NAVAL COASTAL SYSTEMS CENTER

NCSC

PANAMA CITY, FLORIDA 32407

ENVIRONMENTAL ASSESSMENT (EA) FOR LANDING CRAFT AIR CUSHION (LCAC) PROGRAM AT NCSC, PANAMA CITY, FLORIDA

April 1984

NCSC 5216/3 (REV. 3-78)

ENVIRONMENTAL ASSESSMENT (EA)

FOR LANDING CRAFT AIR CUSHION (LCAC) PROGRAM

AT NCSC, PANAMA CITY, FLORIDA

APRIL 1984

EA Abstract

This Environmental Assessment (EA) discusses the proposed Landing Craft Air Cushion (LCAC) program at the Naval Coastal Systems Center (NCSC), Panama City, Florida. The LCAC program will involve testing and evaluation of these air cushioned vehicles (ACVs), with an emphasis on crew training. The Amphibious Assault Landing Craft (AALC) program, of which the LCAC program is now the acquisition program, was assessed in 1977 and 1981 with findings of "no significant impact". Alternatives to the proposed action include: (1) the no action option; (2) altered scope of operations; and (3) alternative test sites. Based on AALC experience, the most sensitive test sites were loosely packed dune and swale areas on Crooked Island. In the course of the LCAC fleet introduction program, emphasis will be placed on the use of upland sites for routine overland missions to mitigate environmental effects on Crooked Island. Short term impacts of the LCAC program include the effects of noise, wakes, turbidity in shallow waters, and some disturbance of vegetation and wildlife in overland maneuvers.

Prepared for:

NAVAL COASTAL SYSTEMS CENTER (NCSC)

for the

U.S. DEPARTMENT OF THE NAVY

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In compliance with Section 102(2)(c) of the

National Environmental Policy Act of 1969

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SUMMARY STATEMENT

This is an Environmental Assessment (EA) of a proposed administrative action, designated the "LCAC Program", to test, evaluate, and conduct a crew training program with Landing Craft Air Cushion (LCAC) and other air cushioned vehicles at the Naval Coastal Systems Center (NCSC), Panama City, Florida. LCAC is the production model air cushioned vehicle (ACV) designed after the prototype JEFF(B) craft of the Amphibious Asault Landing Craft (AALC) program. The AALC program, initiated at NCSC in 1977, was the subject of a 1976 Candidate Environmental Impact Statement (CEIS) and a 1981 Environmental Assessment (EA), both with a finding of "no significant impact" by Chief of Naval Operations (OP-45). This EA treats the LCAC program as essentially a continuation of the AALC program in terms of environmental concerns.

The LCAC program will involve trials and operator training maneuvers with up to four production model LCACs, supplemented by the JEFF(B) and VOYAGEUR, ACVs used in the AALC program. Operations will fall into two major environmental categories: overwater and overland.

Alternative actions considered are: (1) no action, in which the LCAC program would not be conducted at NCSC; (2) altered scope of operations, in which the LCAC program would be adjusted in terms of numbers of craft, test locations, and/or training schedules; (3) alternative test sites, in which mainland sites will be used for most routine overland maneuvers. Of these alternatives, the utilization of mainland site(s) to minimize environmental stresses on Crooked Island, owned by Tyndall Air Force Base, seems most desirable .

This EA uses the results of environmental observations and monitoring conducted throughout the AALC program as a data base from which predictions are made regarding potential impact of the LCAC program. It is evident from these data that overwater operations should present no significant problems of environmental concern. For overland exercises, however, these

data suggest that Crooked Island, a barrier dune formation used for virtually all AALC overland exercises, may not support maximum levels of the LCAC program. Sites on the mainland must be selected and used for routine overland testing and training to avoid unacceptable adverse impact on Crooked Island when the LCAC program is fully under way.

Unavoidable adverse impacts of the LCAC program include:

1. Noise, waves, and similar effects of routine overwater operation are to be expected, but should be minor, temporary, and within acceptable limits.

2. ACV operations in shallow water (up to 3 ft) will disturb bottom sediments and temporarily increase turbidities, but experience with AALC operations indicates that these effects are generally of short duration (less than 30 minutes) and highly localized. Thus, ACV operations pose little threat to sea grass beds and associated benthic communities.

3. Overland operations are of primary environmental concern. Some short term damage to vegetation is unavoidable, but root systems are normally unaffected and live stems rarely broken in areas with close vegetative cover and firm substrate. ACV maneuvers over dunes may flatten crests and shear vegetation, but transit of dunes is generally avoided. Where dunes have been transited, those dunes affected have generally revegetated and restabilized satisfactorily over time. Beaches and washover areas experience some sand displacement, but these areas recover rapidly under natural forces of wind and water. Barrier island areas involving sparse vegetation and loose, unconsolidated sand may suffer substantial sand erosion from ACV prop wash following numerous repeated transits. Such areas should be avoided or use of them limited, with recovery time allowed between transits.

From this assessment, it appears that the LCAC program, conducted within the limits, constraints, and ameliorative measures outlined herein, should result in short-term impact of only minor and acceptable level, while there should be little or no long-term impact on the environment.

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The proposed action, the "LCAC Program", is to test and operate three to four Landing Craft Air Cushion (LCAC) vehicles plus two auxiliary hovercraft at the Naval Coastal Systems Center (NCSC), Panama City, Florida. The LCAC vehicle is a production model hovercraft (generically ACVs, for air cushioned vehicles) with a surf-land transit capability which enables it to carry assault vehicles, troops and supplies to a designated inland point. ACVs represent a notable improvement to amphibious assault capabilities of the Navy and are essential to national defense. The LCAC program at NCSC will involve testing and evaluation of production models, with emphasis on crew training in overland, overwater and surf-land maneuvers. The proposed action will begin with the testing of the first LCAC, scheduled for June 1984, and will continue until all LCAC depart NCSC.

In terms of environmental concerns, the LCAC program is viewed as a continuation of the Amphibious Assault Landing Craft (AALC) program initiated at NCSC in 1977. The AALC program entailed testing, evaluation and crew training activities with two developmental prototype air-cushioned assault landing craft [designated JEFF(A) and JEFF(B)]. Testing and operator training with a smaller ACV, the VOYAGEUR, were also conducted as an integral part of this program. Based largely on accumulated experience with these vehicles in the AALC program, a production model (the LCAC) was designed. The LCAC craft is the primary air-cushioned vehicle to be used in the proposed program, though JEFF(B) and VOYAGEUR will also be used.

Detailed descriptions of the JEFF(B), LCAC and VOYAGEUR are provided in Appendix A. LCAC resembles JEFF(B) in its general dimensions and skirt design. Differences between the two craft include changes in fuel tank design and capacity, design speed, gross weight, number of engines and fan and propellor design.

The AALC program was the subject of a formal Candidate Environmental Impact Statement (CEIS) in March, 1976, with a

[illegible]

finding of "no significant impact" by Chief of Naval Operations (OP-45). In September 1981, an updating Environmental Assessment (EA) compared the predictions of the 1976 CEIS with observed effects of the AALC program, leading to the conclusion that short-term effects would be minimal, and no long-term impacts were to be anticipated due to ACV operations[1]. These documents provide a substantial data base upon which to evaluate the proposed LCAC program and its environmental impact.

ACV operations broadly affect two distinct environmental categories: overwater and overland. This Environmental Assessment (EA) will concentrate on these areas of environmental concern.

A summary of past and estimated future ACV operations at NCSC is presented in Fig. 1. Projected LCAC operations for 1984 total 40 overwater and 20 overland missions. In 1985, 50 overland and 140 overwater missions are planned with the LCAC craft. Overwater VOYAGEUR missions are estimated at 24 in 1984 and 45 in 1985; the 6 overland operations planned for 1984 will increase slightly in 1985. About 50 JEFF(B) overwater missions are scheduled in 1984 and 50 in 1985; scheduled overland missions are 15 in 1984 and 10 in 1985. These planned increases in hovercraft missions support the the need for a new environmental assessment. If the program extends and expands substantially beyond 1985, an updating assessment will be prepared. Outyear usage is expected to be equal to or slightly less than 1985.

Figure 2 shows projected delivery and testing schedules for the first six LCAC production craft, the first two of which will be sequentially tested and evaluated at NCSC. An ACV fleet base currently under construction at Camp Pendleton in California and scheduled to begin operations in mid-1986 (see Figure 3) is expected to finally receive the LCAC craft. Construction of this

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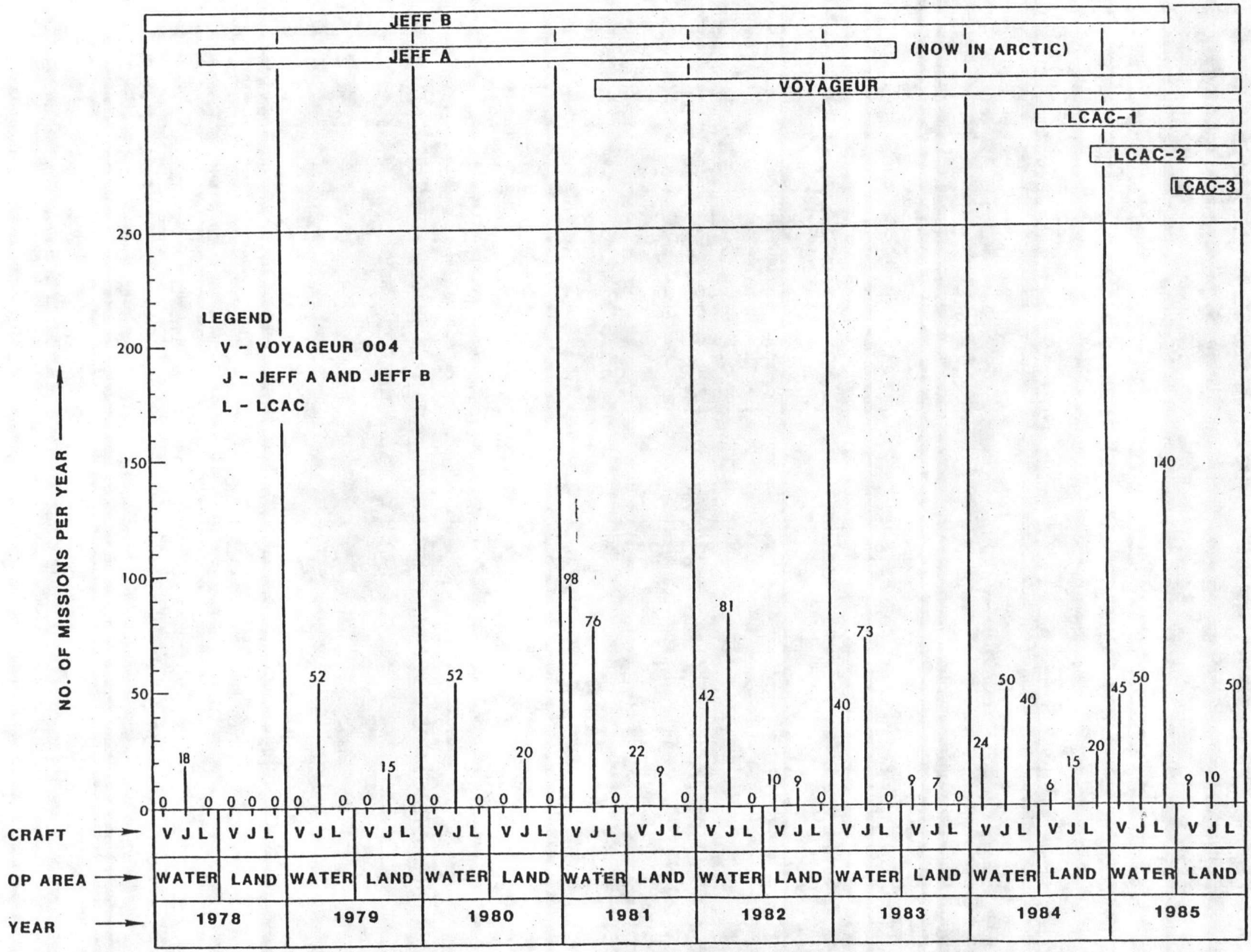
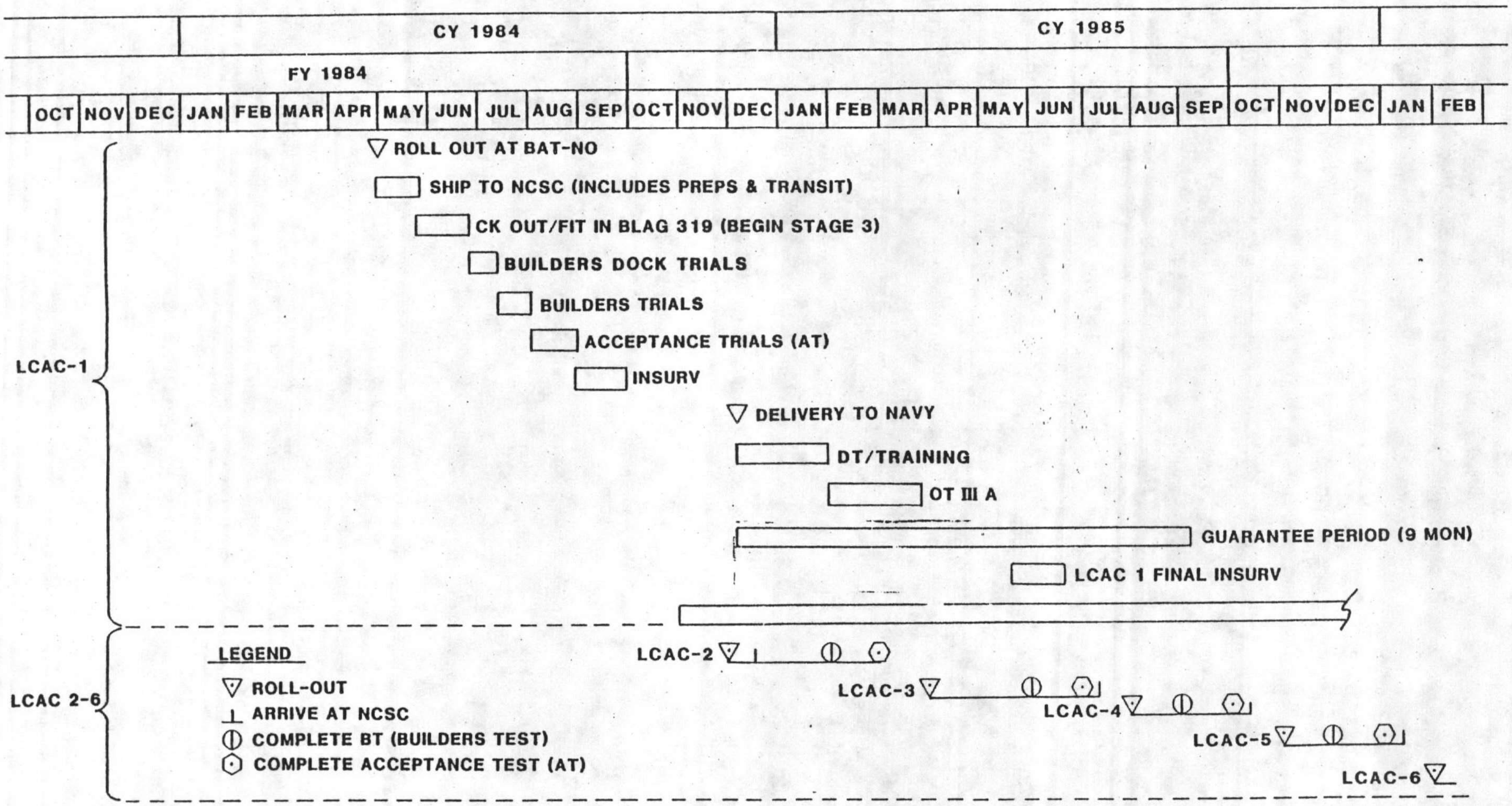
1 These assessments may be seen at NCSC or may be obtained on loan upon request. (Contact - Naval Coastal Systems Center, Attention: Horace Loftin, Ecologist, Code 3240, Naval Coastal Systems Center, Panama City, Florida; (904)-234-4183.



HISTORY AND FUTURE ESTIMATES OF THE MAGNITUDE OF HOVER CRAFT OPERATIONS AT NCSC

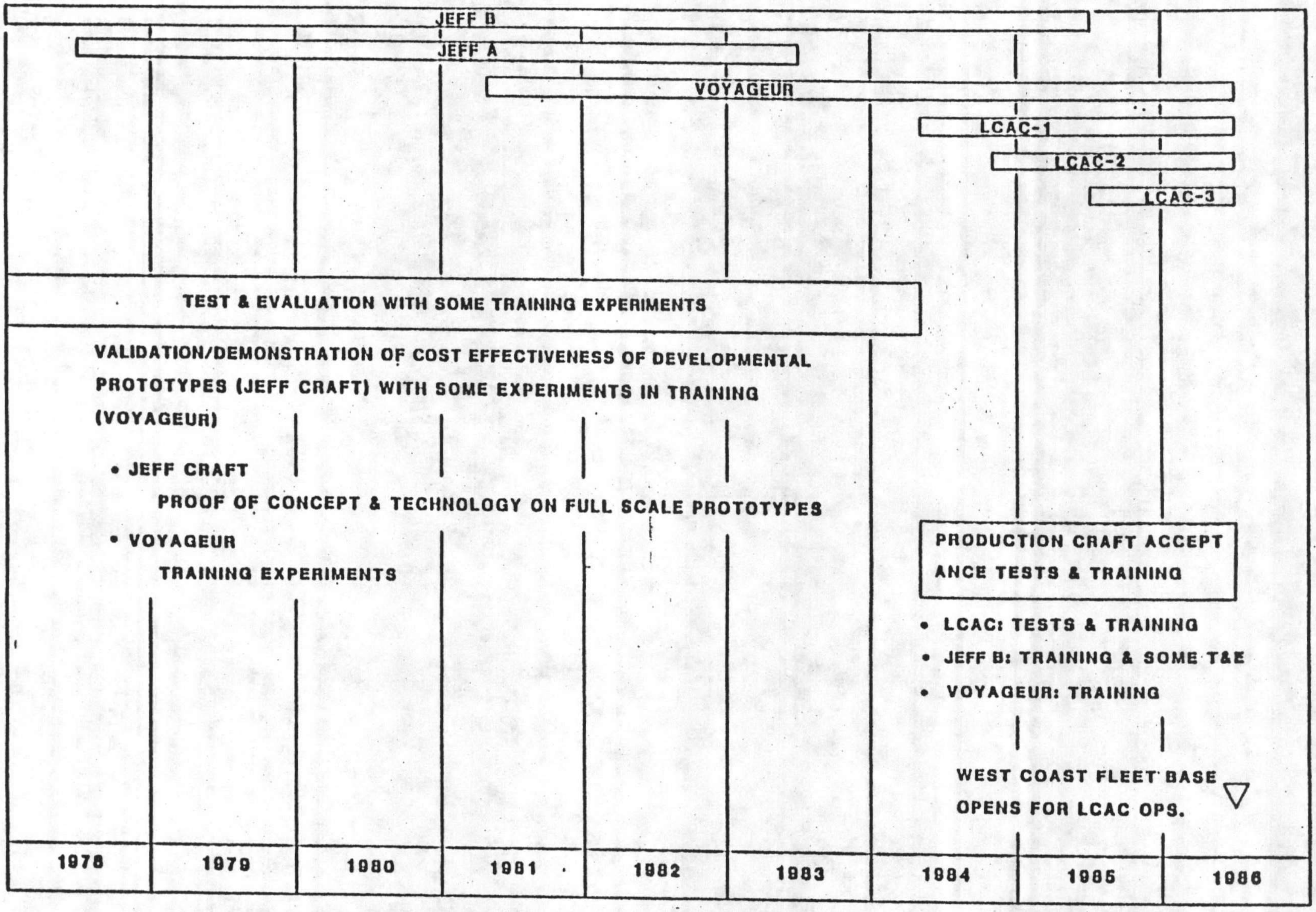
Figure 1



ASSUMED LCAC 1-6 DELIVERY AND T&E SCHEDULE

Figure 2

PRELIMINARY



OBJECTIVE CHANGES IN HOVERCRAFT PROGRAM AT NCSC - PROTOTYPE TO PRODUCTION CRAFT

Figure 3

base and operations of these ACVs are covered in a separate assessment.

II. ALTERNATIVES TO THE PROPOSED ACTION

A. No Action.

The "no action" alternative implies that testing and/or crew training with the LCAC and other ACVs would not be carried out at NCSC. NCSC has existing facilities for ACV housing and operations, presently available nowhere else. It is economically, logistically, and technically infeasible to carry out these activities at another installation at this time. An alternative base location would require construction of new facilities, resulting in delays in testing and operator training. Environmental impacts from ACV operations of the kind and scope of those at NCSC would be experienced at any other locale, while NCSC has an existing record of ACV operations which have been found environmentally acceptable. Thus, there are no apparent environmental advantages to basing the LCAC program elsewhere.

B. Altered Scope of Operations.

It is anticipated (Figure 1) that, in the peak year of 1985, total operations will be approximately 50% greater than in the peak year (1981) of the AALC program. The number of overwater operations in 1985 may increase 40% over 1981 levels, while overland operations may be doubled.

If projected use of the ACVs proves environmentally detrimental, altered scope of operations to acceptable levels of activity is an alternative. Altered operations might involve modification of the numbers of ACVs used , revision or reduction of test and training schedules, and/or variation of training site

locations, (e.g., shifting training to a less sensitive location or to an already modified location).

C. Alternative Test Sites.

Lengthy experience in the AALC program indicated that only minimal adverse effects should result from overwater maneuvers (see 1981 EA, pages 21-26, 27). If LCAC overwater activities should create unforeseen environmental problems, changes in site of operations may be instituted.

During the initial phases of the LCAC program, overland ACV operations will be conducted at existing AALC sites on Crooked Island, a barrier dune peninsula located on the Tyndall Air Force Base. (Detailed AALC site descriptions are presented in Appendix B; see Figure 4 for site locations). According to the 1981 EA, adverse effects resulting from overland maneuvers on Crooked Island were expected to be minimal or none. However, subsequent experience on Crooked Island indicated that continued intensive use of certain test sites, particularly in areas of sparsely vegetated and unconsolidated sand, may create appreciable environmental stresses.

Recognizing the fragility of the Crooked Island environment and the increased potential for adverse environmental effects due to the larger number of planned LCAC missions, NCSC is actively searching for suitable mainland sites for use in routine overland testing and training. Such site or sites can be selected which meet certain craft and operator performance requirements, thereby reducing mission requirements on Crooked Island to only those essential tasks which, by their nature, require that specific environment (e.g., for surf-to-shore maneuvers). Upland sites investigated included modified areas on West Bay, a North Bay site west of the Panama City Municipal Airport, and mainland sites on Tyndall A.F.B. At present, only mainland sites on Tyndall A.F.B. are being considered for ACV use.

LEGEND

- Test sites permitted under existing ISSA
- New proposed test/training sites
- Previously used sites
- → Site access/direction
- T T Drone corridor
- - - Sand/unimproved road

TEST-TRAINING SITE FUNCTION

(A) VOYAGEUR training over unlevel terrain (no dunes)

(B) Former beach training site

(B') ACV training over smooth sloping beach (no dunes)

(C) ACV surf zone site (contingency use only)

(C') ACV surf zone site (minimum of 300 yd. from nearest dune)

(D) ACV overland test/training on level ground

(E) VIP overland island crossing demonstration (incl. dunes on gulf side

(F) Cargo load/unload obstacle and VIP staging area (CEC field site)

(G) ACV unlevel ground test area with straight & curved paths between dunes

(H) Proposed VIP crossing area not authorized

(I) Saline pond area. Limited usage.

(J) Not authorized. Tyndall main airfield complex.

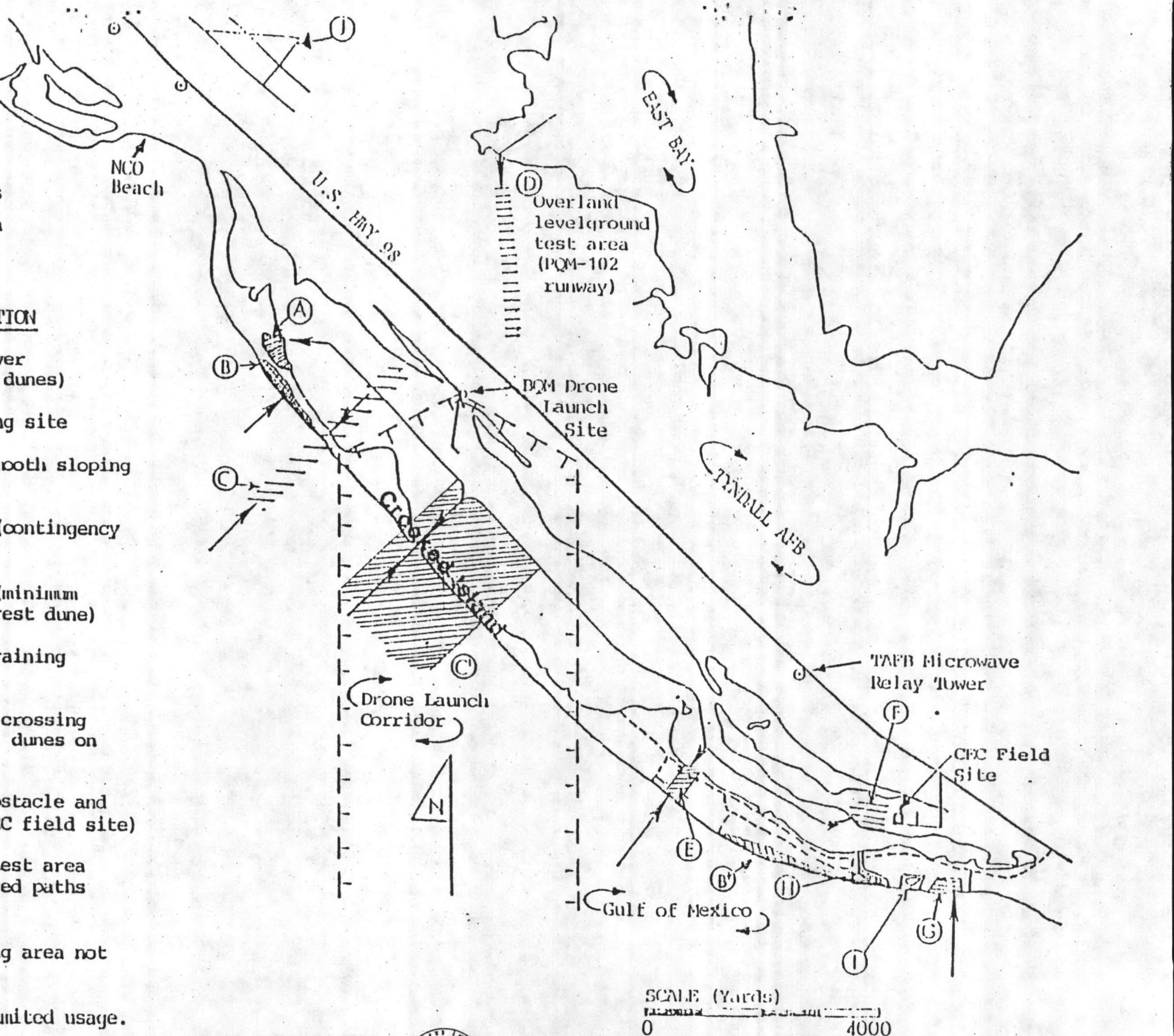


Figure 4

Pending approval by Tyndall A.F.B. of mainland sites, existing AALC sites on Crooked Island will be used at the level of activity agreed upon in the current Interservices Support Agreement with Tyndall A.F.B. Monitoring efforts by NCSC and Tyndall Air Force Base environmentalists will be conducted to detect signs of environmental stress from overland hovercraft activities. In areas where adverse effects from ACV operations are demonstrated, predesignated alternative test sites on Crooked Island will be used to allow recovery of the stressed area. A similar tactic will be used if use of a test site infringes on the seasonal nesting activities of birds or turtles there.

D. <u>Summary Statement of Alternatives.</u>

Based on previous ACV operations in this area, only minimal environmental effects are to be expected from overwater testing. All stated alternatives for proposed overland actions will be considered. The LCAC program will be flexible enough to adapt to environmental circumstances. Less fragile and/or previously modified overland test sites will be sought and, to the extent practicable and adaptable to LCAC objectives, will be preferentially used. Test schedules and/or sites may be changed to accommodate environmental considerations. Further discussion of environmental effect of these alternative actions is presented later in this EA.

III. DESCRIPTION OF THE EXISTING ENVIRONMENT.

A. <u>Area Description.</u>

Panama City, NCSC, and LCAC test areas are located in the western panhandle of Florida between 29°57' and 30°19' north latitude, and 85°23' and 85°52' west longitude on and about the shores of the St. Andrew Bay system (Figure 5). The bay system includes East Bay, in the eastern sector; West and North Bay, in

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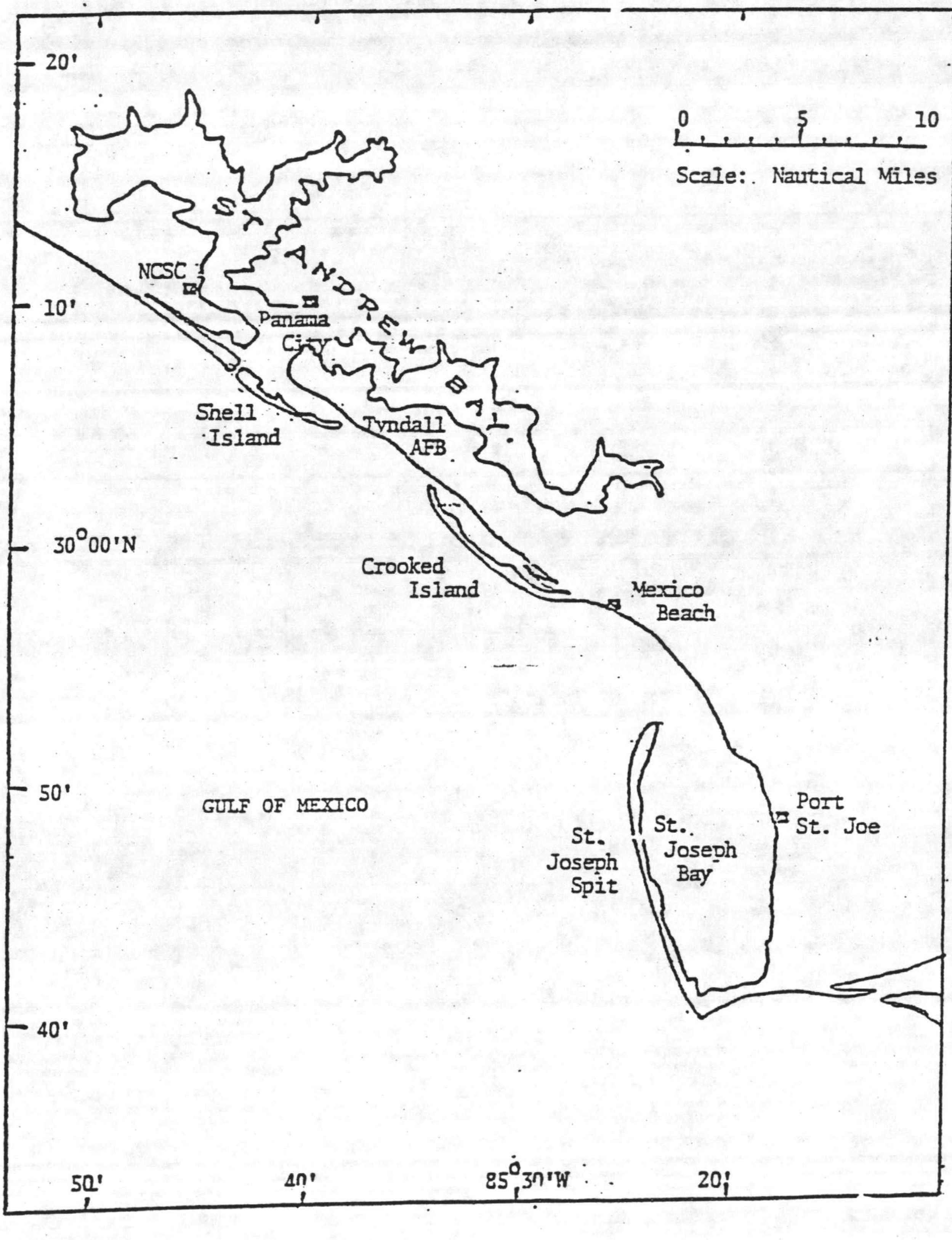

FIGURE 5. MAP OF GENERAL AREA

the northwestern sector; and St. Andrew Bay proper to the south. Total surface area of the bay system is approximately 90 square miles. NCSC, on St. Andrew Bay, is approximately five miles west of Panama City, which is located near the mouth of the bay's east arm. The population of Panama City is approximately 34,250 and of Bay County, 104,500.

The bay system connects with the Gulf of Mexico through two channels, one natural and the other man-made. The latter channel was dredged by the U.S. Corps of Engineers in 1934, and provides a passage for commercial and recreational boat traffic. The natural inlet to the bay is five miles southeast of the ship channel. A barrier island between the two entrances is known as Shell (or Hurricane) Island.

Estuaries in the bay region range from nearly freshwater to marine, depending on their proximity to the Gulf. Bay shores are typically bounded by *Juncus* or *Spartina* marshes. The surrounding undeveloped land is characterized as a pine forest subclimax ecosystem, typical of the northwest Florida area. The white quartz sand beaches of the nearby Gulf of Mexico extend 100 miles east and west of Panama City. Some coastline areas are characterized by classic barrier island dune formations.

Tyndall Air Force Base is located some 10 miles east of Panama City on a peninsula separating East Bay from the Gulf of Mexico. Crooked Island, on the southeastern perimeter of Tyndall, is a peninsular barrier dune formation. Selected test sites on Crooked Island were used in the AALC program, and will be used to a lesser extent in the proposed LCAC program. Tyndall Air Force Base is the site of the Air Defense Weapons Center. This facility employs 6200 civilian and military personnel. The base includes 28,000 acres and is a principal installation of the defense structure for the southeastern United States.

The Naval Coastal Systems Center (NCSC) is a major research and development center of the Navy Material Command (Fig. 6), involved in development, testing, and evaluating military systems designed for use in coastal regions. Approximately 950

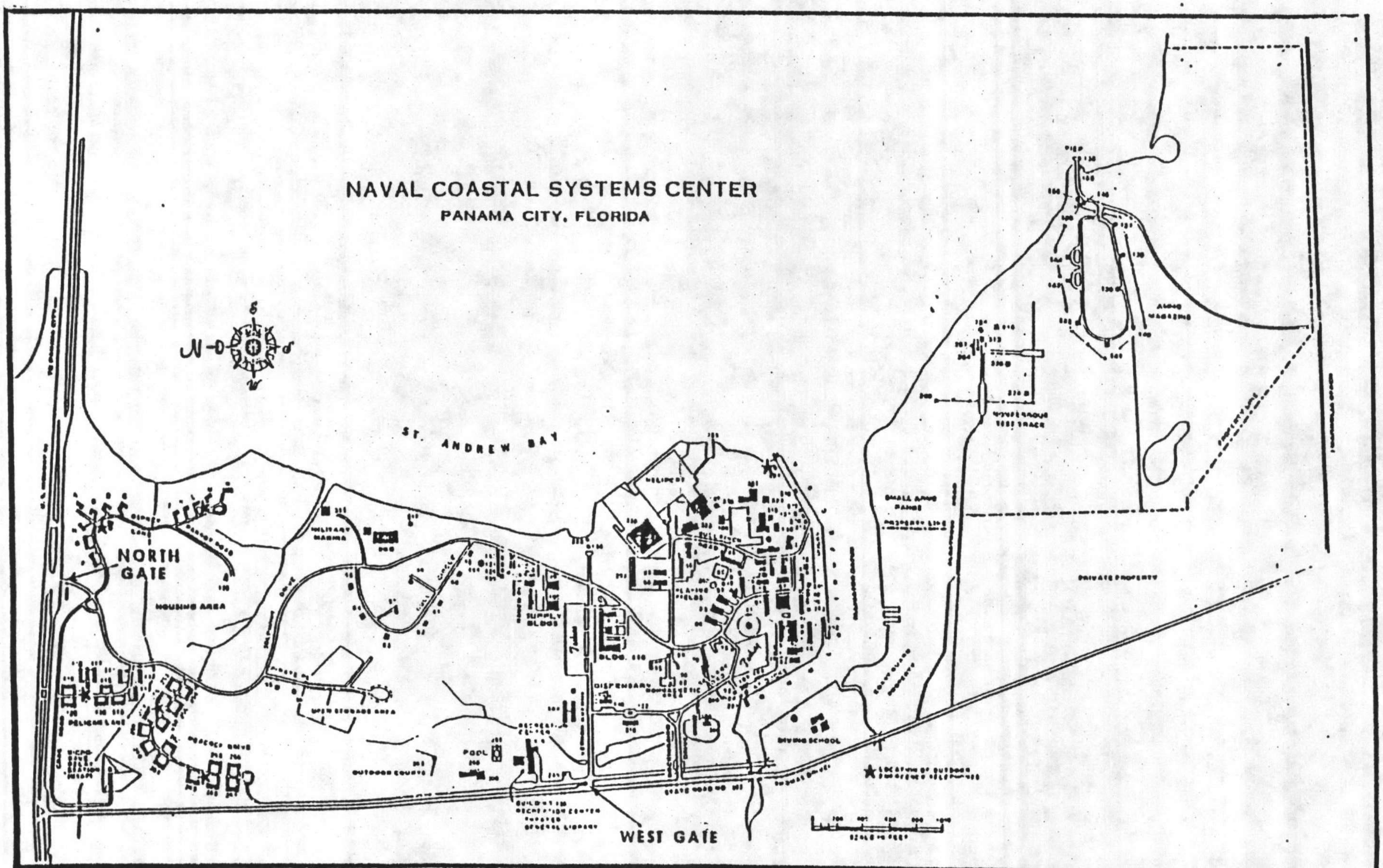
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA
ST. ANDREW BAY
NORTH GATE
HOUSING AREA
SUPPLY BLDGS
DISPENSARY
PRIVATE PROPERTY
DIVING SCHOOL
POOL
OUTDOOR COURTS
WEST GATE

Figure 6

civilians, 150 contractors, and 600 military personnel are employed by this facility, which occupies 650 acres. Building 319 has existing hangar facilities and a concrete ramp to accommodate ACVs.

The climate of this coastal area of northwest Florida is characterized as warm and humid for most of the year, with a brief winter of cooler and stormier weather. Mean air temperature is 82°F in summer and 57° in winter. Mean annual precipitation is 58 inches, with July being the wettest month. Meteorological data for this area is summarized by Salsman and Ciesluk (1978) in NCSC publication TR337-78[2].

B. Marine Operations Areas.

The principal overwater operational areas are graphically depicted in Figure 7. These areas include the open waters of the Gulf of Mexico; Gulf waters adjacent to Shell Island, St. Andrew State Park, and Crooked Island; and all of St. Andrew Bay proper. These overwater areas support a wide range of vertebrate and invertebrate species characteristic of estuarine and marine environments of the region.

NCSC publication TR337-78[2] describes environmental conditions of coastal waters near Panama City. It includes summaries of accumulated data on tides, currents, wave heights, water column characteristics, and bottom conditions. The following information is extracted from this document.

1. Wave Heights. Local coastal waters are generally placid, but large waves are generated during periods of strong wind from fontal storms or hurricanes. Higher sea states are generally experienced in the winter season, and warm weather months are periods of relatively quiescent seas.

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2 Contact Naval Coastal Systems Center, Attention: Horace Loftin, Ecologist, Code 3240 Naval Coastal Systems Center, Panama City, Florida; 904-234-4183.

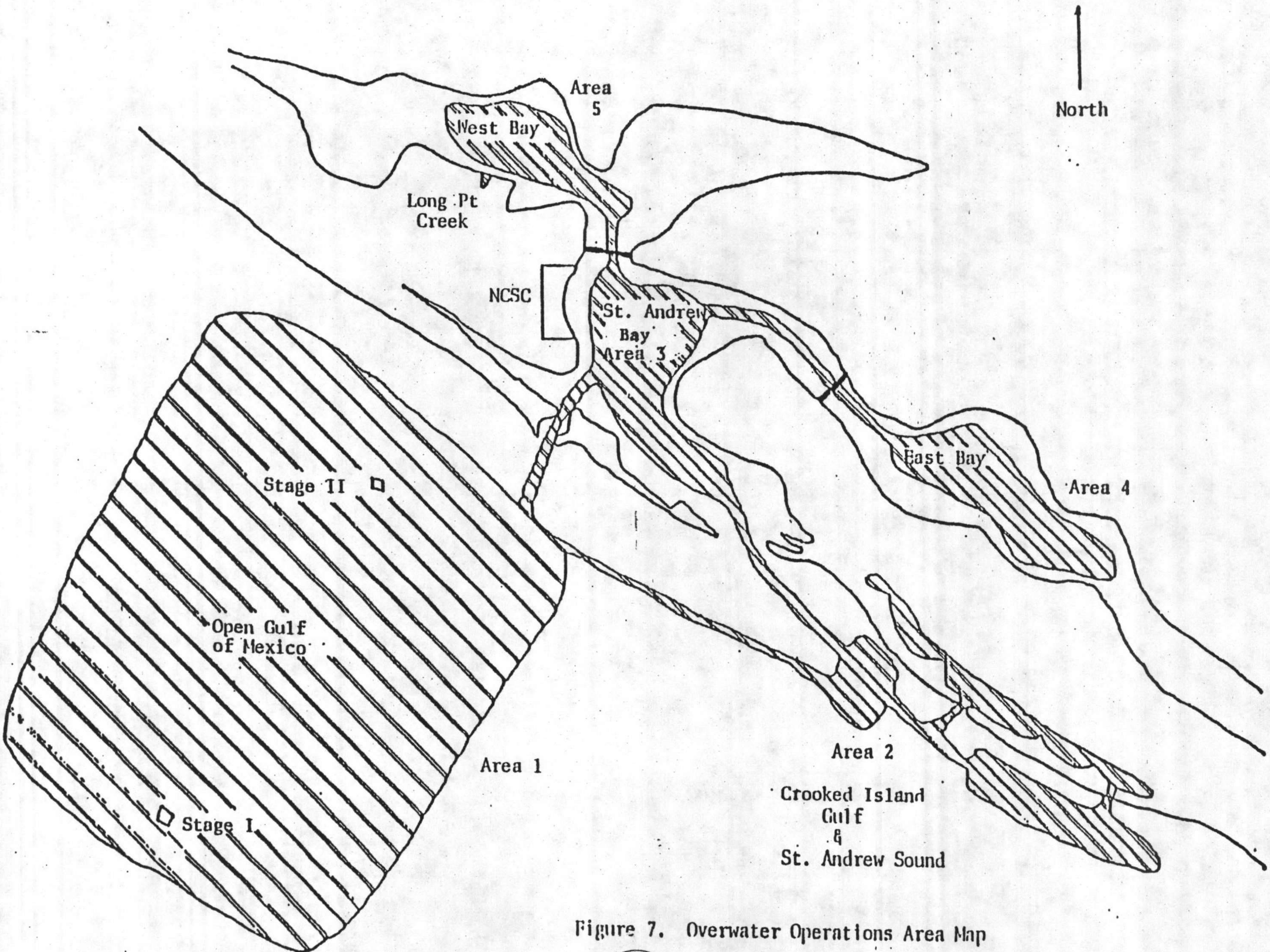

Figure 7. Overwater Operations Area Map

Considerable variability in wave shape, number, position, size, and energy is common. Within St. Andrew Bay, wave action is generally limited to wind waves of less than one foot. Choppy waters are common where strong surface currents are set against the wind, particularly in areas near bay entrances during outgoing tides.

2. Tides. Local tidal oscillations are chiefly diurnal, small in amplitude, and susceptible to marked modifications by wind and water. Difference in elevations between the high and low tide of the day is generally less than two feet. The mean tide range is 1.3 feet, and tides generally take fourteen hours to rise and eleven hours to fall within a lunar day cycle (24.8 hours). Tide water levels are low in late fall and early winter, and remain low in January and February. Water levels rise in spring to an early summer plateau and climb to a September maximum.

3. Currents. The primary mechanism of surface water movement in local coastal waters is wind-induced current. In periods of low wind, rotary tidal currents are detectable. No permanent or semipermanent unidirectional currents have been measured in the coastal area, but this type of current has been observed offshore.

The flow regime of St. Andrew Bay differs considerably from that of the Gulf of Mexico. Entrance channels are subject to strong tidal currents. Within the channel, the current generally floods for 15 hours and ebbs for ten hours, with peak flows varying proportionally with daily tide ranges. Surface currents in the main ship channel can be as great as three knots if strong northerly winds occur with an outgoing tropic tide. Current speeds within the bay are generally less than 0.5 knots, but surface flows of 1.5 knots have been observed near constrictions and within certain bends.

4. Water Column Characteristics. The Gulf of Mexico in this coastal area is characteristically warm, salty, dense, free of particulates, and blue-green in color. The waters of St. Andrew Bay are usually brackish, light greenish-brown in color, and contain materials in suspension and solution. A tide line is easily observed which marks the point of contact between these two bodies of water.

The local sea surface cools to approximately 57°F in January, and warms to 86°F in August. Observed fluctuations in water temperature are due to the passage of high and low pressure systems and wind-induced currents. The water column is characteristically isothermal from summer to winter. A thermocline temporarily disappears when storms bring heavy seas to the area. Shallow bay waters warm rapidly in spring, are warmer than Gulf waters in spring and summer, cool rapidly in the fall, and remain cooler in the winter. Seasonal ranges in temperature have been measured from a low of 45°F in winter to a high of 89°F in summer.

Salinity of coastal waters is characteristically high throughout the year, ranging from 34 to 35 parts per thousand. Salinities within St. Andrew Bay are variable, with water near the mouth of the bay being essentially isohaline and considerably saltier than waters in the upper reaches of the bay.

5. Bottom Conditions, Beaches, and Shores. The local seafloor is characteristically flat and featureless, with sand dominating the scene in the nearby Gulf and around the shores of St. Andrew Bay. Thin deposits of mud are found in the protected central basins of the bay system, and along the deeper portions of the continental shelf and slope. A few rock outcrops are present seaward of the 60 foot depth contour in the Gulf and at several spots within the man-made segment of St. Andrew Bay entrance channel.

Gulf beaches are composed almost exclusively of fine quartz grains with median diameters of 0.1 and 0.2 millimeters. This fine sand extends out across the shallow barrier bar, and down to

depths of 50 to 60 feet where in many places, it gives way to a coarser brown sand containing numerous shell fragments.

Narrow beaches of fine sand literally ring the bay, and shallow bars are present at many locations. Oyster reefs occur on some of the bars within North and East Bays. The remainder of the bay bottom is covered with a thin layer of mud which ranges from less than an inch to no more than 6 feet thick. Substantial quantities of sand and shell fragments are usually noted within mud samples. Seagrass beds and associated benthic communities occur abundantly throughout the bay.

C. Overland Operations Areas.

Virtually all overland maneuvers in the AALC program were conducted on Crooked Island. Mainland test sites considered for use in the LCAC program included: (1) cleared areas in West Bay, (2) a North Bay site, and (3) previously impacted areas on Tyndall mainland. A general description of the vegetation of these areas is included in Appendix C.

The cleared areas in West Bay which may prove suitable for overland operations have been previously modified by timber harvest and planting preparation. The proposed sites are generally bordered by *Juncus* or *Spartina* marshes. Access from West Bay is over a short beach area. The inland environment is a pine woods flatland, characterized by vegetation such as slash pine, saw palmetto, sedges and grasses.

The proposed North Bay site is located at the western tip of the Panama City Municipal Airport. It is covered by shrubs, grasses, and other low lying vegetation. The area is bordered by marsh. Two points of access from North Bay (composed of hard packed sand with no vegetation) are available. Previously modified candidate areas for the Tyndall area include: (1) the CEC area (Site F); (2) the PQM-102 runway (Site D); and (3) the main Tyndall runway (Site J). See Figure 4 and Appendix B for location and description of these sites. Other mainland sites at Tyndall A.F.B. are under investigation at present.

[illegible]

Crooked Island is a classic barrier dune formation which is actually a peninsular extension lying parallel to the mainland of Tyndall. (Appendix D demonstrates the dynamic nature of the Crooked Island geomorphology.) The seaward coastline, composed of beach areas and moving coastal dunes, is characterized by vegetation such as sea oats (Uniola), sea rocket (Cakile), and sea purslane (Sesuvium). Interior coastal dunes are stabilized by trees, shrubs, and other plants. Interdunal swale areas are characterized by low lying shrubs and herbaceous cover, and are interspersed with broad flat grassy areas. Continuing inland, a typical pine flatwoods environment exists, including scrubby pines, oaks and magnolia. This stable inland area gives way to sedge and grass areas, leading to the narrow sandy shoreline which rings St. Andrew Sound landward.

On Crooked Island, gulls, terns and other shorebirds feed and rest along the surf line and beach areas. Some shorebirds (e.g., Least Tern, Black Skimmer) nest above the high water mark and in dune and swale areas. Rabbits, wood mice, deer, and other small mammals characteristically inhabit the relatively isolated area, as evidenced by the many tracks found on Crooked Island. The loggerhead turtle, a protected species, occasionally uses the beaches of Crooked Island for seasonal nesting activities. Similar wildlife may be expected in the mainland site areas. Shorebird nesting should be minimal or nonexistent on the mainland.

All overland areas under consideration for use in the LCAC program are located within the 100 year floodplain level. There are no known archaeological or historical sites which would be affected by ACV operations.

IV. SCOPING REPORT

A scoping meeting of local, state, and federal officials, environmentalists, NCSC and Tyndall Air Force Base environmental personnel was held on November 28, 1983, at NCSC to hear their comments on environmental concerns that should receive attention

in this EA. At the time of this meeting, Crooked Island was to be the principal site for overland operations. The decision to pursue alternative mainland sites for routine overland operations was based in part from consideration of issues raised in this meeting. The attendance list and minutes of this meeting are given in Appendix E. Following are major issues brought up at the meeting.

A. Overwater Operations

Routine overwater operations did not elicit special environmental concern from attendees of the scoping meeting. It was recommended that particular care should be taken during night operations, with emphasis on avoiding trawlers in St. Andrew Bay. A recent manatee sighting near Crooked Island was mentioned, and the potential for encounters with them, other marine mammals, and turtles was discussed.

B. Overland Operations

Overland maneuvers on Crooked Island was the issue most discussed at the scoping meeting. Concern was expressed about possible damage to dunes and vegetation in the course of overland maneuvers. Wildlife considerations centered on the nesting activities of birds and turtles. The effects of surf zone transits to land, where sensitive dune/marsh areas typically exist, was discussed.

C. Other Items of Concern

The effect of ACV noise and its impact on surrounding communities was raised as an unavoidable aspect of ACV operations. Wake-induced erosion of shorelines was another item of concern, as was the effect of wakes on boats operating or tied up in waters near ACV operations.

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Socioeconomic factors and cultural considerations were brought up; specifically, the impact of incoming personnel on community services, housing, and schools. Plans by Tyndall A.F.B. environmentalists for an archaeological survey at Crooked Island, particularly in the area of the Raffield Peninsula, was mentioned.

V. ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

A. Sociological Impacts

1. Community Development. Initiation of the LCAC program will involve an increase of 60 to 120 personnel at NCSC. Families moving to the Panama City area will require housing, educational facilities, and community services, all of which are presently available in adequate supply. These individuals should be readily absorbed into the local community without disruption.

2. Economic Benefits. The LCAC program should be economically beneficial to the Panama City area. This and other activities of NCSC create opportunities for employment both directly (jobs at NCSC) and indirectly (growth of service businesses surrounding NCSC) to the local community.

3. Noise. ACV operations are characterized by high noise output. Technicalities of the noise problem are discussed in Appendix F. Possible adverse effects of noise on people and wildlife include: (1) physical damage to hearing, and (2) resulting behavioral changes. Eight (8) hours of exposure to levels of 90 dB at upper frequencies are required to effect physical damage to the human ear. These levels will not be generated in community areas by the ACVs. There have been no substantial public complaints about ACV noise in the course of the AALC program (see page 8, 1981 EA). Because the LCAC vessels will be quieter than the prototype vehicles (see Table 1), it is anticipated that the noise factor will not create

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[illegible]

[illegible]

[illegible]

[illegible]

TABLE 1. LCAC PROJECTED ENVIRONMENTAL IMPACT: A COMPARISON OF LCAC AND JEFF B

LIST OF PREVIOUS MAJOR CONCERNS		JEFF B	LCAC	COMPARISON OF TREND OF FEATURE CHANGES: LCAC VS JEFF	OVERALL PROJECTED CHANGE IN ENVIRONMENTAL IMPACT
CATEGORY	CRAFT FEATURES AFFECTING				
1. Noise	• Engine # & HP • APU # & HP • Lift Fans • Propellers	• 6-TF40 at 3350 HP ea. (Tot. HP = 20,100 HP) • 2 @ 100 HP ea = 200 HP • 4 centrifugal • 2-4 blade variable pitch (144 in. dia.; 1260 RPM Nom.)	• 4-TF40B at 3955 HP (Tot. HP=15,820 HP) • 2 @ 100 HP ea = 200 HP • 4 centrifugal (more efficient) • Same except more efficient (142 in. dia.; 1314 RPM Nom.)	• Lower • Same • Quieter • Quieter	3-4 decibels quieter
2. Wake	• Design gross wt. • Beam & Length • Design Speed	• 325,000 lb with payload • 47 ft X 87.6 ft • 50 kts in sea state 2	• 338,000 lb with payload • 47 ft X 87.9 ft • 40 kts in sea state 2	• Same • Same • Lower	No substantial change
3. Fuel Spills	• Fuel Type • Fuel Load (typical) • Fuel Capacity • Fuel Tank Type	• JP-5 • 5,000 gal. typical • 5,500 gal. • Bladder	• DFM or JP-5 7,132 gal. • • 7,132 gal. • Integral welded	• Same • Higher typically • Higher • Slightly higher risk.	No substantial change
4. Erosion of Land/Vegetaion	• Cushion Press. • Design Gross Weight • Hover Gap • Prop Wash • Skirt Peripheral Length • Skirt Design • Speed	• 0.7 PSI (100 PSF) • 325,000 lb w/payload • 3.0 Inches • 280 ft/sec @ 3 ft aft • 270 ft • Bag and Finger • Typically 20 kts max	• 0.7 PSI (100 PSF) • 338,000 lb w/payload • 2.5 inches • 280 ft/sec @ 3 ft aft • 270 ft • Bag and Finger • Typically 15 kts max	• Same • Same • Same • Same • Same • Same • Same	No change
5. Effects in shallow water (Turbidity & Grass Beds	• Cushion pressure • Hover Gap • Design Gross Wt. • Skirt Peripheral length • Speed • Max. Draft	• 0.7 PSI (100 PSF) • 3.0 in. • 325,000 lb • 270 ft • 10 kt max. typ. • 3.3 ft	• 0.7 PSI (100 PSF) • 2.5 in. • 338,000 lb • 270 ft • 10 kt max. typ. • 2.8 ft	• Same • No significant change • Same • Same • Less	No substantial change

adverse sociological impacts. The entire test area is frequently subjected to high levels of ambient noise from other sources. Sonic booms from high performance aircraft are common in the Tyndall areas, and NCSC frequently conducts tests with heavy military helicopters. Thus, continuation of ACV operations in the LCAC program should not constitute a notable increase in ambient noise levels of the area.

The proposed overland sites at Tyndall A.F.B. and in the West Bay area are isolated shoreline environments. Thus, noise from ACV operations in these areas should not be a public concern. Operations at the proposed North Bay site should not significantly add to the ambient noise level experienced there due to its proximity to the Panama City Municipal Airport.

No negative effects on wildlife on Crooked Island from noise have been noted in the course of the AALC program (see pages 7 and 8, 1981 EA). Shorebirds may be temporarily disturbed by ACV activity, but no long-term effects are anticipated. Impacts on mainland wildlife should be minimal, as these areas are highly modified. Airborne noise measurements of the JEFF craft were made in 1980, which showed ACV-generated noise levels to fall within acceptable limits (see page 8, 1981 assessment). The reduced noise levels expected from the LCAC craft further reduce the issue of hovercraft noise as a significant environmental concern.

B. Base Facilities

No major coastal construction efforts will be required at NCSC to accommodate the LCAC program, offering the advantage of immediate initiation of the testing and training program. Minor expansion of the existing ACV parking ramp has already received environ- mental clearance and construction has begun.

Fueling of the LCAC vehicles will be from tanker trucks. The fuel (JP-5 or DFM) is trucked as required from an existing facility at Lynn Haven, Florida. LCACs have a fuel capacity of 7,132 gallons. The potential for fuel or oil spillage was discussed in the 1976 CEIS and 1981 EA (see Appendix G).

Relatively small fuel volumes are involved, there is a low probability of spillage incidents, and standard Navy safety precautions will be observed. In the event of an ACV accident, fuel pollution prevention and clean-up facilities are on hand, and measures would be immediately initiated to minimize environmental impacts. The ramp and loading areas are fully equipped to handle minor spillage. No fuel spillages occurred in the course of the AALC program.

C. Overwater Operations

Principal areas of overwater operations are shown in Figure 7. Accumulated experience with the AALC program indicates that no substantial impacts are to be expected from overwater LCAC maneuvers. Figure 1 summarizes the number of overwater missions accomplished in the course of the AALC program. Low speed operation is mandated where the potential for interference with recreational or commercial craft exists (e.g., for all of St. Andrew Bay). Incidences of reported vessel damage resulting from ACV wake occurred early in the AALC program; corrective actions were taken to resolve this problem and no further complaints were registered. (See Appendix H for detailed information regarding ACV waves.)

Turbidity measurements and monitoring of bottom conditions have demonstrated that ACV passage may increase turbidity in shallow waters of up to 3 feet deep for about half an hour, but effects are highly localized and there is minimal effect on sea grasses or associated benthic ecosystems. There have been no incidents of harmful interactions of hovercraft with cetaceans or turtles. A manatee sighting has been reported recently near Crooked Island, but such sightings are so rare that there is little probability of encountering a manatee with hovercraft. The greatest concern of environmentalists for manatees, an endangered species which typically inhabits the waters of southern Florida, is their vulnerability to boat propellor injuries. The ACV is a craft which operates above, not in, the

water. Minor impacts resulted on fish and bottom life as the JEFF(B) transited a shallow marsh pond on Crooked Island, but no deep water incidents have occurred.

D. Overland Operations

Almost all overland operations in the AALC program were conducted on Crooked Island. The previous impact assessments concluded that AALC operations would not create appreciable short term or long term adverse effects on the sites in use. Experience showed this assessment to be essentially correct with one exception: Site G. This site is a narrow swale behind foredunes, on which the VOYAGEUR transitted and maneuvered intensively. The western half of this track, with damp, compacted soil covered thickly with grasses, showed -- as predicted -- little evidence of stress. The eastern half is comprised of unconsolidated sand sparsely covered with dispersed clumps of grass. Here, contrary to expectations, much loose sand was eventually blasted away by the air jets of the ACVs, resulting in substantial soil loss and damage to the clumps of plants within the track. When this adverse effect was detected, all operations in this zone were halted. No further transits are planned on the eastern half of Site G.

It is apparent that Crooked Island can support ACV activities at the level of the AALC program. However, the LCAC program anticipates a maximum annual level of overland operations which is approximately half again that of the maximum AALC year. Given the observed effects of multiple, intensive ACV maneuvers on Site G, it is not clear that Crooked Island can support the entire LCAC overland program without adverse environmental effects.

Therefore, mainland sites are being sought and investigated for use in routine overland testing and operator training. Selected sites for consideration will have ready access from the bay or Gulf across a narrow track to minimize effects on shoreline vegetation. These areas will not involve fragile dune or wetland environments. They will be flat, previously developed

sites, and/or areas in early successional stages of vegetation from prior uses. ACV maneuvers in such areas should cause little or no adverse change over existing conditions, and long term recovery after abandonment should be as good or better than current conditions.

Modified candidate sites include: (1) Sites F, D, and others in the Tyndall mainland area (see Appendix B for descriptions; Figure 4 for location); (2) two areas on North Bay near the Panama City Municipal Airport, and (3) cleared pineland areas on West Bay. Selection and use of such previously modified sites for routine LCAC overland exercises will be such that little short-term or long-term adverse impact can be reasonably anticipated.

It may be necessary to use existing Crooked Island sites for overland operations while mainland sites are selected and made available for LCAC program use. The number of missions should correspond roughly to projections for 1984 (Figure 1), in which as many as 41 overland tests are planned. This level of activity lies within maximum annual AALC operation levels. Thus, overland operations on Crooked Island in the early months of the LCAC program, following the designated usages, constraints, and ameliorative measures of the AALC program, should cause no appreciable adverse environmental effects. Use of the eastern half of Site G will be prohibited to allow recovery of that area; maneuvers along similar areas of loose soil and clumped grass will be avoided or held to a minimum. Effects on Crooked Island in this interim period should conform to the findings of earlier AALC impact assessments and to the observed minimal impact of that program.

Crooked Island is the only feasible location for certain operations, e.g., surf to beach maneuvers. Thus, even with the acquisition of mainland sites for routine LCAC use, there must be some limited use of Crooked Island. Because such use will be below previous AALC levels, this reduced use of Crooked Island should result in less impact than that observed in the AALC program.

[illegible]

To be considered for LCAC use, mainland sites must meet specific program requirements for evaluation and crew training purposes. Wetlands will be avoided and/or minimally impacted. ACV operations on previously modified, upland sites should have no long term effect. Wildlife should not be adversely affected, and there should be no involvement with threatened or endangered species. No mainland site will be selected which involves historical or cultural properties.

Use of existing AALC sites on Crooked Island for the period preceding availability of mainland sites and for specific maneuvers thereafter will be at or below levels of AALC activities, which have been assessed to be acceptable in terms of environmental concerns. Unavoidable aspects of continued ACV operations on Crooked Island will include limited, short-term damage to taller vegetation, minor leveling of designated dune structures, and some erosion of unconsolidated sand along poorly vegetated tracks. Wildlife and vegetation should be minimally affected in areas behind the foredunes. There is a possibility that nesting activities of shorebirds and turtles may be disturbed in the area between the high water mark and the foot of the foredunes. This zone will be closely monitored by NCSC and Tyndall personnel in the appropriate seasons, and areas where nesting is observed will be prohibited for LCAC operations for that time. Operators and crews will be trained in environmental considerations; pre-mission briefings regarding such concerns will be held.

Crooked Island historically has undergone swift and dramatic changes in shoreline, dune structure and other geomorphic features, due to the effects of storm and water. Appendix D illustrates modifications of its shape and position from 1886 to date. It is evident that any long term effects of ACV operations would be insignificant relative to those caused constantly by the action of natural forces.

An archaeological survey of Raffield Peninsula, adjacent to Crooked Island, will be conducted in early 1984 through Tyndall auspices. However, test sites on Crooked Island are not

[illegible]

[illegible] canned [illegible]

[illegible] ages [illegible]

[illegible]

involved. If historical or archaeological sites are demonstrated to exist in areas of LCAC operations, changes in test locations will be made.

VI. SUMMARY OF UNAVOIDABLE ADVERSE IMPACTS

1. Noise, waves, wakes, spray from air blasts, and similar effects of routine ACV operations are expected to occur in the course of the LCAC program. Experience with the AALC program demonstrates that these impacts are temporary, minor, and generally environmentally innocuous.

2. Disturbance of bottom sediments in shallow water (up to 36 inches), particularly at the shoreline, will result from ACV maneuvers. Increases in turbidity, however, are highly localized, short-lived, and no appreciable shore erosion results. No substantial effect on seagrass beds or associated benthic organisms is anticipated.

3. Overland operations involve short term damage to vegetation, shearing of dune crests, and displacement of unconsolidated sand. With the exception of Site G on Crooked Island, recovery from AALC operations has been satisfactory. All overland areas of testing will be closely monitored so that alternative measures may be taken to avoid unacceptable impacts. Use of mainland sites for routine overland operations should reduce and/or eliminate such impacts on the fragile Crooked Island environment.

VII. PROTECTED SPECIES CONSIDERATIONS

Other than the Least Tern and marine turtles on Crooked Island, no endangered or threatened species are involved in ACV overland operations. Reports of turtle nesting activities on Crooked Island beaches had been so infrequent that the 1981 EA regarded any chance of adverse affects on turtles from ACV

activities to be very slight; and the US Fish and Wildlife Service Office of Endangered Species (FWS) concurred in that conclusion. However, in the summer of 1983, Tyndall personnel discovered about nine turtle nests, mostly at or near Site B'. Based on these new records, FWS has advised that formal Section 7 consultation is needed. For this consultation, a systematic monitoring of Crooked Island beaches will be carried out during the nesting season of 1984. Results of this monitoring will allow a realistic assessment of turtle location and abundance, from which protective measures may be taken in the LCAC program. Meanwhile, following FWS advice, no beach maneuvers along the Site B' beach and no nighttime operations near beach shores will be programmed during the May-September 1984 nesting season.

Temporary disturbance of terns and other shorebirds may occur during overland maneuvers and some undetected nests may be destroyed. However, under operational constraints, LCAC activities should impact on shorebirds and their habitats little more than incidentally. ACV operators are under orders to avoid known bird nesting areas. Tyndall and NCSC personnel will closely observe potential nesting areas. Any defined nesting areas will be marked and declared off limits for LCAC missions in nesting season.

For at-sea operations, there is little likelihood of adverse interaction with endangered or threatened species. ACVs operate above the water, with only the skirt in contact with the surface; in the unlikely event of an encounter, damage to an animal is improbable. Interaction of ACVs with rarely-observed manatees and whales, and more abundant dolphins and porpoises, as well as marine turtles, in this area of the Gulf of Mexico is unlikely due to the over-water position of the craft and the relatively high visibility and mobility of the animals. There have been no adverse contacts between ACVs operating at sea and these marine animals during the entire history of hovercraft activities at NCSC.

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[illegible]

[illegible]

[illegible]

VIII. FLOODPLAIN AND WETLAND CONSIDERATIONS

Virtually all of the candidate mainland test sites and Crooked Island sites (excepting the tops of high dunes) lie within the 100-year base floodplain, i.e, below 11 feet elevation. Most of these sites contain some small wetland areas. As required by Executive Orders 11988 and 11990, the following conclusions, derived from this environmental assessment, address floodplain and wetland considerations.

Alternative sites for the proposed action were presented and discussed in this document. No practicable alternative sites occur outside the base floodplain nor would they be devoid of wetland.

The proposed action will not impede flood flow, alter topography or vegetative cover, or directly or indirectly encourage further use of the floodplain or wetland for other than this program.

The proposed action will not affect the maintenance of the natural environment, including short- and long-term productivity of animal life and vegetation, diversity of habitat, and ecological stability. The proposed action includes monitoring efforts, mitigating measures, and flexibility of operation to minimize impacts on floodplain and wetland values.

IX. MONITORING AND MITIGATING MEASURES

See turtle monitoring program description in Section VII, above. Another major monitoring effort of the AALC program, to be continued as a part of the LCAC operation, involves a systematic and quantitative program of fixed quadrant studies at major operation sites on Crooked Island. Similar studies will be initiated at any new test sites, and close observations of seagrass beds and shoreline features will be maintained. If signs of stress are indicated, mitigating measures, such as the use of alternative sites or changes in scope of operations, will be initiated. The NCSC environmentalists will work closely with

[illegible]

Tyndall Air Force Base and other concerned parties to alter or halt any stressful action. To the extent deemed feasible or practicable, restoration efforts may be undertaken in areas which show significant signs of stress. LCAC operators and trainees will receive instruction in environmental concerns pertinent to this operation (e.g., turtle tracks, erosion factors, marsh values).

X. PRODUCTIVITY AND COMMITMENT OF RESOURCES

The preceding discussions, based on experience with the AALC program, demonstrate that short-term effects of the LCAC program should be minor and temporary. No significant long-term effects on environmental quality or productivity are anticipated. There are no irreversible or irretrievable resource commitments in the proposed actions other than fuel, material, manpower, and other logistical expenditures concerned with ACV operation.

XI. PUBLIC AND OTHER AGENCY CONTACTS

State and regional A-95 offices have been notified of the proposed action. A public notice concerning floodplain and wetland considerations, inviting comment and announcing availability of this EA, has been forwarded for publication in the Panama City News Herald. Officials of the Florida Department of Environmental Regulation, Florida Department of Natural Resources, U.S. National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Tyndall Air Force Base have been consulted in the preparation of this EA.

XII. PREPARERS

This EA was prepared by M.E. Cleveland, Scientist, and William H. Tolbert, Principal Scientist, of Planning Systems, Incorporated, Panama City, Florida, 32401, telephone (904)-763-0711, for Dr. Horace Loftin, Ecologist, Code 3240, Naval Coastal

System Center, Panama City, Florida, 32407, telephone (904)-234-4183. Comments and requests for copies should be addressed to Dr. Loftin.

APPENDIX A: VESSEL DESCRIPTIONS

AALC JEFF(B) (Figure A-1)

The Bell Aerospace JEFF(B) has six Avco Lycoming gas turbines for power. They drive four 5 ft diameter double entry 12 blade centrifugal impellers for lift, and two 4 bladed 11.75 ft diameter Hamilton Standard propellers for thrust. There are two 3.8 ft diameter bow thrusters. Each propeller produces 12,000 pounds of thrust, while each bow thruster produces 6,000 pounds of thrust. Steering control is provided by two aerodynamic rudders hinged at the rear of the propeller duct exits, differential propeller pitch, and the bow thrusters.

The main hull is formed by a 4.5 ft deep buoyancy raft with port and starboard side structures. The bottom and sidewalls of the hull are fabricated of welded aluminum. The main deck is of mechanically fastened, hollow-truss type aluminum extrusions.

Each side structure contains three engines and their associated air intakes, exhausts, lift fans, transmissions, and auxiliary power systems. There are transverse and longitudinal bulkheads to form watertight compartments. The cargo deck has 1,738 square feet, permitting a three lane loading arrangement. The floatation skirt is of a 5 ft cushion peripheral bag and finger type.

The helmsman cockpit is raised to provide 360° vision for two helmsmen. A third seat is for another crew member or commander. The crew will normally consist of four operating personnel and one deck mechanic.

JEFF (B) SPECIFICATIONS

Dimensions

Length overall	87.6 feet
structure (less skirt)	80.0 feet
Width overall	47.0 feet
structure (less skirt)	43.0 feet
Height overall	23.6 feet
structure	19.6 feet
Bow ramp width	26.3 feet
Stern ramp width	14.5 feet
Cargo deck area	1,738 square feet

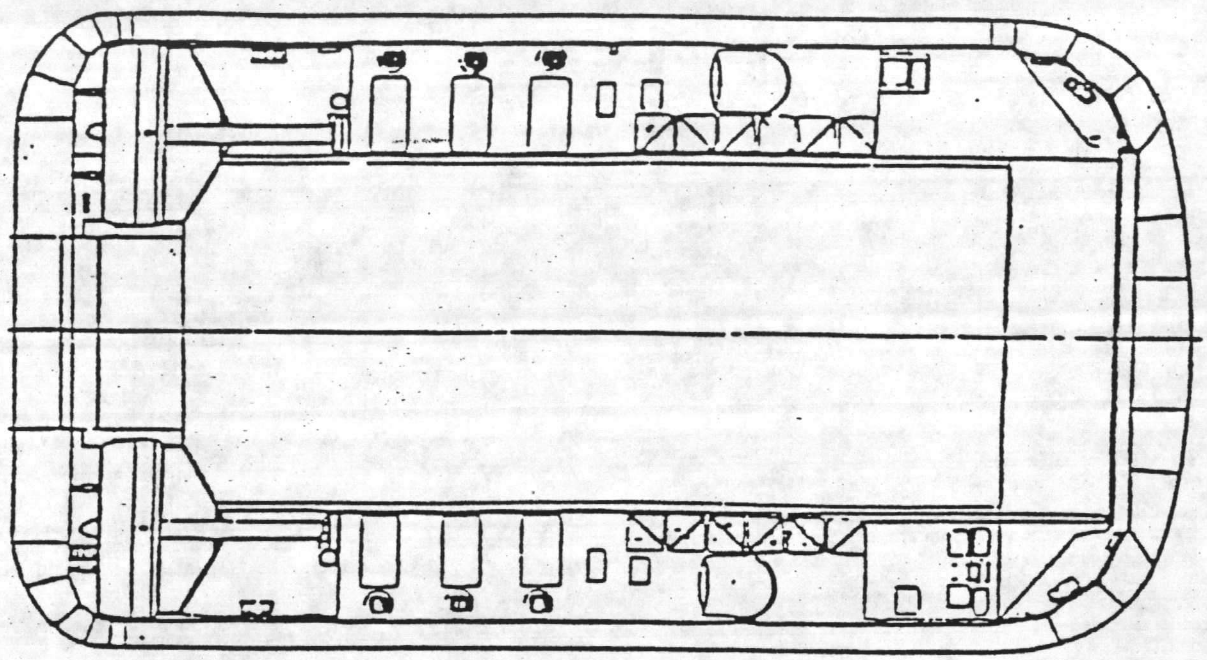
Weight

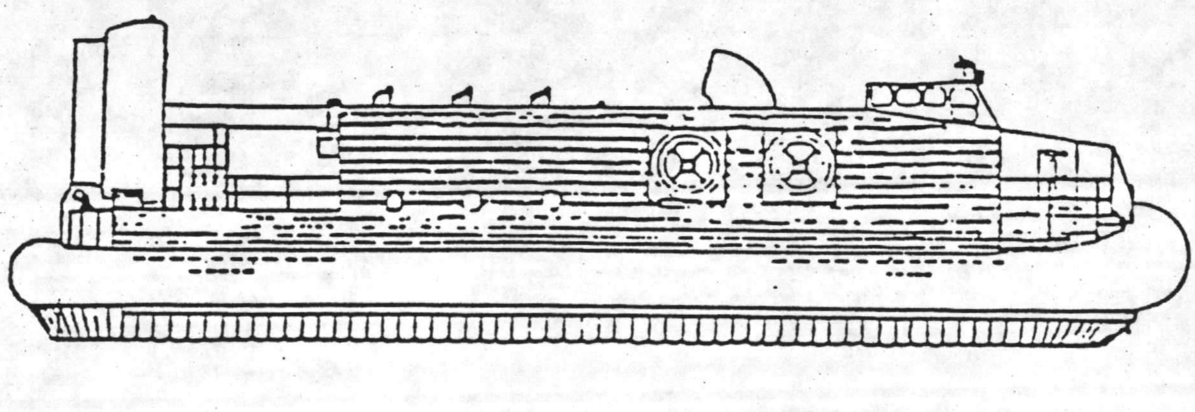
Gross weight	325,474 pounds
Light craft	165,394 pounds
Fuel	40,000 pounds
Design payload	120,000 pounds
Design overload	150,000 pounds

Other

Speed (Sea State 2)	50 knots
Surf	8 foot plunging
Gradient	5.5 degrees
Vertical steps	4 foot
Range	200 nm

Max gradient	13 %
Max obstacle	4.0 ft





BELL AEROSPACE
JEFF (B)

FIGURE A-1

LANDING CRAFT, AIR CUSHION (LCAC) (Figure A-2). The design of the LCAC production model is based on JEFF(B) technology. The LCAC is powered by four gas turbine engines and propelled by two large shrouded propellers. The vehicle rides over land or water surfaces on a cushion of air created by internal fans and contained by a flexible skirt. The flexible skirt clears the substrate by approximately two inches, allowing overland or overwater maneuverability while carrying tanks, trucks, half tracks, supplies and personnel from support ships to shore. The craft design features an open well deck with ramps at both ends. Beam and height dimensions are designed for operation in dry well decks of amphibious support ships.

VOYAGEUR (Fig. A-3). The Bell Aerospace Canada Model VOYAGEUR has an all-welded, heavy gage double-wall marine aluminum structure of modular construction for ready disassembly for deployment. The adaptable flatbed configuration accommodates a 25 ton payload.

VOYAGEUR SPECIFICATIONS

GENERAL

Designation - Bell Aerospace Canada Model 7380, Vogageur
Application - Multi-Mission Amphibious Air Cushion Vehicle
Operating Crew - Two: Commander/Operator;
Navigator/Relief Operator
Payload - Up to 40,000 lb
Maximum cushion pressure - 49.2 lb/ft^2

DIMENSIONS (SKIRT INFLATED)

Length	65.5 ft.
Beam	36.7 ft.
Height	22.0 ft.

WEIGHTS

Weight empty - 35,570 lb
Design gross weight - 78,000 lb
Maximum permissible gross weight - 88,000 lb

ROTATING MACHINERY

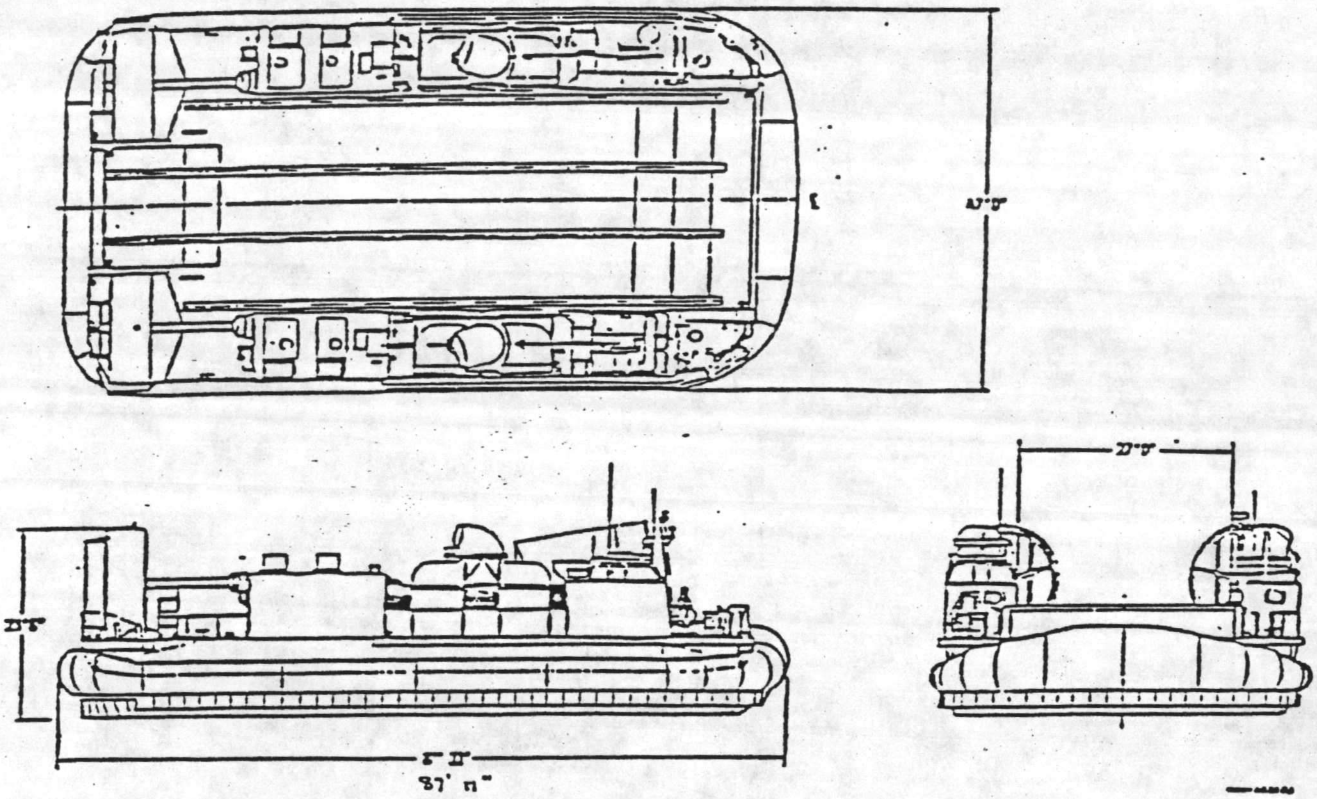
Powerplants - Two UACL ST6T-75 Twin-Pac marine gas turbines (1300 shp continuous 1700 intermittent per unit)
Gearboxes - Bell/Speco
Propellers - Two Hamilton Standard three-blade variable pitch 9-ft diameter
Lift Fans - Two Bell/BHC centrifugal 7-ft diameter

FUEL SYSTEM

Fuel type - Kerosene; JP-4; JP-5; AVGAS; Jet A, etc.
Capacity - 1998 Imp. Gal, 2,400 U.S. Gal.

PERFORMANCE (STANDARD DAY & DESIGN GROSS WEIGHT)

Maximum calm water speed - 45 MPH
Continuous gradient capability (standing start) - 8%
Vertical obstacle clearance: 3 ft
Ditch crossing (width) - 10 ft
Endurance with maximum fuel - 10 to 12 hours
Operable in waves up to at least 6 ft high
Operable in winds up to 50 MPH



● LENGTH OVERALL - HARD STRUCTURE	81 FT 0 IN
- ON CUSHION	87 FT 11 IN
● HEIGHT - OFF CUSHION	19 FT 0 IN
- ON CUSHION	23 FT 6 IN
● MAX HEIGHT ABOVE LIGHT WEIGHT WATERLINE - OFF CUSHION	16 FT 5.5 IN
● BEAM (MAX) - HARD STRUCTURE	43 FT 8 IN
- ON CUSHION	47 FT 0 IN
● CARGO SPACE DIMENSIONS -	67 FT 0 IN BY 27 FT 0 IN
● WIDTH OF RAMP OPENING AND RAMP ANGLES - BOW	27 FT 0 IN/14 DEG
- AFT	15 FT 0 IN/14 DEG
● DRAFT OFF CUSHION	
LIGHT CONDITION - HARD STRUCTURE	1 FT 6 IN
- LANDING RAILS	2 FT 2 IN
DESIGN CONDITION - HARD STRUCTURE	2 FT 2 IN
- LANDING RAILS	2 FT 10 IN
● OPERATING CREW SIZE	5
● DESIGN LOAD DISPLACEMENT	338,250 LB

LCAC TECHNICAL FEATURES AND PRINCIPAL CHARACTERISTICS

FIGURE A-2

2

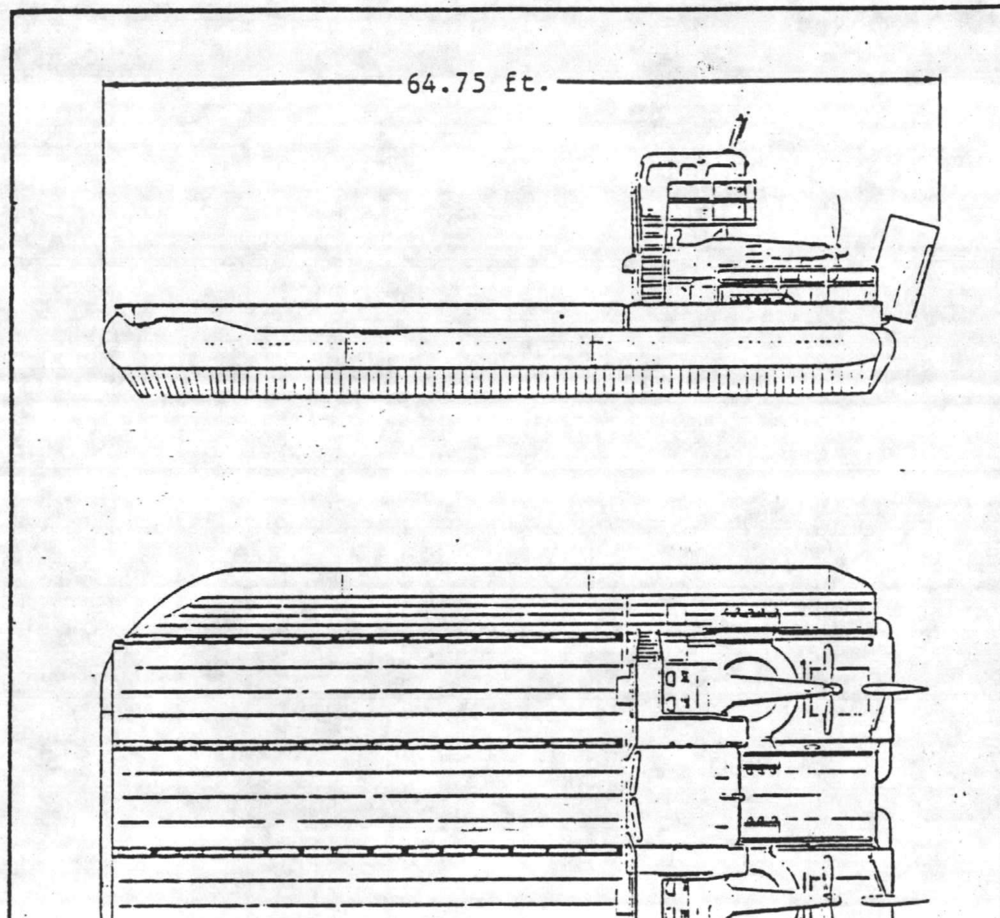


Figure A-3. Voyageur General Dimensions

APPENDIX B: Description of Crooked Island AALC Test Sites

The following description of existing test sites is abstracted from the 1981 Environmental Assessment for the AALC program. Details regarding site location and use, vegetation and wildlife are included. See Figure 4 in text for locations. A list of current restrictions on use of each site is presented on page B-11.

1. <u>Site A: Unlevel Terrain Training Site</u>

This site is located near the western end of Crooked Island, about 2 miles east of Tyndall NCO Beach (Figure B-1). ACV access to the site from the Gulf is across a narrow, flat washover zone (Site C) into St. Andrew Sound and thence into the site from the Sound shore. It lies behind and away from the foredune ridge fronting the Gulf, and no dune passages are involved in ACV operations there. The site is relatively flat but with enough relief (e.g., low mounds, shallow swales) to offer realistic training conditions without obstacles presenting environmental or safety problems. The ACV will operate over a relatively narrow semicircular track which has been marked off by brightly colored baskets fastened in the sand. This track was carefully laid out, with participation of the NCSC ecologist, to avoid environmentally sensitive features and limit the area affected while providing for all training requirements.

Vegetation at Site A is generally sparse and essentially as described in the 1976 CEIS for poorly stabilized areas behind high beach dunes. On some higher elevations, there are small pines and shrubs, but the ACV track steers well away from these. There is a narrow band of marsh grass at the shore entry and exit, as well as a low pocket of marsh grass (not contiguous with the shore) some 350 feet inland from the entry. ACV operations will be under instructions to pass swiftly over the marsh and perform training maneuvers only beyond this area.

During the 1975 - 1977 LACV-30 Program, some 100 transits were made over Site A. Monitoring before and after test runs

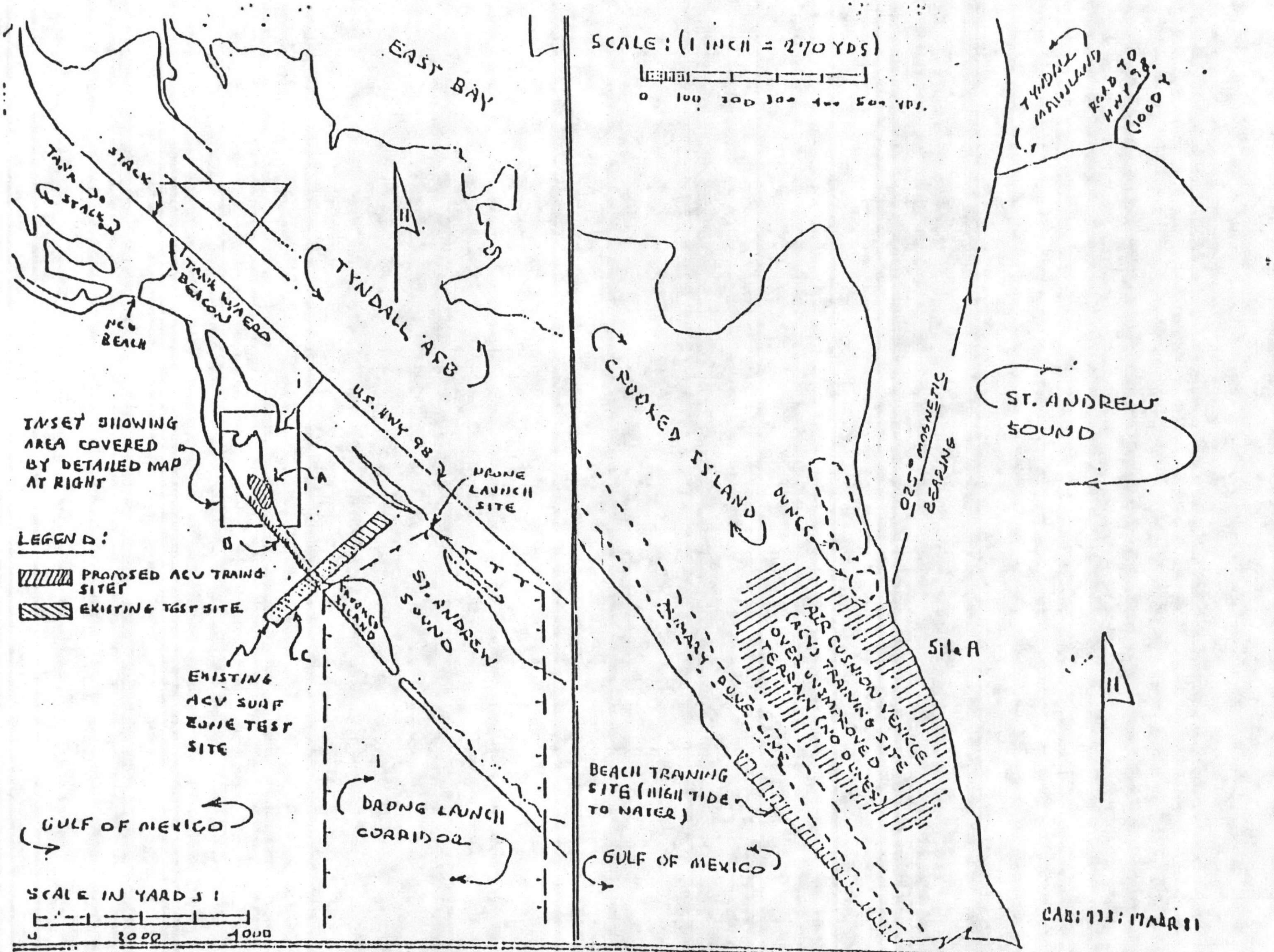


Figure B-1 - Details of Site A.

there showed minimal effect on vegetation and topography. (These tests were reported in Appendix E of the 1976 CEIS and served as a basis for predicting overland effects of the AALC program.) Visits of inspection to Site A have disclosed no obvious signs that an ACV had ever passed over the area; i.e., there was no long-term impact on the environment at Site A. After inspection of the site in 1981, representatives of the Florida Department of Environmental Regulation and U.S. Fish and Wildlife Service concurred that impact from the AALC program should be minimal, given due concern for marshland protection to the extent feasible. Wildlife at Site A is apparently at low concentration, with no involvement of endangered species or their habitat and little likelihood of shorebird breeding there. Some land birds, such as the ground dove, nest in the area, and those within the ACV track will be disturbed.

2. Sites B & B': Smooth Sloping Beach Training Site

Site B was not specifically included in the 1976 CEIS; however, it was covered generically under the discussion on beaching missions. Use of ACVs in amphibious assault landings will require along-shore and along-beach movement to maintain orderly circulation of incoming and outgoing ACV traffic. Thus, practice in such situations is an important phase of ACV pilot training. Site B nicely meets the conditions needed for this training.

Site B is comprised of a strip of beach from the surf line to about the high water mark (i.e., about 60 feet wide) running for about one mile westward from the wash-over area at Site C (Fig. B-1). Its eastern end is about 2 miles from the Tyndall NCO Beach. Access to the site is directly from the Gulf, and the ACVs will operate over flat beach usually awash by the tides at high water. There is no dune involvement. Even in rare cases of loss of steerage, the ACVs would slide downhill; i.e., away from the dunes and toward the surf line.

There is essentially no vegetation on Site B, and so, no effect of ACVs on vegetation here. Operation of the ACVs will

lead to some displacement of unconsolidated beach sand. However, this dynamic area is subject to daily tidal inundation and constant winds, and traces of ACV passage are promptly removed by these natural forces. Gulls, terns, and other shorebirds feed and rest along the surf line and beach here, and these would be temporarily displaced by ACV operations. Some shorebirds (e.g., Least Tern, Black Skimmer) may nest higher on the beach between the upper limits of the site and the sand dunes and might be disturbed by the ACVs. The NCSC ecologist will monitor this area during the spring breeding season for evidence of nesting. If, in consultation with Tyndall environmental authorities, it is concluded that colonial nesting would be significantly disturbed, a recommendation to halt or transfer operations in the affected zone through the breeding season will be made.

There is a possibility of affecting loggerhead turtles (Caretta caretta), an endangered species. Briefly, some of these marine turtles might crawl onto the beach and deposit eggs in holes dug in the dry sand above the landward margin of Site B. ACV operations should be well below potential nesting sites, so any eggs should not be directly affected. In any event, ACV operators will be instructed to avoid operating on the beach when they see the obvious turtle-crawl tracks which denote presence of fresh nests. No historical or archeological properties are involved in Site B.

[Site B has subsequently been removed from active use for ACV operations, to be replaced by Site B' at the eastern end of Crooked Island (see Figure 4 in text). Physical and biological features of Site B' are essentially as described for Site B, and environmental effects of ACV operations similar.]

3. Sites C & C': Surf Zone Test Site

Site C was included in the CEIS for surf zone tests with JEFF craft. This site was also subject of a Preliminary Environmental Assessment (PEA) of May 1981 for pilot training operations with the VOYAGEUR. Both assessments concluded that ACV activities would have only minimal and short-term environmental effects at Site C. With the anticipated use of

[illegible]

[illegible] the [illegible]

[illegible]

[illegible] potential [illegible]

[illegible]

Site A for overland pilot training, Site C will no longer be used for that purpose. ACV operations there will be limited to surf zone and associated testing and for entry and exit to Site A via St. Andrew Sound.

The surf zone tests require ACVs to enter and exit the surf zone at various speeds (8 to 40 knots), angles of attack to the surf, and surf heights. This will require the ACVs to cross over Site C, but there will be no extensive maneuvering over the site. Video documentation of the tests and tracking and a range-bearing precise tracking system will involve equipment carried to the site by four-wheel-drive vehicles.

Site C is situated on Crooked Island about 3 miles east of Tyndall NCO Beach (Figure B-1). The site is a flat, bare washover area, created by high seas during Hurricane Eloise in 1975. This sand flat is about 500 feet in length (i.e., paralleling the beach) and 300 feet deep (from Gulf to Sound). It is terminated east and west by low dune ridges which fall off rapidly toward each shore. The site surface consists of loose sand, and there is essentially no vegetation except scattered clumps of sea oats at its margins. Animal life at Site C is generally limited to flocks of shorebirds which feed and rest along the beach or shore. There are no indications of shorebirds nesting on the site. Loggerhead turtles (Caretta caretta) might use the Gulf beach for nesting, but the situation would be as described for Site B. There are no know historical or archeological properties at Site C.

The principal environmental concern from ACV operations at Site C is with topography; i.e., movement of its unconsolidated sand surface by ACV passage. Both air blast and apron drag from ACVs create visible disturbance of the sand, which is unprotected by any vegetation cover. This matter was closely examined in the 1981 PEA because of the multiple passages and maneuvering involved with pilot training. Topographic monitoring was conducted there as follows: From June 1978 through May 1980, a total of 32 crossings of Site C was made by JEFF craft; in May

1980, the profile of Site C at its center was surveyed. Then from May 1980 through March 1981, 130 additional JEFF craft passages were made, plus 18 multiple-passage missions by the VOYAGEUR; again, the profile was surveyed. Results of the two surveys are diagrammed on Figure B-2, which reveals that the central portion of the site was 2.8 feet higher in elevation in 1981 than in 1980, despite the large number of ACV passages in that time. The data indicate that no appreciable degradation of Site C topography should be expected from ACV operations at this level of intensity. Evidently natural forces acting on this area are such that they dominate and cancel out short-term effects of ACV activities.

[Site C will no longer be used for ACV operations. Instead, Site C' (Figure 4 in text) will be used for ACV maneuvers requiring the topographic features of Site C. Site C' is located about midway of the length of Crooked Island, a bare, flat area formed by the break-through of a new channel across Crooked Island in a recent hurricane. Features are essentially those of Site C, except the new site occupies more area and (especially at its channel end) is more frequently modified by action of wind and water. Environmental effects of ACV operations at Site C' should be similar or less than those predicted for Site C.]

4. <u>Site D: Overland Level Ground Test Area</u>

Site D, the PQM-102 runway at Tyndall A.F.B., was not included in the 1976 CEIS. The runway is, of course, paved. Access to the runway is from East Bay, crossing a narrow band of marsh at the water's edge, and then over a short strip of cleared, level ground onto the runway. The limited number of passages anticipated should have only minimal, short term effect, if any, on the marsh and should not otherwise impact on the environment at Site D. There are no endangered species or other wildlife concerns. There are no known historical or archeological properties involved. [This site is on the Tyndall mainland and not on Crooked Island.]

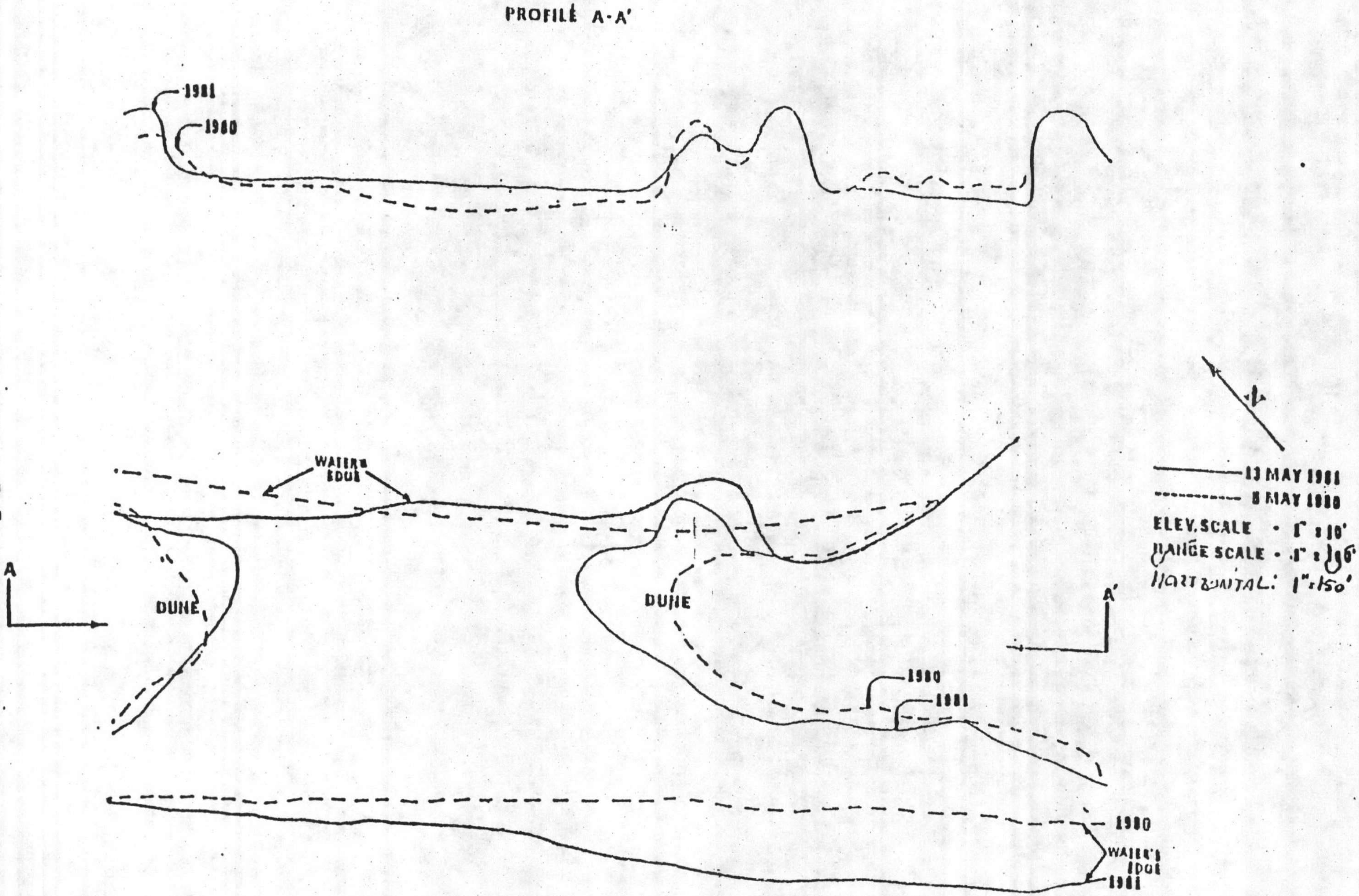


Figure B-2 - Diagram of Site C Topography.

5. Site E: VIP Demonstration Site

It has been necessary throughout the AALC program to provide ACV demonstration trials for dignitaries, including the Secretary of the Navy, Chief of Naval Operations, Commandant of the Marine Corps, and Chairman and members of the Senate and House Armed Forces Services Committees. The typical VIP schedule allows only 20 to 30 minutes for such tours, which necessitates quick passage from the staging area (Site F) on St. Andrew Sound across an overland track on Crooked Island to the Gulf for open water maneuvers.

Site E (Figure 4 in text) nicely meets these requirements. It is only a short distance down the sound from Site F. There is unobstructed entry from the sound to the site, a flat and open path across the island to a ridge of dunes at the Gulf edge, and access to the Gulf across a beach. The run from Sound to Gulf, takes only about 2 minutes, while providing a mix of conditions for demonstrating ACV overland capacity. This site and VIP demonstrations were not covered specifically in the CEIS, though the overland operation and environment involved are typical of those discussed in the CEIS.

Site E is approximately 1000 yards long from Gulf to Sound. Proceeding landward from the Gulf, there is a typical flat beach, followed by a double ridge of fairly high frontal dunes; an intra-dune swale; a poorly defined line of small secondary dunes; a flat area of grasses and low shrubs comprising about two-thirds of the crossing track; a short zone of thinly scattered pines (no pines on the track proper); and a short zone of grass and shrub, followed by a narrow band of marsh at the sound shoreline. Vegetation is essentially as outlined in the CEIS for each type of habitat. Close inspection of Site E reveals little evidence of JEFF craft passages except on the landward side of the frontal dune ridge. At that point, the track leads from a generally flat area sharply up the rear dune face. Apparently, this slope is such that the JEFF craft apron drags as the ACV crests this dune, so that the top of the dune has been somewhat leveled and

vegetation swept off. This is not the case with the dunes seaward of this single rear dune; there is little indication of ACV passage there and across the beach to the surf.

In summary, demonstration missions have caused little short-term and virtually no long-term effect at Site E, except for the one dune. It is recognized that continuous crossing of that dune may create permanent damage. On the other hand, our observations on a similar dune, which had been leveled on top, showed rapid recovery, including revegetation and stabilization with 2 to 3 years. [Alternate exits across dunes at Site E have subsequently been used, thereby markedly reducing effects of multiple passage from a single dune exit and achieving very positive environmental results.]

The infrequent demonstration missions should have little or no effect on the limited wildlife present at either of these open, flat sites. No endangered species or their habitats are involved except possible concerns for sea turtles nesting at the beach exits, which should not be significant. There are no known historical or archeological properties involved at Site E.

6. <u>Site F: Staging Site</u>

Site F, covered in the CEIS, is used for such tests as cargo loading, tie down, and unloading, and as a transfer point for VIP missions. [It is on the Tyndall mainland, not Crooked Island.] In addition to the ACV, the tests involve wheeled vehicles, tracked vehicles, and loading of palletized cargo with both forklift and alongside cranes; VIP missions require helicopters which typically are on the ground there for an hour. Vehicle access to Site F is by road; ACV access is from St. Andrew Sound. [This site is a candidate for expansion and increased use for routine overland training operations in the LCAC program.]

Site F is located west of and adjacent to the Tyndall CEC Field Activity facility near the eastern head of St. Andrew Sound (Figure 4 in text). The site proper is on highly disturbed, flattened ground formerly used as a training area for heavy equipment (e.g., bull dozer) operators. It is sparsely covered with short grasses. A compacted oystershell hardstand is in

[illegible]

place where ACV test activities are conducted. ACVs approach the site from the Sound across a narrow band of marsh at the shore (showing little effect from the passages), and up a cleared, grassy trail to the test area.

There is patently no meaningful environmental impact from ACV activities involved in this disturbed, developed area. No endangered species, or other appreciable wildlife, are involved. There are no known historical or archeological properties at this site, although nearby Raffield Peninsula is of interest to the state of Florida in terms of cultural considerations.

7. <u>Site G: Unlevel Ground Testing Sites</u>

Site G (Figure 4) is located on the extreme eastern end of Crooked Island, just west of the juncture of this barrier bank with the mainland. The site is about 3000 feet in width, involving about a third of Crooked Island's breadth at this point.

Site G was specifically covered in the CEIS for JEFF craft testing operations. The site was also subject of a PEA of May 1981 for overland pilot training with the VOYAGEUR pending clearance of Site A for that purpose. Only minor short-term effects and essentially no long-term effects on the environment were anticipated in these assessments. [However, subsequent experience has shown that the eastern half of the track cannot support persistent ACV activity. Except for the western approach to Site G, which shows little effects of hovercraft activity, Site G has been withdrawn from use as an ACV track pending recovery.]

DESIGNATED AREAS/RESTRICTIONS at CROOKED ISLAND - AALC PROGRAM

AREA	VEHICLE	RESTRICTIONS
A	VOYAGEUR	Access to area A will be through the cut, not via area C.
B/B'	JEFF/VOYAGEUR	Area B is no longer authorized for test purposes. Please note area B' (B prime) located between areas E and I. Usage of B' is limited to the each between the Gulf waterline and the high tide mark. Dune areas will not be utilized.
C/C'	JEFF/VOYAGEUR	Area C is authorized for contingency use only. Coordination between NCSC and Environmental Planning (325 CSG/DEEV) will be effected prior to utilization. Please note area C and is authorized for immediate utilization. ACVs will maintain a minimum distance of 300 yards from nearest dune.
D	JEFF/VOYAGEUR	Area D will be used on a case-by-case basis with prior approval.
E	JEFF	Area E will be utilized for VIP missions only. Two additional access routes will be identified by NCSC with total access routes to area E being three. Utilization rate for area E is limited to one mission per access route every three months.
F	JEFF/VOYAGEUR	No restrictions for area F.
G	VOYAGEUR	Area G is in short distress. Operations in area G, identified as 150 yards long on the swale longitudinal axis, are suspended until recovery is complete. In the interim, the western half of area G can be utilized
H	none	Area H is not authorized.
I	JEFF/VOYAGEUR	Usage of the Saline Pond area will be considered on a case-by-case basis.
J	none	Area J, TAFB main airfield complex, is not authorized.

APPENDIX C: VEGETATION

(The following section, adapted from the 1976 CEIS for the AALC program, describes the coastal environment of this region in terms of its prevailing flora. The descriptions are representative of vegetation types found at Crooked Island and candidate mainland test sites.)

The prevailing type of vegetation is open forests of pine. On the driest uplands or where the sand is deepest, there is a considerable admixture of small black-jack oaks and a few other deciduous trees with small or thick leaves. The wet slopes of the broader branch-valleys have a characteristic bog or wet pine-barren flora, more richly developed in this region than anywhere else in Florida. There are all gradations between dry and wet pine land, as in the neighboring cypress pond region. At the heads of some of the streams are dense tyty bays. Swamps are common, and vary in character with the size of the stream traversing them, and the distance from the coast; the largest streams, which fluctuate the most, being bordered by vegetation indicating richer soil than that of the non-alluvial and estuarine swamps. Shallow ponds with cypress, slash pine or black gum occur in the flatter places, but much less frequently than in region No. 2 (the West Florida Lime Sink Region).

Tyson[1] recognized 16 vegetation types (for the general area) and tabulated the more important plants of each:

I. Non-hammock Communities of Well-drained Soils

A. Coastal Dunes

Dunes by definition are small hills or ridges of sand formed by the movement of the wind. Dunes when first formed move under the influence of the wind, but with time become stabilized and covered with vegetation.

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1 Tyson, E.L. (1953). Eglin Field Deer Investigation, Florida Game and Fresh Water Commission, Project No. W-27-R, annual progress report, memo, 36 p.).

1. Moving Coastal Dunes

These dunes are restricted to the outer coastal margins along the Gulf of Mexico: Characteristics species; *Cakile edentula* (sea rocket), *Sesuvium portulacastrum* (sea purslane), and *Uniola paniculata* (sea oats).

2. Stationary Coastal Dunes

Stationary coastal dunes are located for the most part landward of areas of moving dunes. They are characterized by the presence of trees, shrubs, and other plants which contribute to the stabilization of the sand. Characteristic plants are: *Magnolia grandiflora* (southern magnolia), *Pinus clausa* (sand pine), *Pinus palustris* (long-leaf pine), *Quercus geminata* (sand live oak), and *Quercus myrtifolia* (myrtle oak).

B. Scrub

Scrub is a term for well-drained sandy areas in which trees and shrubs attain only a modest size and the herbaceous vegetation is sparse. The area is dominated by sand pine and various oaks. The soil is of the St. Lucie type and is scarcely more than white sand. Organic matter is rapidly decomposed and leaching is excessive.

3. Rosemary-Sand Pine Scrub

This is a the typical scrub found in dune areas. The vegetation type is named for the two outstanding plant species and is consequently easily recognized. Characteristic species are: *Trees*, *Ilex vomitoria* (yaupon), *Magnolia grandiflora* (southern magnolia), *Pinus clausa* (sand pine), *Quercus geminata* (sand live oak), *Quercus myrtifolia* (myrtle oak), *Quercus virginiana* (live oak); *Shrubs and vines*, *Ceratiola ericoides* (rosemary), and *Chrysoma pauciflosculosa* (woody goldenrod).

The above refers to plant communities of well-drained soils. Kurz and Wagner (1957)[2] have given detailed descriptions of plant communities of marshes and adjacent areas. Table C-1 gives a

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[2] Kurz, H. and Wagner, K. (1957). Tidal Marshes of the Gulf & Atlantic Coasts of Northern Florida and Charleston, South Carolina. Florida State University Studies, 24:1-168pp.

summary of flatwoods, barrens, salt flats, *Juncus* and *Spartina* zones, and Figures C-1 to C-4 show, in more detail, the relations among these plant zones.

MARSH COMMUNITIES

FLATWOODS	BARRENS	SALT FLATS
Vegetation: Fresh soil water xeromorphs.	Blue-green algae and/or a dense diatom flora at times, no seed plants.	Stunted xeromorphic halophytes.
Slash-pine, saw-palmetto, and wire-species present.	Hantschia sp. dominant. About 12 other	Spartina patens, Distichlis, Salicornia, Batis, grass. Borrichia, Aster and Limonium.
Soil: Mature sandy soil: humus near surface; A,B and C horizons; hardpan at 4 feet.	No uniform pattern of stratification. Reworked and redeposited raw sand; sometimes partially differentiated B-horizon about 2.5 feet or more.	As in barrens, but with more humus B-horizon often evident
Water table about 4 feet deep, as shown by hardpan	A water table indicated by hardpan or stained layer. Surface soil dry except at tidal flooding or rain.	A water table indicated by an indefinite hardpan. Surface soil mose but not water logged.
Salinity low or negligible.	Highest salinity of the tidal marshes.	Usually higher than salinity of tidal waters.
pH 3.5-5.5	Alkaline; pH 7.5-8.5	pH about 5.5-7.5
Sand permits percolation of water down to hardpan.	Porous sand with less colloidal material and organic matter at surface than in salt flats permits more rapid percolation and evaporation. Therefore high concentration of salts.	Soil intermediate between Juncus and barrens in humus and porosity; intermediate percolation rate.
Chlorinity neglibible except near marsh soil.	High salt content of soil excludes seed plants. Absence of these and resulting high evaporation rate favors maintenance of high salinity	Open, low vegetation and partially porous soil permits salt concentration by evaporation and percolation, but not to extent reached in barrens.
Tidal exposure: Seldom flooded by	Flooded only by high tides, and then only for short time.	Flooded more frequently than barrens. tide water.

TABLE C-1. Summarized Study of the Tidal Marsh Zonation*
From Kurz and Wagner (1957)

JUNCUS MARSH	SPARTINA ALTERNIFLORA
Vegetation:	
Luxuriant halophytes.	Channel, pool and beach halophytes.
Juncus dominant, occasional Limonium, Distichlis or Batis.	Spartina alterniflora, often no Limonium, competitors; sometimes dominant with intermingling of Juncus, Aster, Batis, or Salicornia.
Soils:	
Mature sandy muck with high Juncus peat content overlying sandy substrate. B-horizon evident near salt flats and near mainland.	Ranging from beach sand, to soil with the greatest peat, colloidal and silt content and the least sand of the salt marsh soils; no B-horizon observed.
Soils usually waterlogged at surface. Variable depth B-horizon suggested.	Upper stratum mucky with high organic content, soaked and water filled cavities at flood tide. Below this, stratum up to 42" thick of moist but not actually waterlogged soil which overlies the water table.
Salinity mostly near that of tidal water, but in some places runs lower or higher than tidal water.	Salinity varies from near that of tidal water at beaches and channels to higher than tidal water in trapped pools of water.
Acid, with lowest pH of salt marshes. pH about 4.5-6.5.	Acid to alkaline, pH 4.7-8.5, but usually a pH of 5.5-7.5 is found.
High humus content near surface retards percolation.	As in Juncus marsh or even more extreme retardation of percolalation.
Dense vegetation. High humus content of soil hinders evaporation and percolation. Frequent tidal flooding tends to reduce chlorinity to seawater concentration, consequently chlorinity lower than in Distichlis flats of barrens.	As in Juncus marsh, plus more continuous inundation maintains tidal concentration of salts. In trapped pools vegetation is more open, hence more evaporation and greater chlorinity.
Tidal exposure:	
Frequent flooding and for long periods.	Greatest tidal flooding of all salt marsh. On beaches extends down to mean sea level.

TABLE C-1. Summarized Study of the Tidal Marsh Zonation* (Con't)

* From Kurz and Wagner (1957)

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FIGURE C-1. The four selected stages illustrate plant community or species elimination accompanying decrease in elevation or degradation of flatwoods remnant Islets.

A. Elevation 2.50 ft.
Middle: Pinus elliottii, Sabal palmetto, Serenon repens, Ilex vomitoria.
Edge: Fimbristylis castanen Spartina spartinae, Distichlia spicaia.

B. Elevation 2.14 ft.
Pinus elliottii eliminated.

C. Elevation 1.46 ft.
Pinus elliottii, Sabal palmetto, Serenoa repens, Ilex vomitoria and Baccharis halimifolia eliminated.

Iva and Juncus dominant. Only stumps of dead pine remain.

Fimbristylis castaneu, Spartina spartinae, Distichlis spicaia scattered over the Islet.

D. Elevation 0.76 ft.
Pure Juncus stand. All other species present in A, B, and C are now eliminated.

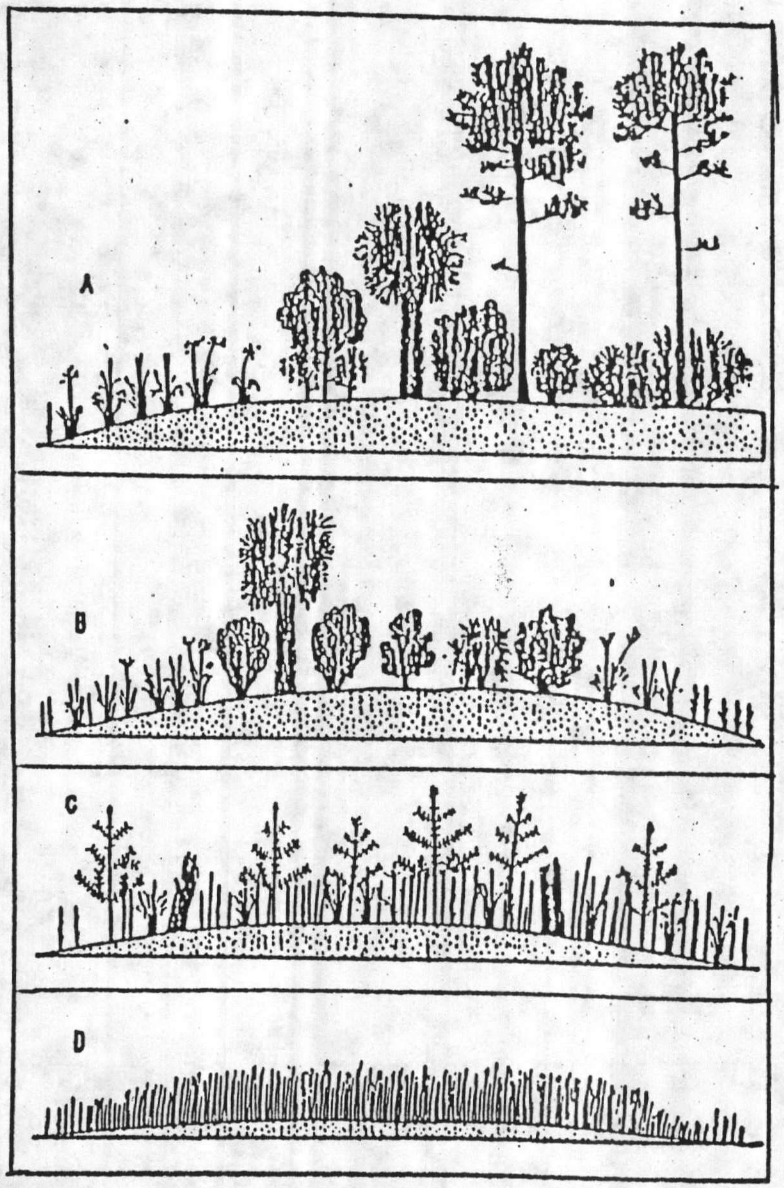


Figure C-1. St. Josephs Bay: Flintwoods remnant islands.

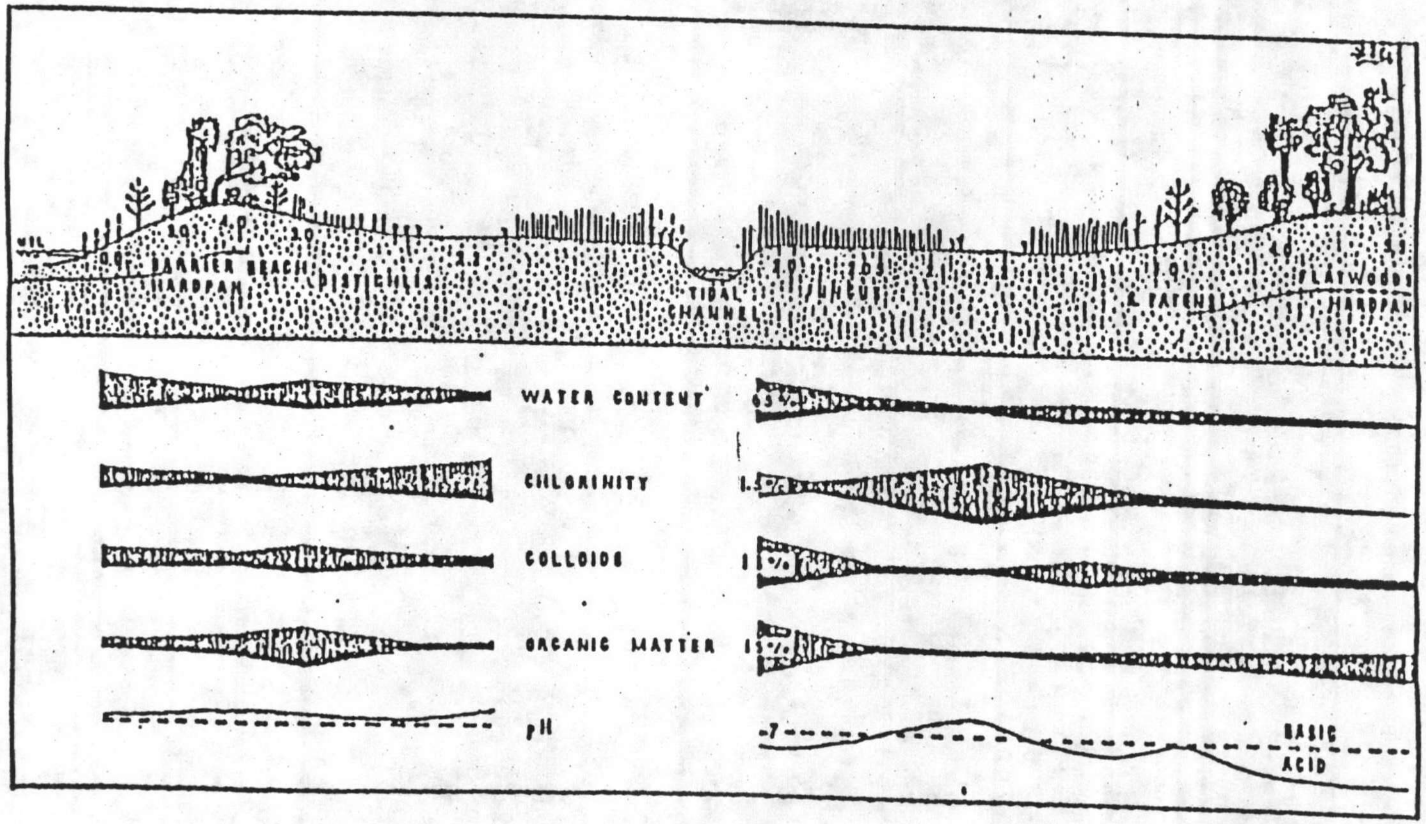
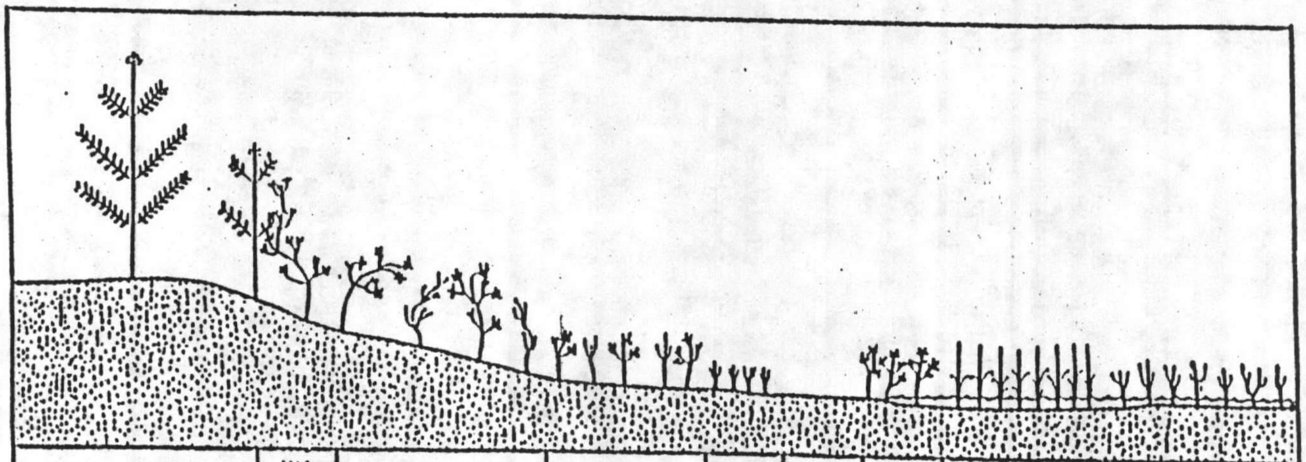


Figure C-2. Generalized Transect of the Salt Marsh.



	IVA-BATIS	BATIS-SALICORNIA	BATIS-SALICORNIA	SAL.	BARREN	BATIS	S. ALTERNIFLORA	SALICORNIA
IVA								
ZONE	H	G	F	E	D	C	A	B
ELEVATION	0.81	0.52	0.16	0.14	0.09	0.07	0.00	0.03
CHLORINITY	0.48	1.37	3.21	3.34	3.68	3.05	2.42	2.87
pH	6.4	6.5	6.5	6.5	6.9	6.6	5.6	5.0
PLANT HEIGHT	30"	18"	6-8"	3-4"		8"	10"	6"

Figure C-3. SALICORNIA-BATIS Zohation and Stature in Relation to elevation. Surface or top soil water, and chlorinity. Elevations are relative to Zone A soil surface. Live Oak Point, 24 May 1953.

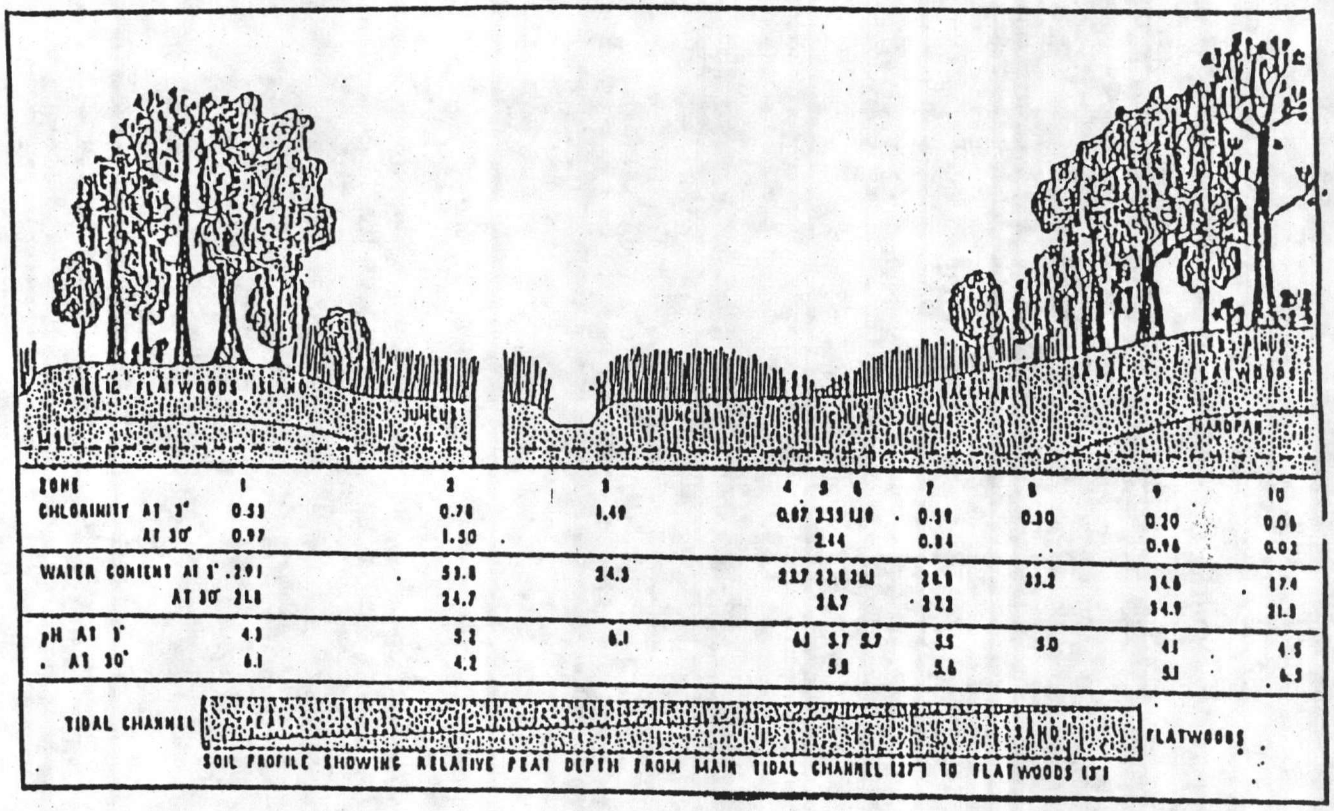
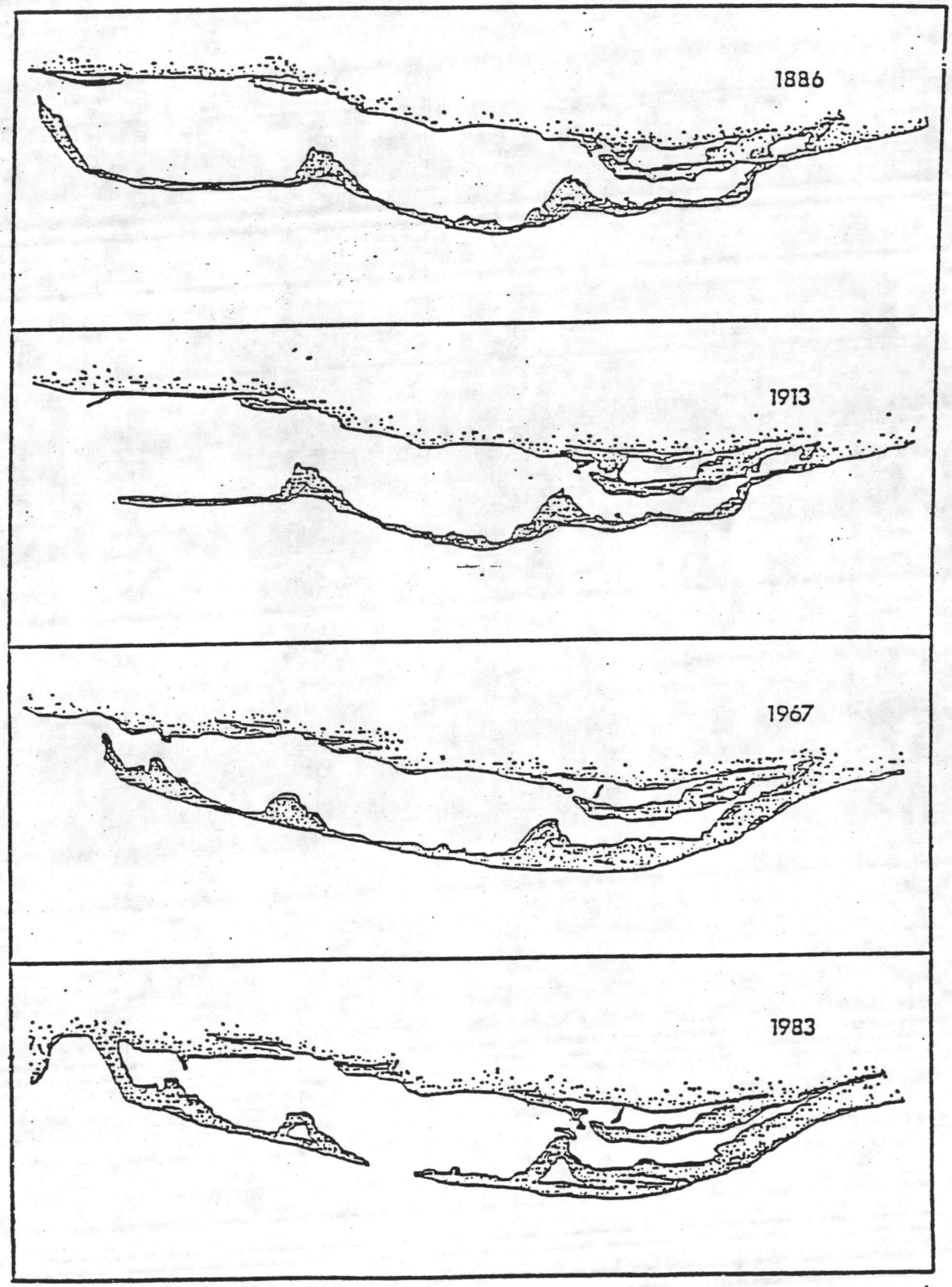
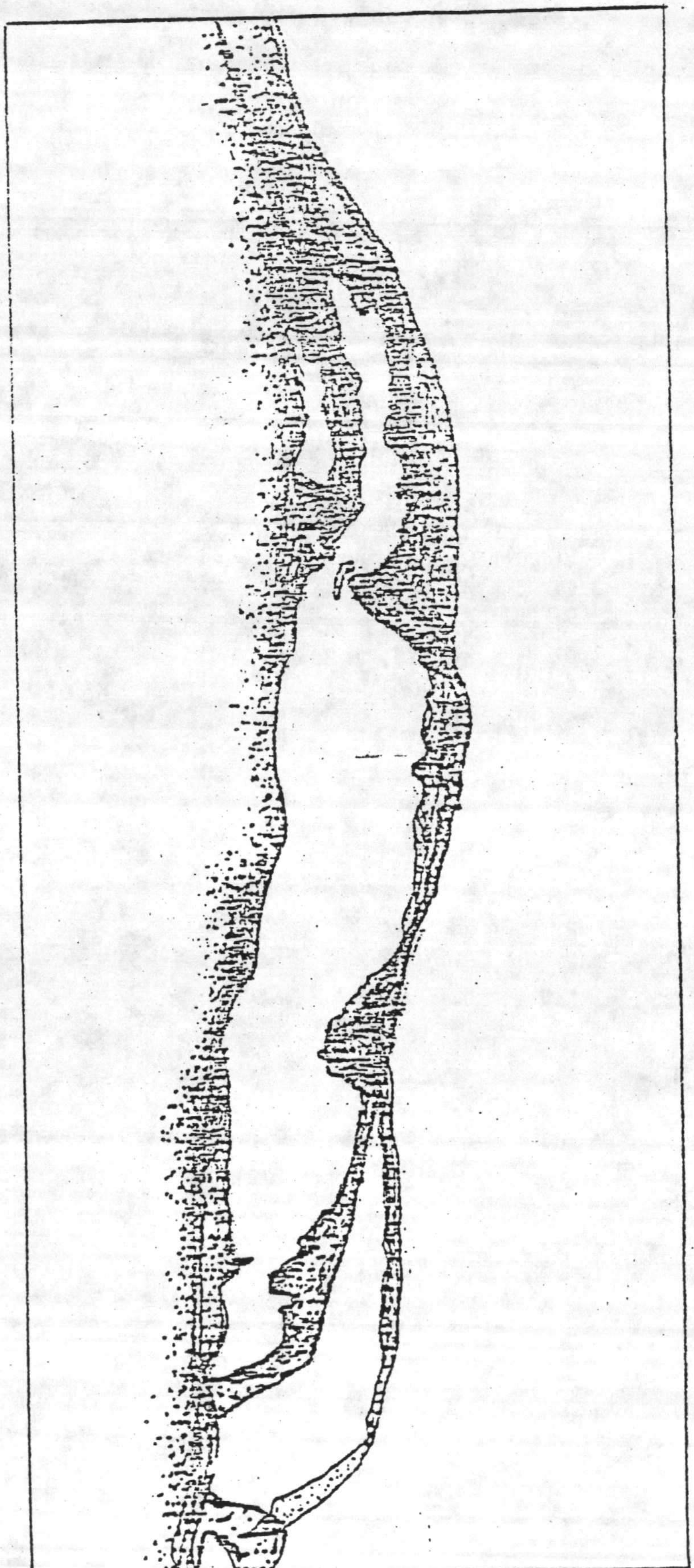


Figure C-4. Shell Point Relic Island to Flatwoods Transect.

APPENDIX D: GEOMORPHOLOGICAL CONSIDERATIONS

A series of maps of Crooked Island from 1886 to the present are shown in this appendix. These maps are drawn to the same scale, and if viewed in sequence and/or overlay (see D-3), demonstrate the dynamic geomorphological characteristics of Crooked Island. (Copies 1 through 10 of this assessment contain an overlay packet.) The shoreline and topography of Crooked Island, which is actually a peninsular extension of the mainland, is in a continual state of flux due to natural forces of wind and water. In 1886, the western arm of Crooked Island extended northerly, almost touching the mainland. In 1913, this extension was not present; a slender arm of beach with no nodes or thickenings of land is in evidence. Fifty years later, a thickening of the western beach area had occurred, and St. Andrew Sound was almost encircled by Crooked Island. A thickening of the eastern arm of the island had also taken place, extending the shoreline area toward the Gulf of Mexico. The present shape of the Crooked Island coastline is dramatic evidence of its fluctuating boundaries. In the mid-1970's, Hurricane Eloise created a pass at the center of Crooked Island. The western sector of the island now touches the mainland, enclosing the western end of St. Andrew Sound. Thus, potential for long-term environmental impact on Crooked Island from ACV operations would appear to be minimal relative to effects wrought by wind and water on this dynamic coastline.


1886
1913
1967
1983



APPENDIX E

LCAC SCOPING MEETING

November 28, 1983

Minutes

The meeting was called to order by Horace Loftin (NCSC Ecologist) who indicated that the LCAC program is a continuation of the AALC program in terms of environmental concerns. He stated that the AALC program, in effect since 1978, has been the subject of two environmental assessments with a finding of "no significant impact." The discussion was turned over to Clifton Bonney (NCSC) who emphasized that a new assessment for the LCAC, which will be conducted at a somewhat more intensive level than the previous AALC program, will be essentially an update of existing AALC assessments. He presented the group with a seven page handout (Enclosure (1)) with comments which are highlighted below.

Page 1 - a line drawing of the new landing craft, its functions and principal characteristics were discussed (see Appendix A).

Page 2 - the JEFF(A) and (B), forerunners of the LCAC vehicles, have similar characteristics. The LCAC production model most closely resembles JEFF(B). The present schedule calls for the first LCAC to be delivered to NCSC in May, 1984 (see Appendix A and Figure 2 in text).

Pages 3 and 4 - presented the characteristics of the VOYAGEUR, which is a somewhat smaller ACV used principally as a trainer craft for pilots. The VOYAGEUR introduces operating crews to characteristics common to all ACVs, and it will continue to be used for pilot training in the LCAC program (see Appendix A).

Page 5 - discussed overall ACV testing and evaluation (T&E) schedule with projected start-up of LCACs. Six boats are to be

delivered to NCSC, the first in May, 1984. The first three (LCAC 1, 2, and 3) will be used for T&E and training; the last three may be delivered to Camp Pendleton in California where an ACU base is scheduled for operation in 1986. The schedule indicates changes between the old amphibious landing craft program and the new LCAC program. JEFF(B) as well as VOYAGEUR will be used for training the LCAC crews. The JEFF(B) will be phased out of the LCAC program sometime in mid-1985 (see Figure 2 and 3 in text).

Page 6 - addressed the number of missions per unit time accomplished in the course of the AALC program and projected future estimates, both overland and overwater, for the LCAC program. These estimates will probably be updated within the next 2 or 3 months. An environmental assessment will be approved by CNO (OP-45), the Navy's environmental assessment office, prior to the initiation of testing. The target date for completion of the assessment is May 1, 1984, when the LCAC - 1 is expected to arrive. The assessment will include a proration by operating areas for estimates of future schedules (see Figure 1 in text).

Page 7 - compared craft design features of the JEFF(B) and LCAC vehicles which are very similar; thus LCAC impact on the environment is also expected to be similar (see Appendix A and Table 1 in text).

Mr. Bonney then opened the sessions to specific questions, issues and concerns from representatives attending the scoping meeting. Beth Cleveland (PSI) asked about the disparity between the typical fuel load for the JEFF(B) (5000 gallons) and the LCAC (1500 gallons). Mr. Bonney replied that the JEFF(B) rarely used the amount of fuel it is capable of carrying on a typical mission. The JEFF(B) has approximately four hours of fuel to the reserve level. He stated that no mission will last that long.

Jack Taylor (Taylor Biological Co. Inc.) questioned the potential for adverse impacts on shorebirds at Crooked Island by ACV maneuvers. Horace Loftin replied that no impact had been observed to date. Rudolph Osbolt stated that birds cannot be driven from their nesting areas, and that ground doves and shorebirds nest in these areas. He indicated that he has

[illegible]

followed hovercraft activities since the first of the year and has ridden on the craft. He has observed the craft running within three to four feet of nests on crossovers, and expressed concern over damage to vegetation.

Major Joe Ward (TAFB) asked for a description of the mission of the craft. Mr. Bonney explained that the LCAC program would provide the Navy with a new amphibious assault craft to replace the old LCM type craft. By using LCAC, he explained, the percentage of world beaches open to assault will increase form 17% to 70%. The LCAC will be used to carry war machines, materials and troops in support of the Marine Corps. The ACVs will be able to stand off the coast or horizon and launch. Mr. Bonney explained that the Navy is in the process of building two fleet ACU bases at Camp Pendleton California, and at Little Creek, Virginia Beach, Virginia. If these bases were in operation this coming year, none of the LCACs would come to NCSC. Panama City's role in the larger program is to provide training and evaluation and to define signature characteristics of the craft.

Bruce Nolte (NCSC Code 201B) stated that tests and trials are a major part of the LCAC program, as there is a need to evaluate the contractor's products on the delivery of the craft. He emphasized that the LCAC objective is to verify craft performance.

Major Ward asked about the reasons for the use of Tyndall, to which Bruce Nolte replied that Crooked Island was required for the testing and evaluation of crew members, pilots, and craft performance in overland maneuvers. Joe Ward asked why the ramp was not sufficient for these purposes. Clifton Bonney explained that maneuvers in the natural environment are required to test performance characteristics, such as maneuverability over a certain slope of terrain. AALC operations at Tyndall have revealed problems with airborne sand and grass being ingested into the gas turbine engines. There are four primary engines and two APUs on each craft, and a filtration system was developed to handle this problem as well as problems with salt spray. The

[illegible]

craft is required to operate overland, oversea and in the surf zone in 8 feet of plunging surf, and must therefore be tested in these environments. Mr. Bonney concluded that Crooked Island at Tyndall Air Force Base provides the coastline environment required to meet the needs of the LCAC program. Bill Tolbert (PSI) added that any new weapon must be tested in the environment in which it will be used, and that the LCAC must be tested in transit from beach to land.

Major Ward expressed concern over disturbances which may destroy the beach or interfere with turtles and birds. He suggested minimizing the number of transiting runs. Bill Tolbert stated that NCSC had the same concerns. Major Ward pointed out the increase in the number of missions. Horace Loftin stated that the new assessment will address alternatives to the proposed action. He commented that pilots must be trained in overland maneuvers, and a viable alternative would be the construction of an artificial environment for an overland practice area. This would reduce the number of missions in the natural environment.

Major Ward asked how much training, testing, and evaluation would be considered sufficient. Mr. Bonney discussed the constraints of program budgeting and suggested that it is unlikely that available funding will support the desired level of T&E and training. The number of missions will not be proportional to the number of boats, and the craft will probably not be run full time. He concluded that fuel, for example, can cost as much as one-half the budget.

Robert McGill (TAFB) asked how the VOYAGEUR differs from the JEFF(B). Mr. Bonney described the VOYAGEUR as a smaller, lighter displacement craft with a lower horsepower than JEFF(B) and LCAC. It has less wake, carries less fuel, causes less erosion, and can work in shallow water. VOYAGEUR noise levels, however, are comparable to the larger craft.

Robert McGill questioned the timing of missions in terms of the calendar year. Mr. Bonney replied that 80% of the missions will take place in the spring, summer and fall, but particularly in the spring due to good weather conditions.

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Robert McGill then expressed concern over nesting periods. Mr. Bonney stated that the Interservice Support Agreement (ISSA) with Tyndall Air Force Base recognizes this concern, and that alternate areas will be utilized when there is nesting activity. Horace Loftin added that seasonality of scheduling to accommodate wildlife needs will be given every consideration.

Robert McGill made a comment relative to historical sites in the Raffield Peninsula. Horace Loftin commented that historical and archaeological sites are also of interest to the Navy and would be addressed in the new environmental assessment.

Joan Scott (TAFB) suggested that training ACV operators to recognize environmental communities to avoid during maneuvers would relieve environmental stresses. Horace Loftin commented that there have been cases in the past where undesignated areas have been violated, and urged that people and operations should be controlled as carefully as the initial selection of the test sites. Commander Wetherell (ACU-5) promised that all operations would be controlled and disciplinary actions taken for breaches of nondesignated areas. He commented that violations can be avoided by pre-mission briefings. Joan Scott added that on-site training of operators in environmental concerns is desirable.

Jack Taylor asked three questions: (1) Will artificial shores be constructed? (2) Are night operations being planned?, and (3) Will there be disembarking of troops and vehicles? Clifton Bonney replied that the likelihood of embarking vehicles is high, because the LCAC has a performance requirement to deliver wheeled and tracked vehicles to a surface area where they can operate. This operation will be done in an area approved by civil engineers. In the past, the Air Force built an oyster shell inland off-loading area. Clifton Bonney stated that there will be night operations; Commander Wetherell added that night operations will be a low percentage of total missions. Wm. Jay Troxel (U.S. Fish & Wildlife Service) cautioned that special considerations must be taken at night due to trawling in St. Andrews Bay. Horace Loftin emphasized that extraordinary tests (such as the mine explosion tests of the AALC program) will be

[illegible]

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treated as separate programs requiring separate assessments, and that the purpose of this environmental assessment was to address routine LCAC T&E and training missions. Jack Taylor reiterated his earlier question concerning the construction of artificial shores. Clifton Bonney replied that there were no such plans.

Jack Taylor asked about the limiting elevation affecting LCAC transit capabilities. Clifton Bonney stated that the LCAC can transit barriers 5 to 6 feet in height. The craft should be capable of operating where the elevation changes gradually, and can operate over rocks or coral substrates. The objective of the LCAC in amphibious assault is to transport tracked and wheeled vehicles past the sand beach and far enough inland for independent maneuverability.

Major Ward asked what amount of hovering overland will be required. Commander Wetherell indicated that low speed operation tests will involve extended periods of hovering. The disadvantages of the old amphibious assault craft are slow speed, requirement for close proximity to the beach, and assault limitations relative to beach type (tides, water depth, offshore bars, etc.). In contrast, the LCAC has an over-the-horizon capability, can reach high speeds, can move inland as far as 1000 meters to unload vehicles and troops for Marine Corps use, and is not dependent on factors relative to beach type. The Commander continued to explain that the ACV operator must develop the skills to maneuver the hovercraft onto the beach and to a preset inland destination under all types of conditions. Maneuvering around and over obstacles are training requirements which can be met by constructing an artificial course.

Major Ward asked if the LCAC can run over barriers, such as wire and tank traps. Clifton Bonney indicated that the craft flies over such obstacles.

Horace Loftin suggested that, although overland operations were of greatest environmental concern to all parties, there were five impact areas presented by Mr. Bonney (see Table 1 in text). He requested that the representatives present at the meeting discuss the handout. In response, Major Ward suggested that the

environmental assessment address wildlife issues, especially endangered species and marine mammals. Rudy Osbold stated that he had observed manatees and sea turtles in the vicinity of the test area. Bill Tolbert stated that the possibility of manatee occurrence must be addressed. Joan Scott added there are records of manatee sightings at Eglin. Larry Taylor (DER) indicated that there are reports of increased densities of turtle nesting on Crooked Island, negating statements regarding this endangered species made in earlier assessments of the AALC program. Horace Loftin assured the group that the new environmental assessment for the LCAC program would include a statement of consultation with Tyndall authorities regarding nesting activities on Crooked Island and that breeding areas would be avoided.

Harry Allen (TAFB) brought up the potential impacts of noise and erosion effects on the Capehart housing area. Clifton Bonney replied that reducing speed and power levels and adjusting prop angles should address this issue. Thirty to thirty-five knots is the typical ACV transit speed, which creates a wake of 1 to 1-1/2 feet. He emphasized that ACV wakes are comparable to those created by a 16-foot outboard. The typical wake size should not cause significant erosion problems. Horace Loftin stated that areas where noise is a potential problem will be identified in the assessment. Clifton Bonney reemphasized that problems which occurred in the past with excess ACV wakes were minor incidents which occurred due to mistakes or emergencies, and were restricted to the Port Authority and marina near NCSC.

Harry Allen expressed concern over the delicacy of the environment at overland test sites, emphasizing the issues of erosion and impacts on nesting and vegetation. In his opinion, nature cannot replace destroyed vegetation. He suggested that a management plan to restore vegetation would be desirable. Horace Loftin pointed out that operation in an area dedicated to minimal impact was compensated for by the concomitant enhancement of an undedicated area. Clif Bonney asked Harry Allen if his suggestion regarding a management plan involved restoration. Harry Allen responded by asking what the Crooked Island

environment would look like in twenty years. Horace Loftin indicated that, within that time frame, he could envision reparation by natural means, and asked Mr. Allen for his more immediate suggestions. Mr. Allen mentioned that assessment objectives are to minimize environmental costs, and that the choices involved compensation and reparation considerations. Harry Allen reiterated his interest in restoration efforts. Bill Tolbert stated that most overland missions will occur in previously modified areas selected cooperatively with Tyndall Air Force Base authorities. He emphasized the monitoring efforts which have been conducted as a part of the AALC program, and asked if Tyndall representatives had documentation to compare to that generated by NCSC ecologists. Major Ward requested specification of monitored parameters. Bill Tolbert briefly described the monitoring program (relating to vegetation density quadrat studies) which was designed by Means and Platt Associates, contractors outside NCSC. Horace Loftin observed that natural reparation has occurred in areas previously used for AALC maneuvers. He suggested the use of alternative sites to mitigate stress in any one area, which would allow immediate restoration to be done.

Major Ward discussed his concern for potential destabilization of beaches and dunes at Crooked Island. Clif Bonney described a topographic survey made in an area where over 100 ACV transits had been conducted. This study demonstrated no ACV effect on sand elevations, and is described in the updated assessment of the AALC program. The test site of the topographic study, originally a surf zone site, is a narrow neck of land 150 feet across; Hurricane Eloise effected a cut across the site, and transits were made to the northwest. He emphasized the predominant role of weather in sand transport, and the positive results obtained from the topographic study. Harry Allen remarked that there was no control area included in the study. Bill Tolbert stated that setting up a control area is not feasible in such a dynamic environment, and that to say that all changes that have occurred in this area are due to ACV maneuvers

[illegible]

is irresponsible. Horace Loftin stated that use of the environment entails a certain amount of abuse. The topographic surveys have shown no significant impact on the beach or dunes. The beach remained high and sand dunes had grown back together considerably. Horace Loftin concluded that an obvious concern of LCAC operations will be overland maneuvers at Crooked Island.

Larry Taylor (DER) discussed his concern with the frequency of planned operations in marsh areas, which are sensitive to wake-induced erosion. Horace Loftin stated that operation in marsh areas is limited to transits from the Sound to land, an area where marsh zones typically exist. Larry Taylor pointed out that such transit areas should be carefully designated so only small zones of marsh and beach are disturbed. He emphasized the need for pilot training in environmentally sensitive areas. Based on the AALC program, he saw no significant turbidity problem with ACVs, but he mentioned a possible impact on grasses in the ramp area. Horace Loftin stated that no great damage to grasses has occurred in the ramp area given hundreds of transits over the beds. Larry Taylor commented that erosion occurs easily in shallow zones. He suggested that use of alternative sites in an alternating fashion may result in all areas being stressed. Horace Loftin stated that most damage has occurred in dedicated areas; therefore the use of alternative sites is a viable option.

Larry Taylor expressed interest in plans for construction of a designated parking area for the LCAC vehicles. Horace Loftin explained that a parking stand is being enlarged at NCSC. Sites A through G have been designated on Crooked Island for specific tests relative to AALC objectives. New designations and restrictions will be defined for the LCAC program as a function of the Memo of Understanding with Tyndall Air Force Base.

Major Ward asked if the new assessment would consider the larger number of vehicles. Horace Loftin replied that this is a primary consideration of the new assessment.

Jay Troxel addressed the potential for problems created by inexperienced crews, and was assured by Commander Wetherell that any inexperienced crew members would be trained by crews with

experience in the AALC program. Horace Loftin added that the question of crew capability should be addressed in the new LCAC assessment.

Jay Troxel emphasized points made in the course of the meeting concerning turtles, terns, migratory birds, and seasonality of nesting behaviors. He requested that the environmental assessment be simply written, avoiding the use of Navy acronyms.

Robert McGill asked about the use of Site D from East Bay to the Drone runway. Clif Bonney replied that, to his knowledge, this area had only been used once.

Horace Loftin addressed the issue of the socioeconomic impact of the LCAC program on the Panama City area. Commander Wetherell predicted an increase in personnel numbers from 40 to approximately 100, with a maximum increase to 160 people. He pointed out that personnel increases will involve the introduction of few new families to the area, since most individuals will be sent to NCSC for short-term training. Horace Loftin concluded that there will be no significant impact on housing, schools or community services.

Major Ward asked if the LCAC program would phase out in the next two years. Commander Wetherell predicted that the time frame for ACV training will extend over the next four (4) years. Camp Pendleton, scheduled for operation in 1986, may receive delivery of the last three LCAC vehicles (LCAC-4, 5 & 6). After 1986, NCSC will most likely test craft for the planned East Coast ACU base in Little Creek.

Bill Tolbert stated that any additional questions or concerns should be addressed to Horace Loftin within the next month. Horace Loftin then adjourned the meeting.

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Enclosure (2)

APPENDIX F: NOISE

Noise is an unavoidable aspect of ACV operations. It is predicted that new engineering design features of the LCAC production model will reduce noise levels from that of JEFF(B) (see Table 2). No substantial complaints of noise from ACV operations have been registered in the course of the AALC program, and it is not anticipated that noise will be a major environmental concern to the LCAC program.

Noise Propagation

<u>General</u>. Sound propagates through the atmosphere via a series of traveling compressions and rarefactions of ambient atmospheric pressure. When this series of pressure waves affects the response of the ear in an unpleasant or unwanted way, it is known as noise. Predicting levels of objectionable sound is a difficult task at a refined level, and often even on a gross level. The problem involves many facets including types of undesirable sounds, the level (sound pressure level - SPL) and the associated frequency at which sound becomes annoying, the normal background noise, the weather and terrain conditions, and a host of other considerations.

It is most common and convenient to measure the SPL with a logarithmic scale referenced to a pressure of 0.0002 microbar expressing the SPL in decibels (dB). To calculate the SPL, L_x, at a point along the radius extending from the sound source through the point of the reference measurement under calm conditions is given below:

$$L_x = L - 20 \log \frac{x}{r} \qquad (1)$$

L is the measured dB level at a point outside the near field (three pressure wavelength or more from the source), r the distance at which the dB level was measured, and x the distance

from the source for which the dB level is calculated.

Besides the calculation as given, arising from geometric dissipation of the SPL, additional attenuation results from the atmosphere at various frequencies under various humidity and temperature conditions. Generally speaking, the higher the humidity the less is the attenuation from the atmosphere. At each frequency octave band, the attenuation due to the atmosphere is subtracted from the dB level as calculated in equation (1) to give the resultant dB level at each frequency octave band.

Behavioral characteristics of the community in response to noise have been shown to fall into two categories: psychological and sociological variables and physical factors that cause behavioral changes. At present, quantifying psychological and sociological variables is at a primitive stage. Physical noise exposure parameters that affect a community's behavior include: the level of background noise and the amount of previous exposure to the noise source considered. Also important to the evaluation of noise effects on the community is the season of operation, community attitude, and the character or tone of the noise itself. Weight must also be given for the time and duration of operation throughout the day.

The outstanding method to accurately quantify these effects is to determine the Community Noise Equivalent Level (CNEL). This approach is outlined in the EPA publication "Community Noise" NTID 300.3, as prepared by Wyle Laboratories. Details regarding methods of determining CNEL are available in the CEIS for the AALC program in Appendices G-K.

A recent report by Bolt, Beranek and Newman, Inc. entitled "Noise and Operational Characteristics of the U.S. Navy Landing Craft Air Cushion (LCAC)", (BBN Report 4426, Project 08226, Sept. 1980), describes the noise and operational characteristics that can be expected from the LCAC. This information is based on measurements of and experience with the two prototype vehicles JEFF(A) and JEFF(B) and formed the basis for the model for predicting noise levels arising from LCAC operations.

The following far field noise measurement tests were performed:

a. Stationary idle and runup

b. Ramp approach and departure

c. Passby over water at high and low speed

d. Pirouettes (rotation in place) over water

e. Beach crossing at medium and low speed

f. Passby over land at medium speed.

The maximum noise levels that a person might experience standing outside as the LCAC passes by in the Panama City area are shown in Figure F-1. These noise level contours were derived using a typical proposed LCAC mission scenario, as described in BBN Report 4426.

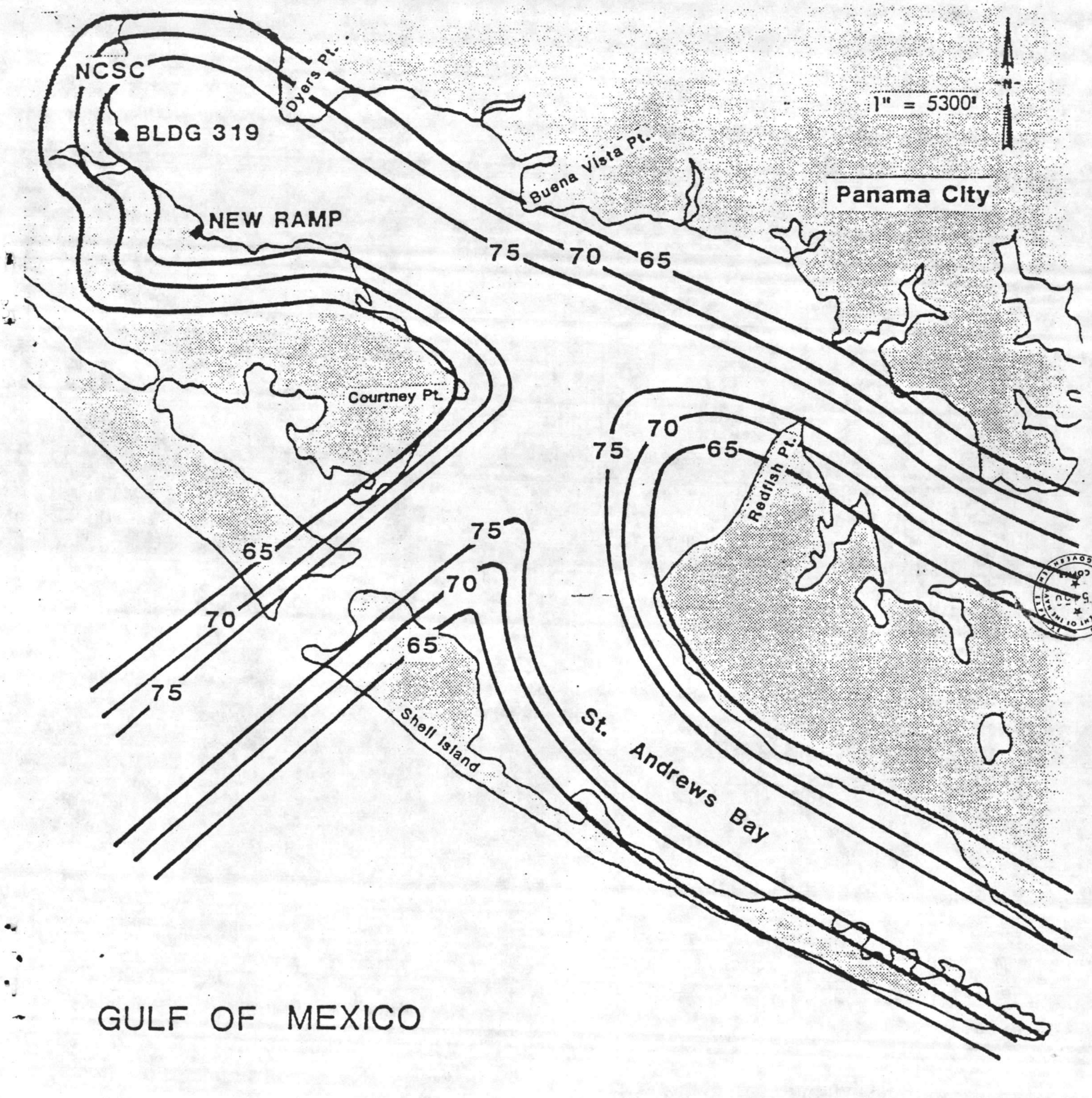

FIGURE F-1. Maximum Noise Level Contours (L_{max}) for Air Cushioned Vehicle Operations at Panama City in 1985.

APPENDIX G: FUELS

In the event of fuel spillage, NCSC and U.S. Coast Guard facilities at Alligator Bayou are readily available and well-equipped to handle clean-up. The potential impact of fuel spills in Gulf waters, restricted waters (such as St. Andrew and East Bays), and wetlands was discussed in the 1976 CEIS for the AALC program. It was concluded that spills would be of a nondisastrous level in these environments. The remote possibility of spills from ACV activities and the low fuel volumes involved minimizes the likelihood of environmental damage. Standard Navy operations procedures for oil spills will be followed in case of accidental spillage.

Following are descriptions of the physical properties of hovercraft fuels as presented in the 1976 CEIS. These characteristics are applicable to fuels which will be employed in the LCAC program.

Physical Properties of Hovercraft Fuels

The two AALC's use MIL-J-5161, MIL-T-5624 (JP4, JP5) and MIL-F-16884 (diesel fuel marine #2) fuels to operate the six turbine engines. MIL-F-16884 is equivalent in properties to commercial Jet A or kerosene fuel, while the MIL-T-5624 is JP 4/JP 5 and has the properties of commercial Jet B. The MIL-J-5161 is related to aviation gas.

It is recognized that the AALC is not likely to have a spill of its total fuel capacity all at once primarily because there are more than one fuel tank and any operation will decrease the fuel level, lessening the severity of any spill.

APPENDIX H: Wakes

Air cusioned vehicles create the largest waves at hump speed, which can be calculated as

$$v^2 = \frac{lg}{\pi}$$

where:

v = velocity (ft./sec.)

g = acceleration due to gravity (32.16 ft./sec.^{2})

l = length of craft (ft.)

Hump speeds for the Jeff craft have been established as approximately 18.5 knots (from the CEIS for the AALC program), which generates a 3.3 foot wave in 20 feet of water. At depths of 25 to 30 feet of water, a one-foot wave is generated at 10 knots, and a 0.7 foot wave at 50 knots. At 10 knots in five feet of water, the ACVs generate a 1.4 foot wave. At 50 knots in five feet of water, a 0.6 foot wave results. These wave heights are comparable to or smaller than waves generated by recreational and commercial boating activities. No substantial change in generated wave heights is expected with the LCAC vehicles (see Table 1). Low speed operations will be observed in critical areas such as ship traffic zones, bridges, channels, marinas, etc., where ACV wakes may create uncomfortable conditions for boaters.