the STS greatly exceeds the NEAR mission requirements and would not be considered a reasonable alternative launch system.

2.2.1.3.2 US. Expendable Launch Systems

Potential alternative US. expendable launch systems include the Titan IIG/ Star 48, the Delta II 7325/Star 48, the Titan IIS/Star 48, the Delta II 7925/PAM-D, and the Atlas I/Centaur.

Neither the Titan IIG/Star 48 nor the Delta II 7325/Star 48 meet the minimum mass performance criteria, and are not considered reasonable alternatives.

The Titan IIS/Star 48 is only in the conceptual stage and is not currently available. In addition, no launch pads are available that could launch a Titan II vehicle from the CCAS or KSC.

Both the Delta II 7925/PAM-D and the Atlas launch systems meet the minimum NEAR mission requirements. However, the Delta II 7925/PAM-D system costs significantly less than the Atlas and has a higher reliability than the Atlas launch system. In addition, the Atlas I and IIA vehicles are no longer available. The Atlas II provides an excess of performance at a significantly higher cost (approximately \$25-35 M).

2.2.1.4 Summary

Of the launch systems examined, the Delta II 7925/PAM-D combination is the best-suited for the NEAR mission, for the reasons listed below:

- The mass performance of the Delta II 7925/PAM-D most closely matches the NEAR performance requirement [JPL 1993].
- The Delta II 7925/PAM-D is the most reliable alternative launch system of those systems meeting the NEAR performance criteria.

- The Delta II 7925/PAM-D is the lowest cost alternative launch system of those systems meeting the performance criteria [JPL 1993].
- Of the reasonable alternative launch systems examined, all were approximately equal in their potential environmental impacts [DOT 1986].

2.2.2 No-Action Alternative

The No-Action alternative would result in not undertaking the mission, and hence in the loss of opportunity to obtain this scientifically significant data set.

SECTION 3

GENERAL ENVIRONMENTAL CHARACTERISTICS OF CAPE CANAVERAL AIR FORCE STATION AND SURROUNDING AREA

The information provided in this section is summarized from the reference documents cited in the text. Refer to those references for more complete information and maps of environmental resources.

3.1 REGIONAL AND LOCAL ENVIRONMENT

For the purposes of this document, the region of interest (Figure 3-1) consists of the six county area of Volusia, Seminole, Lake, Orange, Osceola, and Brevard counties.

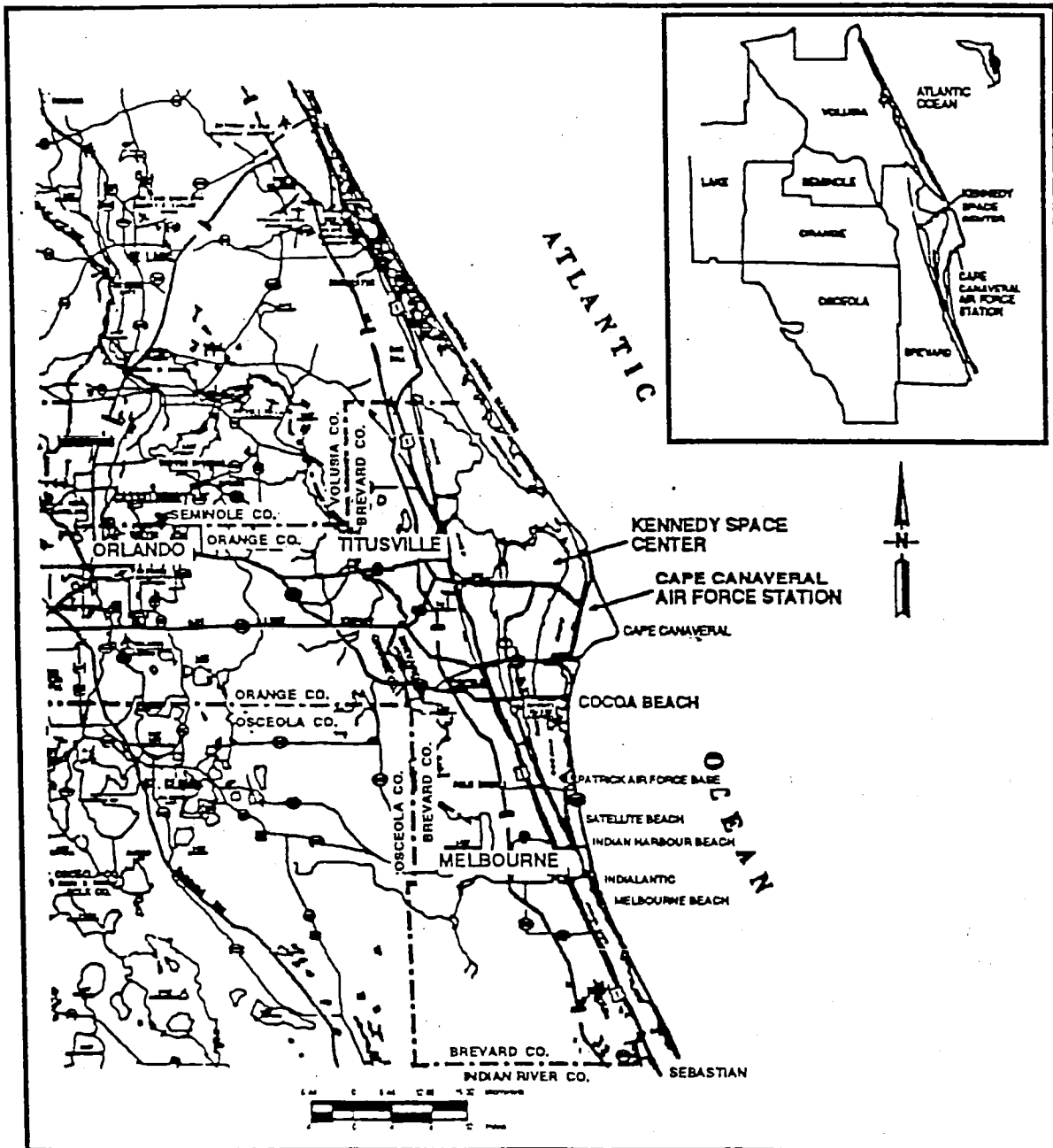
The Cape Canaveral Air Station is located in Brevard County on the eastern coast of Florida, near the city of Cocoa Beach and 75 km (45 miles) east of Orlando. The station occupies nearly 65 square km (25 square miles) of the barrier island that contains Cape Canaveral, and is adjacent to the National Aeronautics and Space Administration Kennedy Space Center, Merritt Island, Florida. CCAS is bounded by KSC on the north, the Atlantic Ocean on the east, the city of Cape Canaveral on the south, and the Banana River and KSC/Merritt Island National Wildlife refuge on the west (Figure 3-2).

3.1.1 Population Distribution

For the last forty years, the population and economy of Brevard County has been closely linked to the growth of the space program. There was a constant influx of aerospace contractors and military personnel from the early 1950s through the mid-1960s. Employment levels dropped in the late-1960s, however, reflecting major cutbacks in NASA operations. The local aerospace economy recovered after 1979 due to a renewed national emphasis on launch activities.

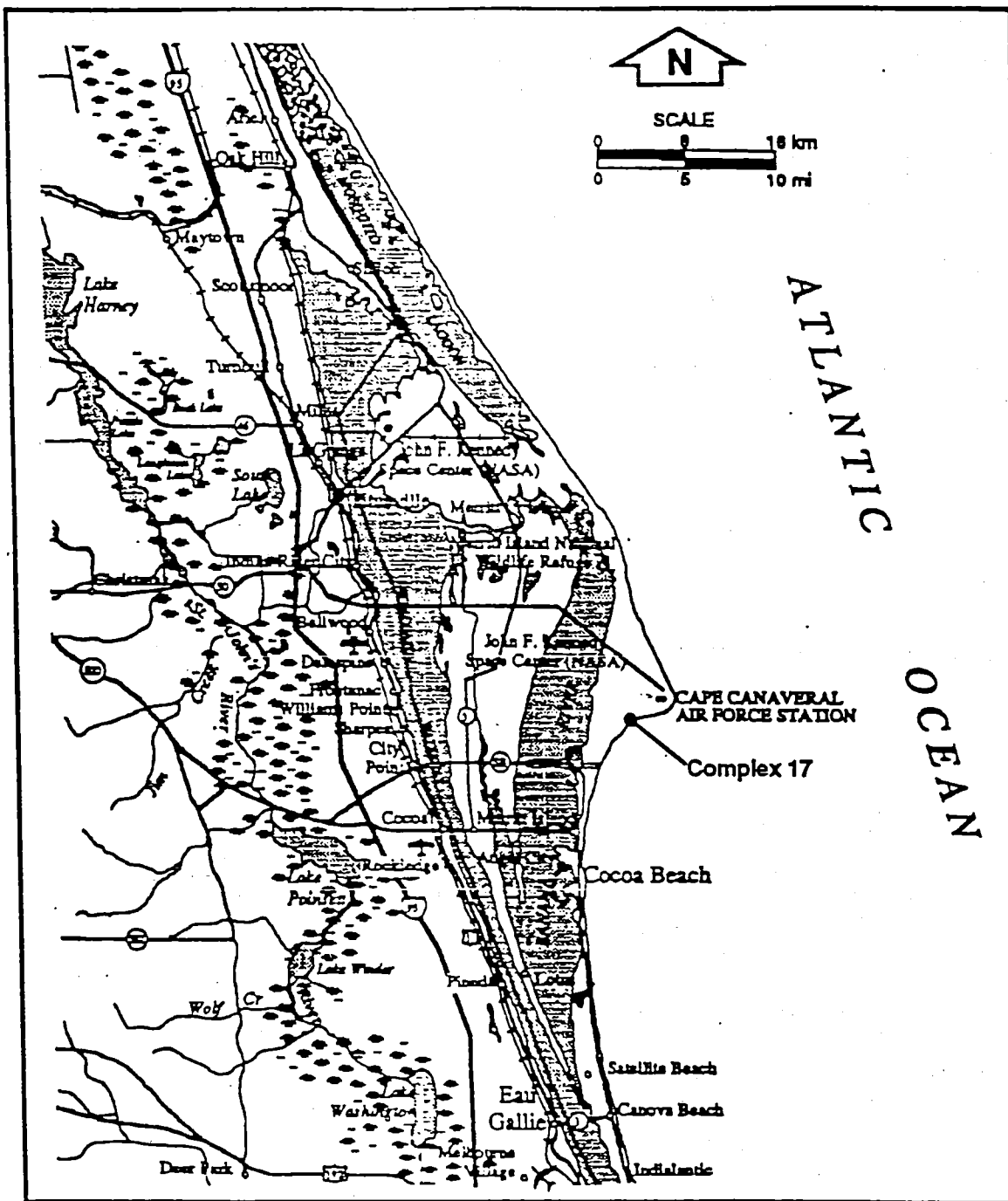
The CCAS employs approximately 11,700 people, but has no permanent residents. About 95 percent of the installation's military and civilian contractor personnel live in Brevard County, with the remainder residing in the surrounding counties. Major population centers include Titusville (20 km [12 miles] northwest), Cocoa Beach (13 km [8 miles] south), Cocoa (12 km [7 miles] southwest), and Cape Canaveral (0.8 km [0.5 miles] south). All military personnel serving at the station are assigned to Patrick Air Force Base, about 25 km (15 miles) to the south of CCAS. [USAF 1990]

The population growth rate for Brevard County has been projected at 3.2 percent through 1995; this would imply a population of about 473,000 by that year. The



Source: [NASA 1986]

Figure 3-1. Regional Area of Interest



Source: [NASA 1986]

Figure 3-2. Location of CCAS Relative to the Region of Interest

greatest increase is expected to occur in southern Brevard County and the lowest in the central portion of the county [USAF 1990]. In February 1990, Brevard County's civilian labor force was 178,359 and the unemployment rate was 5.4 percent. The employment base for the region consists primarily of manufacturing, retail trade, services (with an emphasis on tourism), and government-related enterprises. Brevard County workers received a total personal income of nearly \$5.5 billion in 1987, which translates to a per capita income of \$14,650 [USAF 1991].

3.1.2 Land Use

Only about 8 percent, or 132,742 hectares (ha) (328,000 acres), of the total region (1.7 million ha; 4.1 million acres) is urbanized [ECFRPC 1992], with the largest concentrations of people occurring in three metropolitan areas:

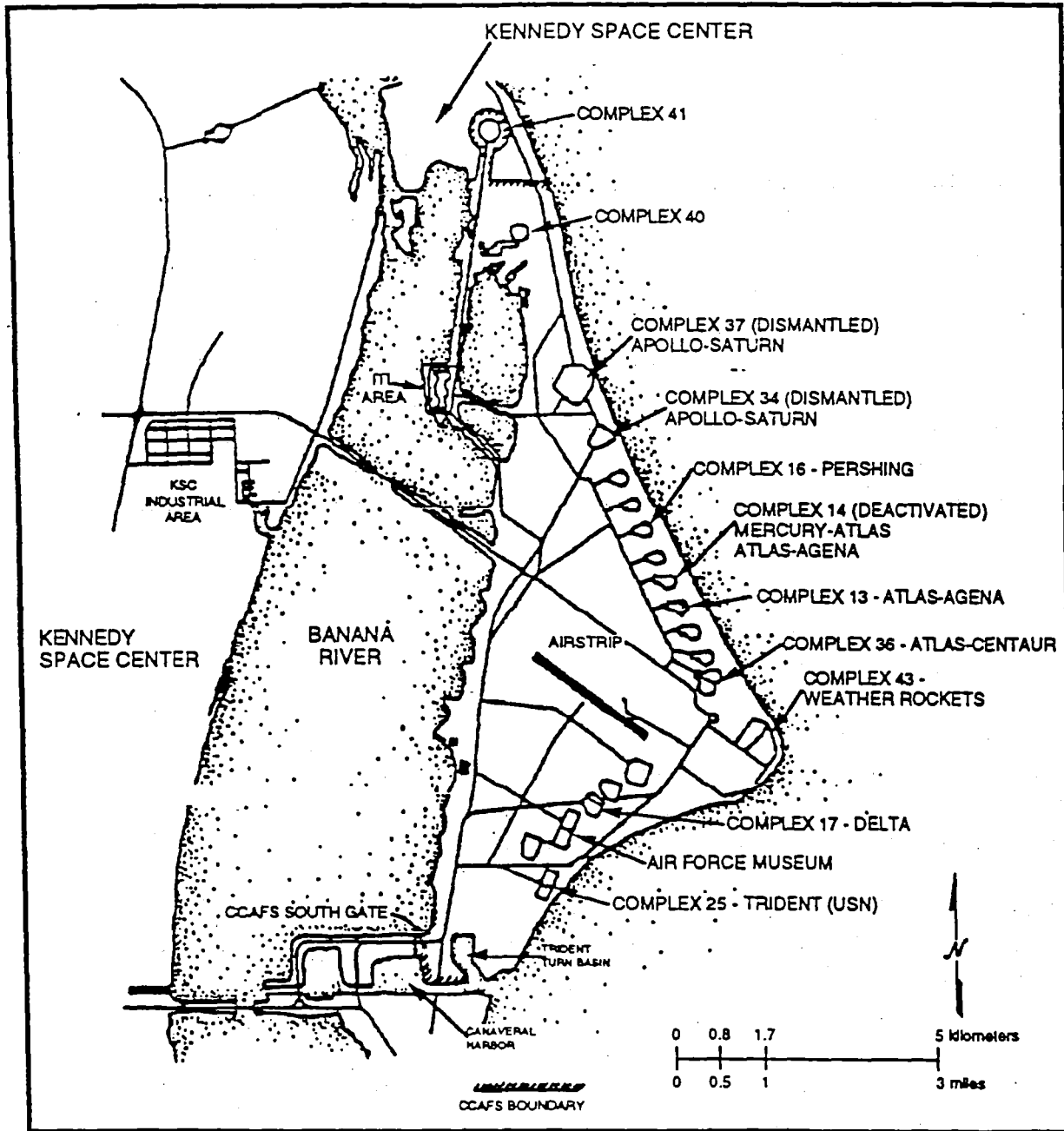
- Orlando, in Orange County, expanding into the Lake Mary and Sanford areas of Seminole County to the north, and into the Kissimmee and St. Cloud areas of Osceola County to the south,
- the coastal area of Volusia County, including Daytona Beach, Port Orange, Ormond Beach, and New Smyrna Beach, and
- along the Indian River Lagoon and coastal areas of Brevard County, specifically the cities of Titusville, Melbourne, and Palm Bay.

Approximately 85 percent of the region's population lives in urban areas.

The majority of the region is considered rural, which includes agricultural lands and their associated trade and service areas, conservation and recreation lands, and undeveloped areas. About 35 percent of the regional area is devoted to agriculture, including more than 5,000 farms, nurseries, and ranches. Agricultural areas include citrus groves, winter vegetable farms, pasture land and livestock, foliage nurseries, sod farms, and dairy land.

In Brevard County, approximately 68 percent of the developed land use is agricultural, 12 percent is residential, 2 percent is commercial, 1 percent industrial, and 1 percent institutional. The remaining 16 percent is comprised of various other uses. The developed land areas are clustered in three areas in a north-south pattern along the coast and the banks of the Indian and Banana Rivers [USAF 1990].

Approximately 30 percent of the CCAS (about 1,880 ha; 4,700 acres) is developed, and consists of launch complexes and support facilities (Figure 3-3). The remaining 70 percent is comprised of unimproved land. The CCAS also contains a small industrial area, the Air Force Space Museum, Canaveral Harbor for the docking of submarines, and an airstrip that was initially constructed for research and development in recovery operations for missile launches. Many of the hangars located on the station are used for missile assembly and testing.



Source: [USAF 1986]

Figure 3-3. Land Use at CCAS

Future land use patterns are expected to remain similar to current conditions. The Kennedy Space Center (KSC) occupies almost 56,000 ha (about 140,000 acres), about 5 percent of which is developed land. Nearly 40 percent of the KSC consists of open water areas, such as portions of the Indian and Banana Rivers, Mosquito Lagoon, and all of Banana Creek [USAF 1990].

Launch Complex 17 (Figure 3-4) is located in the southern portion of the CCAS, approximately 0.8 km (0.5 miles) west of the Atlantic Ocean, 2.5 km (1.5 miles) east of the Banana River, and roughly 5.7 km (3.4 miles) from the station's South Gate. The complex consists of two launch pads, 17A and 17B, each with its own mobile Missile Service Tower, Fixed Umbilical Tower, cable runs, and Fuel Storage Area.

A concrete exhaust flume on each pad deflects exhaust gases away from the pad to reduce the noise and shock wave that result from ignition of solid rockets and the first stage of the launch vehicle. The launch complex includes a water deluge system that sprays water directly into the solid rocket exhaust plume to reduce acoustic loads on the vehicle.

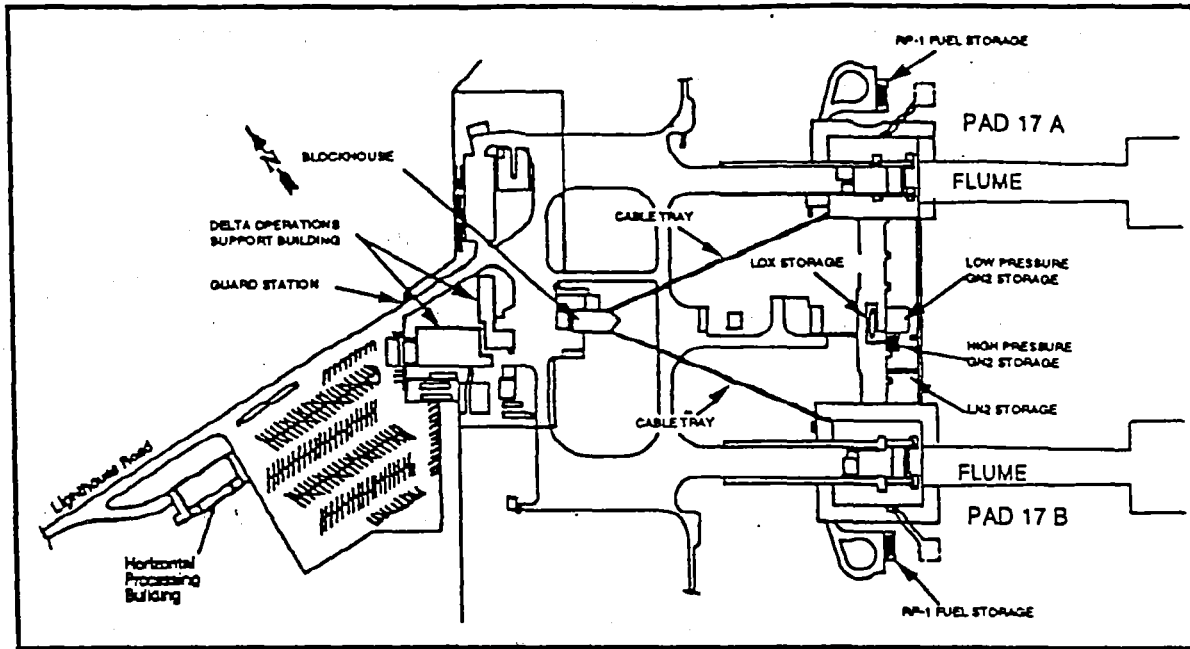
The two launch pads share common pressurant gas (nitrogen) storage facilities, located in bunkers between the pads, and are monitored from a common blockhouse, located at a distance from the launch pads. Other miscellaneous support and service facilities are shared between them, as well. LC-17 was renovated in the late 1980s to support an upgraded version of the Delta launch vehicle.

3.1.3 Economic Base [NASA 1990]

The region's economic base is tourism and manufacturing. Tourism-related employment includes most jobs in amusement parks, hotels, motels, and campgrounds, as well as many occupations in the retail trade and various types of services. Manufacturing jobs, while probably outnumbered by tourism jobs, may provide more monetary benefits to the region because of higher average wages and a larger multiplier effect.

The region's agricultural activities include citrus groves, winter vegetable farms, pastures, foliage nurseries, sod, livestock, and dairy production. In the central region, 30 percent of the land is forested and supports silviculture, including harvesting of yellow pine, cypress, sweetgum, maple, and bay trees. In Osceola County, large cattle ranches occupy almost all of the rural land. Agricultural employment declined in 1986 to just 2.2 percent of the region's employment base.

Commercial fisheries in the two counties bordering the ocean (Brevard and Volusia) landed a total of approximately 9,727 metric tons (about 21.4 million pounds) of finfish, invertebrates, and shrimp in 1988. Brevard and Volusia Counties ranked third and fourth, respectively, among the east coast counties of Florida in total 1988 finfish landings.



Source: [USAF 1988]

Figure 3-4. Launch Complex 17

3.1.4 Public Facilities and Emergency Services [USAF 1990]

The city of Cocoa provides potable water, drawn from the Floridan Aquifer, in Ocscaeola County. The maximum capacity is 152 million liters (40 million gallons) per day, and average daily consumption is about 99 million liters (26 million gallons) per day.

The cities of Cocoa, Cape Canaveral, Cocoa Beach, and Rockledge are each served by their own municipal sewer systems. Unincorporated areas are accommodated by several plants, some of which have reached capacity. Municipal plants in Cape Canaveral, Cocoa Beach, and Cocoa have been expanded and plans are in the works for expansion of the Rockledge system.

Florida Power and Light supplies electricity throughout Brevard County and CCAS. Police departments in the five municipalities of the central Brevard area have an average of one officer per 631 people, and fire protection has one full-time officer per 936 people. Health care within the area is available at 28 general hospitals, three psychiatric hospitals, and two specialized hospitals. CCAS is serviced by a rail spur from the Florida East Coast Railway.

Rail transportation for Brevard County is provided by Florida East Coast Railway. A main line traverses the cities of Titusville, Cocoa, and Melbourne, and spur lines provide access to other parts of the county, including CCAS [USAF 1986].

3.1.5 CCAS Facilities and Services

CCAS receives its water supply from the city of Cocoa, and uses roughly 11.4 million liters (3 million gallons) per day. To support launch facility deluge systems, the distribution system at CCAS was constructed to provide up to 114,000 l (30,000 gal) per minute for up to ten minutes. [USAF 1990]

The CCAS provides for its own sewage disposal with on-site package sewage treatment plants (STPs). The LC-17 STP has a capacity of 57,000 l (15,000 gal) per day and is permitted by the Florida Department of Environmental Protection (FDEP). [USAF 1988].

All nonhazardous solid waste generated on CCAS is collected by a refuse contractor and transported to the Brevard County landfill. The CCAS landfill, located approximately 122 m (400 ft) northeast of the station's airstrip is only permitted to receive construction debris and ACMs. Hazardous wastes are accumulated at a number of locations throughout CCAS pending disposal. Wastes generated from commercial launch operations must be disposed of under the commercial generator's own identification number. Commercial use of CCAS Hazardous Waste Storage Facilities and disposal support depends upon its permit and the commercial agreements signed with the 45th Space Wing. CCAS has a Resource Conservation and Recovery Act (RCRA) permitted Explosive Ordnance Disposal (EOD) facility which supports disposal of CCAS- and KSC-generated wastes, such as shavings from SRMs. All hazardous wastes generated at CCAS are managed according to the CCAS Petroleum Products and Hazardous Waste Management Plan (OPlan 19-14).

To prevent oil or petroleum discharges into U.S. waters, a Spills Prevention, Control, and Countermeasures Plan (SPCCP) is required by the EPA's oil pollution prevention regulation. A SPCCP has been integrated into the CCAS Oil and Hazardous Substance Pollution Contingency Plan (OPlan 19-1). Spills of oil or petroleum products that are federally listed hazardous materials will be collected and removed for proper disposal by a certified contractor according to this plan. All spills/releases will be reported to the host installation per OPlan 19-1.

The Launch Base Support (LBS) Contractor conducts all environmental, security, fire and police services on CCAS. A mutual agreement for fire protection services exists between the city of Cape Canaveral, KSC, and the LBC Contractor at CCAS. The station is equipped with a dispensary under contract to NASA. The dispensary normally works on a forty-hour week basis. If medical services cannot be provided by the dispensary, hospitals at Patrick Air Force Base (PAFB) and in Cocoa Beach, Rockledge, Titusville, and Melbourne are used. [USAF 1986]

3.1.6 Archeological and Cultural Resources

Within the region, there are 81 sites that are listed in the National Register of Historic Places [DOI 1991], and 2 in the National Register of Historic Landmarks.

In 1982, an archeological/historical survey of CCAS was conducted that consisted of literature and background searches and field surveys. The survey located 32 prehistoric and historic sites and several uninvestigated historic localities. Results of the field survey indicated that many of the archeological resources had been severely damaged by the construction of roads, launch complexes, power lines, drainage ditches, and other excavation. The survey recommended 11 sites for further evaluation to determine eligibility for the National Register of Historic Places. [RAI 1982]

The protection and interpretation of significant resources associated with the space program are underway by the Department of Interior, National Park Service, and USAF, through the Man in Space National Historic Landmark Program. Areas at CCAS designated as landmark sites include the Mission Control Center and launch complexes 5, 6, 13, 14, 19, 26, and 34, which were used during the Mercury and early Gemini manned space flights. [USAF 1988]. LC-17 has been determined to be eligible for listing in the National Register of Historic Places.

3.2 NATURAL ENVIRONMENT

3.2.1 Meteorology and Air Quality

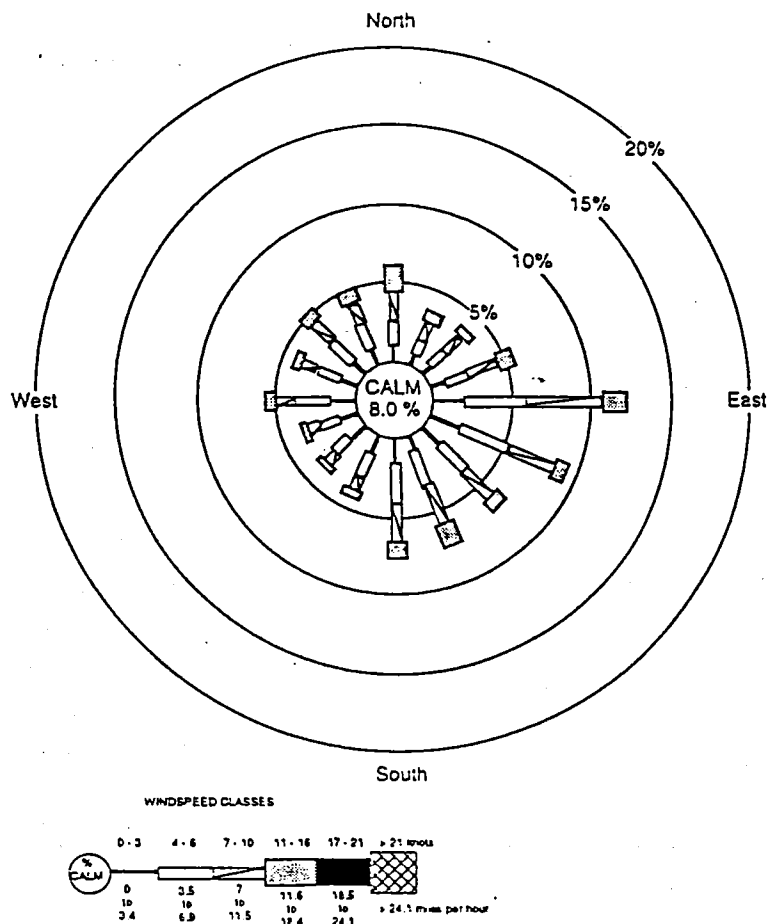
3.2.1.1 Meteorology

The climate of the region is subtropical with two distinct seasons: long, warm, humid summers and short, mild, and dry winters [NASA 1992]. Rainfall amounts vary both seasonally and yearly. Average rainfall is 128 centimeters (51 inches), with about 70 percent falling during the wet season (May to October). Temperature is less variable — prolonged cold spells and heat waves rarely occur. Tropical storms, tropical depressions, and hurricanes occasionally strike the region, generally in the period starting in August and ending in mid-November. The possibility of winds reaching hurricane force in Brevard County in any given year is approximately 1 in 20 [USAF 1986]. Tornadoes may occur, but are very scarce. Hail falls occasionally during thunderstorms, but hailstones are usually small and seldom cause much damage. Snow in the region is rare.

Summer weather typically lasts about nine months of the year, starting in April. Afternoon thundershowers are common and usually result in lower temperatures and an ocean

breeze. Occasional cool days occur as early as November, but winter weather generally commences in January and extends through March. [NASA 1986]

The wind rose in Figure 3-5 shows the annual average frequency distribution of average wind speed and direction in the vicinity of CCAS. At CCAS, winds typically come from the north/northwest from December through February, from the southeast from March through May, and from the south from June through August. Sea breeze and land breeze phenomena occur commonly over any given 24-hour period due to unequal heating of the air over the land and ocean. Land breeze (toward the sea) occurs at night when air over land has cooled to a lower temperature than that over the sea; sea breeze (toward the land) occurs during the day when air temperatures over the water are lower. The sea breeze and land breeze phenomena occur frequently during the summer months, less frequently during the winter. [USAF 1986]



Source: Adapted from [USAF 1988]

Figure 3-5. Wind Rose Indicating Wind Speed and Direction — Lower Atmospheric Conditions: Cape Canaveral 1968 - 1978 Annual Averages

3.2.1.2 Air Quality

Air quality at CCAS is considered good, primarily because of the distance of the station from major sources of pollution. There are no Class I or nonattainment areas for criteria pollutants (ozone [O₃], nitrogen oxides [NO_x], sulfur dioxide [SO₂], lead [Pb], carbon monoxide [CO], and particulates) within about 96 km (60 miles) of CCAS. Orange County was a nonattainment area for ozone until 1987, when it was redesignated as an ozone attainment maintenance area. [NASA 1992]

The station and its vicinity are considered to be "in attainment" or "unclassifiable" with respect to National Ambient Air Quality Standards (NAAQS) for criteria pollutants [USAF 1990]. The criteria pollutants and the federal and state standards are listed in Table 3-1. Though NAAQS apply to continuously emitting sources, they will be used for comparative purposes throughout this EA.

The daily air quality at CCAS is chiefly influenced by a combination of vehicle traffic, maintenance activities, utilities fuel combustion, and incinerator operations. Space launches influence air quality only episodically. Two regional power plants are located within 20 km (12 miles) of the station and are believed to be the primary source of occasional elevations in nitrogen dioxide and sulfur dioxide levels. Ozone has been CCAS's most consistently elevated pollutant. However, since January 1, 1992, the primary standard for ozone has not been exceeded. [DC 1995]

3.2.2 Noise

Monitoring of ambient noise levels at CCAS has not been performed. However, it would be expected that noise generated at the station would include sources from day-to-day operations, launches of space vehicles, industrial operations, construction, and vehicular traffic [USAF 1990].

Day-to-day operations at CCAS would most likely approximate that of any urban industrial area, reaching levels of 60 to 80 decibels (dBA), but with a 24-hour average ambient noise level that is somewhat lower than the EPA-recommended upper level of 70 dBA [USAF 1990, NASA 1992].

Launches occur infrequently, but during liftoff launch vehicle rocket engine noise is characterized as intense, composed predominantly of low frequencies, and has a relatively short duration. LC-17 makes use of a water deluge system for noise abatement. This noise is usually perceived by the surrounding communities as a distant rumble. Space launches also generate sonic booms during vehicle ascent and stage reentry. Launch-generated sonic booms are directed upward and in front of the vehicle and occur over the Atlantic Ocean. Stage

Table 3-1. State and Federal Air Quality Standards

Pollutant	Averaging Time	State of Florida Standard	Federal Primary Standard	Federal Secondary Standard
Carbon Monoxide (CO)	8-hour *	10 mg/m ³ (9 ppm)	10 mg/m ³ (9 ppm)	none
	1-hour *	40 mg/m ³ (35 ppm)	40 mg/m ³ (35 ppm)	none
Lead (Pb)	Quarterly Arithmetic Mean	1.5 µg/m ³	1.5 µg/m ³	same as primary
Nitrogen Dioxide (NO ₂)	Annual Arithmetic Mean	100 µg/m ³ (0.05 ppm)	100 µg/m ³ (0.05 ppm)	same as primary
Ozone (O ₃)	1-hour +	235 µg/m ³ (0.12 ppm)	235 µg/m ³ (0.12 ppm)	same as primary
Sulfur Dioxide (SO ₂)	Annual Arithmetic Mean	80 µg/m ³ (0.03 ppm)	80 µg/m ³ (0.03 ppm)	none
	24-hour *	260 µg/m ³ (0.1 ppm)	365 µg/m ³ (0.14 ppm)	none
	3-hour *	1300 µg/m ³ (0.5 ppm)		1300 µg/m ³ (0.5 ppm)
Particulate Matter 10 (PM10)	Annual Arithmetic Mean		50 µg/m ³	same as primary
	24-hour *		150 µg/m ³	same as primary

Source: [NASA 1992]

NOTE: mg/m³ = milligrams per cubic meter

µg/m³ = micrograms per cubic meter

ppm = parts per million

* Not to be exceeded more than once per year

+ Not to be exceeded an average of more than one day per year over a three-year period

reentry sonic booms also occur over the open ocean and do not impact developed coastal areas [USAF 1990]. Some launch vehicle related noise levels measured at KSC are shown in Table 3-2.

Peak noise levels created by industrial and construction activities — mechanical equipment such as diesel locomotives, cranes, and rail cars — could range from about

Table 3-2. Launch Noise Levels at Kennedy Space Center

SOURCE	NOISE LEVEL	REMARKS
Titan IIC	93.7 dBA	21 October 1965
Saturn I	89.2 dBA	Average of 3 launches
Saturn V	91.0 dBA	15 April 1969
Space Shuttle	89.6 dBA	Estimated

Source: [NASA 1992]

90 to 111 dBA. Vehicular traffic noise ranges from around 85 dBA for a passenger auto to about 100 dBA for a motorcycle. [NASA 1992]

3.2.3 Land Resources

3.2.3.1 Geology

The region is underlain by a series of limestone formations, with a total thickness of several thousand feet. The lower formations contain the Upper Floridan Aquifer, which is under artesian pressure in the vicinity of the station. At CCAS, the Upper Floridan Aquifer commences at a depth of about 80 meters (260 feet) and is about 110 meters (360 feet) thick [USAF 1990]. Beds of sandy clay, shells, and clays of the Hawthorn formation overlay the Floridan Aquifer, isolating the Floridan Aquifer from other, more shallow aquifers. The Hawthorn formation lies at a depth of about 30 meters (100 feet) at CCAS and is about 50 meters (160 feet) thick. Overlying the Hawthorne formation are upper Miocene, Pliocene, Pleistocene, and recent age deposits, which form secondary, semi-confined aquifers and the Surficial Aquifer, which lay at depths up to about 30 meters (100 feet).

CCAS lies on a barrier island composed of beach ridges formed by wind and wave action. This island, approximately 7.5 km (4.5 miles) wide at the widest point, parallels the Florida shoreline and separates the Atlantic Ocean from the Indian River, Indian River Lagoon, and Banana River. The land surface elevation ranges from sea level to about 6 meters (20 feet) above sea level at its highest point. LC-17 is located near the southeastern shore of the station. This area is designated as above the 500 year floodplain. [USAF 1990]

3.2.3.2 Soils

Soils on CCAS have been mapped by the U.S. Department of Agriculture Soil Conservation Service (SCS). Soil types that have been identified by the SCS in the vicinity of LC-17 are Canaveral Complex, Palm Beach Sand, Urban Land, and Canaveral-Urban Land Complex. These native soils are composed of highly permeable, fine-grained sediments typical of beach and dune deposits. Based on examination of well and soil borings from CCAS, the near-surface stratigraphy is fairly uniform, consisting of Pleistocene age sand

deposits that underlie the installation to depths of approximately 30 meters (100 feet). [USAF 1988]

3.2.4 Hydrology and Water Quality

3.2.4.1 Surface Waters

The station is located on a barrier island that separates the Banana River from the Atlantic Ocean. As is typical of barrier islands, the drainage divide is the dune line just inland from the ocean. Little runoff is naturally conveyed toward the ocean; most runoff percolates or flows westward toward the Banana River. The majority of storm drainage from CCAS is collected in manmade ditches and canals and is directed toward the Banana River.

Major inland water bodies in the CCAS area are the Indian River, Banana River, and Mosquito Lagoon. These water bodies tend to be shallow except for those areas maintained as part of the Intracoastal Waterway. The Indian and Banana Rivers, part of the same estuarine lagoon system known as the Indian River Lagoon, which connect adjacent to Port Canaveral by the Barge Cannal, which bisects Merritt Island, have a combined area of 60,000 ha (150,000 acres) in Brevard County and an average depth of 1.8 m (6 ft). This area receives drainage from 216,000 ha (540,000 acres) of surrounding terrain.

Predominant ocean currents in the vicinity of CCAS are north of the area. From the Cape Canaveral region to 26 km (16 miles) offshore, the average ocean current speed is 1.7 to 5 km per hour (1 to 3 miles per hour). Beyond about 26 km, the system of currents becomes known as the Florida Current of the Gulf Stream. The central axis of the Gulf Stream is located approximately 83 km (50 miles) off the coast of Florida at Cape Canaveral.

3.2.4.2 Surface Water Quality

Surface water quality near CCAS and KSC is monitored at 11 long-term monitoring stations that are maintained by NASA. Other monitoring stations in the general area are maintained by Brevard County, the U.S. Fish and Wildlife Service, and the Florida Department of Environmental regulation [NASA 1992]. In general, the water quality in the monitored surface waters in the Banana River has been consistently good. Both the northern and southern segments of the Banana River tend to be brackish to saline (15 to 36 parts per thousand [ppt]) at NASA Causeway East [USAF 1990]. Water quality in other portions of the Indian River Lagoon system ranges from good to poor. The Indian River Lagoon is an estuary of National Significance. The FDEP does not allow treated sewage discharge into these waters. Water quality monitoring data for the southern segment of the Banana River is summarized in Table 3-3.

Table 3-3. Summary of Water Quality Monitoring Data for South Banana River

Parameter	Average Value	Range of Values	State FDER Class III Standards
Conductivity (µmhos/cm)	33,300	12,470 - 50,500	Varies
Total Suspended Solids (mg/l)	32	1 - 143	No standard
Turbidity NTU	2.09	0.76 - 5.0	29 NTU above background
Oil and Grease (mg/l)	0.8	<0.2 - 3.9	≤ 5.0; no taste or odor
Phenols (µg/l)	128	32 - 364	< 300
Alkalinity (mg/l)	130	109 - 168	≥ 20 (fresh water)
pH	8.6	7.4 - 9.2	6.5 - 8.5 (marine water)
Total Kjeldahl Nitrogen (mg/l)	1.96	0.23 - 15.00	No standard
Nitrate Nitrogen (mg/l)	0.02	<0.02 - 0.06	No standard
Ortho Phosphate (mg/l)	0.032	<0.025 - 0.08	No standard (marine)
Chlorophyll A (mg/m ³)	5.0	<0.5 - 74.7	No standard
Biological Oxygen Demand (mg/l)	2.5	<1 - 7	No standard
Chemical Oxygen Demand (mg/l)	712	478 - 1361	No standard
Dissolved Oxygen (mg/l)	6.6	2.1 - 10.2	≥ 4 mg/l (marine water)
Total Organic Carbons (mg/l)	5.41	2.23 - 13.00	No standard
Aluminum (mg/l)	0.62	< 0.10 - 8.47	≤ 1.5 (marine water)
Cadmium (µg/l)	0.56	<0.01 - 2.86	≤ 0.3
Chromium (mg/l)	0.020	<0.001 - 0.05	0.5 (Cr ⁺⁶)
Iron (mg/l)	0.075	<0.040 - 0.178	0.3 (marine water)
Zinc (mg/l)	0.023	< 0.01 - 0.234	86 (fresh water)
Silver (µg/l)	17.88	< 0.05 - 31.3	≤ 0.05 (marine water)

Source: [NASA 1992]

NOTE: mg/l = milligram per liter
 µg/l = microgram per liter
 µmhos/cm = micromhos per centimeter

The Banana River is designated a Class III surface water, as described by the Federal Clean Water Act of 1977. Class III standards are intended to maintain a level of water quality suitable for recreation and the production of fish and wildlife communities.

The Banana River is also designated an Outstanding Florida Water (OFW) by the Florida Department of Environmental Regulation. An OFW is provided the highest degree of protection of any Florida surface waters. [NASA 1992]

3.2.4.3 Ground Waters [USAF 1988]

Ground water at the station occurs under both confined (artesian) and unconfined (nonartesian) conditions. Confined ground water is located in the Floridan Aquifer, which

serves as the primary ground water source in the coastal lowlands. Recharge to the Floridan Aquifer occurs primarily in northern and central Florida.

Although good quality water may be obtained from the Floridan Aquifer throughout much of the state, water from this formation on CCAS is highly mineralized and is not used for domestic or commercial purposes. Water for domestic and commercial purposes in this area is generally retrieved from the shallow, unconfined aquifer.

This unconfined surficial aquifer, or water table, is composed of recent and Pleistocene age surface deposits, and is usually found up to 1.5 meters (5 feet) or so below land surface. It is recharged by rainfall along the coastal ridges and dunes. The unconfined aquifer formation at CCAS ranges in depth from about 15 m (50 feet) at the coastal ridge to less than 6 m (20 feet) in the vicinity of the St. Johns River. The unconfined aquifer beneath LC-17 is not used as a water source.

3.2.4.4 Ground Water Quality

Ground water of the Floridan Aquifer at CCAS is not used as a domestic or commercial water source. Table 3-4 summarizes the water quality characteristics of a sample collected from the Floridan Aquifer underlying the west-central portion of the station. The sample exceeded national drinking water standards for sodium, chloride, and total dissolved solids (TDS). [NASA 1992]

Overall, water in the unconfined aquifer in the vicinity of KSC and CCAS is of good quality and meets the State of Florida Class G-II (suitable for potable water use; total dissolved solids less than 10,000 milligrams per liter) and national drinking water quality standards for all parameters, with the exception of iron, and/or total dissolved solids [NASA 1992, USAF 1990]. There are no potable water wells located at Launch Complex 17 or in its vicinity.

Ground water monitoring wells are sampled in accordance with the ground water monitoring plan required by the Florida Department of Environmental Protection Industrial Waste Water Permit. Ground water quality in five monitoring wells at LC-17 is generally good, with some detectable quantities of trace metals and organic compounds reported in one well, and detectable zinc concentrations in another [MDC 1990]. These results suggest that soil contaminants detected by earlier studies [USAF 1988] may be relatively non-mobile under the present soil conditions.

3.2.5 Biotic Resources

The station is located in east-central Florida on the Cape Canaveral peninsula. Ecological resources at CCAS are influenced by the Atlantic Ocean on the east and the Banana River on the west. Vegetation communities and related wildlife habitat are

Table 3-4. Ground Water Quality for the Floridan Aquifer at CCAS

Parameter	Average Value (mg/l)	Drinking Water Standards (mg/l)
Nitrates (as Nitrogen)	< 0.01	10 (primary standard)
Chlorides	540	250 (secondary standard)
Copper	<0.01	1.0 (secondary standard)
Iron	0.02	0.3 (secondary standard)
Manganese	<0.001	0.05 (secondary standard)
Sodium	1400	160 (primary standard)
Sulfate	85	250 (secondary standard)
Total Dissolved Solids	1,425	250 (secondary standard)
pH	7.6	6.5 - 8.5 (secondary standard)
Zinc	<0.01	5.0 (secondary standard)
Arsenic	<0.01	0.05 (primary standard)
Barium	0.02	1.0 (primary standard)
Cadmium	<0.001	0.01 (primary standard)
Chromium	0.001	0.05 (primary standard)
Lead	<0.001	0.05 (primary standard)
Mercury	0.0005	0.002 (primary standard)
Selenium	0.006	0.01 (primary standard)

Source: [USAF 1988]

NOTE: mg/l = milligrams per liter
 primary standard = National Interim Primary Drinking Water Regulations
 secondary standard = National Secondary Drinking Water Regulations

of barrier island resources of the region. Major community types at CCAS include beach, coastal strand and dunes, coastal scrub, lagoons, brackish marsh, and freshwater systems in the form of canals and borrow pits.

The restrictive nature of CCAS and KSC activities has allowed large areas of land to remain relatively undisturbed. In addition to communities found at CCAS, coastal hammocks and pine flatwoods are found on KSC to the northwest and increase the ecological diversity and richness of the area [USAF 1988]. A majority of the 65 square km (25 square mile) complex consists of coastal scrub, woodland, strand, and dune vegetation. Coastal scrub and coastal woodland provide excellent cover for resident wildlife. Coastal strand occurs immediately inland of the coastal dunes and is composed of dense, woody shrubs. Coastal dune vegetation (a single layer of grass, herbs, and dwarf shrubs) exists from the high tide point to between the primary and secondary dune crest. Wetlands represent only a minor percentage (less than 4 percent) of the total land area and include freshwater marsh, mangrove swamp, and salt swamp. Known hammocks are small, total less than 0.8 sq. km (0.3 mi²),

and are characterized by closed canopies of tree, shrub, and herb vegetation. Most of the wildlife species resident at the station can be found in each of these vegetation communities. No federally designated threatened or endangered flora are known to exist at CCAS. [USAF 1991]

3.2.5.1 Terrestrial Biota [USAF 1988]

Natural upland vegetation communities found on CCAS are coastal dune, coastal strand, coastal scrub, and hammock. Wetlands found on-site include both marshes and swamps.

The coastal dune community extends from the coastal strand system to the high tide line. Dune systems develop on poorly consolidated, excessively drained sands that are exposed to constant winds and salt spray.

Launch Complex 17 is surrounded by coastal scrub vegetation. The coastal scrub community covers approximately 3,760 ha (9,400 acres), or about 78 percent of the undeveloped land on CCAS. This community is distributed on excessively drained, nutrient-deficient marine sands.

Coastal strand vegetation occurs between the coastal dune and scrub communities and lies just east of LC-17. Coastal strand communities exist on sandy, excessively drained soils dominated by shrubs and often are nearly devoid of ground cover vegetation.

CCAS beaches are nonvegetated, but provide significant wildlife resources. The tidal zone supports a large number of marine invertebrates, as well as small fish that are food for various shorebirds. CCAS and KSC beaches also provide nesting habitat for three species of sea turtles.

Coastal hammocks are characterized by closed canopies of cabbage palm, the dominant tree species. Hammocks are shaded from intense insolation, and therefore retain higher levels of soil moisture than the previously described habitats. No hammocks occur in the immediate vicinity of LC-17, the nearest one being about 3 km (1.8 miles) west of the site, adjacent to the Banana River.

Wetlands within and surrounding station facilities are important wildlife resources. Wetland types that are found in the area include fresh water ponds and canals, brackish impoundments, tidal lagoons, bays, rivers, vegetated marshes, and mangrove swamps. Numerous areas containing wetland indicator vegetative species occur near LC-17. Saltwater marsh/swamp areas occur near LC-17 along the Banana River shoreline, along drainage canals and at the tip of Cape Canaveral. These soils are not suitable for cultivation, yet do contain swamp plants that support migratory and wading birds. [USAF 1990]

Species of plant and animal life observed or likely to occur on CCAS are listed in [USAF 1988].

3.2.5.2 Aquatic Biota [USAF 1988]

The northern Indian River lagoon ecosystem is a shallow system with limited ocean access, limited tidal flux, and generally mesohaline salinities. The aquatic environment is subject to wide fluctuations in temperature and salinity due to the shallowness of the system. The entire Indian River Lagoon is a component of the National Estuarine Program. The northern Banana River adjacent to CCAS is an Outstanding Florida Water.

Sea grasses are present in the Indian River system, generally found in patches in shoal areas less than 1 meter (3 feet) deep and surrounded by open, sandy terrain. Benthic invertebrates found in the northern Indian and Banana Rivers include marine worms, mollusks, and crustaceans, typical of estuarine systems. Epibenthic invertebrates collected from the area included horseshoe crabs, blue crabs, and penaid shrimp.

The area is not considered an important nursery area for commercially important shrimp species. Mosquito Lagoon, north of the complex, has been considered an important shrimp nursery area. Blue crabs were determined to spawn in the area.

Few freshwater fish species inhabit the area. Many of the area's freshwater fish species are believed to have been introduced by man. Primary reasons for the low diversity in fish species are considered to be latitude, climate, low habitat diversity, and limited ocean access.

3.2.5.3 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service, the Florida Game and Fresh Water Fish Commission (FGFWFC), and the Florida Commission on Rare and Endangered Plants and Animals (FCREPA) protect a number of wildlife species listed as endangered or threatened under Federal or State of Florida law. The presence, or potential for occurrence, of such species on CCAS was determined from consultations with FWS, FGFWFC, and CCAS and KSC environmental staff, and from a literature survey. Table 3-5 lists those endangered or threatened species in Brevard County residing or seasonally occurring on CCAS and adjoining waters.

A review of the list indicates that six species (southeastern kestrel, Florida scrub jay, and eastern indigo snake, gopher tortoise, Florida mouse, southeastern beach mouse) potentially occur in the immediate vicinity of LC 17. It should be noted that owls frequently

Table 3-5. Listed and Proposed Threatened and Endangered Animal Species and Candidate Animal Species In Brevard County and Their Status On CCAS

SPECIES ^a	STATUS ^b			CAPE CANAVERAL AIR FORCE STATION ^c
	USFWS	FGFWF	FCREPA	
Atlantic Loggerhead Sea Turtle	1	T	T	Occurs on beach/nests
Green Sea Turtle	E	E	E	Occurs on beach/nests
Leatherback Sea Turtle	E	E	R	Occurs on beach/nests
Kemp's Ridley Sea Turtle	E	E	E	Occurs on beach/no nests
Hawksbill Sea Turtle	E	E	E	Occurs offshore/no nests
Eastern Indigo Snake	T	T	SSC	Resident
American Alligator	T(S/A)	SSC	SSC	Resident
Atlantic Salt Marsh Snake	T	T	E	Not observed
Gopher Tortoise	T	SSC	T	Resident
Florida Scrub Jay	T	T	T	Resident
Wood Stork	E	E	E	Resident
Southern Bald Eagle	E	T	T	Visitor
Piping Plover	E	T	SSC	Visitor
Arctic Peregrine Falcon	T	E	E	Transient
Southeastern Kestrel	- -	T	T	Resident
Bachman's Sparrow	C2	- -	- -	Visitor
Reddish Egret	C2	SSC	R	Visitor
West Indian Manatee	E	E	T	Resident in waters
Southeastern Beach Mouse	T	T	- -	Resident
Finback Whale	E			Offshore waters
Humpback Whale	E			Offshore waters
Right Whale	E			Offshore waters
Sperm Whale	E			Offshore waters
Sei Whale	E			Offshore waters
Florida Mouse	C2	SSC	T	Resident
Round-Tailed Muskrat	C2	- -	SSC	Possible resident

Source: Adapted from [USAF 1990], [NASA 1992]

NOTES:

- ^a Scientific names of listed species are in [NASA 1992] and [USAF 1990]
- ^b E = endangered; S/A = similarity of appearance; T = threatened; C2 = proposed for listing as threatened; R = rare; SSC = species of special consideration
FWS = U.S. Fish and Wildlife Service
FGFWFC = Florida Game and Fresh Water Fish Commission
FCREPA = Florida Commission on Rare and Endangered Plants and Animals
- ^c resident = a species that occurs on CCAS year-round
visitor = bird species that occurs at CCAS but does not nest there
transient = bird species that occurs on CCAS only during season of migration
not observed = species occurs either as a resident or as a visitor in Brevard County but has not been observed on CCAS

nest on the UTs and/or the MSTs on LC-17. Three additional species may occasionally occur in wetlands on CCAS. West Indian manatees are known to occur in the Banana River and the Mosquito Lagoon and green turtles, and loggerhead turtles along Atlantic Ocean beaches.

SECTION 4

ENVIRONMENTAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVES

The activities associated with completing the preparations of the NEAR spacecraft primarily involve refining the spacecraft and mission designs, and spacecraft fabrication, assembly, and component testing at APL. While such fabrication activities may generate small quantities of effluents normally associated with tooling or cleaning operations, these are well within the scope of normal activities at the fabrication/testing facilities and will produce no substantial adverse environmental consequences.

Pre-launch activities (i.e., those activities occurring at the launch site) would involve integration and testing with the launch vehicle and final launch preparations, such as spacecraft and launch vehicle fueling operations, and would culminate in a successful nominal launch of the NEAR spacecraft.

The following sections summarize the environmental effects of a normal Delta II 7925/PAM-D launch and flight, and the effects of possible abnormal spacecraft operations or flight conditions for the launch of the NEAR spacecraft.

4.1 ENVIRONMENTAL IMPACTS OF A NORMAL LAUNCH

4.1.1 Air Quality

4.1.1.1 Emissions

Airborne emissions will be generated by pre launch, launch, and post-launch operations. The majority of emissions will be produced by the graphite epoxy motor solid rockets (9 GEMs on the Delta II 7925 vehicle) and the liquid first stage of the Delta II vehicle during launch. Six of the GEMs and the first stage of the Delta II will be ignited during lift-off. The primary products of GEM combustion will be carbon monoxide (CO), carbon dioxide (CO₂), hydrochloric acid (HCl), aluminum oxide (Al₂O₃) in soluble and insoluble forms, nitrogen oxides (NO_x), and water. Combustion products of the GEM are listed in Table 4-1. Major exhaust products of the Delta II first stage will be CO, CO₂, and water. Exhaust products from the Delta II first stage are given in Table 4-2.

Other emissions resulting from Delta II operations include fuel and oxidant vapors which may escape to the atmosphere during pre launch or post-launch operations. The first stage of the Delta II uses RP-1 as a fuel and liquid oxygen as an oxidizer. The vehicle's second stage employs Aerozine 50 as a fuel and nitrogen tetroxide (N₂O₄) as an oxidizer. Both stages will be loaded while the vehicle is on the launch pad.

Table 4-1. Combustion Products for the GEM Solid Rocket

Combustion Product	Product Mass Fraction	Product Mass per GEM		Product Mass for 6 Ground-Lit GEMs		Product Mass for 3 Air-Lit GEMs		Total Product Mass for 9 GEMs	
		kg	lbs	kg	lbs	kg	lbs	kg	lbs
AlCl	0.0002	2	5	14	31	7	16	21	47
AlCl ₂	0.0002	2	5	14	31	7	16	21	47
AlCl ₃	0.0001	1	3	7	16	4	8	11	24
AlClO	0.0001	1	3	7	16	4	8	11	24
Al ₂ O ₃ (soluble)	0.2959	3,512	7,727	21,074	46,363	10,537	23,181	31,611	69,544
Al ₂ O ₃ (insoluble)	0.0628	745	1,640	4,473	9,840	2,236	4,920	6,709	14,760
CO	0.2208	2,621	5,766	15,725	34,596	7,863	17,298	23,588	51,894
CO ₂	0.0235	279	614	1,674	3,682	837	1,841	2,511	5,523
Cl	0.0027	32	71	192	423	96	212	288	635
H	0.0002	2	5	14	31	7	16	21	47
HCl	0.2109	2,503	5,507	15,020	33,045	7,510	16,522	22,530	49,567
H ₂	0.0228	271	595	1,624	3,572	812	1,786	2,436	5,359
H ₂ O	0.0773	918	2,019	5,505	12,112	2,753	6,056	8,258	18,168
N ₂	0.0823	977	2,149	5,861	12,895	2,931	6,448	8,792	19,343
OH	0.0002	2	5	14	31	7	16	21	47

Source: Adapted from [MDSSC 1992]

Table 4-2. Exhaust Products for the Delta II 7925 First Stage

Combustion Product	Mass Fraction	Product Mass	
		kilograms	pounds
CO	0.4278	41,173	90,580
CO ₂	0.2972	28,603	62,928
H	0.0001	10	21
H ₂	0.0139	1,338	2,943
H ₂ O	0.2609	25,110	55,242
OH	0.0002	19	42

Source: Adapted from [MDSSC 1992]

RP-1 and liquid oxygen will be loaded into the first stage of the launch vehicle twice during the normal sequence of pre launch operations. The tanks are fully loaded approximately two weeks prior to launch to test the fuel system's integrity. Following testing, the tanks will be drained and the RP-1 and liquid oxygen returned to storage tanks for later re-use. The second loading occurs within several hours before launch. Any fuel spillage that occurs during the loading process is collected in sealed trenches leading from the RP-1 storage tanks to the launch pad, and the RP-1 is then evacuated from these trenches into sealed 55 gallon drums for subsequent disposal by a certified subcontractor. Vapor losses during first stage loading will be minimal, due to the low volatility of RP-1.

Aerozine 50 and N_2O_4 would be loaded into the second stage approximately 3 days prior to the scheduled launch date. Pollution control devices are utilized to control emissions resulting from fuel and oxidizer handling operations. Chemical scrubbers are used to remove pollutants from the vapors; the scrubber solutions are then released into drums for disposal by a certified subcontractor. The air emissions from the scrubbers have been sampled as per Florida Department of Environmental Protection air permit and has been found not to emit in excess of the permit operating conditions. Spillage of Aerozine 50 or N_2O_4 , although not expected, would be collected in stainless steel tubs under the scrubber units, then collected in drums and disposed of by a certified subcontractor in accordance with OPlan 19-1.

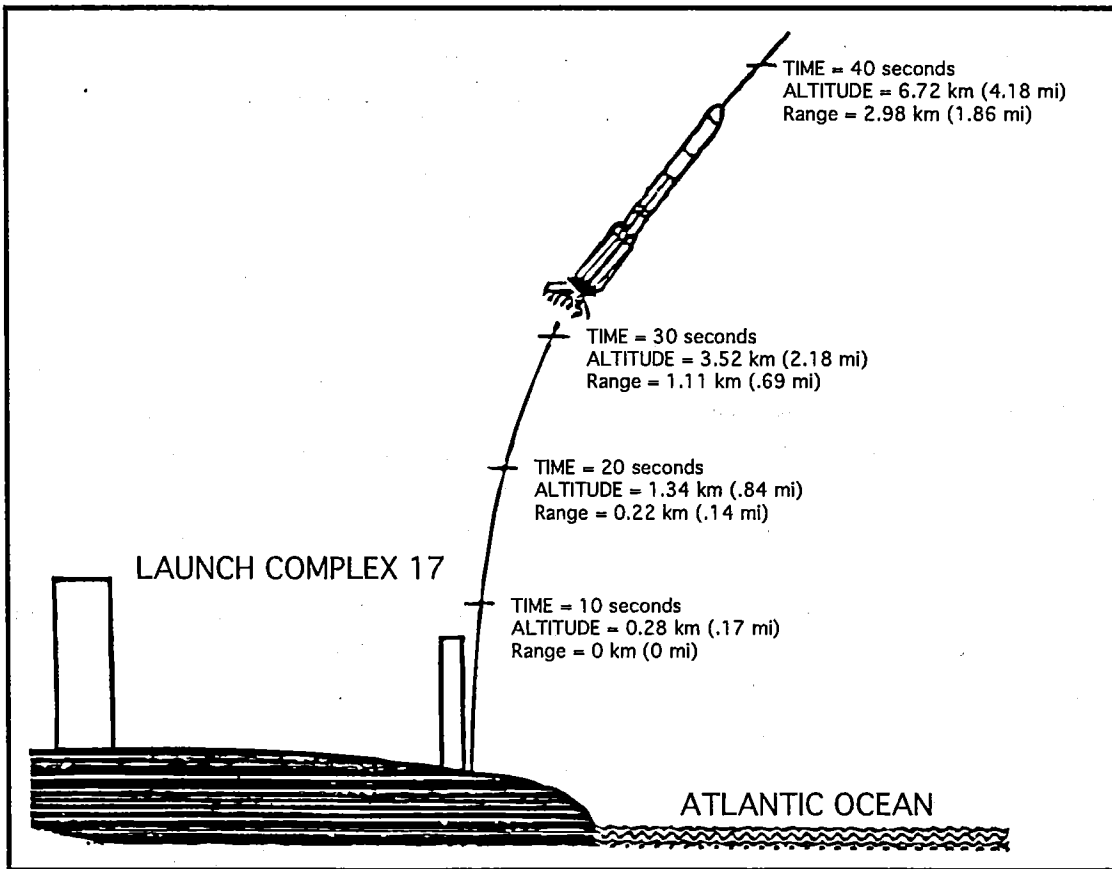
If a fuel leak occurs on the launch pad, an evaluation is made to determine if the magnitude constitutes an environmental concern. If it does, fuel flow is stopped and the problem corrected immediately. If the nature of the leak is minor (i.e. drip leak) the drip will be contained, generally by using a pad soaked in neutralizer, and fueling operations would continue. The leak would then be corrected during pad rehab after the launch. If a significant leak in the vehicle or spacecraft is detected after loading, the pad would be evacuated and a determination made to either fix the leak or initiate emergency off-load procedures.

An accidental fuel release could occur in the event of a rupture of a part of the propellant loading system, mainly as a result of over pressurization of the system. However, redundant flow meters and automatic shutdown devices on the propellant loading system will prevent overfilling of the propellant tanks. Automatic pressure monitoring devices on the tanks and feed system prevent over pressurization.

In the unlikely event of a vehicle destruction on the pad, failure in flight, or a command destruct action, liquid propellant tanks and GEM casings are ruptured. Under these circumstances, most of the released liquid propellants would ignite and burn. Rupture of the GEM casings creates a sudden reduction in chamber pressure, which will extinguish most of the solid propellants; only a portion may continue to burn.

4.1.1.2 Impacts

In a normal launch, exhaust products from the Delta II 7925 (Tables 4-1 and 4-2) are distributed along the launch vehicle's path (Figures 4-1 and 4-2). The quantities of exhaust emitted per unit length of the trajectory are greatest at ground level and decrease continuously. The portion of the exhaust plume that persists longer than a few minutes (the ground cloud) is emitted during the first few seconds of flight and is concentrated near the pad area. Prior to launch all non-essential personnel are evacuated from the launch site to areas a minimal distance outside the facility perimeter. Necessary personnel remain inside the complex blockhouse until the area has been monitored and declared clear. Little information has been developed specifically for the Delta vehicle, but data from the Titan program has been used as a basis for comparison [USAF 1988].

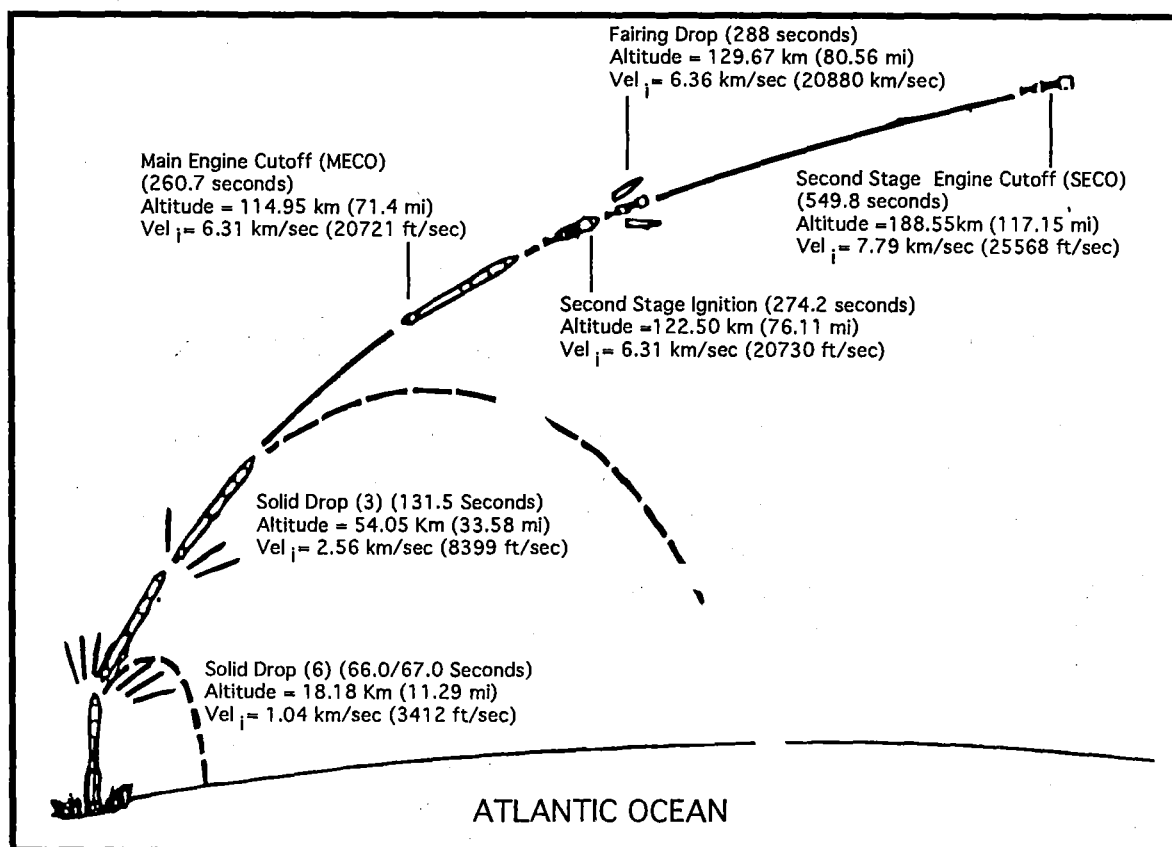


Source: Adapted from [MDA 1993]

Figure 4-1 Delta II 7925 Launch Area Flight Profile

To estimate the peak ground level concentrations of ground cloud pollutants, the US Air Force has extrapolated Delta II exhaust plume diffusion data from models developed for the Titan launch vehicle program. These Titan models are used to calculate peak ground level concentrations of various pollutants in ground clouds. Due to the similarity in propellant types, the Delta vehicle ground cloud will be similar in composition to that produced by the Titan. However, the size of the Delta ground cloud should be considerably smaller than that of the Titan because the Delta vehicle and solid rocket GEMs contain less propellant, produce less vapor, and accelerate off the launch pad more quickly than the Titan. The ground cloud resulting from a normal Delta II launch is predicted to have a radius of about 20 meters (about 67 feet).

From these estimates, HCl concentrations from a Delta II ground cloud should not exceed 5 ppm beyond about 4.3 km (2.7 miles) downwind. The Occupational Health and Safety Administration (OSHA) permissible exposure limit (PEL) for HCl is 5 ppm for an 8-hour time-weighted average. Although National Ambient Air Quality Standards



Source: Adapted from [MDA 1993]

Figure 4-2. Delta II 7925 Boost Profile (Up to Orbit Injection)

(NAAQS) have not been adopted for HCl, the National Academy of Sciences (NAS) developed recommended short-term exposure limits for HCl of 20 ppm for a 60-minute exposure, 50 ppm for a 30-minute exposure, and 100 ppm for a 10-minute exposure. Since the nearest uncontrolled area (i.e., general public) is approximately 4.8 km (3 miles) from LC-17, HCl concentrations are not expected to be high enough to be harmful to the general population. The maximum level of HCl expected to reach uncontrolled areas during preparation and launch of the Delta II would be well below the NAS recommended limits. Appropriate safety measures will also be taken to ensure that the permissible exposure limits defined by the Occupational Safety and Health Administration are not exceeded for personnel in the launch area.

The same predictive modeling techniques used for HCl were also applied to CO and Al₂O₃. For Titan launches, CO concentrations were predicted to be less than 9 ppm except for brief periods during actual lift-off. Prior to, during, and for about 20 minutes after launch, the area within the perimeter is cleared of personnel in accordance with Range Safety practices. During launch, gases are exhausted at temperatures ranging from 2,000 to 3,000 degrees. Most of the gases then immediately rise to an altitude of about 2,000 feet, where they are dispersed by the prevailing winds. Moreover, carbon monoxide gas is expected to rapidly oxidize to carbon dioxide (CO₂) in the atmosphere, and therefore, CO concentrations for Titan launches are not expected to exceed the NAAQS of 35 ppm (1 hr average) beyond the immediate vicinity of the launch complex. The nine GEMs used for the Delta launch constitute less than 20 percent of the propellant loading of the two SRMUs, and therefore, the CO concentration for Delta launch is predicted to be on the order of 2 ppm (1-hour average).

Aluminum oxide exists as a crystalline dust in solid rocket motor (SRM) exhaust clouds, but is inert chemically and is not toxic. However, since many of the dust particles are small enough to be retained by lungs, it is appropriate to abide by NAAQS for particulate matter smaller than 10 microns (PM-10). The maximum 24-hour Al₂O₃ concentration beyond the distance of the nearest CCAS property boundary predicted by the REEDM model for a Titan IV-Type 2 launch, was 25 µg/m³, which is well below the 24-hour PM-10 NAAQS for PM-10 of 150 µg/m³ [USAF 1990]. Scaling from the Titan IV REEDM predictions, based on the solid propellant mass proportion of the Delta II 7925, the Al₂O₃ peak concentrations should not exceed 5 µg/m³. The NAAQS for continuous emitters of particulate matter, 150 µg/m³ (24-hour average), should not be exceeded by a Delta II launch due to the short nature of the launch event.

Nitrogen oxides may enter the atmosphere through propellant system venting, a procedure used to maintain proper operating pressures. Air emission control devices will be used to mitigate this small and infrequent pollutant source. First stage propellants will be carefully loaded using a system with redundant spill-prevention safeguards. Aerozine 50 vapors from second stage fuel loading will be processed to a level below analytical detection by a citric acid scrubber. Likewise, N₂O₄ vapors from second stage oxidizer loading will be passed through a sodium hydroxide (NaOH) scrubber. These scrubber wastes will be

disposed by a certified hazardous waste contractor according to the CCAS Petroleum Products and Hazardous Waste Management Plan (OPlan 19-14). The scrubber operation is a FDEP permitted activity. Air emissions monitoring is conducted in accordance with the FDEP permit.

During the last 20 years there has been an increased concern about human activities that are affecting the upper atmosphere. Space vehicles that use SRMs have been studied concerning potential contribution to stratospheric ozone depletion because of their exhaust products, with the primary depleting component being HCl. Extrapolating from estimates made using the REEDM model for the Titan IV solid rocket motor upgrade (SRMU) effects on stratospheric ozone, the net decrease in ozone resulting from launching eight Titan IV-Type 2 SRMUs over a twelve-month period is predicted to be on the order of 0.02 percent [USAF 1990]. A Delta II 7925 with nine GEMs is less than 20% of the SRMUs propellant loading. Therefore, scaling from the Titan IV-Type 2 prediction, the net stratospheric ozone depletion from nine GEMs, which are planned for use with Delta II, has been predicted to be on the order of 0.0005 percent. Based on the history of six Delta launches per year average for the past eight years, launching six Delta II 7925 with nine GEMs in a twelve-month period is extrapolated to result in a cumulative net stratospheric ozone depletion on the order of 0.003 percent. Consequently, no substantial impact on stratospheric ozone is anticipated.

In addition to the near-pad acidic deposition that could occur during a launch, there is a possibility of acid precipitation from naturally-occurring rain showers falling through the ground cloud shortly after launch. Since the ground cloud for a Delta II launch is very small (radius of about 20 m or 67 ft) and concentrates around the launch pad, there should be no substantial acid rain beyond the near-pad area.

4.1.2 Land Resources

Overall, launching a Delta II vehicle is expected to have negligible negative effects on the land forms surrounding Launch Complex 17 [USAF 1988]. However, launch activities could have some small impacts near the launch pad associated with fire and acidic depositions. Minor brush fires are infrequent by-products of Delta launches, and are contained and limited to the ruderal vegetation within the launch complexes; past singeing has not permanently affected the vegetation near the pads. Wet deposition of HCl, caused by rain falling through the ground cloud or SRM exhaust, could damage or kill vegetation. Wet deposition is not expected to occur outside the pad fence perimeter, due to the small size of the ground cloud and the rapid dissipation of both the ground cloud and SRM exhaust plume [USAF 1990]. Since no new facilities will be constructed, the proposed action will not occur in wetlands. However, there may be minor short-term impacts to wetlands biotic resources due to acid deposition and noise associated with the launch.

4.1.3 Local Hydrology and Water Quality

Water, supplied by municipal sources, is used at LC-17 for deluge water, launch pad wash down and fire suppressant, and potable water. Most of the deluge, wash down, and fire suppressant water is collected in a concrete catchment basin; however, minor amounts may drain directly to grade. The only potential contaminants used on the launch pad are fuel and oxidizer, and the only release of these substances would occur within sealed trenches and should not contaminate runoff. Any accidental or emergency release of propellants from the Delta vehicle after fueling would be collected in the flume located directly beneath the launch vehicle and channeled to a sealed concrete catchment basin. If the catchment basin water meets the criteria set forth in the FDEP industrial waste water discharge permit, it is discharged directly to grade at the launch site. If it fails to meet the criteria, it is treated on site to meet permit discharge criteria and disposed to grade or collected and disposed of by a certified contractor. No discharges of contaminated water are expected to result from medium launch vehicle operations at LC-17. To ensure this, the ground water in the discharge area is monitored quarterly by Air Force Bioenvironmental Engineering Services.

The primary surface water impacts from a normal Delta II launch involve HCl and Al₂O₃ deposition from the ground cloud. The cloud will not persist or remain over any location for more than a few minutes. Depending on wind direction, most of the exhaust may drift over the Banana River or the Atlantic Ocean, resulting in a brief acidification of surface waters from HCl. Aluminum oxide is relatively insoluble at the pH of local surface waters and is not expected to cause elevated aluminum levels or significant acidification of surface waters. The relatively large volume of the two bodies of water compared to the amount of exhaust released is a major factor working to prevent a deep pH drop and associated fish kills. There have been no fish kills recorded in the Atlantic Ocean or Banana River as a result of HCl and Al₂O₃ deposition during a normal launch. [45 AMDS/SGPB] A normal Delta II launch will have no substantial impacts to the local water quality.

4.1.4 Ocean Environment

In a normal launch, the first and second stages and the SRMs will impact the ocean. The trajectories of spent stages and SRMs will be programmed to impact a safe distance from any US coastal area or other land mass. Toxic concentrations of metals are not likely to occur due to the slow rate of corrosion in the deep ocean environment and the large quantity of water available for dilution.

Along with the spent stages will be relatively small amounts of propellant. The release of solid propellants into the water column will be slow, with potentially toxic concentrations occurring only in the immediate vicinity of the propellant. Insoluble fractions of the first stage propellant will spread rapidly to form a localized surface film that will evaporate in several hours. Second stage propellants are soluble and should also disperse rapidly.

Concentrations in excess of the maximum allowable concentration (MAC) of these compounds for marine organisms will be limited to the immediate vicinity of the spent stage. No substantial impacts are expected from the reentry and ocean impact of spent stages, due to the small amount of residual propellants and the large volume of water available for dilution. [USAF 1988].

4.1.5 Biotic Resources

A normal Delta II launch is not expected to substantially impact CCAS terrestrial, wetland, or aquatic biota. The elevated noise levels of launch are of short duration and will not substantially affect wildlife populations. Wildlife encountering the launch-generated ground cloud may experience brief exposure to exhaust particles, but will not experience any significant impacts. Aquatic and terrestrial biota may experience acidified precipitation, if the launch occurs during a rain shower. This impact is expected to be insignificant due to the brevity of the ground cloud and the high buffering ability of the surrounding surface waters to rapidly neutralize excess acidity.

4.1.6 Threatened and Endangered Species

Any action that may affect federally listed species or their critical habitats requires consultation with the US Fish and Wildlife Service (FWS) under Section 7 of the Endangered Species Act of 1973 (as amended). The US FWS has reviewed the actions which would be associated with a Delta II launch from LC-17 and has determined that those actions would have no effect on state or federally listed threatened (or proposed for listing as threatened) or endangered species residing on CCAS and adjoining waters [USAF 1988], [NASA 1992].

4.1.7 Developed Environment

4.1.7.1 Population and Socioeconomics

Launching the NEAR mission will have a negligible impact on local communities, since no additional permanent personnel are expected beyond the current CCAS staff. Launch Complex 17 has been used exclusively for space launches since the late 1950s. The NEAR mission will cause no additional adverse impacts on community facilities, services, or existing land uses.

4.1.7.2 Safety and Noise Pollution

The "Medium Launch Vehicle Accident Risk Assessment Report" [MDSSC 1986] describes the launch safety aspects of the Delta II vehicle, support equipment, and LC-17 facilities. The report identifies design and operating limits that will be imposed on system elements to preclude or minimize accidents resulting in damage or injury. Normal operations

at CCAS include preventative health measures for workers such as hearing protection, respiratory protection, and exclusion zones to minimize or prevent exposure to harmful noise levels or hazardous areas or materials. Operations are in compliance with OSHA regulations and with 45 SW ERR 127-1.

The engine noise and sonic booms from a Delta II launch are typical of routine CCAS operations. To the surrounding community, noise from launch-related activity appears, at worst, to be an infrequent nuisance rather than a health hazard. In the history of the USAF space-launch vehicle operations from CCAS, there have been no problems reported as a result of sonic booms, most probably because the ascent track of all vehicles and the planned reentry of spent sub orbital stages are over open ocean, thus placing sonic booms away from land areas. Shipping in the area likely to be affected is warned of the impending launches as a matter of routine, so that all sonic booms are expected and of no practical consequence [USAF 1988].

4.1.7.3 Archaeological and Cultural Resources

Since no surface or subsurface areas will be disturbed, no significant archaeological, historic, or cultural sites are expected to be affected by launching the NEAR spacecraft. LC-17 has been identified as eligible for listing in the National Register of Historic Places. LC-17 supports and is the site of existing launch operations. The proposed NEAR mission launch falls within the scope of activities normally occurring at LC-17 and should have no effect on its historic characteristics.

4.1.8 Environmental Justice

Executive Order 12898 mandates each Federal agency to make achieving Environmental Justice a part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its actions on low-income populations and minority populations. Since the proposed action will not result in substantial environmental impacts, environmental justice issues covered by the executive order do not come into play.[NASA 1994]

4.2 ACCIDENTS AND LAUNCH FAILURES

4.2.1 Liquid Propellant Spill

The potential for an accidental release of liquid propellants will be minimized by strict adherence to established safety procedures and compliance with OSHA regulations and with 45 SW ERR 127-1. First stage propellants, RP-1 and liquid oxygen, will be stored in tanks near the launch pad within cement containment basins designed to retain 110% of the storage tank volumes. Post-fueling spills from the launch vehicle will be channeled into a sealed

concrete catchment basin and disposed of in accordance with OPlan 19-1. Second stage propellants, Aerozine 50 and N_2O_4 , are not stored at LC-17 and will be transported to the launch site by specialized vehicles.

The most severe propellant spill accident scenario would be releasing the entire launch vehicle load of N_2O_4 at the launch pad while conducting propellant transfer operations. This scenario would have the greatest potential impact on local air quality. Using again the Titan predictive models [see paragraph 4.1.1.2] and scaling for the Delta propellant loading, airborne NO_x levels from this scenario should be reduced to 5 ppm within about 150 m (about 500 feet) and to 1 ppm within 300 m (about 1,000 feet). Activating the launch pad water deluge system would substantially reduce the evaporation rate, limiting exposure concentrations in the vicinity of the spill that are above federally established standards. Propellant transfer personnel will be outfitted with protective clothing and breathing equipment. Personnel not involved in transfer operations will be excluded from the area during such operations.

4.2.2 Launch Failures

In the unlikely event of a launch vehicle destruction, either on the pad or in-flight, the liquid propellant tanks and SRM cases would be ruptured. Due to their hypergolic (ignite on contact) nature, a launch failure would result in a spontaneous burning of most of the liquid propellants, and a somewhat slower burning of SRM propellant fragments. Tables 4-3 and 4-4 define the combustion products of a GEM SRM failure and a catastrophic launch pad failure. This release of pollutants would have only a short-term impact on the environment near LC-17.

Launch failure impacts on water quality would stem from unburned liquid propellant being released into CCAS surface waters. For most launch failures, propellant release into surface waters will be substantially less than the full fuel load, primarily due to the reliability of the vehicle destruct system.

If there was an early flight termination and failure of the vehicle destruct system, it is remotely possible that the entire stage 2 propellant quantity could be released to the ocean. Shallow or confined surface water systems would receive most of the impact. The release of the entire stage one RP-1 fuel load in this near-pad intact vehicle impact scenario would form a very thin film (less than 0.003 cm, or 0.001 inches) covering a water surface area less than 4.4 square km (1.7 square miles). This film would be expected to dissipate within a few hours. In this hypothesized worst case, which has never occurred for the Delta II, Aerozine 50 and N_2O_4 contaminants could exceed allowable concentrations for an approximate radius of 241 m (800 ft) in water depths exceeding 3 m (9 ft) deep. However, even given this worst case scenario, the impacts to ocean systems would be localized and/or transient in nature, and expected to recover within days [USAF 1988].

Table 4-3. Combustion Products for Delta II 7925 GEM Failure Scenario

Combustion Product	Product Mass Fraction	Total Propellant Mass of 105,872 kg	
		kg	lb
Al ₂ O ₃	0.1759	18,623	40,971
Ar	0.0064	678	1,492
C	0.0143	1,514	3,331
CH ₄	0.0000	0	0
CO ₂	0.1329	14,070	30,954
Cl ₂	0.0000	0	0
HCl	0.1071	11,339	24,946
H ₂ O (liquid)	0.1274	13,488	29,674
H ₂ O (gaseous)	0.0136	1,440	3,168
N ₂	0.4188	44,339	97,546
O ₂	0.0000	0	0

Source: Adapted from [MDSSC 1992]

Table 4-4. Combustion Products for Delta II 7925 Catastrophic Failure Scenario

Combustion Product	Product Mass Fraction	Total Propellant Mass of 209,433 kg	
		kg	lb
Al ₂ O ₃	0.0926	19,393	42,666
Ar	0.0064	1,340	2,949
C	0.0191	4,000	8,800
CO ₂	0.2514	52,651	115,833
Cl ₂	0.0000	0	0
HCl	0.0551	11,540	25,387
H ₂ O (liquid)	0.1556	32,588	71,693
H ₂ O (gaseous)	0.0141	2,953	6,497
N ₂	0.4051	84,841	186,651
O ₂	0.0000	0	0

Source: Adapted from [MDSSC 1992]

The calibration source for the XGRS contains a total of 30 micro curies of iron-55 isotope source. In the unlikely event of a release of a release to the environment, this source is so small that no adverse impacts are anticipated.

SECTION 5 REGULATORY REVIEW

5.1 AIR QUALITY

The Florida Department of Environmental Protection (FDEP) regulates air pollutant emission sources in Florida and requires permits for the construction, modification, or operation of potential air pollution sources [FDEP 1986]. Emissions from mobile sources, such as aircraft and space launch vehicles, do not require a permit. This exception does not include support facilities such as propellant loading systems.

Stationary, ground-based sources associated with space vehicle launches are subject to FDER review. Because no new stationary sources will be constructed for the NEAR launch, there is no requirement for new air quality permits.

The Delta II oxidizer and fuel vapor air pollution control devices at CCAS are in compliance with FDEP and National Ambient Air Quality Standards (NAAQS) regulations. The citric acid scrubber for Delta II propellants is probably one level of control beyond that required by the FDEP.

5.2 WATER QUALITY

5.2.1 Stormwater Discharge

Florida's stormwater discharge permitting program is designed to prevent adverse effects on surface water quality from runoff. A discharge permit will not be required for NEAR because the launch would not increase stormwater runoff rates or reduce the quality of the existing runoff.

5.2.2 Sanitary and Industrial Wastewater Discharge

LC-17 and the NEAR spacecraft and launch vehicle assembly facilities have potable water and sanitary waste disposal permits. No new permits will be required for the NEAR processing or launch.

Wastewater from LC-17 will include deluge and washdown water discharged during NEAR launch activities. An application has been filed with the FDEP to permit discharge from LC-17. The permit will be issued based on demonstration that discharge would not significantly degrade surface water or ground water.

5.2.3 Floodplains and Wetlands

LC-17 is not located in a floodplain. Impacts to wetlands from the launch of the NEAR would not exacerbate impacts from other CCAS activities or launches. Therefore, no new permits will be required for the NEAR launch.

5.3 HAZARDOUS WASTES

CCAS was issued a Resource Conservation and Recovery Act, Part B Hazardous Waste Operations permit in January 1986 [USAF 1986]. All hazardous wastes generated at CCAS will be managed according to the CCAS Hazardous Waste Management Plan (OPlan 19-14). Hazardous wastes produced during processing and launch operations, except propellant wastes, will be collected and stored in hazardous waste accumulation areas before being transferred to a hazardous storage area. These wastes will eventually be transported to an off-station licensed hazardous waste treatment/disposal facility. Propellant wastes will be disposed of in compliance with Federal and State regulations as well as 45 SW Operations Plan. [OPlan 19-14]

5.4 SPILL PREVENTION

To prevent oil or petroleum discharges into US waters, a Spills Prevention, Control, and Countermeasures Plan (SPCCP) is required by the Environmental Protection Agency's Oil Pollution Prevention Regulation. A SPCCP has been integrated into the CCAS Oil and Hazardous Substance Pollution Contingency Plan (OPlan 19-1). Spills of oil or petroleum products that are federally listed hazardous materials will be collected and removed for proper disposal by a certified contractor according to Cape Canaveral Air Station (CCAS) OPlan 19-4, Hazardous Substance Pollution Contingency Plan [USAF 1990]. All spills/releases of hazardous substances/wastes will be reported to the host installation per OPlan 19-1. Clean up cost will be borne by the party responsible for the release incident.

5.5 COASTAL MANAGEMENT PROGRAM

The Federal Coastal Zone Management Act of 1972 established a national policy to preserve, protect, develop, restore, and/or enhance the resources of the nation's coastal zone. The Act requires federal agencies that conduct or support activities directly affecting the coastal zone, to perform these activities in a manner that is, to the maximum extent practicable, consistent with approved state coastal zone management programs.

Delta II launches from LC-17 have been demonstrated to be consistent to the maximum extent practical with the State of Florida's Coastal Management Program, based on compatible land use, absence of significant environmental impacts and compliance with

applicable regulations [USAF 1986]. NEAR mission processing and launch would add no substantial impact beyond those determined to be associated with the Delta II. NASA has determined that the proposed NEAR mission and associated operations is consistent with, to the maximum extent practicable, Florida's Coastal Zone Management Program.

5.6 ARCHAEOLOGICAL AND CULTURAL RESOURCES

In accordance with 36 CFR Part 800, the Florida Department of State, Division of Historical Resources, has reviewed the planned Pathfinder launch for possible impact to archaeological and historical sites or properties listed, or eligible for listing, in the National Register of Historic Places. Their review indicates no significant archaeological or historical sites are recorded in the Florida Master Site File, nor are likely to appear there. They consider it unlikely that any such sites would be affected by the proposed action. [FLORIDA 1993] Because the NEAR launch is nearly identical to that of the Pathfinder, utilizing the same launch vehicle and launch complex, the findings of the Florida Division of Historical Resources apply to NEAR.

NASA has also determined that the proposed action will have no effect on property listed, or eligible for listing, in the National Register of Historic Places.

SECTION 6 REFERENCES

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- DOI 1991 United States Department of the Interior, *National register of historic Places, Florida Index*. National Park Service, Washington, DC, July 25, 1991.
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- ECFRPC 1992 East Central Florida Regional Planning Council. *East Central Florida Comprehensive Regional Policy Plan*. Winter Park, Florida, February 1992.
- ERR 127-1 Eastern Range Regulation, Range Safety
- FDEP 1986 Florida Department of Environmental Regulation, Florida Administrative Code, *Air Pollution Sources*, Chapter 17-2, October 1986.
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- MDA 1994a McDonnell Douglas Aerospace, *Preliminary Analysis for the NEAR Spacecraft Mission*, MDA Memorandum A3-L230-M-94-080, September 1994.
- MDA 1994b McDonnell Douglas Aerospace, *Delta II Launch Vehicle Data for MESUR Environmental Assessment* (H41910), March 11, 1994.

- MDC 1990 McDonnell Douglas Corporation, *Ground Water Assessment Report for Launch Complex 17, Cape Canaveral Air Force Station, Brevard County, Florida*, Prepared for MDC by Post, Buckley, Shuh, and Jernigan, Inc., November 1986.
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- NASA 1990 National Aeronautics and Space Administration, *Final Environmental Impact Statement for the Ulysses Mission (Tier 2)*, June 1990.
- NASA 1992 National Aeronautics and Space Administration, *Environmental Resources Document, Kennedy Space Center, KSC-DF-3080*. Prepared for NASA by Edward E. Clark Engineers Scientists, Inc., March 1992.
- NASA 1993 National Aeronautics and Space Administration, *KSC Ionizing Radiation Protection Program*, KSC Handbook (KHB) 1860.1, March 1993
- NASA 1994 National Aeronautics and Space Administration, *Environmental Justice Strategy*
- OP Plan 19-1 Cape Canaveral Air Station, *Oil and Hazardous Substance Pollution Contingency Plan*
- OP Plan 19-4 Cape Canaveral Air Station, *Hazardous Substance Pollution Contingency Plan*
- OP Plan 19-14 Cape Canaveral Air Station, *Petroleum Products and Hazardous Waste Management Plan*
- RAI 1982 Resource Analysts Inc., *Archaeological Resource Survey, Kennedy Space Center and Cape Canaveral Air Force Station*, 1982.

- USAF 1986 United States Air Force, *Environmental Impact Analysis Process, Environmental Assessment Complementary Expendable Launch Vehicle*, Cape Canaveral Air Force Station, Florida, 1986.
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- USAF 1990 United States Air Force, *Environmental Assessment, Titan IV/Solid Rocket Motor Upgrade Program*, Cape Canaveral Air Force Station, Florida (Vandenberg Air Force Base, California), February 1990.
- USAF 1991 United States Air Force, *Environmental Assessment, Delta Centralized Facility*, Cape Canaveral Air Force Base, Florida (Engineering-Science, Inc.), June 1991.

**APPENDIX A
CORRESPONDENCE WITH STATE AND FEDERAL AGENCIES**

NOTE:

While preparing this Environmental Assessment, NASA solicited comments from a range of Federal and Florida State Agencies. A distribution list may be found at the end of the NASA Letter of Intent dated February 10, 1995. There has been formal correspondence with Patrick Air Force Base and Kennedy Space Center. Their comments have been addressed.

This appendix contains the comments received from other Federal and Florida State Agencies.

Where no other agency written response is provided in this appendix, none was received.

National Aeronautics and
Space Administration

Headquarters
Washington, DC 20546-0001



FEB 10 1995

Copy to Attn of: SLN

To Potentially Concerned Agencies:

NASA is seeking approval for plans to launch the Near Earth Asteroid Rendezvous (NEAR) spacecraft on a mission to orbit Asteroid 433 Eros and gather information about its surface and composition. Current mission plans call for the spacecraft to be launched in February 1996 from the Eastern Test Range at the Cape Canaveral Air Station (CCAS), Cape Canaveral, Florida. In accordance with policies of NASA and requirements of the National Environmental Protection Act, NASA is preparing an Environmental Assessment (EA) to evaluate any mission-specific environmental impacts and alternatives. It is expected that the Mars Pathfinder Mission EA dated July 1994, would cover most of the required information except for the NEAR spacecraft description.

The NEAR mission would be designed to fulfill the most critical objectives of exploration of a near earth asteroid as part of NASA's solar system exploration program.

The baseline plan calls for NEAR to be designed as a solar-powered spacecraft small enough to be launched on a Delta II 7925 launch vehicle. A solid propellant Payload Assist Module Delta (PAM-D) upper stage will then place the spacecraft on a flight path to the near earth asteroid 433 EROS. The spacecraft will carry a small amount of the isotope Iron 55 as a calibration source in one of its instruments.

Prelaunch spacecraft testing and propellant loading operations would occur at the Kennedy Space Center and the CCAS, in Florida. After processing, the spacecraft would be transferred to the CCAS Launch Complex 17 for mating with the launch vehicle. No requirements for new or modified Government or contractor facilities have been identified, and no new facilities or modifications are planned for the mission.

The NEAR EA will address the Proposed Action of preparing for and implementing the NEAR mission to be launched from CCAS using the Delta II 7925/PAM-D launch system. Options discussed will include, but not necessarily be limited to, the use of alternative launch vehicles and the no action alternative.

The primary environmental impacts expected are those associated with the launch vehicle, which are discussed in U.S. Department of the Air Force, Headquarters Space Division, Environmental Assessment: Air Force Space Division, Medium Launch Vehicle

Program, Cape Canaveral Air Force Base, Florida (Environmental Science and Engineering Inc., Gainesville, Florida, May 1988). Those effects include the impact of rocket fuel combustion products on the quality of air, water, land and wetland, biotic resources, and historical sites. Other topics to be addressed in the Environmental Assessment are safety concerns and socioeconomic impacts.

Any comments you may presently have should be sent to me within 30 days of the date of this letter, at NASA Headquarters, Code SL, 300 E Street, SW, Washington, DC 20546. If you need further information, please contact Mr. Kenneth M. Kumor at NASA Headquarters at (202) 358-1112.

Sincerely,

William L. Piotrowski

William L. Piotrowski
Acting Director
Solar System Exploration Division
Office of Space Science

Distribution:

JE/Mr. K. Kumor
SLN/Ms. E. Beyer
EPA/Federal Facilities Enforcement Office
APL/Mr. T. Coughlin
Canaveral National Seashore/Mr. W. Simpson
Florida State Clearinghouse/Ms. S. Traub-Metlay
Patrick Air Force Base/Mr. O. Miller
Mr. E. Gormel
St. Johns River Water Management District/Mr. G. Lowe
U.S. Fish & Wildlife Service/Mr. A. R. Hight



STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

2740 CENTERVIEW DRIVE • TALLAHASSEE, FLORIDA 32399-2100

LAWTON CHILES
Governor

LINDA LOOMIS SHELLEY
Secretary

August 2, 1995

Ms. Elizabeth Beyer
National Aeronautics and Space
Administration Headquarters
Solar System Exploration Division
Code SLN
Washington, DC 20546-0001

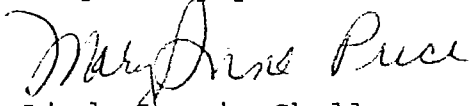
RE: National Aeronautics and Space Administration Projects
- Draft Environmental Assessment for the Near Earth
Asteroid Rendezvous (NEAR) Mission - Brevard County,
Florida
SAI: FL9502170090CR

Dear Ms. Beyer:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Governor's Executive Order 93-194, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

Based on the information contained in the draft environmental assessment and the enclosed comments provided by our reviewing agencies, the state has determined that the above-referenced project is consistent with the Florida Coastal Management Program.

Very truly yours,

for 
Linda Loomis Shelley
Secretary

LLS/rk

Enclosures

COUNTY: BREVARD

DATE: 06/26/95
COMMENT DUE DATE: 05/31/95
CLEARANCE DUE DATE: 06/30/95
SAI#: FL9502170090CR

STATE AGENCIES

LOCAL/OTHER

OPB POLICY UNITS

Community Affairs
Environmental Protection
Game and Fresh Water Fish Comm
Transportation

St. Johns River Water Manag. District

Environmental Policy/C & ED

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JUN 28 1995
CENTRAL OFFICE FDOT
ICAR COORDINATOR

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JUN 28 1995
Florida Coastal
Management Program

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

- Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.
- Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.
- Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.
- Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

Draft Environmental Assessment for the Near Earth Asteroid Rendezvous (NEAR) Mission - Brevard County, Florida

FOR CONSISTENCY PROJECTS, SEE REVERSE SIDE FOR INSTRUCTIONS.

To: **State Clearinghouse**
Executive Office of the Governor -OPB
Room 1603, The Capitol
Tallahassee, FL 32399-0001
(904) 488-8114 (SC 278-8114)

Florida Coastal Management Program
Department of Community Affairs
Suite 305, Rhyne Building
2740 Centerview Drive
Tallahassee, FL 32399-2100
(904) 922-5438 (SC 292-5438)

EO. 12372/NEPA

- No Comment
- Comments Attached
- Not Applicable

Federal Consistency

- No Comment/Consistent
- Consistent/Comments Attached
- Inconsistent/Comments Attached
- Not Applicable

No impact on Highway System

From:

Division/Bureau: FDOT

Reviewer: R. Freeman

Date: 6/28/95

COUNTY: BREVARD

DATE: 05/17/95
COMMENT DUE DATE: 05/31/95
CLEARANCE DUE DATE: 06/30/95
SAI#: FL9502170090CR

STATE AGENCIES

LOCAL/OTHER

OPB POLICY UNITS

Community Affairs
Environmental Protection
Game and Fresh Water Fish Comm
Transportation

St. Johns River Water Manag. District

Environmental Policy/C & ED

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JUN 26 1995
Florida Coastal
Management Program

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

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Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

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MAY 17 1995

OFFICE OF Intergovernmental Programs

CCAS/Near Earth Asteroid Mission

FOR CONSISTENCY PROJECTS, SEE REVERSE SIDE FOR INSTRUCTIONS.

To: State Clearinghouse
Executive Office of the Governor -OPB
Room 1603, The Capitol
Tallahassee, FL 32399-0001
(904) 488-8114 (SC 278-8114)

EO. 12372/NEPA

Federal Consistency

Florida Coastal Management Program
Department of Community Affairs
Suite 305, Rhyne Building
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(904) 922-5438 (SC 292-5438)

- No Comment
- Comments Attached
- Not Applicable

- No Comment/Consistent
- Consistent/Comments Attached
- Inconsistent/Comments Attached
- Not Applicable

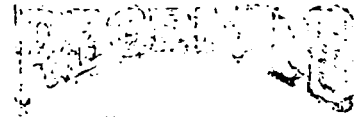
BASED ON THE INFORMATION RECEIVED, THE PROJECT APPEARS TO BE UNDER THE PERMITTING AUTHORITY OF THE APPLICABLE WATER MANAGEMENT DISTRICT

From: FDEP

Division/Bureau: *Intergovernmental Programs*

Reviewer: *Auson Hogg*

Date: *28 June '95*



JUN 23 1995

FLORIDA DEPARTMENT OF STATE

Sandra B. Mortham
Secretary of State

DIVISION OF HISTORICAL RESOURCES

R.A. Gray Building
500 South Bronough Street
Tallahassee, Florida 32399-0250

Director's Office
(904) 488-1480

Telecopier Number (FAX)
(904) 488-3353

June 21, 1995

Ms. Suzanne Traub-Metlay
State Clearinghouse
Executive Office of the Governor
Room 1603, The Capitol
Tallahassee, Florida 32399-0001

In Reply Refer To:
Frank J. Keel
Historic Sites Specialist
(904) 487-2333
Project File No. 952044

RE: Cultural Resource Assessment Request
SAI# FL9506070600C
Mars Global Surveyor Mission Environmental Assessment
Brevard County, Florida

Dear Ms. Traub-Metlay:

In accordance with the provisions of Florida's Coastal Zone Management Act and Chapter 267, *Florida Statutes*, as well as the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced project(s) for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical or architectural value.

A review of our records indicates that Launch Complex (LC) 17 is a contributing resource to the Cape Canaveral Launch Complex National Historic Landmark. However, we note that LC 17 is an actively used complex. Therefore, it is the opinion of this office that the proposed use of Launch Complex 17 will have no adverse on historic properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical or architectural value.