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Honduras

August 1973

Military Geography

NATIONAL INTELLIGENCE SURVEY

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This chapter was prepared for the NIS by the Defense Intelligence Agency. Research was substantially completed by May 1973.

Honduras

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This chapter supersedes the geographic coverage in the General Survey dated August 1969

FIGURES

Military Geography

A. Location (U/OU)

Honduras spans the nearly 200-mile-wide[1] Central American isthmus from the Pacific Ocean to the Caribbean Sea and has an east–west extent of about 420 miles (Figure 20). Within 1,000 nautical miles are Cuba, the gulf coast of the United States, the oilfields of western Venezuela, and the Panama Canal (Figure 1).

The second largest country in Central America, roughly triangular-shaped Honduras has an area of 43,300 square miles, slightly more than that of the state of Tennessee, and a population of about 2,813,000.

B. Topography (U/OU)

Honduras is an area of predominantly rugged interior highlands fringed along the coasts by narrow plains. Nearly four-fifths of the country is forest- or scrub-covered (Figure 2) mountainous terrain traversed by relatively narrow flat-floored steep-sided valleys and interspersed with hills and scattered intermontane basins (Figure 3). The plain along the Caribbean coast is forested except along streams in the west where subsistence and commercial agriculture prevails and in the east where savannas occur. The Pacific coastal plain is predominantly scrub covered (Figure 4) behind the extensive coastal swamps that stretch along the entire distance from El Salvador to Nicaragua. There are some volcanoes, but they are dormant. Both coasts and a large area around Tegucigalpa are subject to frequent but generally mild earthquakes.

The highlands are most rugged in the west, where the highest peaks range from 8,000 to 9,400 feet above sea level. Other mountain peaks are mainly between 5,000 and 8,000 feet and are lowest and least rugged in the east. Belts of hills, which are most extensive in the

[1]Distances are in statute miles unless nautical miles are specified.

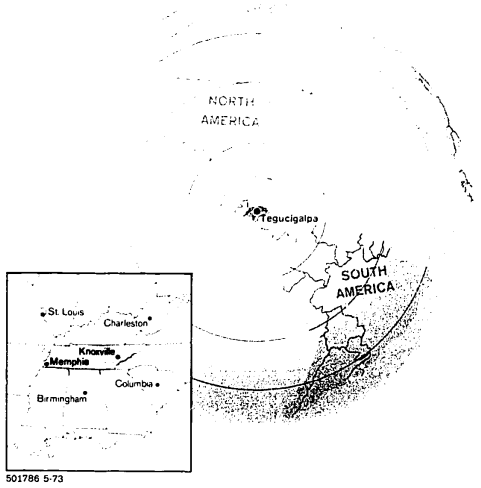


FIGURE 1. Location and comparative area (U/OU)

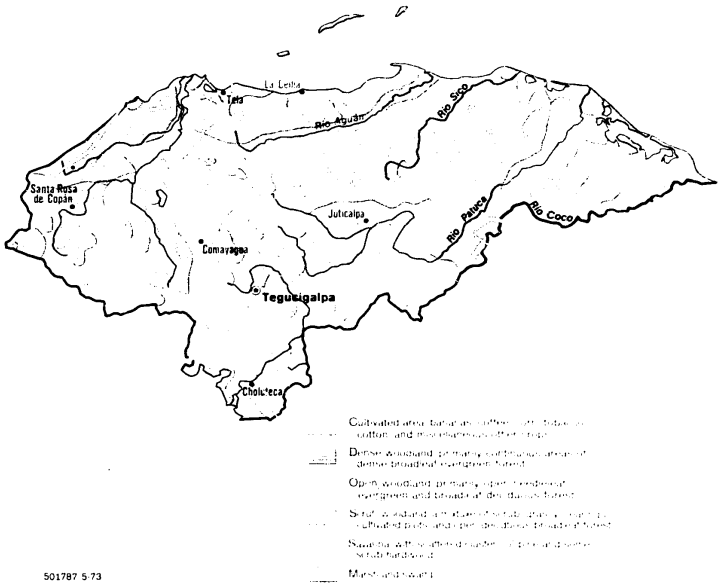


FIGURE 2. Vegetation (U OU)

east, generally border the plains. Slopes of the hills and lower mountains are mostly between 35% and 45%; however, on many higher mountains and some hills, slopes exceed 100%. Local relief (difference in elevation between tops and bottoms of adjacent topographic features) is generally 4,000 to 8,000 feet in the west and 1,500 to 3,000 feet in the east. The few intermontane basins commonly are 3,000 to 4,500 feet above sea level and have gently rolling to hilly surfaces. Numerous streams descend from the highlands through steep, winding valleys and rocky canyons as much as 300 feet deep. Water supplies correspond closely to the rainfall regime and are subject to great seasonal fluctuations. During the wet season, May or June through October streams increase greatly in size and many become torrential. During the remainder of the year, most streams greatly decrease in size, and many become mere trickles in their upper reaches. Most of the mountains and hills are forested. Open forests (Figure 5) of pine and oak are predominant except in the east and north where dense broadleaf evergreen forests cover extensive areas. On many lower slopes, in valleys, and in the south, oak, scrub, and grass are common (Figures 6 and 7). Pasture and cultivated vegetation are common in river valleys, intermontane basins, and on some of the lower slopes of mountains. Most of the population lives in the basins and valleys, chiefly in small towns, villages, and a few large cities in the western and central parts of the highlands. Settlements are small, and many are isolated. The principal transportation facility is the North Road, which connects the important centers of population in the highlands. Elsewhere, there is a sparse transportation network, consisting of tracks, trails, and a few poorly maintained roads.

The flat to gently rolling plains along the Caribbean coast (Figure 8) extend unbroken in a generally east–west alignment along the entire northern coast of Honduras; in places they are nearly separated by coastal ranges. Except for the valleys of the Rio Ulua and Rio Aguan,* the only major inland extension of the plains is in the east, where lowlands extend into the interior as much as 70 miles. Elevations range from sea level to nearly 1,000 feet at the base of the highlands. Local relief ranges from 50 to 150 feet and slopes generally are less than 2%. In the slightly higher parts of the eastern plains, some slopes range between

*For diacritics on place names, see the list of names on the apron of the Military Geographic Factors map, the map itself, and maps in the text.

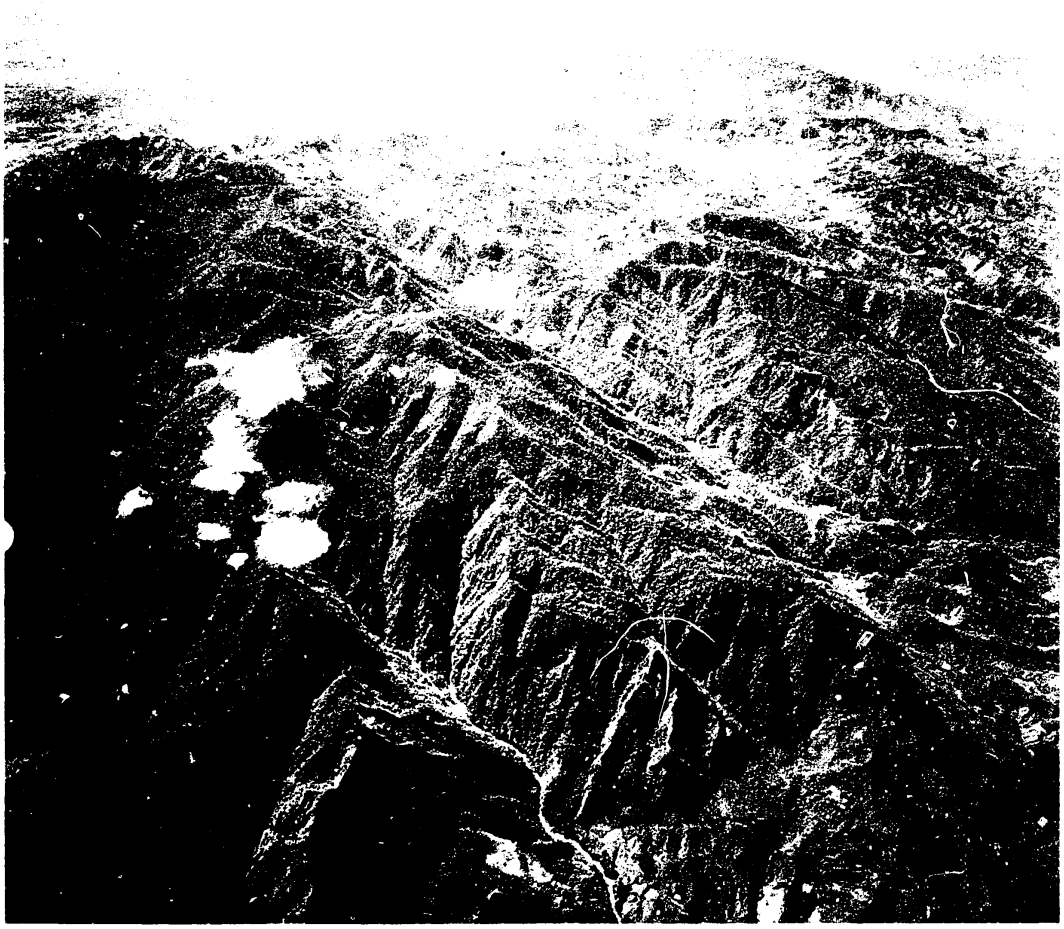


FIGURE 3. The western section of the interior highlands is the most rugged part of the country. It is a diverse area of broken serrated crests, narrow V-shaped valleys, gorges, mountainsides of more than 100% slope, small clusters of dissected hills, and a few intermontane basins. Needleleaf evergreen and broadleaf deciduous forests cover most slopes and scrub woodland the remainder. (C)

FIGURE 4. Dry scrub forest and savanna are extensive in the southern lowlands near the Pacific coast. Here, near San Lorenzo, the low broadleaf deciduous trees are interspersed with areas of shrubs and bunchgrass and grassy clearings. The nearly flat to rolling surfaces of the coastal plain are interrupted by scattered hills along the margin where it merges with the foothills of the interior highlands. (C)

2% and 5%, and there are scattered clusters of hillocks, mostly less than 300 feet high, that have slopes ranging between 10% and 20%. Numerous broad, meandering streams cross the plains (Figure 9). Most major streams are more than 3.5 feet deep all year, and many are over 250 feet wide. During the wet season, June through January, streams increase greatly in size and frequently inundate large areas. Most of the plains are covered by dense broadleaf evergreen forest. In the east, however, the plains are covered by pine savanna dotted with palmettos and low clusters of scrub hardwood. Large marshes fringe much of the coast (Figure 10) and, in places, extend a considerable distance inland along the major streams. Cultivated areas consist mainly of banana plantations (Figure 11) that are concentrated in the valleys of the Rio Ulua, Rio Chamelecon, and Rio Aguan. Most of the population lives in scattered settlements located mainly in the west, particularly in the banana-growing areas. Transportation facilities consist of a section of the North Road and a sparse network of roads serving the agricultural areas. A 3'6"- and a 3'0"-gage railroad connect the banana-growing areas with the ports.

Along the Pacific coast there is a narrow, nearly flat to rolling coastal plain containing isolated hills and volcanic peaks. Most of the plain is barely above sea level and contains marshes and mangrove swamps that extend several miles inland. Tidal inundations cover much of this area. Inland, the plain is gently rolling and merges with the foothills of the highlands. Slopes are generally less than 3% and in most places local relief is 50 to 150 feet; however, local relief in some of the scattered hills and volcanic peaks ranges between about 500 and 2,500 feet and slopes are mainly over 45%, with some exceeding 100%. The streams crossing the plains are relatively small, and some of the smallest are dry for short periods during the year. However, during the wet season, May through October, all streams increase in width and depth and inundate large areas in many places. During this period, all the major streams are over 6 feet deep and range from 250 to over 500 feet wide. Most of the plain is covered by extensive marshes, and dense stands of mangrove border the streams along the coast (Figure 12). The interior is covered mainly by scrub; there are grassy openings, and some deciduous broadleaf forest along the inland streams. Most of the population is located on widely dispersed subsistence farms and in small market towns; coastal areas are generally uninhabited. Transportation facilities consist of a section of the Inter-American Highway and a few poorly maintained roads.

FIGURE 5. Open forests of pine or oak or both are predominant in the central highlands. In this part of the Montanas de Comayagua, pine is dominant, and the trees have straight trunks 50 to 100 feet high and 1 to 4 feet in diameter. Undergrowth is sparse and consists of grass and herbaceous vegetation 1 to 3 feet high. Fire hazard is great, especially from March to May. (C)

FIGURE 6. Many valleys in the interior highlands are covered by broadleaf deciduous forests, scrub, and grass. In this area near Tegucigalpa, trees are mostly deciduous, have open and discontinuous canopies, are 25 to 80 feet high, and have trunks mostly 1 to 3 feet in diameter. The open low scrub consists of shrubs 2 to 10 feet high and bunchgrass. The trees and shrubs lose their leaves in the dry season, November through April. (C)

FIGURE 7. Vegetation in the hills and low mountains in the southern part of the country is predominantly scrub, savanna, and open deciduous forests. In these areas, large timber is scarce or lacking, and forest and grass fires are common in the dry period. (U OU)

FIGURE 8. A low coastal plain sweeps for about 400 miles across the entire northern part of Honduras. The flat to gently rolling surfaces have slopes mostly 2% or less and are less than 500 feet in elevation. Here, in the northeast, surfaces barely exceed sea level. Broadleaf evergreen forest is prevalent. (C)

FIGURE 9. Broad streams snake their way across the almost flat surfaces of the Caribbean lowland. Banks are low and interstream areas barely exceed sea level and consequently parts of the lowland are often inundated, especially during the wet season, June through January. Marshes and swamps, such as shown here, border the lower reaches of many of the streams. In this area near the border with Guatemala, the Rio Motagua, right background, is 250 to 500 feet wide, more than 6 feet deep year round, relatively placid, and silt laden. (C)

FIGURE 10. Mangrove swamps are common along much of the relatively flat Caribbean lowland. The dense growth consists of shrubs and trees 10 to 20 feet high that have slender arching prop roots 4 to 8 feet high. This area near Puerto Castilla is almost impenetrable for man and machines. (C)

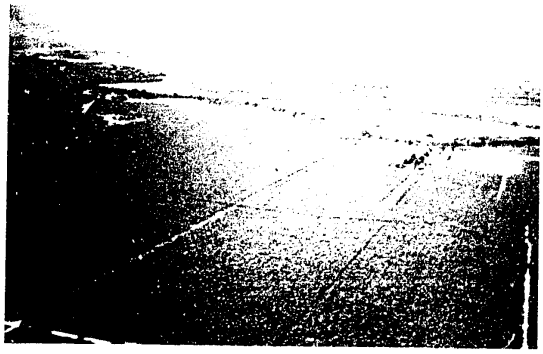


FIGURE 11. Banana plantations cover large areas of the Caribbean lowland, particularly the valleys, where the soil is rich. These plantations are in the Rio Ulua valley southeast of San Pedro Sula. The plants are 10 to 15 feet high and are generally planted in rows 10 to 15 feet apart. Harvest is continuous. An extensive network of drainage ditches forms a grid across the plantation. There is no fire hazard. (C)

FIGURE 12. The Pacific coastal lowland has extensive wet areas bordering the lower reaches of most streams. Here, along the sinuous Rio Negro, are dense mangrove swamps and salt flats; the flats are flooded by tides exceeding 9 feet. (C)

C. Climate (U/OU)

The climate, primarily tropical, is marked by distinct regional differences, notably in temperature and rainfall (Figure 13). The low latitude of the country and the nearby warm ocean waters bring about the tropical nature of the climate, and differences in terrain and differences in exposure to the trade winds of both hemispheres cause most of the regional variations. It is invariably hot all year throughout the coastal lowlands. In contrast, a more temperate climate prevails in the highlands, where afternoons are comfortably warm and nights are comparatively cool. Wet and dry seasons are pronounced in much of the country, but in some sections they are ill-defined and vary in length.

The Caribbean lowlands have an unhealthy climate all year. Temperatures and relative humidities in this section are persistently high, causing sultry conditions that are extremely enervating. Average afternoon maximum temperatures are in the 80's (°F.) and low 90's and afternoon humidities are mostly in the 70's (%). During the early morning, minimum temperatures dip to the 65°F. to 75°F. range but humidities climb to the upper 80's (%) or 90's. Annual rainfall is abundant, averaging over 100 inches at exposed locations and occurs mainly as convective showers. The showers, often heavy, are most frequent in June through January, falling on 10 to 25 days per month. Average monthly amounts vary throughout this period and from place to place; the wettest months usually accumulate 10 to 20 inches or more. Thunderstorm activity is mainly confined to May through October, when thunderstorms occur on 10 to 20 days per month in most months. Minimum rainfall generally occurs in March and April throughout this region. Cloudiness is typical of the trade wind zone, and cumuliform clouds are the predominant type. The periods of greatest and least cloudiness mirror those of rainfall; afternoons are the cloudiest time of day all year. Visibility is generally good in all months, the greatest restrictions to visibility occurring during shower activity. The northeast trades are predominant in this region throughout the year; they often enhance the afternoon sea breezes to produce moderate speeds of 10 to 15 knots. The strongest winds are associated with tropical storms and hurricanes that enter the coast an average of once every 3 or 4 years during June through November; winds and flooding from torrential rains cause great damage.

The interior highlands have a healthier climate than the lowlands. Afternoon temperatures here are pleasantly warmed to the 70°F. to 85°F. range and nighttime temperatures are cooled to the 45°F. to 65°F. range. Infrequently, temperatures may drop to near freezing in the high valleys and plateaus in December through February during outbreaks of cold polar air from the north. Lower relative humidity is most responsible for the more comfortable highlands climate. This is especially apparent in the afternoon when average values are mostly in the 40's (%) and 50's, thereby suppressing the sultry conditions that would result from higher humidity. Annual rainfall varies from about 35 inches in the more sheltered sections to near 70 inches in the exposed locations. The highlands have a long wet period, May through October, and an equally long dry period, November through April. The wet season is distinguished by a July–August lull (called the *veranillo*) in most sections, resulting in a large range of average monthly rainfall for the region, roughly 5 to 20 inches. Showers and thundershowers are frequent; the latter are most prevalent, occurring during thunderstorms on 10 to 20 days in most months of the wet season. Monthly rainfall during the dry season is more regular, with amounts generally less than 3 inches. Large towering cumulus and cumulonimbus cloud masses are abundant during the wet season. In contrast, clear to partly cloudy skies and fair weather cumulus prevail during the dry season. Visibilities are generally good all year except during early morning fog in the valleys, during afternoon showers, and when clouds shroud the mountain slopes. Surface winds are light and quite variable; because of the rugged terrain, mountain–valley breezes are common.

The Pacific lowlands are oppressively hot and humid during part of the year and hot but less humid during the remainder of the year. Mean daily maximum temperatures are in the 90's (°F.) and low 100's all year and the mean daily minimums, in the middle 70's, offer marginal relief. The heat is seemingly intolerable in May through October when high humidities, generated by moist onshore winds, combine with the high temperatures and create extremely enervating conditions. Drier air overlays this region in the remaining months, resulting in lower humidities; this makes the afternoon heat more tolerable. Annual rainfall approaches 80 inches at most places and is distributed in pronounced wet and dry seasons. Monthly rainfall during the wet season, May through October, averages 7 to 20 inches compared to monthly rainfall of less than 2 inches during the dry season, November through April. Showers and thundershowers are frequent, often heavy, and sometimes torrential during the wet months but are infrequent and moderate in intensity during the dry months. Cloudiness has a similar seasonal distribution. Throughout the wet season skies

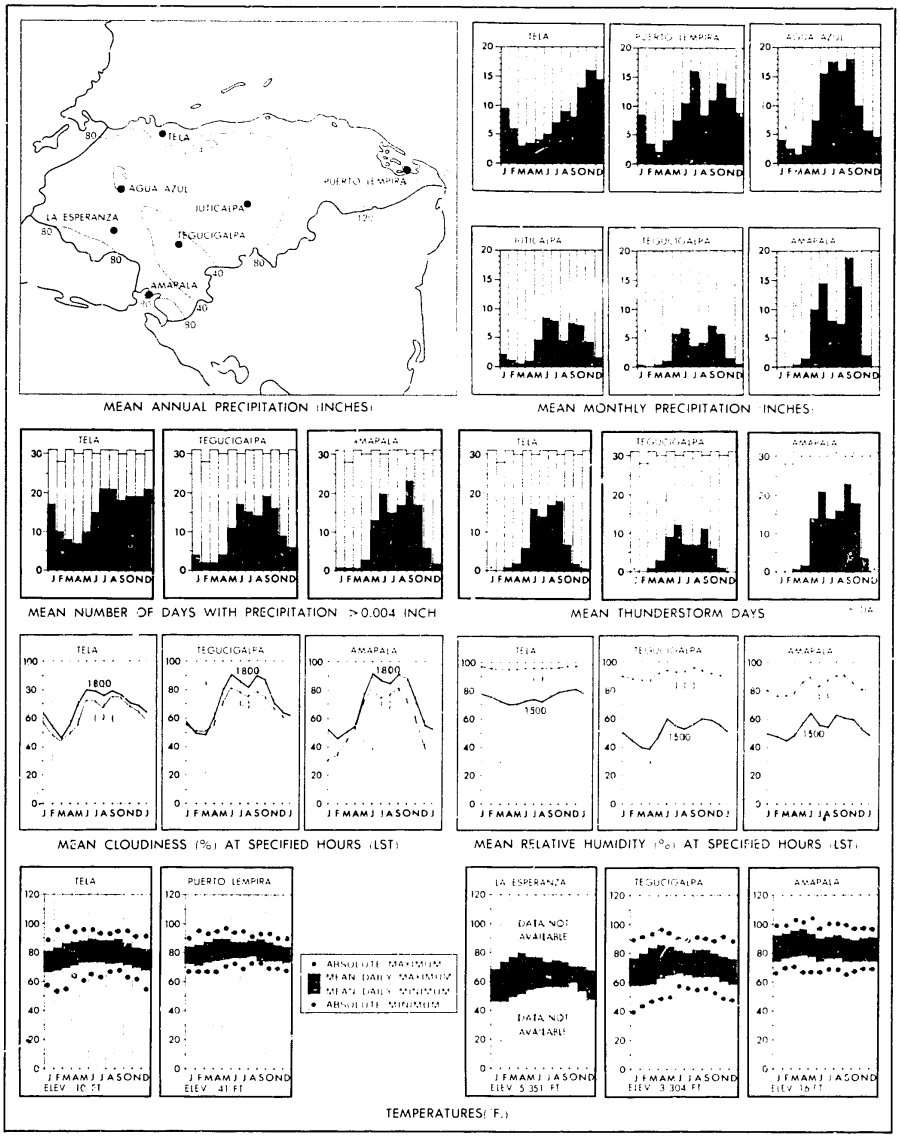


FIGURE 13. Precipitation, thunderstorm days, cloudiness, relative humidity, and temperatures. (U/OU)

are profuse with billowing cumulus clouds, which often build to the cumulonimbus stage and result in 10 to 25 thunderstorms per month. Overcast skies are almost daily occurrences. During the dry season, particularly December through March, sunny skies abound and cloud conditions seldom progress beyond the partly cloudy state. Visibilities are excellent during the dry season and are generally very good in the wet season, except during shower activity and light early morning fogs. Weak trade winds from the South Pacific invade this region in the wet-period months and often reinforce the afternoon sea breezes, the predominant winds all year. Tropical cyclones only rarely affect this coast.

D. Military geographic regions (C)

Differences in terrain afford a basis for dividing the country into three military geographic regions—the Caribbean Lowland, Interior Highland, and Pacific Lowland (Figure 1). The combination of environmental conditions within each region would have a relatively uniform effect on military operations, but there would be marked differences between regions.

1. Caribbean Lowland

This region consists of flat to gently rolling plains covered mostly by dense broadleaf evergreen forests. Only along the western portion of the coast and along some large streams are there extensive agricultural clearings. In the east there are some large savanna areas. The road network is sparse.

These plains are poorly suited for large-scale conventional ground operations. The road network is sparse and generally inadequate for heavy military traffic; ruts, potholes, mud, and washouts during the wet season would greatly hinder or preclude most offroad movement. Offroad dispersal and cross-country movement would be severely hindered or precluded in most of the region by dense forest, numerous streams too deep to ford, wet ground much of the year, and by marsh along the coast. Conditions for cross-country movement are best in the areas of pine savanna in the east during the dry season. Considerable effort would be required to construct roads. In many places, extensive clearing would be necessary, and many culverts, bridges, and stretches of raised roadbed would be required. Marshes and seasonally flooded areas would require large amounts of fill. The dense forests covering most of the region afford good cover from small arms fire, limited cover from flat-trajectory fire, and concealment from air and ground observation. Some additional cover and concealment would be provided by natural levees along the lower courses of streams and by drainage ditches in the cultivated areas. Sites suitable for the construction of bunker-type installations are available only in the higher, better drained plains in the east. There are few sites suitable for the construction of tunnel-type installations because of inadequate relief, a high water table, and poor drainage.

Airmobile and airborne operations would be precluded in most of the region by dense forests; exceptions are cultivated areas along streams, savannas in the east, and along the shore, where there are a few areas suitable for helicopter landings. In addition, flying conditions are poor from May through January because of rain, cloudiness, and frequent thunderstorms. Sites suitable for airdrops and landings of assault-type aircraft are restricted to the few existing airfields, some savanna plains in the east, and the cultivated river valleys. Sites suitable for the construction of airfields are located only in the larger stream valleys and on the interior margins of the eastern plains. In many places, however, runway lengths and orientations would be restricted by marshes, seasonally flooded areas, and by adjacent highlands. Natural foundations are generally fair, and little grading or clearing would be required. Raised subgrades, however, would be required in areas subject to flooding, and extensive drainage facilities would be necessary.

The Caribbean coast is only fairly well suited for large-scale amphibious operations. The central part is poorly suited and the eastern part is almost wholly unsuited largely because of prohibitive exit conditions due to swampy and marshy coastal terrain and a lack of transportation routes. However, the western part of the coast is fairly well suited. Sea approaches to the coast of the region are encumbered by numerous scattered islands, islets, reefs, rocks, shoals, and bars. Most of the coast is fringed by sandy shores, and there are 24 beaches suitable for large-scale landings, mostly along the western part. Exits from the beaches are primarily by cross-country movement short distances to roads. From about one-third of the beaches tracks, streets, or roads lead directly inland.

Many parts of the Caribbean Lowland are well suited for irregular forces. Extensive multilayer broadleaf evergreen forests provide ready avenues for clandestine movement as well as areas for concealed camps and storage caches. The track and trail system around settlements in the more densely populated areas would facilitate movement. However, soft and slippery soils, inundated areas, and flooded streams would hinder passage during the wet season. Scattered farms and shifting agriculture as well as considerable amounts of natural foods could provide sustenance for

irregulars. The extensive forests reach to the shore in many places where numerous small beaches provide opportunities to land small numbers of men and equipment. The isolated nature of much of the coastal plain facilitates escape and sanctuary in Honduras and across the borders into Nicaragua and Guatemala.

2. Interior Highland

Covering four-fifths of the country, this region is characterized by rugged, mostly forested hills and mountains. Some lower slopes and many valleys are under grass or cultivation and, in the dryer regions of the south, scrub and grass are predominant. The road network is sparse though a fair trail net connects most populated places.

This region is the most difficult in which to conduct large-scale conventional ground operations. The road network, with the exception of the bituminous-surfaced sections of the North Road, is inadequate for large-scale movement. Onroad movement would be severely hampered by sharp curves, steep grades, numerous single-lane low-capacity bridges, fords, and narrow stretches of road. In addition, heavy rains during the wet season make many sections of roads impassable because of mud, landslides and washouts, and flood-swollen fords. Offroad dispersal and cross-country movement would be slowed or precluded by the steep slopes of the hills and mountains and by dense vegetation on the forested slopes. Locally, movement would be possible in a few valleys and basins during the dry season. Large areas are unsuited for the construction of roads; extensive grading, blasting, cutting, and filling would be required, and alignments would be severely restricted. In many places, considerable clearing would be necessary and tunnels and many bridges required. The numerous surface irregularities provide abundant cover from flat-trajectory fire, and the dense forests afford excellent concealment from ground and air observation. There are many sites suitable for the construction of tunnel-type installations, but sites for the construction of bunker-type installations are available only locally, mainly in valleys and basins.

The Interior Highland is poorly suited for airmobile and airborne operations because of rugged terrain and dense forests. Helicopter landings would be limited to some ridgetops, valleys, and basins where grass or cultivated vegetation predominates and to existing airfields. Sites for airdrops and landings of assault-type aircraft are even more restricted. Only some valleys, basins, and a few airfields are suitable. Airfields could be constructed in a few of the larger river valleys and on some of the upland plains and basins, but many would have restricted approaches and runway orientations.

The rugged nature of the Interior Highland and the extensive forests make a large portion of the region well suited for irregular warfare. Conditions for clandestine movement are good except on lower slopes of the mountains in the south and in some valleys where grass and light scrub are predominant. Although the road network is sparse, a fair trail and track system connects most populated places. Steep slopes and slippery soils and flooded streams during the wet season would hinder movement. Natural foods are available though not abundant. In the southern and western portions of the region numerous farms and villages in the valleys could provide food and shelter. In some areas, particularly in the south, surface water sources are scarce to nonexistent during the dry season. Escape routes and sanctuary areas in forested, rugged terrain are plentiful, extending across the borders with Guatemala and Nicaragua.

3. Pacific Lowland

This region is a nearly flat to rolling plain having extensive marshes and swamps along the coast; inland, the vegetation is mostly scrub and grass. Except for the Inter-American Highway that extends across the region, there are few roads.

The plains along the Pacific coast are poorly suited for large-scale conventional ground operations. The extensive permanently wet areas along the coast and the large areas subject to stream flooding restrict movement in many places to the few roads. Vehicular movement would be facilitated by the Inter-American Highway; however, the few secondary roads could not support sustained military traffic. Offroad dispersal and cross-country movement would be severely hindered or precluded by the widespread marshes and mangrove swamps and by soft soils and flooded streams during the wet season. On the inland margins of the plains, offroad dispersal and cross-country movement would be feasible during the dry season, but direction of movement would be restricted by streams too deep to ford. Roads having generally unrestricted alignments and requiring little construction effort could be constructed on the inland margins of the region. However, in most of region alignments would be restricted because of the large areas of swamps, marshes, and seasonally flooded land. Many culverts, bridges, raised roadbeds, and large amounts of fill would be required. Some cover from flat-trajectory fire and concealment from ground and air observation would be available in patches of forest along the streams and in the swampy areas but would be limited elsewhere. Only a few sites are available for

the construction of bunker-type installations in the interior margins of the region, and most excavations would require support. Sites suitable for the construction of tunnel-type installations are few.

The Pacific Lowland is generally unfavorable for airmobile and airborne operations, although fair opportunities exist for helicopter landings in pastures, fields, and areas of light vegetation. Soft soils, flooded streams, and large inundated areas would restrict operations seasonally. There are some sites, away from the coast, suitable for airdrops, landings of assault-type aircraft, and airfield construction. However, many sites are subject to seasonal flooding. The construction of airfields would require large amounts of fill, raised subgrades, and extensive drainage facilities. In addition, runway orientations and lengths would be restricted in many places by swamps, marshes, seasonally flooded areas, and by the adjacent highlands.

The coast is wholly unsuited for large-scale amphibious operations because of severely channelized and obstructed sea approaches and prohibitive exit conditions due to mangrove and fresh-water swamp, marsh, and a lack of transportation routes. Sea approaches are restricted to the relatively shallow Golfo de Fonseca that contains numerous islands, islets, shoals, reefs, and extensive tidal flats. The coast is low and mostly fringed by wide, muddy shores backed by swamp and marsh. There are no beaches suitable for large-scale landings.

The Pacific Lowland is not well suited for irregular force operations except for the extensive swamps and marshes along the coast. Most of the region provides little concealment from ground and air observation. Food and other supplies are available from scattered farms and commercial agriculture but natural foods are scarce. Small numbers of men and equipment could be landed at isolated points along the coast; movement would be slowed in the extensive swamps and marshes. Long-range escape routes and sanctuary areas are virtually nonexistent due to the limited possibilities for concealment and lack of inhabited areas.

E. Strategic areas (C)

There are two strategic areas, San Pedro Sula and Tegucigalpa (Figure 20). They are the leading administrative, military, commercial, land and air transport, and telecommunication hubs in the country, have 90% of all industrial plants, and, according to the 1970 census, over 40% of the nation's urban residents and 13% of the total population. The strategic areas contain the only two cities of more than 100,000 inhabitants in the country. Of lesser significance is Puerto Cortes, the largest port in the country.

1. San Pedro Sula

This strategic area, comprising the city and its suburbs (Figure 14), is Honduras' industrial capital, most important distribution point for imports and exports shipped by land between the interior and Puerto Cortes, and principal military aircraft dispersal site. San Pedro Sula also is a departmental capital, has a population estimated in 1972 at 116,000, and is a regional commercial, telecommunication, and transport center. The strategic area is connected by rail as well as by a good highway to the nation's main port and the country's best airport, La Mesa International

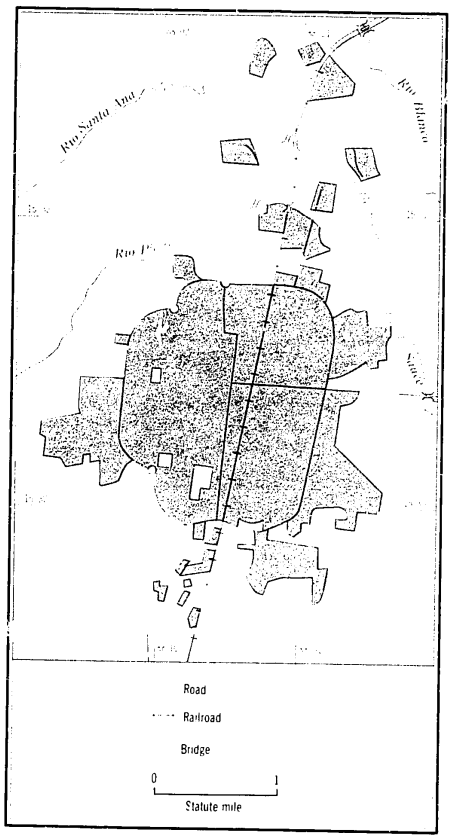


FIGURE 14. San Pedro Sula Strategic Area (S)

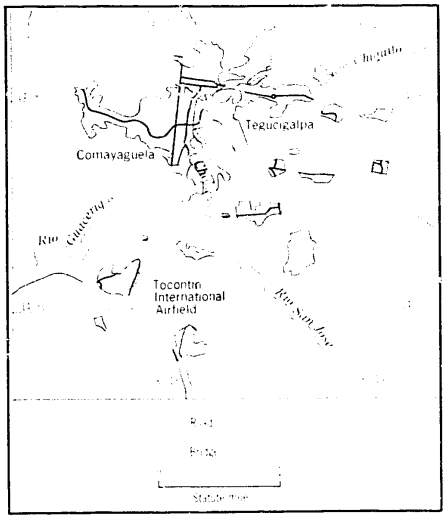


FIGURE 15. Tegucigalpa Strategic Area (S)

Airfield, is 7 miles southeast. This is the only airfield in the country capable of accommodating the largest commercial jets; it is also used by the Honduran Air Force as a dispersal base for their combat aircraft. Another major military installation, at the northern outskirts of San Pedro Sula, contains billeting facilities and an underground ammunition storage depot for the headquarters units of the II Army Zone and the 3d Infantry Battalion. At least 3,400 barrels of petroleum products are stored throughout the strategic area. The diversified manufacturing establishments in the area account for 75% of all plants in the country, many of which may be characterized as medium-heavy industry. Significant industrial plants include one of the largest plastics manufacturers in Latin America (annual polyethylene capacity: 3,900 tons), a steel-rolling and wire-drawing mill, an antimony ore-extraction plant, the world's largest manufacturer of frozen banana puree, and the largest producers in Central America of shirts and underwear. Other plants produce natural and synthetic textiles, cement and other construction materials, pharmaceuticals, rubber, beer and foods, and other consumer goods.

2. Tegucigalpa

This strategic area, comprising Tegucigalpa and the adjacent city of Comayaguela and their surrounding suburbs (Figures 15 and 16), is significant chiefly because it contains the national capital. It is the principal political, administrative, economic, military, and telecommunication center in the country. The Tegucigalpa–Comayaguela urban area is the largest population center in Honduras and had an estimated 256,000 inhabitants in 1972. It also is a regional road and air transport hub and industrial center. A road in good condition connects it to the Inter-American Highway crossing the southern part of the country near the Pacific coast, and another road in good condition leads northward to Puerto Cortes; lesser roads converge on it from the east. Tocontin International Airfield provides domestic and international service. Manufacturing establishments in the area, representing about 15% of the national total, are primarily in the light industry category; their production is chiefly for local consumption. The more important include a distillery and a brewery, wearing apparel manufacturers, sawmills, cement products plants, and food processors. Petroleum products storage facilities in the strategic area total about 7,600

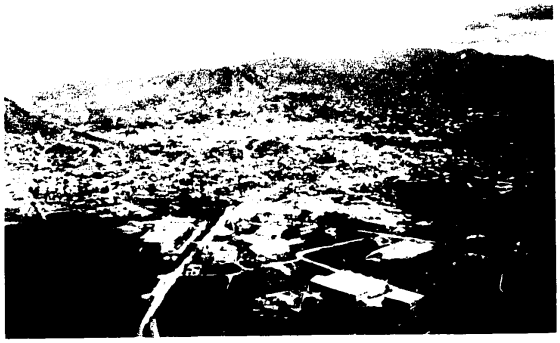


FIGURE 16. The twin-city complex of Tegucigalpa–Comayaguela is in the valley of the Rio Choluteca in the south-central interior highlands. The continued growth of the cities has pushed the built-up areas up the sides of the mountains enclosing the valley. (C)

barrels. The most significant military installations are: the Ministry of Defense, with facilities for the Chiefs of Staff, and the Officers Advanced School (*Escuela de Aplicaciones Militares*), where junior army officers up to the rank of captain are trained, at the northwest and northeast edges of Tegucigalpa, respectively; the General Francisco Morazan Military Academy, where elementary school graduates are trained to become army and air force officers, in central Comayagueia; 1st Infantry Brigade installations, south of Comayagueia; and, adjacent to the airfield, all the Honduran Air Force's principal installations, including their Military Aviation School. The foremost legislative and educational institutions in the country also are in the strategic area: the Presidential Palace and the National Autonomous University of Honduras; the latter has an enrollment of about 3,000.

3. Other significant area

Puerto Cortes, the fourth largest town in Honduras, had a population estimated at 24,549 in 1972 and is the country's largest port, handling 66% of the national maritime traffic in 1970. It also is the site of Honduras' only petroleum refinery, which has a daily crude throughput capacity of 14,000 barrels. Petroleum storage facilities in the area total 911,000 barrels, including tankage for 360,000 barrels of crude oil and 325,000 barrels of products at the refinery. Puerto Cortes also is an important land transport center; it is the northern terminal of the Honduras National Railway line, with associated railroad repair facilities and classification yard, as well as the terminal of the main highway southward to the national capital.

F. Internal routes (C)

The internal routes provide the easiest avenues of movement between land and sea approaches and the strategic areas and between the strategic areas (Figure 20). Information on these routes is given in Figure 17.

G. Approaches

The perimeter of Honduras, 1,460 miles, consists of 950 miles of land boundaries and 510 miles of coastline. Honduras claims territorial waters extending 12 nautical miles offshore. Data on boundaries is presented in Figure 18. (U/OU)

1. Land (C)

There are few suitable land approaches to Honduras. Most of the land boundaries are across rugged, forested mountains and hills or wet or forested plains, and cross-country movement would be difficult. Except for a few trails, the only transportation lines leading to the Honduras borders are those of the Inter-American Highway from El Salvador and Nicaragua. The best approach is from El Salvador.

The approach from San Miguel, El Salvador, extends southeastward mainly across rolling to dissected and cultivated plains and rugged, brush-covered hills. It contains a two-lane road that has a bituminous-treated surface in fair to good condition and, for part of the approach, a 3'0"-gage single-track railroad. The railroad does not reach the border, terminating at the port of La Union but the road bends northeastward to enter Honduras. An alternate, more direct road extends northeast from San Miguel through mostly brush-covered hills and joins the Inter-American Highway 4 miles from the border. This road is two lanes wide and bituminous surfaced. In the approach, offroad dispersal would be feasible, but cross-country movement would be limited by steep slopes, rugged terrain, and, from May through October, by wet soils.

The approach from San Salvador, El Salvador, crosses rugged brush-covered mountains and hills. It contains a road that is 20 to 23 feet wide and has a bituminous surface and 4-foot shoulders. In the north, there are a few short sections where the road has a gravel surface. Offroad dispersal and cross-country movement of vehicles would be precluded by the dissected terrain.

The approach from Esteli, Nicaragua, is mainly across steep hills and mountains and severely dissected plains; there are small areas of cultivated fields intermingled with patches of forest and grassland. This approach contains a road that is two lanes wide, has a bituminous-treated surface, and is in fair condition; the road is a section of the Inter-American Highway. For the most part, offroad dispersal and cross-country movement would be difficult because of the rugged terrain.

2. Sea (C)

Offshore approaches to the Caribbean coast are encumbered by a chain of reef-fringed islands, which roughly parallels the central part of the coast, and by numerous reefs, shoals, and several islets and islands. The nearshore approaches are partly obstructed by scattered reefs, rocks, and shoals. In addition, shifting bars closely front many stretches of coast. Average

FIGURE 17. Internal routes (C)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
El Salvador border in west to San Pedro Sula strategic area. From border to southwest of Sula across rugged, mostly forested hills and mountains; remainder mostly broad, cultivated valley of Rio Chamelecon.	Two lanes, bituminous surfaced; in good condition. Alignment fairly good, considering the rugged terrain.	None	Precluded in mountains because of steep slopes. Restricted in valley by river too deep to ford and by perennially wet areas; unsuited when soils are soft for occasional periods of a few days to a week throughout year.
El Salvador border in east to Tegucigalpa strategic area. Western one-third across gently rolling, mostly scrub-covered plains. Remainder across rugged, scrub-covered hills and forested mountains.	Two lanes, bituminous-treated surface, in good condition. Steep grades and sharp curves in places in hills and mountains.	None	In plains possible only during dry season when soils firm; in hills and mountains precluded except locally.
Nicaragua border to near Nacaome where it joins route from El Salvador. Eastern half across rugged, scrub- or forest-covered mountains and scrub-covered hills. Western segment across gently rolling mostly scrub-covered plains.	Two lanes, bituminous-treated surface, in good condition. Some steep grades and sharp curves in hills and mountains.	None	Feasible in plains during dry season; precluded, except locally, in hills and mountains.
Amphibious landing area near Puerto Cortes to San Pedro Sula strategic area. Mostly across wet, cultivated or forested plains.	Two lanes, bituminous-treated surface, in poor to fair condition.	Single track, 3'6" gage, in good condition; parallels road.	Restricted or precluded in plains by soft soils and dense vegetation.
Amphibious landing area near Tela to San Pedro Sula strategic area. Across flat to rolling cultivated plains except for short segment that is across forested hills.	Two lanes, bituminous-treated surface, in good condition.	Single track, 3'6" gage, in good condition; connects with San Pedro Sula via La Fragua and Baracoa.	Generally infeasible, except locally, because of soft soils. In areas of cultivation, hindered by numerous drainage ditches and streams and soft soils for much of year. In hilly area hindered by dense forest and steep slopes.
Between San Pedro Sula and Tegucigalpa strategic areas. Across wet, cultivated, or forested plains to vicinity of El Jaral; remainder across forest-covered hills and mountains except in Comayagua-Villa de San Antonio area where in broad scrub-covered valley.	Two lanes, bituminous-treated surface, in mostly good condition but some stretches at each end in poor condition.	Single track, 3'6" gage, parallels road as far as Potrerillos.	Precluded, except locally, in hills and mountains by steep slopes, dense vegetation, and soft soils. Conditions fair in valley except from May through October, when unsuited because of soft soils.

FIGURE 18. Boundaries (U/OU)

BOUNDARY	LENGTH	STATUS	TERRAIN
	Miles		
Nicaragua	570	Demarcated and undisputed	Mostly across forested or scrub-covered coastal plains, hills, and rugged mountains. In west, mainly along river courses and ridge crests. In east, mainly along Rio Coco.
El Salvador	220	In dispute, undefined except for a section in the east along the Rio Goascoran.	Mostly across forested mountains. However, near Pacific coast along Rio Goascoran across predominantly scrub-covered coastal plain.
Guatemala	160	Demarcated and undisputed	Mostly across rugged forested mountains. A short portion near Caribbean coast aligned along Rio Motagua.

nearshore bottom slopes range from 1 on 36 to 1 on 262. Surf 4 feet or higher ranges from infrequent in all seasons on several beaches to a maximum of approximately 40% of the time on exposed beaches during October through March. Tides are diurnal with a maximum range of about 1 ½ feet.

Offshore approaches to the Pacific coast are clear but are restricted to the Golfo de Fonseca and severely channelized within the gulf by islets, islands, shoals, rocks, and reefs. The nearshore approaches are partly obstructed by islands, shoals, reefs, and mudflats. Tides in the gulf are semidiurnal, and the spring range is from 8 to 10 feet. Surf 4 feet or higher seldom occurs. The coast is low, swampy, muddy, and largely fringed by mangrove.

The 24 beaches on the Caribbean coast are mostly located in groups scattered along the western two-thirds. About two-thirds of the beaches are over 1 mile long and the longest is 15 miles. Beach materials are predominantly sand and average widths range from 10 to 90 yards at low water and from 5 to 55 yards at high water. Average low-water to high-water gradients range from 1 on 19 to 1 on 132, and in the high-water zone gradients are estimated to range from 1 on 10 to 1 on 20. The beaches are backed by partly cultivated plains and areas of swamp and forest. Mostly forested hills and mountains back the plains. Exits from the beaches are generally cross-country for short distances to roads, tracks, and trails.

There are no beaches suitable for large-scale amphibious operations on the Pacific coast; however, there is one extremely poor landing place at Cedeno on the eastern shore of the Golfo de Fonseca and one landing place on Isla del Tigre within the gulf.

The two amphibious landing areas shown on Figure 20 provide the best access to internal routes leading to the strategic area. Data on the landing areas are presented in Figure 19.

3. Air (U/OU)

Air approaches[3] to Honduras from the northwest are over Mexico, Guatemala, El Salvador, and British Honduras; from the north and east over the Caribbean Sea; from the southeast over Nicaragua and Costa Rica; and from the southwest over the Pacific Ocean. Topographic hazards in the air approaches consist of high mountains in Guatemala, El Salvador, and Nicaragua. Elevations range up to 13,800 feet in Guatemala, 9,200 feet in El Salvador, and 6,900 feet in Nicaragua. Weather conditions in all approaches are generally favorable for flying throughout the year. However, conditions are generally best in December through March, when cloudiness (20% to 55%) is at a minimum, thunderstorms are infrequent, and the risk of severe turbulence or aircraft icing is remote. Weather is generally least favorable in May through October, when cloudiness (50% to 90%) is at a maximum, thunderstorms are most numerous, and the risk of turbulence or aircraft icing is greatest. During the latter period, thunderstorms are most frequent (5 to 15 per month) over land areas, especially along exposed ridges and slopes. They are most likely to occur during the afternoon over land and at night over water.

Tropical cyclones may affect the approaches over the two water bodies. However, they are rare in the Pacific approach and average only one or two per year in the Caribbean approach, usually in June through October. These storms generally are accompanied by widespread cloudiness, heavy showers, turbulence, and strong winds.

In all approaches upper winds below about 20,000 feet are predominantly easterly; above this level to at least 55,000 feet, winds are mostly westerly in December through May, easterly in June through August, and variable in September through November. Mean speeds are less than 50 knots at all levels throughout the year.

[3]The discussion zone for air approaches extends approximately 300 nautical miles beyond the borders of Honduras.

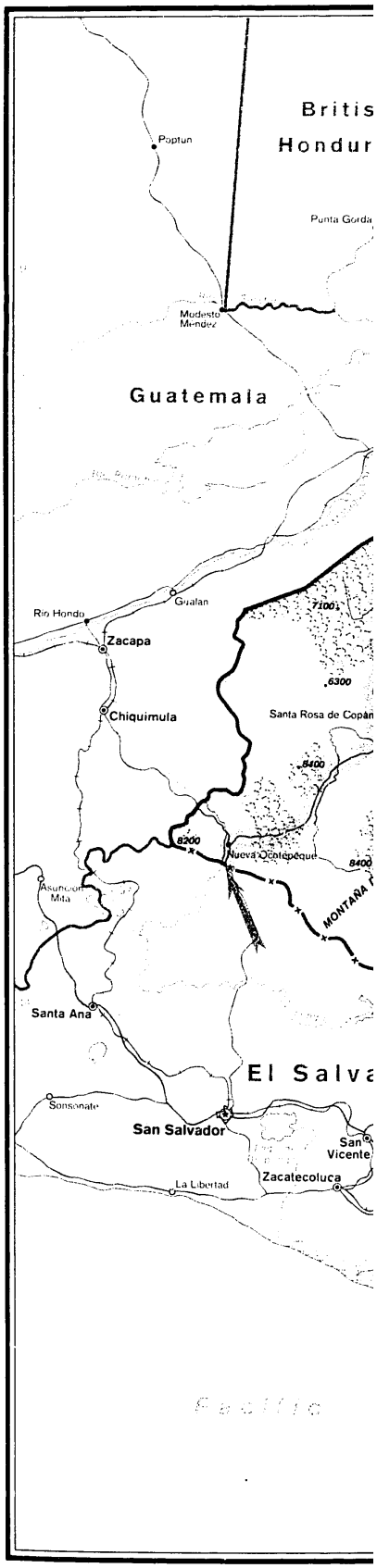
FIGURE 19. Amphibious landing areas (C)

LOCATION	APPROACH	BEACH	TERRAIN BEHIND BEACH AND EXITS
SW. of Puerto Cortes...	Seaward of 5-fathom depth contour partly obstructed by widely spaced shoals; shoreward of 5-fathom depth contour partly obstructed by scattered shoals and by bars near L.W. line; piers at N.E. end and near center. Nearshore bottom sand and mud with some coral and shell; average gradient 1 on 229 but in a few places suitable for dry-ramp LST landings; surf 4 ft. or higher negligible in all seasons; tidal range 0.6 ft., diurnal.	$2^1/_2$ mi. long, nearly all usable; 5 to 15 yd. wide at L.W. and 2 to 6 yd. at H.W.; average L.W. to H.W. gradient 1 on 31. H.W. zone unknown but probably 1 on 15 or steeper; material sand.	Flat plain covered by grass and open forest extends inland to partly forested, low hills; villages near beach in center part and at N.E. end; exits by cross-country movement as far as 100 yd. inland to loose-surfaced coastal road leading to hard-surfaced road; narrow-gage railroad leads inland from Puerto Cortes.
Tela.....	Seaward of 5-fathom depth contour clear except for shoal; shoreward of 5-fathom depth contour partly obstructed by bars close off L.W. line; pier at Tela. Nearshore bottom sand and mud; average gradient 1 on 60; in places usable for dry-ramp LST landings; surf 4 ft. or higher on W. beach expected up to approximately 30% of time Oct. Dec.; on E. beach infrequent in all seasons; tidal range 1 ft., diurnal.	$5^1/_2$ mi. long, $3^3/_4$ mi. usable; includes 2 beaches; W. beach $4^1/_2$ mi. long, nearly all usable; 35 to 65 yd. wide at L.W. and 8 to 28 yd. at H.W., average L.W. to H.W. gradient 1 on 104, H.W. zone unknown but probably 1 on 15 or steeper; material sand. E. beach 930 yd. long, all usable; 20 to 55 yd. wide at L.W. and 10 to 30 yd. at H.W.; average L.W. to H.W. zone gradient 1 on 63, H.W. zone unknown but probably 1 on 15 or steeper.	Forested, partly grassy plain; W. half of W. beach immediately backed by Tela; exits via streets of Tela, trails, or cross-country movement to loose-surfaced road; narrow-gage railroads with transloading platform clear Tela.

(1)

Places and features referred to in this chapter (u.ou)

	COORDINATES	
	° ′N.	° ′W.
Baracoa	15 43	87 52
Cedeño	13 08	87 25
Comayagua	14 25	87 37
Comayagüela	14 05	87 13
El Jaral	14 54	88 03
El Progreso	15 21	87 49
Esteli, Nicaragua	13 05	86 23
Golfo de Fonseca (*gulf*)	13 10	87 40
Isla del Tigre (*isl*)	13 16	87 38
La Fragua	15 38	87 49
La Unión, El Salvador	13 20	87 51
Montañas de Comayagua (*mts*)	14 23	87 26
Nacaome	13 31	87 30
Potrerillos	15 11	87 58
Puerto Castilla	16 01	86 01
Puerto Cortés	15 48	87 56
Rio Aguán (*strm*)	15 57	85 44
Río Chamelecón (*strm*)	15 51	87 49
Río Choluteca (*strm*)	13 07	87 19
Río Coco (*strm*)	15 00	83 10
Río Goascorán (*strm*)	13 25	87 48
Río Motagua, Guatemala (*strm*)	15 44	88 14
Río Negro (*strm*)	13 02	87 17
Río Ulúa (*strm*)	15 53	87 44
San Lorenzo	13 25	87 27
San Miguel, El Salvador	13 29	88 11
San Pedro Sula	15 27	88 02
San Salvador, El Salvador	13 42	89 12
Sula	15 15	88 33
Tegucigalpa	14 06	87 13
Tela	15 44	87 27
Villa de San Antonio	14 16	87 36



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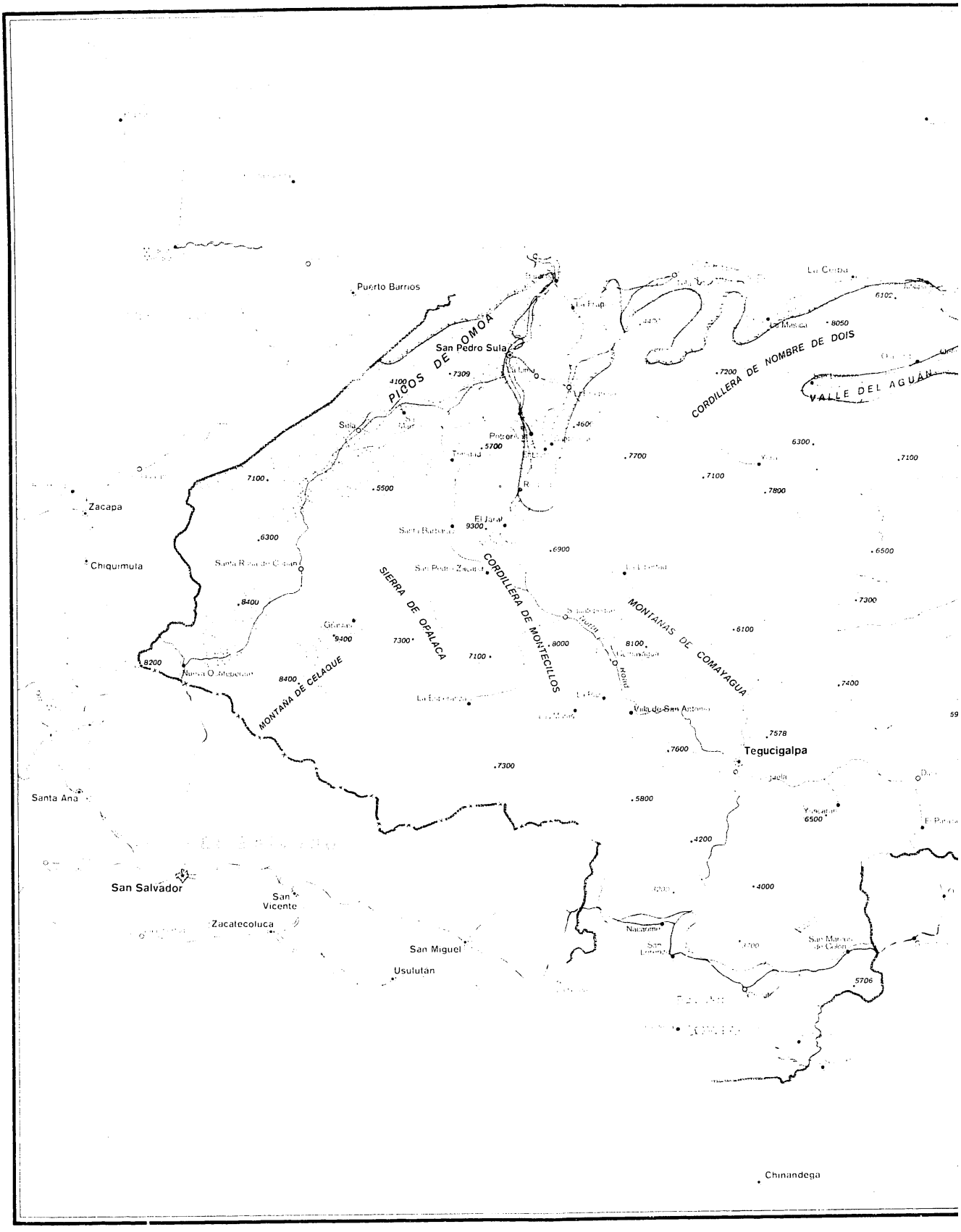

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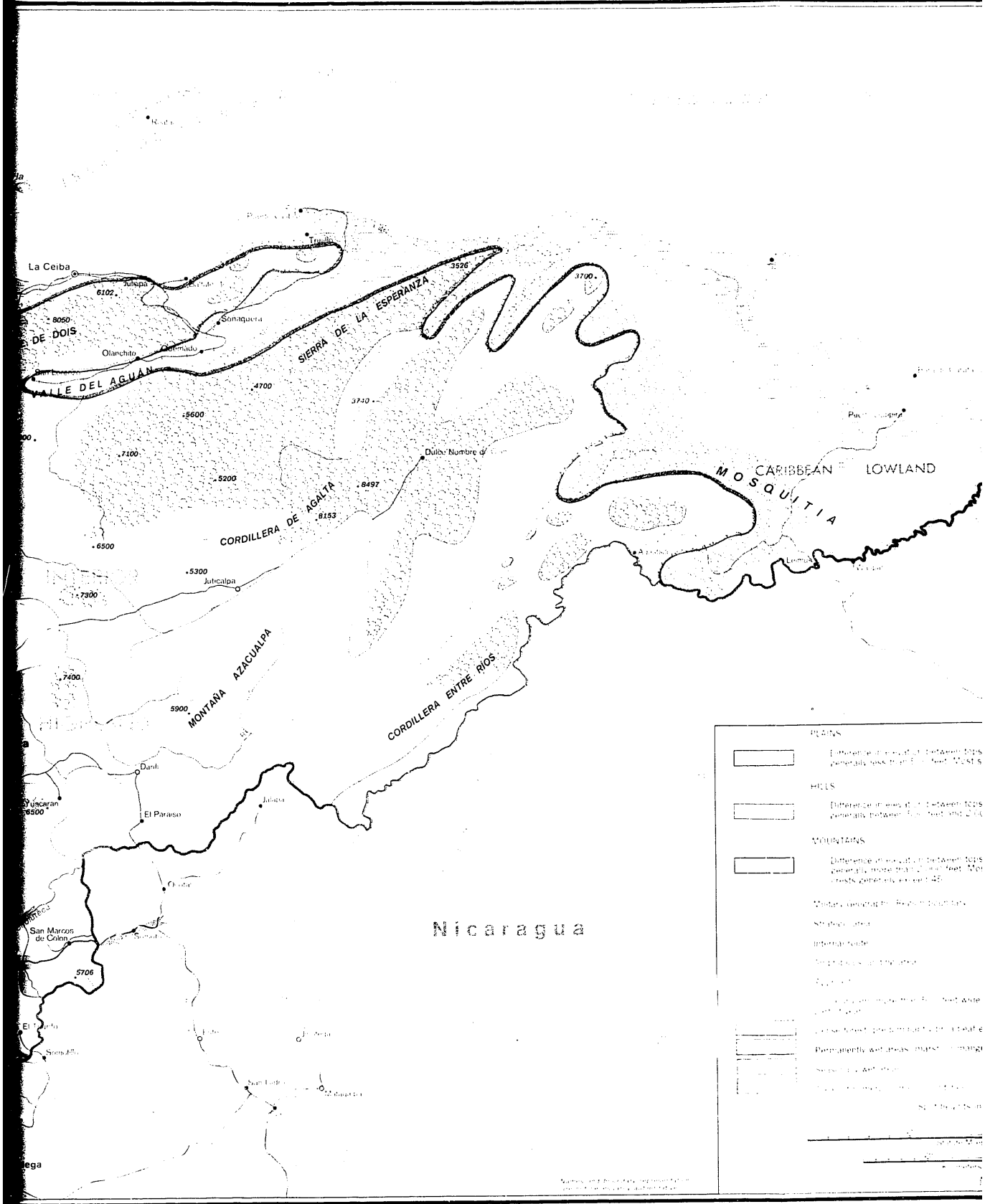

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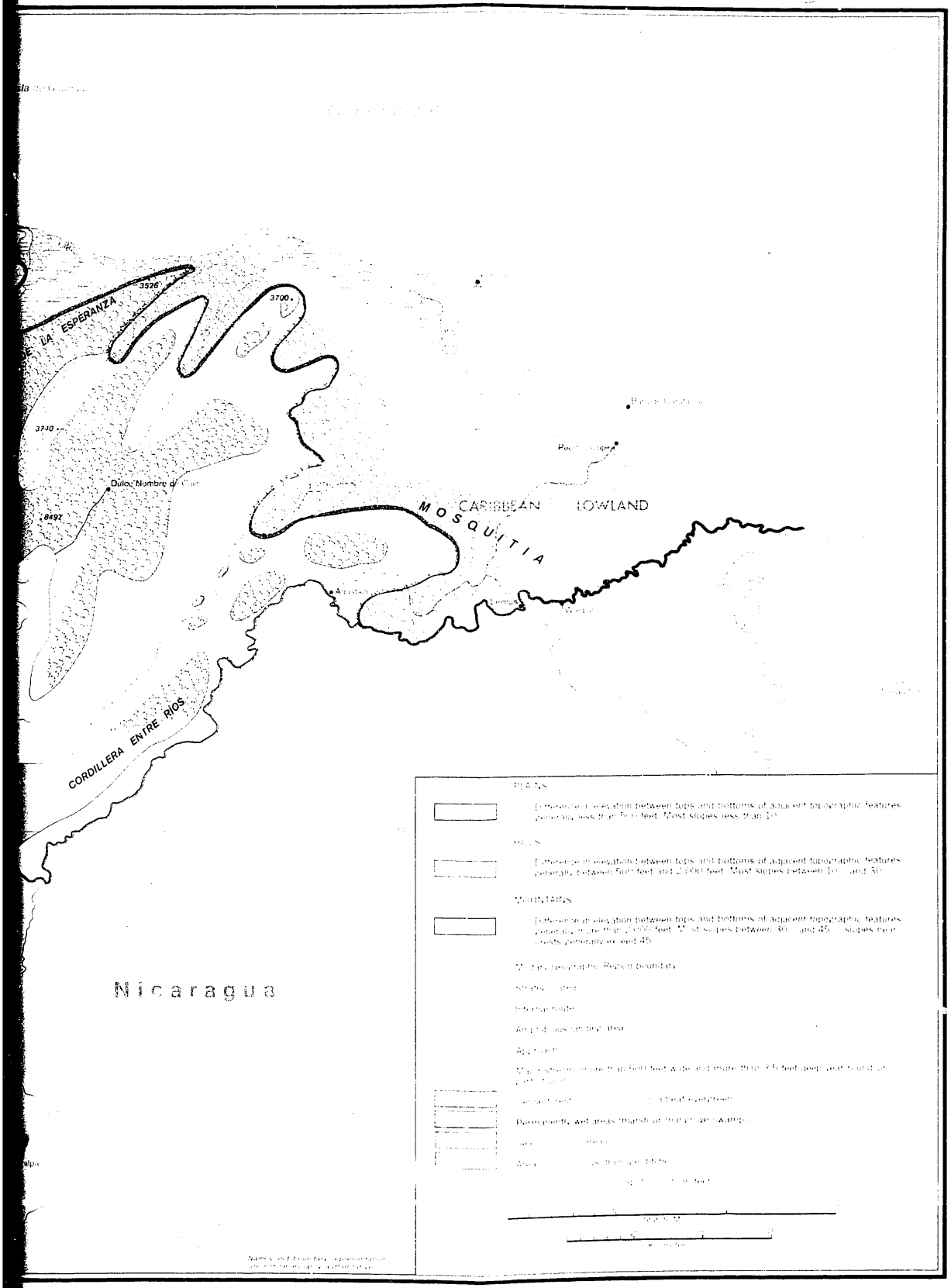

Military geographic factors Figure 20