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Mozambique

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Military Geography

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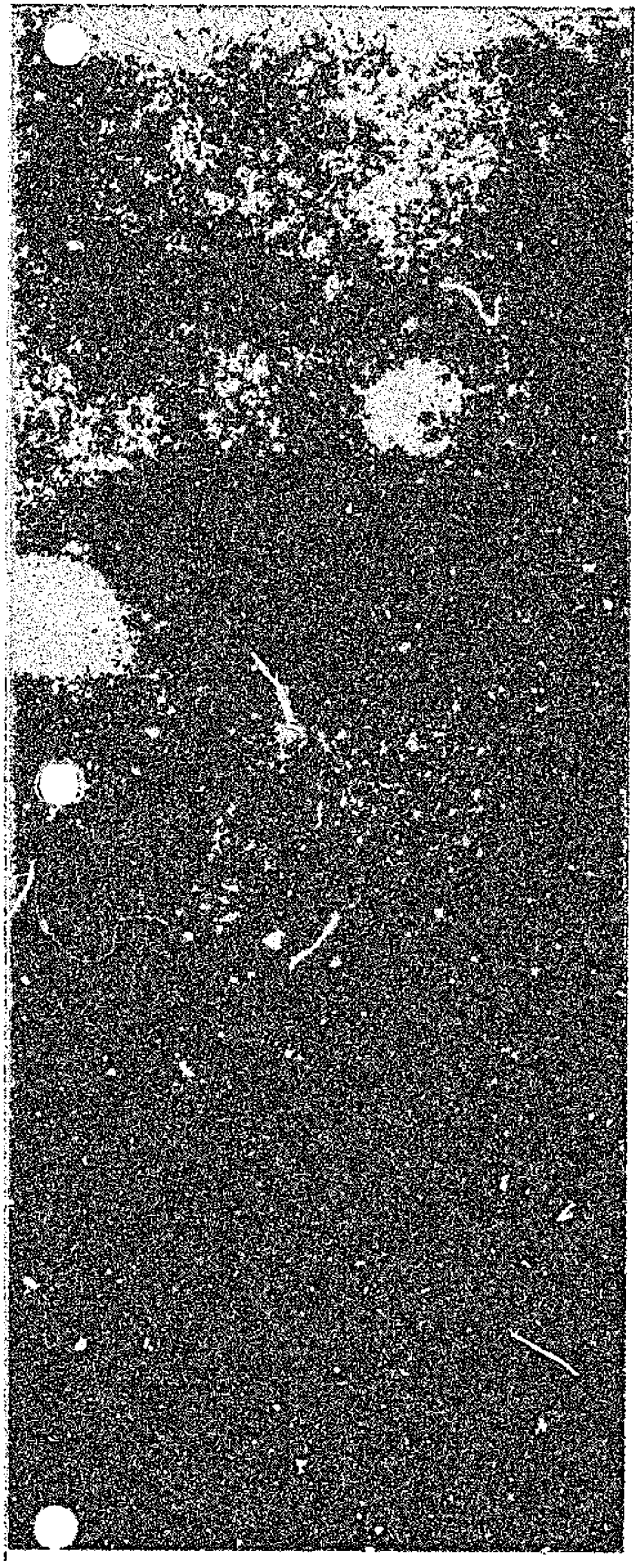

MOZAMBIQUE

CONTENTS

This General Survey chapter supersedes the military geographic coverage in the General Survey dated August 1967.

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FIGURES

Military Geography

A. Location and description (U/OU)

Mozambique lies along the coast of southeastern Africa. Its long irregular shores face Madagascar across the 215- to 535-nautical-mile-wide Mozambique Channel. On its landward side, Mozambique borders on six countries, two of which are also white-dominated territories, South Africa and Rhodesia, and one of which almost bisects Mozambique, the black African state of Malawi. Mozambique has an area of 303,769 square miles and a population of 8,598,000 as of June 1973. The country is about 1,240 miles[1] long and ranges in width from about 400 miles in the north to approximately 30 miles in the south. Superimposed on the eastern United States, Mozambique would extend from the Canadian border to northern Florida, and from western Indiana to the Atlantic Ocean.

1. Topography

The terrain of Mozambique consists principally of flat to rolling plains, which rise gradually inland from the coast and culminate in rugged ranges of hills and scattered mountains in the north and west (Figure 24, the Military Geographic Factors map at the end of the chapter). Most of the country is forested, although there are large savanna areas, mainly in the south and northwest, and widely scattered cultivated areas, chiefly near the major settlements along the coast (Figure 1). Several large streams flow across the country from the west and discharge into the Mozambique Channel.

The plains are flat to rolling (Figure 2); however, north of the Zambezi, isolated rocky hills (Figure 3) and several small mountainous areas break the surface. Most of the plains are less than 1,500 feet above sea level, and extensive areas, particularly in the south, are less than 650 feet. Local relief is generally less than 200 feet; along the western margins of the plains it is between 200 and 500 feet. Most slopes are less than 10%, and extensive areas are less than 2%. Isolated hill slopes are between 10% and 30%, and slopes in the mountainous areas are more than 30%, commonly exceeding 45%.

Several broad, deep perennial streams flow eastward across the plains in wide, shallow valleys. The streams are meandering and marshy in their lower courses, and mangrove swamps are common at their mouths (Figure 4). The larger streams and their major tributaries are more than 500 feet wide in most of their courses and are commonly more than 3.5 feet deep at high water and less than 3.5 feet at low water. The lower courses of the major streams are more than 3.5 feet deep throughout the year (Figure 5). The Zambezi, the largest stream in the country, is 1 to 3 miles wide and 6 to 9 feet deep all year (Figure 6). Streambanks are low but steep and locally marshy; stream bottoms are commonly sandy or gravelly. Extensive flooding often occurs during the high water period (early November through March or April). During this period, many small shallow lakes are formed. During the low water period (generally early April or early May through October), these lakes dry up, smaller streams become dry, and even the large streams are greatly reduced in size.

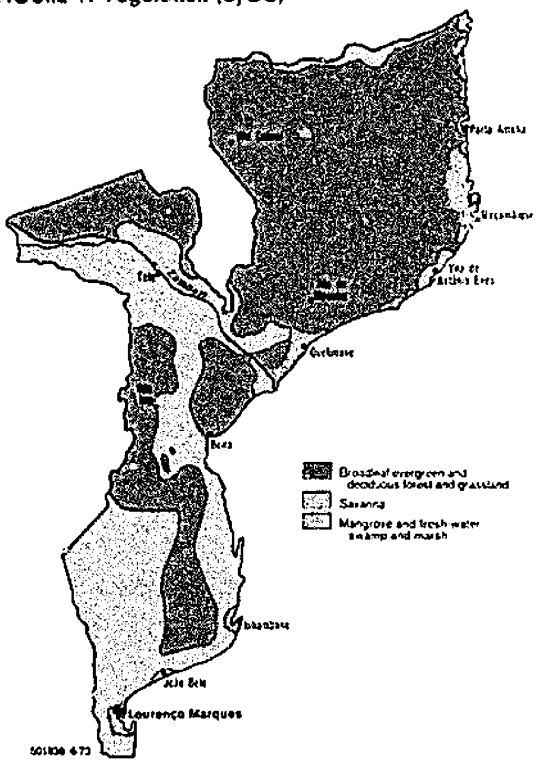
Vegetation in the plains consists of open broadleaf evergreen and deciduous forests which contain numerous grassy or cultivated clearings. Dense mangrove swamps are scattered along the coast (Figure 25). Savanna of dense grass up to 5 feet tall and scattered trees or patches of forest covers over half of the area south of the Rio Save; a large area along the northern coast between Lumbo and Porto Amelia[2] is covered by savanna that consists of sparse grass 1 to 3 feet tall and scattered thorn trees. Cultivated areas, mainly plantations of sisal (Figure 7), coconut (Figure 8), cotton, and citrus fruits, are widely scattered throughout the plains but are located primarily near the coast.

The ground is chiefly firm and dry or moist most of the year, although it may be wet and soft a few times a month for a day or less after rains, usually between

[1] Distances are in statute miles unless nautical miles are specifically stated.

[2] For diacritics on place names see the list of names on the apron of the Military Geographic Factors map and the map itself.

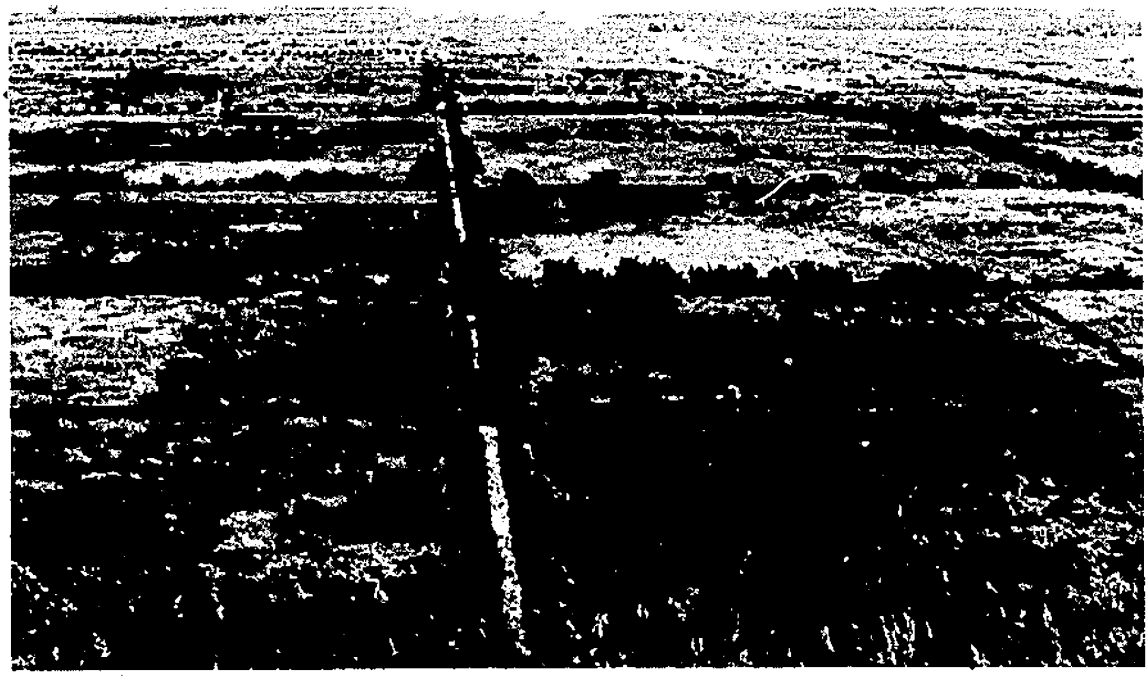
FIGURE 1. Vegetation (U/OU)



mid-November and mid-April. In some river valleys and in marshes and swamps, the ground is wet and soft much or all of the year.

The coastal areas contain most of the major towns, the best road and railroad facilities, extensive plantations, and many small rural settlements. Elsewhere, there are only a few significant towns, scattered native villages, isolated plantations, and a few small mining communities. The major cities and towns generally have a rectangular street pattern; the main streets are mostly wide, bituminous surfaced, and tree lined. Commercial and administrative buildings in the cities are constructed of masonry and concrete and are generally 2 or 3 stories high but may be as much as 10 or 12 stories in Lourenco Marques (Figure 17) and Beira. In the European residential areas, houses are generally of concrete, timber, or galvanized metal, have tile or tar-covered sheet metal

FIGURE 2. Extensive flat to rolling plains cover most of eastern Mozambique. In the south, as in the area shown here north of Joao Belo, elevations generally are less than 650 feet, and slopes mostly are less than 2%. The plains are marshy in places and have been reclaimed for cultivation. The network of drainage ditches that crisscrosses the almost featureless surface is the only dissection for many miles. (U/OU)



roofs, and are 1 or 2 stories high. Houses in the better built African communities are of stucco-covered concrete blocks, but many African residential areas are slums, consisting of flimsy corrugated metal and wooden shacks with scrap sheet metal roofs or of thatched-roofed mud huts. Streets in the slum areas are narrow and mostly unsurfaced. The cities and towns are connected by a sparse network of roads. The railroad network consists of several separate, unconnected systems. The railroads, which extend inland from the coastal cities and towns, are mostly 3'6" gage, single track, and in generally good condition.

The highlands of Mozambique consist mostly of rugged hills interspersed with areas of rolling to moderately dissected upland plains and small but rugged mountain ranges (Figure 9). The hills and mountains are severely dissected by deep, steep-sided narrow valleys or gorges (Figure 10). Summits range from rounded domes to sharp pinnacles. Near Lake Nyasa and along parts of the Malawi border there are several high, steep, discontinuous, north–south trending escarpments. Elevations in the highlands are mostly between 650 and 3,280 feet; however, several mountain peaks are over 5,000 feet, and the highest point in the country is almost 8,000 feet. Local relief in the upland plains is mostly between 250 and 500 feet; in the hills, 500 to 2,000 feet; and in the mountains, from 2,000 to 5,000 feet. Slopes in the plains are mostly less than 10%, generally 10% to 30% in the hills, and 30% to 45% in the mountains.

The highlands are drained by several large, widely spaced, perennial streams and numerous short, intermittent streams. The major streams are over 500 feet wide and over 3.5 feet deep during the high water period (early November through March or April), and the Rio Lugenda and the Zambezi are over 3.5 feet deep throughout the year. During the high water period, the major streams have extremely high velocities and often flood valleys in the lower plains. During the low water period (early April or early May through October), most small streams are dry, and large streams are generally reduced in size. The

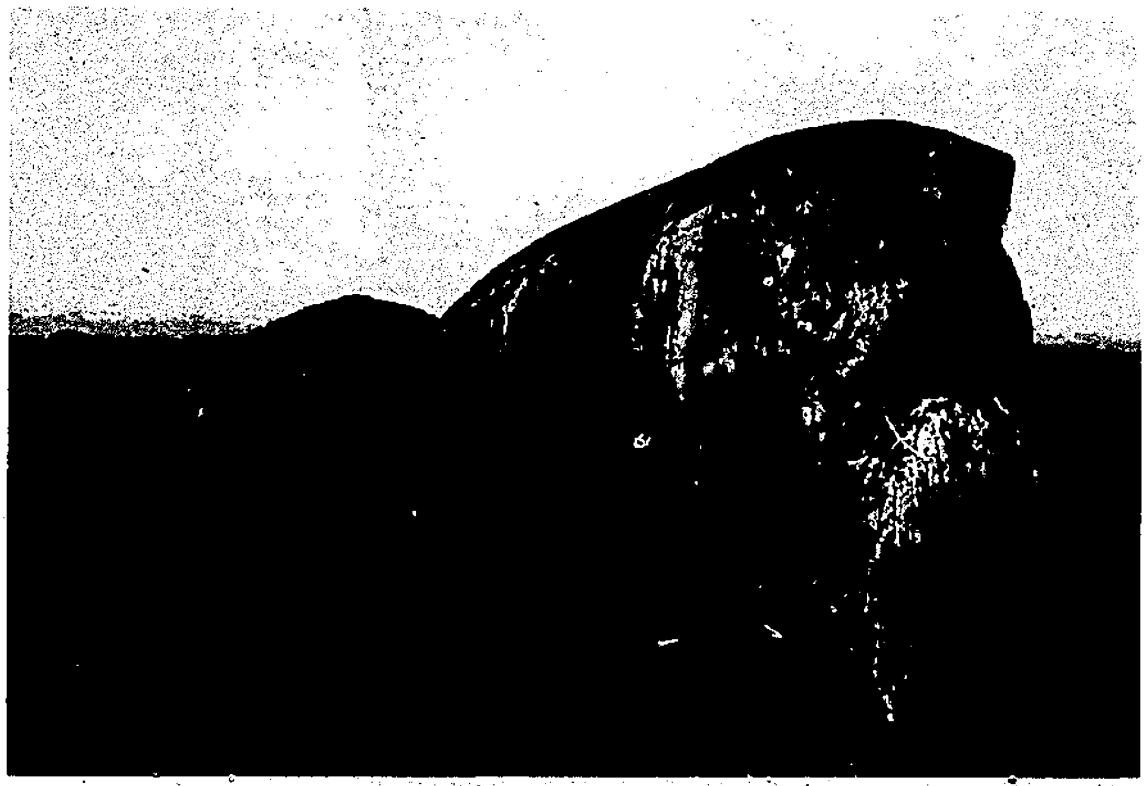


FIGURE 3. Granitic knobs with domed summits and barren, rocky, striated sides rise abruptly from the rolling surfaces of the northern plains, generally up to 1,300 feet above adjacent surfaces. However, they may be readily bypassed. (C)

streams have numerous falls and rapids, mostly rocky bottoms, and high, steep banks; in many places they flow through deep, narrow gorges and valleys with walls up to 1,000 feet high (Figure 11).

Most of the highlands are covered by open to dense broadleaf evergreen and deciduous forests (Figure 12). Dense broadleaf evergreen forests with a thick undergrowth of shrubs and vines cover many valleys and fringe the larger streams. Scattered thickets of bamboo, large grassy areas (Figure 13), and cultivated areas are scattered throughout the open forests. Savanna, with dense grass 3 to 5 feet high, covers a large area of mostly rolling plains and hills along the upper Zambezi (Figure 1).

FIGURE 4. Broad, winding, sluggish streams cross the wet coastal plains of central Mozambique. In this area near Beira, watercourses are numerous and provide routes to the interior through the extensive marshes and swamps that spread inland many miles along the streams. (U/OU)

FIGURE 5. The major streams crossing the plains are broad and deep and present formidable barriers to north–south movement. This stretch of the Rio Incomati near its mouth is more than 500 feet wide and too deep to ford throughout the year. Banks are low but steep and are fringed by marshes. (U/OU)

FIGURE 6. The Zambezi, the longest stream in the country, ranges from 1 to 3 miles wide in this stretch at the western edge of the plains where the stream emerges from its tortuous course through the highlands. The stream is more than 6 feet deep year round and a major obstacle to crossings. (U/OU)

The ground is generally dry except from mid-November to mid-April, when it is chiefly moist. In the lower plains and valleys, it is chiefly wet from mid-December to mid-May. The ground is generally firm when dry or moist and soft when wet.

Throughout most of the highlands there are only a few significant towns, mainly near the western border of Mozambique; these have characteristics similar to the towns in the coastal plains. The settlement pattern consists mostly of scattered native villages, isolated plantations, and small mining communities. The transportation network is sparse.

2. Climate

Mozambique has a tropical climate, with a pronounced wet season, December through March, and a long dry season, generally May through October (Figure 14). April and November are transition periods

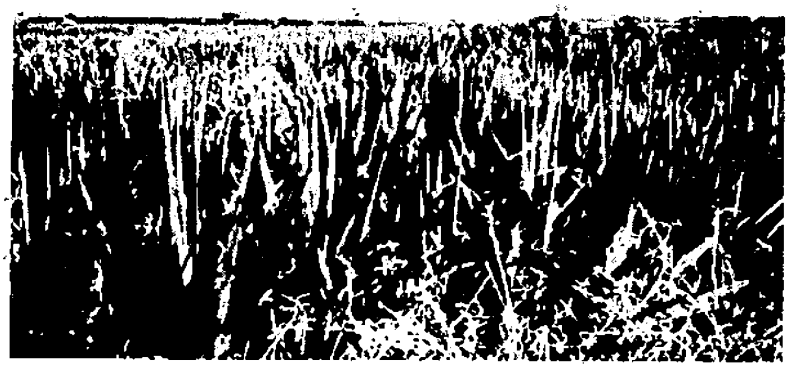


FIGURE 7. Sisal is one of the major crops on the coastal plain, particularly in the northeast. Plants have spiny-pointed swordlike leaves 3 to 5 feet high and are grown in rows about 5 feet apart. (U/OU)

FIGURE 8. Coconut plantations are scattered along the coast, but the largest are near Quelimane. The trees, which provide some timber, are 20 to 80 feet high, have trunks about 1 foot in diameter, and are spaced up to 25 feet apart. The undergrowth is low grass or is lacking. (U/OU)

FIGURE 9. These rugged highlands west of Vila Pery contain some of the highest elevations in the country. Numerous long, rounded, roughly parallel ridges separated by deep ravines and V-shaped valleys extend in waves from the almost vertical, rocky sides of the mountains. Grass covers the ridges and dense broadleaf evergreen forest the ravines and valleys. (C)

between the wet and dry seasons. Besides the country's tropical location, the climatic controls include the nearby oceanic waters, the intertropical convergence zone, and the varied terrain.

The wet season is oppressively hot and humid almost everywhere. On the coast, afternoon temperatures are slightly moderated by the sea breezes, so that mean daily maximums are held mostly to the 85°F. to 90°F. range. The hottest afternoon temperatures occur in the low-lying valleys of the interior. Here, most daily maximums are in the 90°F. to 105°F. range, and temperatures occasionally exceed 110°F. at many places. The only relief is at the higher elevations, where afternoon temperatures rise only to the 70's (°F.). At night mean daily minimum temperatures decrease to the 60's in the interior but only to the 70's on the coast. Mean relative humidity is high throughout this season in all sections of the country and, in combination with the high temperatures, creates almost stifling conditions during the day and continued sultry conditions at night. Most of the annual rainfall is received during the wet season and the transition months, when the intertropical convergence zone (ITCZ) is over or near Mozambique. The varying intensity of the ITCZ, however, results in wide fluctuations of annual rainfall amounts across the country, from less than 20 inches in some western parts to greater than 60 inches in several mountainous sections. Wet-season rainfall is frequent and mostly in the form of showers; monthly amounts average mainly between 5 and 10 inches. The heaviest showers occur during thunderstorms, which normally number 5 to 15 per month throughout this period. Cloudiness also is at a maximum at this time, ranging between 50% and 80% in most months. Overcast skies are frequent and completely clear skies are rare. Diurnal variations of cloudiness are small in the interior but are more noticeable on the coast, where there is a tendency toward clearing in the evenings. The clouds are predominantly cumulus types; some develop into

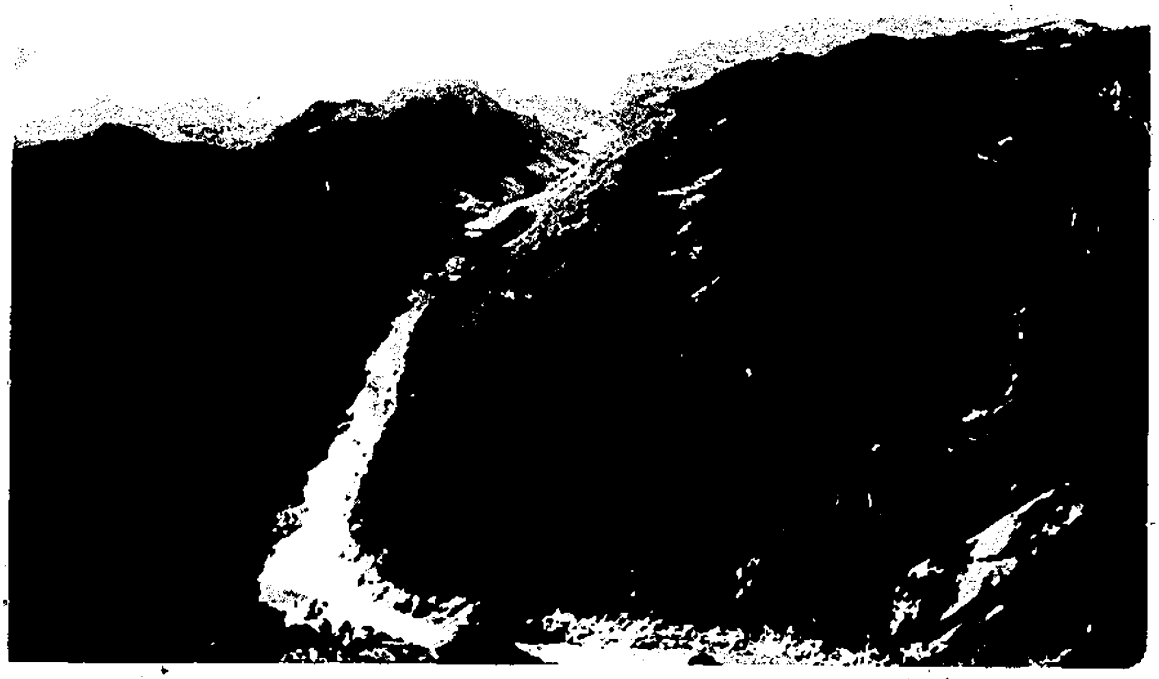


FIGURE 10. Deep, narrow valleys and ravines carve the highlands into numerous discontinuous random ridges. Here, east of Chicoa, the Zambezi cuts through the mountains in a restricted winding course. In this stretch, the river is 60 to 250 feet wide and more than 3½ feet deep throughout the year. (C)

large masses and extend vertically to 30,000 feet or higher. Visibility is generally good except for an occasional light fog or haze at night or in the early morning, especially in the interior. The greatest restrictions to visibility occur during the brief but heavy showers. The surface winds are strongly regulated by local influences, mainly because of the weakness of the trade winds. Either calm or light, variable winds predominate in the interior, while land and sea breezes are well defined on the coast; only the sea breeze reaches moderate speeds. Strong gusts or occasional squalls usually accompany the thunderstorms. The strongest winds, however, are associated with tropical cyclones which enter the Mozambique Channel on an average of two per year, mainly in December through March. Widespread damage from violent winds, some in excess of 75 knots, and severe flooding from torrential rains are most likely in the coastal lowlands.

The dry season is somewhat cooler and dryer in the interior, but on much of the coast throughout this period the afternoons continue to be warm and humid. Mean daily maximum temperatures at the lower elevations are in the 70°F. to 90°F. range with mean daily minimums in the 50°F. to 70°F. range. The coolest temperatures occur in the mountains, where nighttime frosts occasionally occur at the highest elevations. Mean relative humidity is lowest in the interior, where afternoon readings are in the 20% to 55% range throughout most of the dry season. Because of high humidities, the coast has sultry weather the year around. Rainfall is light and comparatively infrequent in most months of the dry season. Thunderstorms are rare. Cloudiness, reaching annual minimums, ranges normally between 20% and 60%. Clear skies are frequent almost everywhere but are especially prevalent in the evenings on the coast. Visibility is poorest in this season but is seldom reduced below 2 miles. The principal restrictions are a thick haze (known locally as *cacimbo*), smoke from brush fires, and early morning fog. Local effects continue to govern the surface wind regime. Land and sea breezes prevail on the coast, and calms or light, variable winds are prominent in the interior. Strong winds are infrequent everywhere.

FIGURE 11. River gorges are common in the highlands; here, the Zambezi flows as much as 1,000 feet below the upland summits. Banks are rocky and steep, and the stream is wide and deep. (C)

FIGURE 12. Dense broadleaf evergreen forest covers large areas of the hills and mountains. In this area near the Rhodesia border, trees are about 40 to 70 feet high, have trunks 1 to 2 feet in diameter, and are closely spaced. They provide moderate-size construction timber. Clearings are primarily covered by grass. (C)

FIGURE 13. Open broad'eaf forest, chiefly evergreen, with a commonly thin canopy, covers a large part of the nighlands. This view is near Vila Paiva de Andrada, and there is a dense undergrowth of grass and other herbaceous plants as well as scattered shrubs and low palms. During the dry period, generally May through October, the grass and other herbaceous plants are susceptible to fire. (C)

B. Military geographic regions (C)

Differences in terrain are the basis for dividing Mozambique into four military geographic regions (Figure 24). The Northern Plains and Southern Plains Regions consist mainly of well-drained flat to rolling plains; the Western Highlands Region comprises a complex of rugged hills and mountains and rolling to dissected upland plains; and the Central Wet Plains Region is a wet coastal lowlands formed mainly by the deltas of the Zambezi and other major streams of central Mozambique. The combination of environmental conditions within each region would have a relatively uniform effect on military operations, but there would be marked differences between adjacent regions. The Northern Plains and Southern Plains are similar and are discussed together.

1. Northern Plains and Southern Plains

Conditions for large-scale conventional ground operations are favorable during most of the year in these areas. Vehicular cross-country movement would be only moderately restricted on the extensive flat to rolling, chiefly dry plains covered by open forest or savanna vegetation. Movement would be hindered locally by streams, scattered marshes and wet areas, and patches of dense forest. Seasonal restrictions to movement are flooding along major streams during the high water period and soft ground for short periods after heavy rains. Onroad movement would be fairly easy seasonally, although most roads are narrow, and there are many low-capacity wooden bridges, fords, and ferry crossings. Most roads are lightly surfaced with gravel or are of earth, and they become impassable at times during the wet season. Conditions for offroad dispersal are good except during periods when the ground is soft. Construction of new roads would encounter few restrictions in most parts of the regions. Alignments are generally unrestricted, natural foundations are fair to good, and construction materials are available, although water may be scarce during the dry season. Conditions for concealment and cover are fair to poor. In the broadleaf evergreen

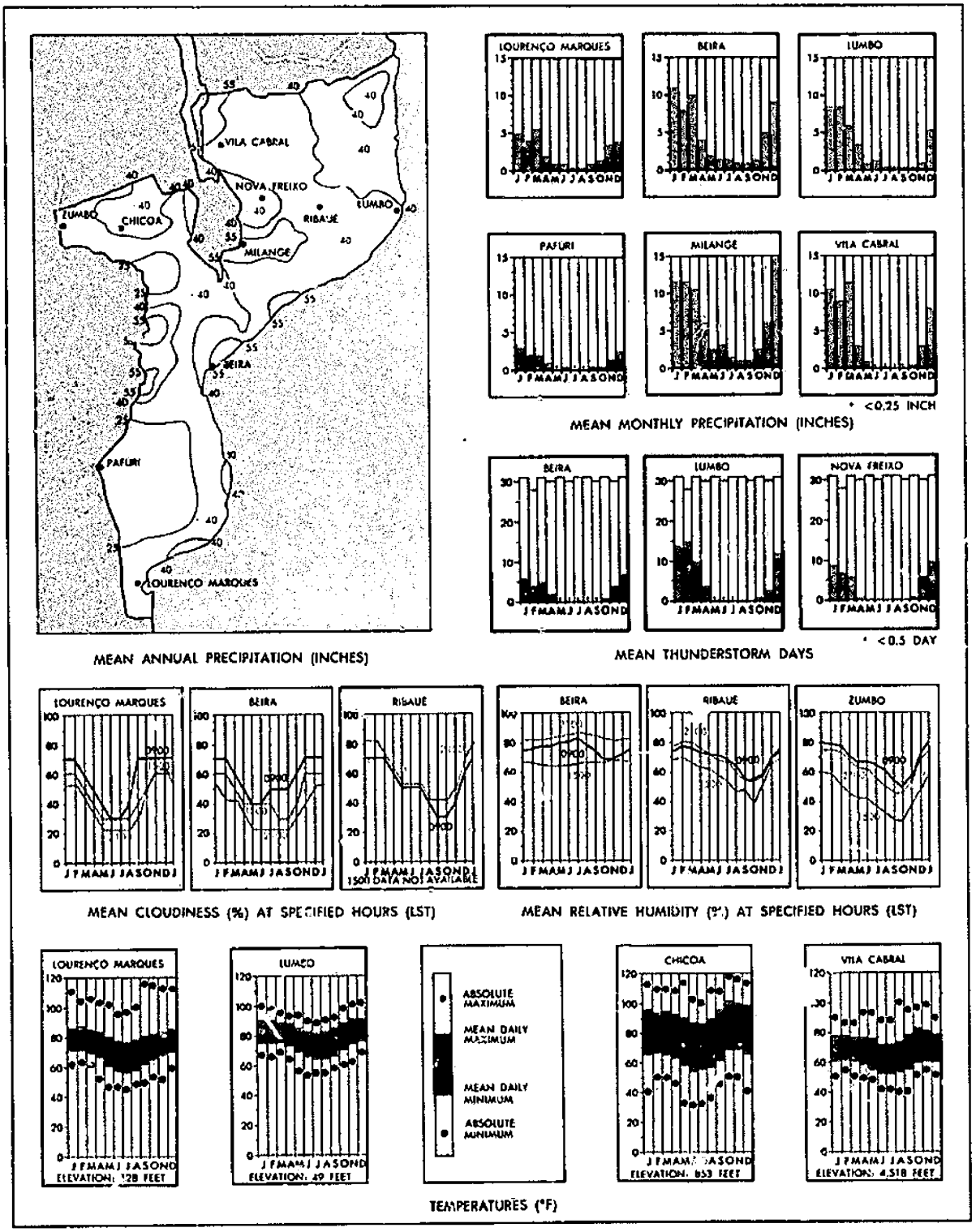


FIGURE 14. Precipitation, thunderstorm days, cloudiness, relative humidity, and temperatures (U/OU)

forests, which are located mainly in the Northern Plains Region, the thin but nearly continuous canopy provides fair year-round concealment from air observation. The less extensive areas of broadleaf deciduous forests throughout both regions provide limited concealment because the canopy is thin and broken and trees are leafless for several months of the year. In the savanna areas, mainly in the south, limited concealment from ground observation would be afforded by tall grass. Cover from flat-trajectory fire and concealment from ground observation would be afforded by scattered surface irregularities. Bunkers could be constructed throughout most of both regions; soils are deep, well drained, stable, and easily excavated. Construction of tunnel-type installations would be limited mainly to the scattered hill areas.

Much of the northern and southern plains is unsuited for airborne and airmobile operations because of extensive forests, scattered areas of hills and mountains, and marshy and swampy areas; however, large savanna areas, which cover about half of the southern plains and smaller parts of the northern plains, are generally well suited. In each region there are several airfields suitable for landings of assault-type aircraft. Helicopters could land most places in the savanna areas, in scattered clearings in the forested areas, and at the existing airfields. Large airfields with unrestricted runway orientations and air approaches could be constructed in most parts of both regions. Little grading would be required; however, clearing would be necessary in the forested areas. Natural foundations are fair to good, and construction materials consisting of sand and gravel and laterite suitable for crushing are available.

Conditions are fair for irregular force operations in the northern and southern plains. Concealment would be available throughout most parts of the plains, but cover would be limited. Conditions for concealment and cover are most favorable north of the Zambezi. The broadleaf evergreen forests that cover a large part of the northern plains have a thin but fairly continuous canopy and provide fair concealment from air observation year-round. Less favorable for concealment are the open to dense, tall broadleaf deciduous forests that are extensive along the northern coast and in the valley of the Rio Luria; these forests have a discontinuous canopy, and most trees are leafless 2 months or more at various times. Both the broadleaf evergreen and the broadleaf deciduous forests have scattered thickets of bamboo, but they also have areas of grassland and clearings for cultivated crops. The tall grass, up to 5 feet high, and clumps of trees and forest patches in the savanna areas that cover most of the southern plains provide some concealment from ground observation but little concealment from air observation. The low broadleaf deciduous forests in the south have thin and broken canopies in addition to being leafless for several months and have minor value for concealment from air or ground observation. Cover is limited throughout the regions, but possibilities are best north of the Zambezi, where isolated rocky hills and hilly and mountainous areas rise abruptly from the surface of the plains. In the south, the dissected Lebombo Mountains provide substantial cover and concealment from ground observation, but their areal extent is small. Limited cover as well as concealment from ground observation would be provided by steep banks of major streams in both regions and by drainage and irrigation ditches in many of the cultivated areas in the south. Cross-country movement on foot would be easy; most obstacles can be bypassed or are seasonal. Food is available and consists of garden vegetables and fruits grown around the larger settlements, citrus fruits and bananas near Lourenco Marques, and extensive areas of cultivated crops, chiefly millet, corn, manioc, sweet potatoes, and peanuts, in the savanna areas and in clearings in the forested areas. Although water is plentiful, it is likely to be biologically contaminated. Away from the numerous streams and lakes surface water is scarce or lacking. Materials for use as shelter and firewood are available and abundant in the forested areas; less abundant sources are the patches of forest in the savannas in the south. Because of the hot, humid climate, both regions have many varieties of stinging and biting insects, some of which are vectors of tropical diseases. In addition, both regions have many dangerous animals and poisonous snakes. Conditions are largely unfavorable for supplying irregular forces by sea because of obstructed approaches, heavy surf, and few beaches. Conditions are favorable for delivering supplies by air except during the wet season, December through March, when cloudiness is at a maximum, ranging between 50% and 80% in most months. Sanctuaries along the borders in neighboring countries would be limited because of the open grass-covered flat to rolling plains that compose most of the international boundary zones of the regions; only along the short boundary with Swaziland and the border with South Africa north of Swaziland is terrain rugged enough for refuge and protection of irregular forces.

The coasts of both regions are unfavorable for amphibious operations because of partly obstructed and restricted approaches, heavy surf during much of the year, and mostly poor exits. Offshore approaches

to the coast of the northern plains are encumbered by an almost continuous chain of islands, islets, reefs, and shoals; in the south, offshore approaches are partly obstructed by shoals. Nearshore approaches in both the north and south are partly obstructed by rocks, reefs, shoals, and islands. Tides are semidiurnal, with spring ranges from 4 feet in some places in the south to over 12 feet in the north. Surf 4 feet or higher may occur at any time along unprotected stretches of coast; maximum occurrences are during April through June in the north and January through March in the south. Nearshore bottom materials are mostly mixtures of sand, mud, and rock, with clay and coral in places. The few beaches consist mostly of sand, and gradients are mostly mild to moderate in the low water to high water zone and steep in the high water zone. In the north, widths range from 100 to 800 yards at low water and 10 to 60 yards at high water; in the south, they range from 50 to 300 yards at low water and 5 to 60 yards at high water. Exits are by cross-country movement and by tracks, trails, and chiefly earth roads.

2. Western Highlands

This region is unsuited for large-scale conventional ground operations. Cross-country movement of vehicles, except in scattered areas of flat to rolling, partly forested plains, would be difficult. The steep slopes restrict movement largely to narrow valleys and gorges and small intermontane plains. A thick undergrowth of shrubs and vines severely hinders movement through forests in some of the moist valleys and along larger streams. From early November through March or April, most streams are too deep to ford, and many valleys are flooded. The road network is sparse, and large areas in the north have no roads. Roads are of earth or have a light gravel surface and cannot sustain heavy traffic for prolonged periods. Narrow surfaces, ferries, fords, low-capacity bridges, and sharp curves and steep grades are common. During the wet season, roads may become impassable. Conditions for offroad dispersal are poor in the hills and mountains but are generally good in the plains except where hindered locally by dense forest. Road construction would be difficult because of steep slopes and forests. Much grading, blasting, and clearing would be required. Protection against landslides would be required on steep slopes in the mountains. Natural foundations are fair to good, and construction material is generally available. Good cover and concealment are available in many parts of the region. High streambanks, steep valley sides, and escarpments afford concealment from ground observation and protection from flat-trajectory fire. Good concealment from air observation would be provided by extensive forests in much of the region. In the savanna areas, tall dense grass affords fair concealment from ground observation. There are numerous sites suitable for underground installations in most of the region. Tunnel-type installations with short adits and adequate cover could be constructed in many places in the hills and mountains, although much drilling and blasting would generally be required. The best sites for bunkers are in the plains and hills, where the soil is mostly deep, well drained, and easily excavated.

The Western Highlands are unsuited for airborne and airmobile operations because of the extensive rough terrain. Large-scale parachute landings would be restricted mainly to the savanna plains along the Zambezi; small landings would be possible in places within the hills and intermontane valleys, but air approaches are restricted. There are several airfields suitable for landings of assault-type aircraft. Helicopters could land in the savanna areas and at scattered sites within the hills and mountains. In most places, construction of new airfields would be difficult because of rugged terrain; construction of large airfields with unrestricted approaches would be limited mainly to areas of flat plains along the Zambezi. Natural foundations are mostly fair to good, but construction materials are scarce south of the Zambezi.

Most of the region is well suited for irregular force operations. Conditions for concealment and cover are good, and the rugged relief and sparse road network favor the movement of small groups on foot rather than the movement of large conventional forces. The broadleaf evergreen forests that cover large parts of the eastern and southwestern highlands provide concealment from air observation, particularly those in the southwest along the border with Rhodesia, where the forests have a dense continuous canopy. The broadleaf deciduous forests in the northeastern and northwestern sections of the region are less favorable sources for concealment because canopies are thin and broken, and trees are leafless for several months. In the savanna areas, the dense grass is up to 5 feet high and provides fair concealment from ground observation. Excellent cover and concealment from ground observation are afforded by the dissected surfaces of the hills and mountains and by high streambanks. Irregular forces could move easily through the region except in the steeper hills and mountains and in the few discontinuous marshes and swamps, where movement would be difficult. The population density is low, and towns generally are small. Food supplies

are most abundant in the savanna areas in the Zambezi valley and in clearings in the forests. Small grains, sweet potatoes, and peanuts are most prevalent, and vegetables and fruits are grown around the larger settlements. There are several large game reserves in the region. Fresh water is scarce or lacking away from lakes and larger streams, which provide plentiful supplies year-round, but the water generally is biologically contaminated. There is a high incidence of disease in the region, and there are many species of dangerous animals and snakes. Shelter materials and firewood are in good supply. Conditions are most favorable for supplying irregular forces by air in the upland plains that are interspersed throughout the hills; elsewhere, conditions are unfavorable because of rugged terrain. The dissected hills and mountains in adjoining southwestern Malawi and east-central Rhodesia could provide sanctuaries for irregular forces operating in the region (Figure 15).

3. Central Wet Plains

This region is unsuited for large-scale conventional ground operations. Vehicular cross-country movement would be seriously hindered or precluded in most places by extensive swamps and marshes, dense forests with thick undergrowth, and numerous streams. The road system is sparse and consists mostly of narrow earth or gravel-surfaced roads which become impassable during the wet season. The main roads generally have concrete bridges; elsewhere, there are fords, ferries, and wooden bridges, and the bridges are subject to washouts during high water. Conditions for offroad dispersal are poor. Road construction would be precluded in the swampy and marshy areas and difficult in the wet forested plains. Extensive clearing, filling of swamps and marshes, bridging, raised subgrades, and flood protection in many low places would be necessary. Concealment from air and ground observation is provided in much of the region by broadleaf evergreen forests; cover from flat-trajectory fire is lacking. The region is unsuited for tunnel-type installations because of inadequate relief and the great depth to bedrock. The only good sites for bunkers are in the dry sandy and silty soils north of Beira, but clearing would be necessary.

The region is mostly unsuited for airborne and airmobile operations. Only a few small sites suitable for parachute landings and helicopter landings are available in scattered grassy areas and plantations along the Zambezi and near Quelimane. Assault-type aircraft could land at airfields near Beira and Quelimane. Construction of new airfields would be difficult in the swampy and marshy areas, but large airfields with unrestricted runway orientations and air approaches could be constructed north of Beira. Generally only minor grading would be required, but clearing, raised subgrades, and good drainage systems would be required, and construction materials are commonly lacking.

Conditions are fair for irregular force operations. Conditions for concealment are good, but cover would be limited and movement on foot would be difficult. Good concealment from air observation and to a lesser extent from ground observation is afforded by tall broadleaf evergreen forests, which cover most of the

FIGURE 15. The steep forested slopes and marsh-fringed banks that flank both the Malawi shores, shown here, and the Mozambique shores of Lago Chirua facilitate the operations of irregular forces crossing this segment of the border. Conditions for conventional force operations are greatly restricted in the vicinity of the lake. (C)

southern part of the region. These forests have a dense continuous canopy and a thick undergrowth of shrubs and vines. Most of the remainder of the region is fresh-water swamp and marsh, and conditions for concealment are spotty. Concealment from air observation would be provided by the broadleaf evergreen forests in the swamps and from ground observation by tall grass in the marshes. Cover is lacking nearly everywhere because of the low relief. Cross-country movement on foot would be difficult and hazardous, and vehicular movement would be precluded by the permanently wet ground of the swamps and marshes, the great number of channels and watercourses of every size, dense forests, and impenetrable undergrowth. Conditions for movement are only slightly improved during the dry season, May through October. Food supplies are most abundant in the Zambezi valley and around the larger settlements and consist of small grains, vegetables, and fruits. Large quantities of fresh water are available, but bacterial contamination is high. Conditions are unfavorable for supplying irregular forces by air because of the forests and swampy and marshy areas and for supplying forces by sea because of obstructed approaches and heavy surf.

Amphibious operations would be difficult because of partly obstructed approaches, frequent high surf, and poor exits. Sandy shores are backed by mangrove, extensive swamps and marshes, and flat, forested plains crossed by numerous streams. Offshore approaches are clear, although nearshore approaches are partly obstructed and restricted by shoals, reefs, islets, and sandbars. Nearshore bottom materials are mostly mixtures of sand and mud. Tides are semidiurnal with spring ranges of from 11 feet in the north to 18½ feet in the south. Surf 4 feet or higher may occur at any time along unprotected stretches of coast with maximum occurrences during April through June. The beaches along the coast consist of sand; gradients are mostly mild in the low water to high water zone and steep in the high water zone. Widths range from 180 to 700 yards at low water and from 10 to 125 yards at high water. Exits from the beaches are by cross-country movement and by tracks, trails, and earth or gravel-surfaced roads.

C. Strategic areas (C)

The cities of Lourenco Marques and Beira, together with their environs, constitute the strategic areas of Mozambique (Figure 24). They are the largest cities and ports and the principal industrial, transportation, political, military, and commercial centers in the country.

1. Lourenco Marques

Lourenco Marques (Figures 16 and 17) is the capital, largest city (1970 estimated population about 380,000), principal port, and major transportation, commercial, and industrial center of the country. It also serves as a major port for Rhodesia, the Republic of South Africa, and Swaziland and is the headquarters for the Portuguese armed forces in Mozambique. Important industrial installations include a steel rolling mill, railroad workshops, a textile mill, and a concrete products factory. A cement plant and a petroleum refinery (throughput capacity 18,000 barrels per day) are located at Matola-Rio, an industrial suburb 6 miles west of Lourenco Marques. The refinery has storage facilities for 832,000 barrels of crude oil and 416,000 barrels of refined products. Additional refined products storage depots in the strategic area have facilities for storing a total of about 1,300 barrels. The country's principal airfield, located at the northern edge of Lourenco Marques, is used by

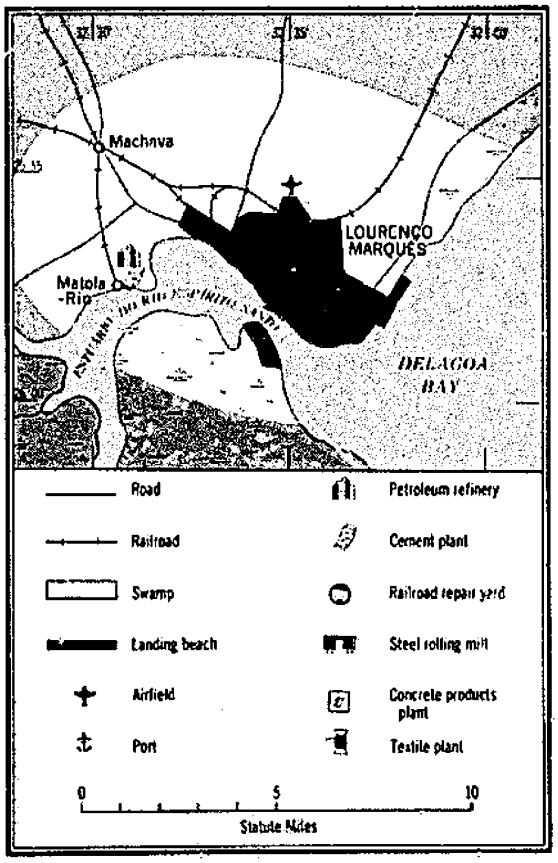


FIGURE 16. Lourenco Marques strategic area (C)

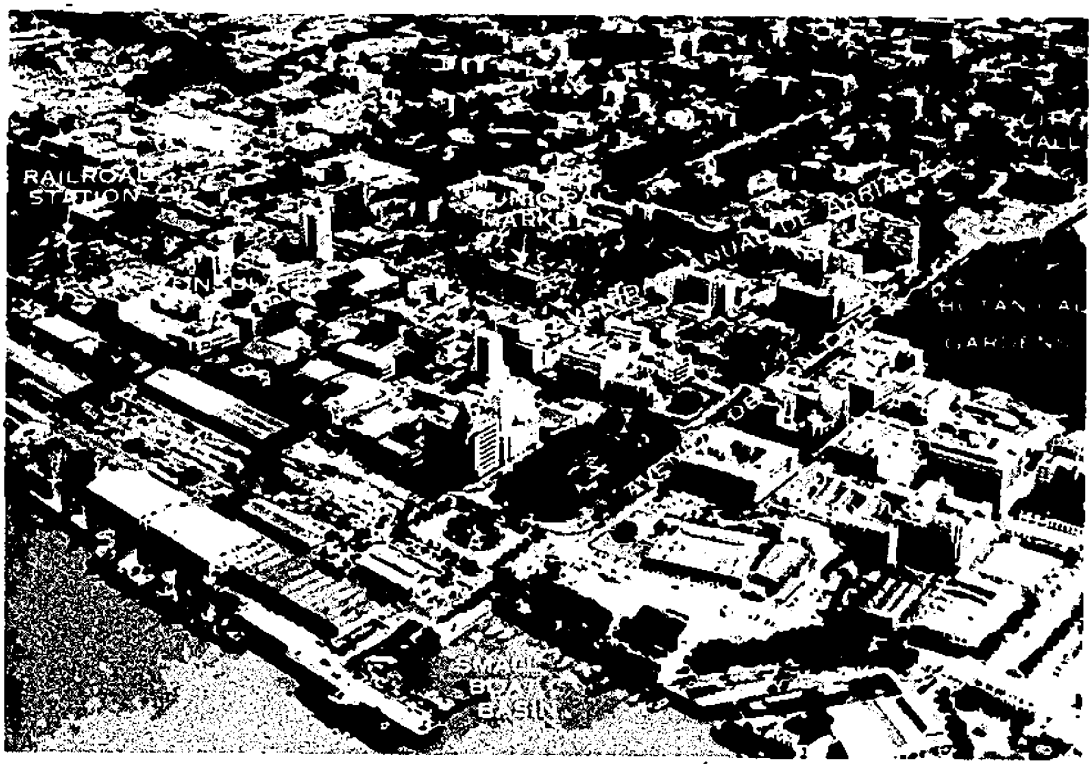


FIGURE 17. The capital of Mozambique, Lourenco Marques, is an attractive city with broad tree-lined streets conforming to a grid pattern. Although there are many modern multistory office and apartment buildings, older structures, such as the railroad station and city hall, have traditional Portuguese architectural styles. (U/OU)

domestic and international airlines and by the Portuguese Air Force.

2. Beira

Beira (population about 115,000) is the second largest city, port, and commercial center in the country (Figures 18 and 19). The port also serves Rhodesia and Malawi. Most of the industry in the strategic area is located at Manga and Vila do Dondo. Plants at Manga produce electric cable, copper wire, metallurgical products, and automobile batteries; those at Vila do Dondo produce cement, asbestos-cement products, brick, and tile. A large Portuguese Army installation, an important railroad repair yard, and POL storage facilities with a total capacity for approximately 1,640,000 barrels of refined products are located at Beira. The country's only long-distance pipeline transports crude oil from the port of Beira to a refinery near Umtali, Rhodesia. The airfield near Manga is used by domestic and international airlines and by the Portuguese Air Force.

3. Other important areas

In addition to the two strategic areas, several towns in the country have significance as marketing centers, capitals of administrative districts, military bases, and transportation centers. Nacala, the most important of these, is the third largest port and site of the largest Portuguese Air Force base in Mozambique. The town is also a regional marketing center. Principal industries include a cement factory and POL depots with facilities for storing approximately 160,000 barrels of refined products.

D. Internal routes (C)

The internal routes provide the easiest avenues of movement between the land approaches and the strategic areas and between the strategic areas (Figure 24). Information on these routes is given in Figure 20.

E. Approaches

The perimeter of Mozambique is 4,410 miles; of this, 1,535 miles is seacoast. Mozambique claims

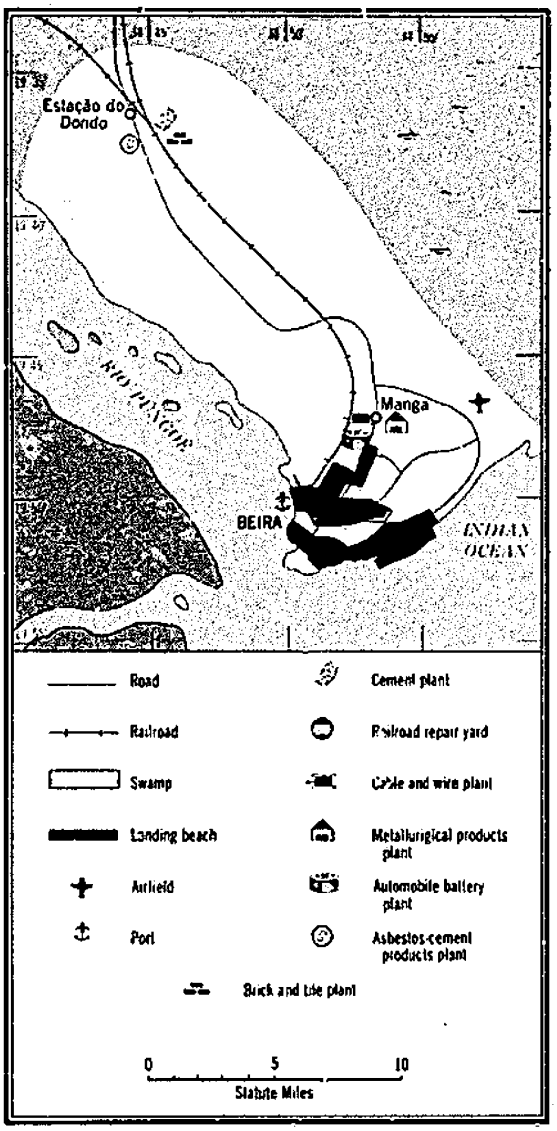


FIGURE 18. Beira strategic area (C)

territorial waters extending 6 nautical miles offshore. There are no boundary disputes between Mozambique and adjoining countries, and all boundaries are demarcated and unfortified. Additional data on land boundaries is presented in Figure 21. (U/OU)

1. Land (C)

Conditions for cross-country movement in the northern and southern border zones are fair to good most of the year on flat to rolling plains and poor in the central section because of rugged terrain. Widely spaced roads, mostly one lane and of earth, and a few 3'6"-gage single-track railroads cross the borders. The approaches shown on Figure 24 are the best means of land access to Mozambique. Detailed information on the land approaches is presented in Figure 22.

2. Sea (C)

Approaches to Mozambique are through the Indian Ocean and Mozambique Channel. Offshore approaches to the central part of the coast are clear but are obstructed by shoals in places in the south and by rocks, reefs, shoals, and islands in the north. Nearshore approaches are restricted and partly obstructed by rocks, reefs, shoals, islands, and mudflats. Tides are semidiurnal with spring ranges of from 4 to 18½ feet. Surf 4 feet or higher may occur at any time along unprotected stretches of coast and, in some places, up to 40% of the time January through March, 41% April through June, 37% July through September, and 36% October through December. Nearshore bottom materials are sand and mud mixed with coral, rock, or clay in some places. Only a small percentage of the coast is considered to have usable beach. Exit conditions are poor. The amphibious landing areas shown on Figure 24 provide access to the strategic areas.

The landing area near Lourenco Marques is about 1¼ miles long and is all usable; however, because of exposed mudflats at low tide, usage is recommended only at high water. Offshore approaches are restricted to the bay entrance channel and partly obstructed by shoals with least depths of 27 feet. Nearshore approaches are restricted to a dredged channel, with a least depth of 26¾ feet, and partly obstructed by shoals, with least depths of 13¼ feet. Tides are semidiurnal with a spring range of 12 feet; surf 4 feet or higher is infrequent in all months. Nearshore bottom material is a mixture of sand, rocks, and mud; bottom slopes would not permit dry-ramp LST landings. Beach material is predominantly sand, which is firm where wet and soft where dry. Widths range from 200 to 300 yards at low water and from 10 to 20 yards at high water. Gradients range from flat to mild in the low water to high water zone and are steep in the high water zone. The beach is backed by brush-covered dunes and a partly wooded sandy strip, which in turn are backed by a sandy plain partly covered by brush and grass and traversed by swamp-fringed streams. Exits are mainly by cross-country movement and by tracks and trails to a bituminous-surfaced coastal road approximately 100 to 300 yards behind the beach.

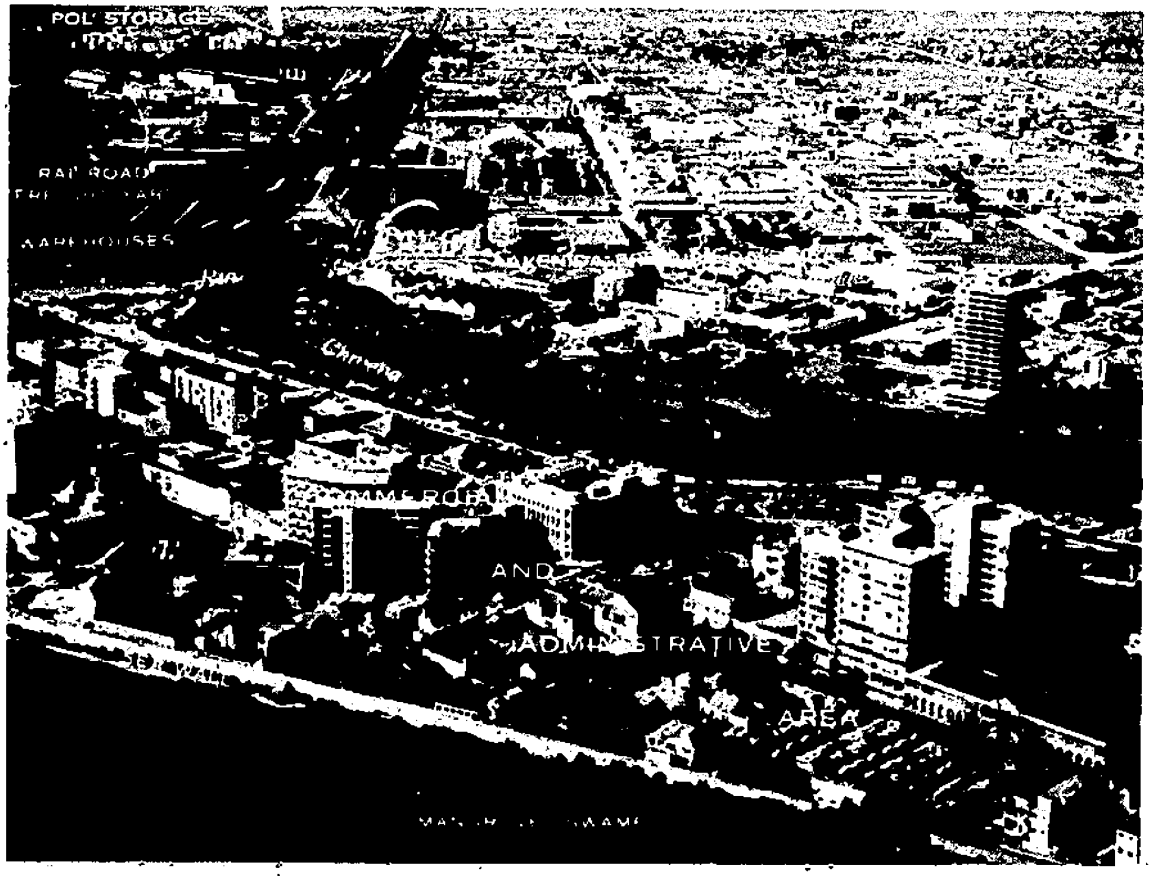


FIGURE 19. The Rio Chiveve separates the commercial and administrative area from the rest of Beira. The port area, not shown here, is to the left of the railroad freight yard, where the Rio Chiveve joins the broad estuary of the Rio Pungoe. (U/OU)

The amphibious landing area located approximately 30 miles northeast of Lourenco Marques is about 12 miles long and nearly all usable. Offshore approaches are partly obstructed by shoals with least depths of 22½ feet approximately 5 miles off the northeastern part and flanked to the southwest by several shoals with least depths of 10½ feet. Nearshore approaches are mostly clear. Tides are semidiurnal with a spring range of 7 feet; surf 4 feet or higher may occur up to 27% of the time January through March, 19% April through June, 17% July through September, and 18% October through December. Nearshore bottom material is predominantly sand; bottom slopes would probably permit dry-ramp LST landings in some places. Beach material is predominantly sand, which is firm where wet and soft where dry. Widths range from 150 to 300 yards at low water and 30 to 50 yards at high water. Gradients are mild to gentle in the low water to high water zone and mostly steep in the high water zone. The beach is backed by a belt of steep, brush-covered dunes extending up to 1¼ miles inland. The dunes are backed by a low plain partly covered by brush, trees, and patches of swamp and cultivation and traversed by several swamp-fringed streams. Exits are by cross-country movement and by tracks and trails to a bituminous-surfaced road up to 13 miles inland.

The amphibious landing area near Beira (Figure 23) is approximately 2½ miles long and all usable, because of flat gradients usage is recommended only at high tide. Offshore approaches are mostly clear to the east and southeast. Nearshore approaches are partly obstructed by drying shoals approximately 300 yards off beach center. Tides are semidiurnal, with a spring range of 18½ feet. Surf 4 feet or higher can be expected 21% of the time January through March, 19% April through June, 21% July through September, and 25% October through December. Nearshore

FIGURE 20. Internal routes (C)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
Tanzania border to Beira strategic area. Across mostly flat to rolling plains and, in central section, small scattered areas of hills and mountains. Vegetation mostly dense to open broadleaf evergreen and deciduous forest and small scattered grassy and cultivated areas.	One to two lanes, earth with some gravel or bituminous sections, in fair condition; may be impassable at times during wet season, December through March.	Three sections of 3'6" gage, single-track line in fair to good condition; one east and west of Nampula, one extending southward from Vila de Mocuba, and one between Zambezi River and Vila do Dondo.	Conditions primarily fair; steep streambanks, deep streams, forests, and, for periods in December through May, soft and miry soils major hindrances.
Malawi border to Tanzania–Beira strategic area route at Vila de Mocuba. Across mostly forested hills.	Mostly one lane, earth, in fair condition..	None.....	Conditions poor because of steep, forested slopes.
Rhodesia border to Beira strategic area. Across mountains near the border, hills in the western part, and plains in the east. Vegetation mostly broadleaf evergreen forest but numerous grassy and cultivated areas; swamps and marshes along Rio Pungoe.	One to two lanes, bituminous treated surface, in good condition. Several narrow low-capacity bridges potential bottlenecks. Road may be flooded by Rio Pungoe during high water period, early November through March or April.	3'6" gage, single track, in good condition.	Conditions mostly poor because of steep slopes, forests, swamps, and marshes.
Connects Rhodesia–Beira strategic area at Muda with Lourenco Marques strategic area. Across flat to rolling, mostly savanna-covered plains; however, there are patches of forest, cultivated areas, and swamps and marshes.	Mostly two lanes, bituminous surfaced, in good condition.	Two stretches of 3'6" gage, single-track line; one extends southward from Inhambane and is in fair condition, the other extends northward from Lourenco Marques and is in good condition. 2'5½" gage, single-track line in fair condition between Chicomo and Joao Belo.	Conditions mostly fair to good; swamps, marshes, forests, and streams hindrances in places, soft and miry soils and flooded areas restrictions for periods in December through April.
South Africa border to Lourenco Marques strategic area. Across mostly cultivated or savanna-covered hills and plains.	One lane, bituminous treated surface, in poor to fair condition.	3'6" gage, mostly single track, in good condition.	Conditions only fair; hindrances include swamps, marshes, streams, and in hills, steep slopes.

FIGURE 21. Boundaries (U/OU)

BOUNDARY	LENGTH	TERRAIN
Tanzania	470	Boundary marked primarily by the Rio Rovuma, which flows across flat to rolling plains covered mostly by grass and scattered clumps of trees and scrub. In the west, the boundary crosses a narrow band of rugged hills and steep mountains bordering Lake Nyasa. In this rugged section, the vegetation consists mainly of deciduous forest, with scattered evergreen scrub and areas of open grassland.
Malawi	975	Approximately 205 miles are in Lake Nyasa and short segments cross Lago Chiuta and Lago Chirua. The boundary is mostly across hills and rugged mountains; however, in places it traverses low, wet plains. The vegetation consists primarily of open to moderately dense deciduous forest and grassland; in the northwest, there is an area of broadleaf evergreen forest.
Zambia	200	Rolling plains and hills; in the west the boundary is marked by a stream. Vegetation consists chiefly of open to moderately dense deciduous forest, with many grassy openings.
Rhodesia	765	Hills and rugged mountains in the central sector and flat to rolling plains elsewhere. Vegetation consists of grass and scattered trees on the plains and open to moderately dense deciduous forest and areas of dense broadleaf evergreen forest in the hills and mountains. Streams which flow in deep valleys mark much of the northern segment.
South Africa	340	Flat to moderately dissected plains with scattered ridges and hillocks except for a 40-mile stretch north of Swaziland, where it is along the crests of hills. Vegetation is primarily savanna; in the hills there is some moderately dense deciduous forest and scrub and near the coast some marshy areas.
Swaziland	65	Hills covered by grass and scattered deciduous trees and scrub.

bottom material is a mixture of sand and mud; bottom slopes would not permit dry-ramp LST landings. Beach material is sand, which is firm where wet and soft where dry. Widths range from 180 to 700 yards at low water and average 30 yards at high water. Gradients range from mild to moderate in the low water to high water zone and are steep in the high water zone. The beach is backed by a low, brush-covered bank, which in turn is backed by a sandy plain partly covered by brush and containing swamp areas. Exits are by cross-country movement or by streets to a bituminous-surfaced road up to 750 yards inland.

3. Air (U/OU)

Air approaches[3] to Mozambique from the north and west are over southern Tanzania, Malawi, central and eastern Zambia, extreme southeastern Zaire, eastern Rhodesia, a small part of eastern Botswana, eastern South Africa, and Swaziland. The terrain consists mostly of hills, mountains, and highland plains. Elevations are chiefly between 1,000 and 4,500 feet, although many peaks are over 5,000 feet. The highest elevations are 9,715 feet in Tanzania about 160 nautical miles from the border, 9,843 feet in Malawi 7 nautical miles from the border, 8,517 feet in Rhodesia less than 10 nautical miles from the border, and 7,805 feet in South Africa about 170 nautical miles from the border.

Approaches from the south and east are over the Indian Ocean and the Mozambique Channel. The only topographic hazards are the Comoro Islands in the Mozambique Channel, about 165 nautical miles from the coast of Mozambique; the highest elevation is 8,399 feet.

Weather conditions in all approaches are usually most favorable in May through September, when clear to partly cloudy skies prevail, and are least favorable during November through March, when cloudiness and rainfall are at a maximum. Most cloudiness and rainfall are the result of convective activity associated with orographic lifting, solar heating, convergence, and tropical cyclones. Consequently, the principal cloud type is cumulus. Low stratus clouds may occur during the morning but usually dissipate by noon. Visibility is usually good all year, seldom less than 2 ½ miles. Occasionally, low clouds, drizzle, and fog restrict visibility in summer, and smoke and haze, resulting from brush fires, may reduce visibility during winter. Most thunderstorm activity occurs during October through April, with the maximum occurring in December and January. During these months, thunderstorms occur on 5 to 10 days per month in the southern and eastern approaches, and about 10 to 20 per month in the northern and western approaches. During May through September, all approaches experience thunderstorms on 3 days or less per month. Low-level turbulence is most pronounced over the

[3]The discussion zone for air approaches extends approximately 200 nautical miles beyond the borders of the country.

FIGURE 22. Land approaches (C)

APPROACH	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
From Lindi, Tanzania. Across a flat coastal plain covered mostly by savanna and cultivated crops and by forests in a few places.	Mostly one to two lanes; crushed-stone or gravel surfaces, with some bituminous sections; in fair condition.	None.....	Fairly easy except during wet season, generally in March through May, when greatly hindered by streams too deep to ford, soft soils, and flooded areas near streams.
From Blantyre, Malawi. Across hills and a small area of plains covered by dense forest and scattered cultivated clearings.	One to two lanes, bituminous-treated surface, in good condition; sharp curves and steep grades in places.	In west, road roughly paralleled by 3'6" gage, single-track line.	Conditions poor because of steep, forested slopes.
From Odzi, Rhodesia. Across rugged, densely forested hills and mountains.	Two lanes, bituminous-treated surface, in good condition. Numerous sharp curves and steep grades; landslides frequent during rainy season, in November through March. Bridge over Odzi river about 260 feet long and 12 feet wide with 12-foot vertical clearance, potential bottleneck.	3'6" gage, single track, in good condition.	Severely restricted by steep slopes and dense forest.
From Kaapmuiden, South Africa. Across flat to rolling plains except in west, where traverses hills. Vegetation mostly savanna and patches of forest and scrub.	Two lanes, bituminous surface, in good condition.	3'6" gage, single track, in good condition.	Fairly easy in plains, hindered by steep slopes in hills.

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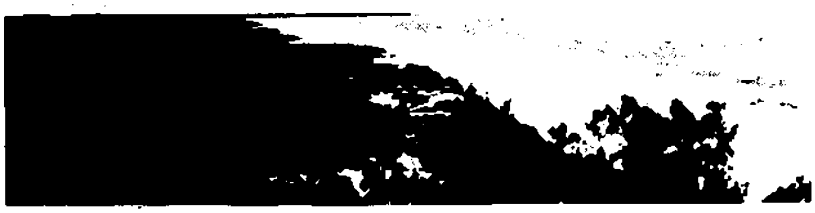

FIGURE 23. The beach near Beira is fairly long and wide and backed by a sandy, brush-covered plain containing swampy and marshy areas. Nearshore approaches are partly obstructed by shallow water. (C)

land, especially over the mountains. Turbulence is often associated with thunderstorms. The average height of the freezing level in all approaches is close to 16,000 feet throughout the year except in approaches from the south in winter, when the level drops to 10,000 feet at times. However, aircraft icing is most likely to occur in summer. During this time, icing is confined mostly to cumulus and cumulonimbus clouds, but icing may occur any time clouds are present above the freezing level. Upper winds are mostly light and variable below 20,000 feet in all approaches throughout the year. Above 20,000 feet, westerlies prevail all year in the southern approaches, whereas in the northern approaches the winds alternate in prevalence between easterlies in summer (December through February) and westerlies in winter (June through August). The strongest winds occur in the southernmost approaches near 40,000 feet, where mean speeds in the westerlies vary from 45 knots in January to 70 knots in July. Tropical cyclones from the Indian Ocean occasionally affect the air approaches from the east, causing periods of extensive cloudiness, heavy rains, and strong gusty winds. An average of two tropical cyclones occur each year.

Places and features referred to in this General Survey (u/ou)

	COORDINATES	
	° 'S.	° 'E.
Alto Ligonha	15 31	38 16
Angoche, Ilha (*isl*)	16 20	39 51
Arusha, Tanzania	3 22	36 41
Augusto Cardoso	12 43	34 49
Bagamoyo, Tanzania	6 26	38 54
Bandula	19 01	33 09
Beira	18 04	33 13
Binga, Monte (*mt*)	11 52	35 02
Blantyre, Malawi	15 48	35 02
Boane	26 02	32 19
Bons Sinais, Rio dos	18 03	36 56
Border Siding, Malawi (*rr siding*)	17 09	35 12
Búzi, Rio (*strm*)	19 52	34 46
Cabora Bassa (*gorge*)	15 34	32 50
Caia (*rr sta*)	17 50	35 20
Cambine (*mission*)	23 36	35 15
Capoche (*strm*)	15 23	32 53
Catembe	26 00	32 33
Catur	13 45	35 37
Changara	16 50	33 16
Chicoa	15 36	32 21
Chicomo	24 59	33 06
Chinde, Rio (*strm*)	18 33	36 28
Chirua, Lago (*lake*)	15 12	35 50
Chiuta, Lago (*lake*)	14 55	35 50
Chiveve, Rio (*strm*)	19 50	34 50
Cochemane	16 57	32 51
Dona Ana	17 25	35 04
Espirito Santo, Estuário do (*estuary*)	25 59	32 37
Feruka, Southern Rhodesia (*rr siding*)	18 58	32 33
Fingoe	15 10	31 53
Furancungo	14 54	33 37
Gaza	18 34	34 40
Goba	26 12	32 08
Gôndola	19 05	33 39
Gorongosa, Parque Nacional da (*park*)	18 45	34 20
Inchope	19 12	33 56
Incomati, Rio (*strm*)	25 46	32 43
Inhambane	23 52	35 23
Inhamitanga	18 13	35 11
Inharrime	24 28	35 01
João Belo	25 04	33 39
Kaapmuiden, South Africa	25 32	31 19
Kongwa, Tanzania	6 12	36 25
Lebombo Mountains (*hills*)	26 15	32 00
Licuare, Rio (*strm*)	17 54	36 49
Limpopo River (*strm*)	25 12	33 32
Lindi, Tanzania	10 00	39 43
Lourenço Marques	25 58	32 34
Lugenda, Rio (*strm*)	11 26	38 33
Lumbo	15 00	40 44
Lúrio, Rio (*strm*)	13 31	40 32
Machipanda (*rr sta*)	19 00	32 41
Macomia	12 15	40 08
Macondes, Planalto dos (*plateau*)	11 30	39 00
Macossa	17 54	33 56
Macuse, Rio (*strm*)	17 45	37 13
Malvernia	22 05	31 40
Manga	19 47	34 53
Manjacaze	24 43	33 50
Maotas	25 53	32 37
Mapai	22 51	31 58
Maputu, Rio (*strm*)	26 11	32 42
Marromeu	18 17	35 56
Matola, Rio (*strm*)	25 59	32 27
Matola-Rio	25 49	32 27
Mau-ê-ele	24 21	34 06
Mbeya, Tanzania	8 54	33 27
Milange	16 05	35 47
Moamba	25 36	32 15
Moçambique	15 32	39 51
Moçambique, Ilha de	15 03	40 45
Mocímboa da Praia, Baía (*bay*)	11 20	40 25
Molócuè, Rio (*strm*)	17 08	38 32
Mozambique Channel (*strait*)	20 00	43 00
Mtwara, Tanzania	10 16	40 11
Mucanha, Rio (*strm*)	15 39	31 35
Mucêlo, Rio (*strm*)	17 38	37 02
Muda	19 23	34 25
Mueda	11 39	39 33
Mzinga, Tanzania	6 53	37 37
Nacala	14 33	40 40
Nacala, Porto de (*bay*)	14 31	40 39
Nacala-Velha	14 33	40 36
Nachingwea, Tanzania	10 23	38 46
Namaacha	25 58	32 01
Nampula	13 43	39 50
Namialo	14 55	39 59
Nampula	15 07	39 15
Namuiranga	10 32	40 2
Nayuci, Malawi	14 56	35 52
Nova Freixo	14 49	36 33
Nova Sofala	20 10	34 44
Nyassa, Lake (*lake*)	12 00	34 30
Odzi, Southern Rhodesia	18 58	32 23
Odzi, Southern Rhodesia (*strm*)	19 47	32 24
Ponta Dobela (*point*)	26 31	32 54
Porto Amélia	12 57	40 30
Púngoè, Rio (*strm*)	19 50	34 48
Quelimane	17 51	36 52
Ressano Garcia	25 27	32 00
Revuè	19 25	33 22
Ricatla, Lagoa (*lake*)	25 46	32 37
Rovuma, Rio (*strm*)	10 29	40 28
Salamanga	26 29	32 39
Salisbury, Southern Rhodesia	17 50	31 03
Save, Rio (*strm*)	21 00	35 02
Sena	17 28	35 02
Shire Bridge Siding, Malawi (*rr sta*)	15 18	35 04
Songea, Tanzania	10 41	35 39
Sunate	13 06	29 59
Tembe, Rio (*strm*)	26 00	32 29
Teto	16 10	33 36
Umbelúzi, Rio (*strm*)	26 01	32 28
Umpala	26 03	32 19
Umtali, Southern Rhodesia	18 58	32 40
Vila Cabral	13 18	35 14
Vila Caldas Xavier	14 24	33 01
Vila de António Enes	16 12	39 54
Vila de Mocímboa da Praia	11 20	40 21
Vila de Mocuba	16 51	36 56
Vila de Sena	17 26	35 02
Vila do Chinde	18 34	36 27
Vila do Dondo	19 36	34 44
Vila Fontes	17 49	35 23
Vila Franca do Save	21 09	34 33
Vila Gouveia	18 03	33 11
Vila Luisa	25 41	32 41
Vila Montize	16 10	33 46
Vila Paiva de Andrada	18 41	34 04
Vila Pery	19 08	33 29
Xinavane	25 02	32 47
Zambesi River (*strm*)	18 50	36 17
Zóbuè	15 36	34 26

Selected Airfields

Beira	19 48	34 54
Lourenco Marques	25 55	32 34
Lumbo	15 02	40 40
Marrupa	13 14	37 33
Mocimbao da Praia	11 21	40 21
Mueda	11 40	39 34
Mutarara	17 22	35 02
Nacala	14 28	40 43
Nampula	15 06	39 17
Nova Freixo	14 49	36 32

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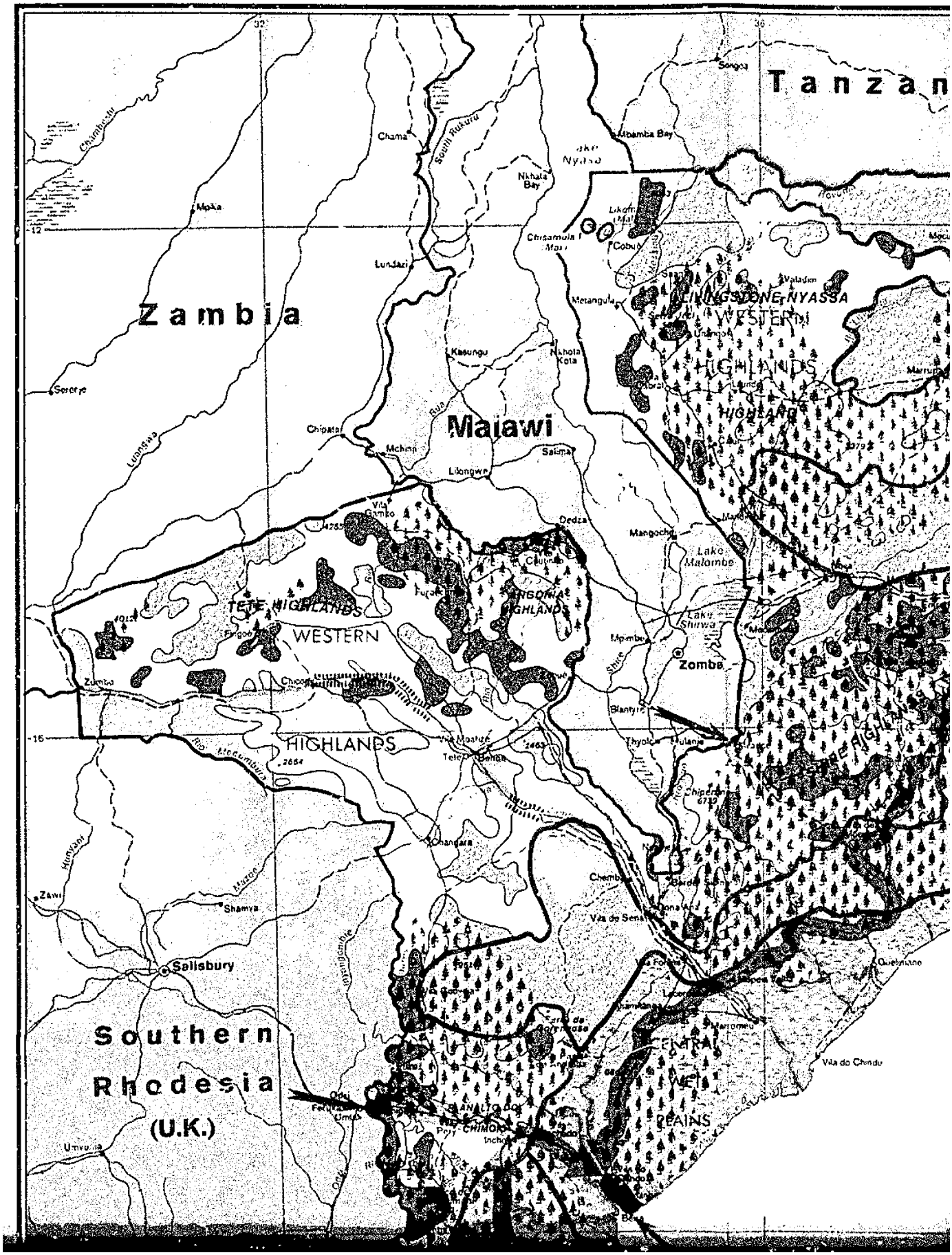
Dona Ana	17 25	35 04
Espírito Santo, Estuário do (*estuary*)	25 59	32 37
Feruka, Southern Rhodesia (*rr siding*)	18 58	32 33
Fingoe	15 10	31 53
Furancungo	14 54	33 37
Gaza	18 34	34 40
Goba	26 12	32 08
Gôndola	19 05	33 39
Gorongosa, Parque Nacional da (*park*)	18 45	34 20
Inchope	19 12	33 56
Incomati, Rio (*strm*)	25 46	32 43
Inhambane	23 52	35 23
Inhamitanga	18 12	35 11
Inharrime	24 28	35 01
João Belo	25 04	33 30
Kaapmuiden, South Africa	25 32	31 19
Kongwa, Tanzania	6 12	36 25
Lebombo Mountains (*hills*)	26 15	32 00
Licuare, Rio (*strm*)	17 54	36 49
Limpopo River (*strm*)	25 12	33 32
Lindi, Tanzania	10 00	39 43
Lourenço Marques	25 58	32 34
Lugenda, Rio (*strm*)	11 26	38 33
Lumbo	15 00	40 44
Lúrio, Rio (*strm*)	13 31	40 32
Machipanda (*rr sta*)	19 00	32 41
Macomia	12 15	40 08
Macondes, Planalto dos (*plateau*)	11 30	39 00
Macossa	17 54	33 56
Macuse, Rio (*strm*)	17 45	37 15
Malvernia	22 05	31 40
Manga	19 47	34 53
Manjacaze	24 43	33 50
Maotas	25 53	32 37
Mapai	22 51	31 58
Maputu, Rio (*strm*)	26 11	32 42
Marromeu	18 17	35 56
Matola, Rio (*strm*)	25 59	32 27
Matola-Rio	25 49	32 27
Mau-é-ele	24 21	34 06
Mbeya, Tanzania	8 54	33 27
Milange	16 05	35 47
Moamba	25 36	32 15
Moçambique	15 [illegible]	39 51
Moçambique, Ilha de	15 [illegible]	40 45
Mocímboa da Praia, Baía (*bay*)	11 20	40 25
Molócuè, Rio (*strm*)	17 03	38 52
Mónapo	14 55	40 18
Montepuez	13 07	39 00
Mopeia Velha	17 59	35 43
Morogoro, Tanzania	6 49	37 40
Moshi, Tanzania	3 21	37 20
Mtwara, Tanzania	10 16	40 11
Mucanha, Rio (*strm*)	18 39	31 35
Mucêlo, Rio (*strm*)	17 38	37 02
Muda	19 23	34 25
Mueda	11 39	39 23
Mzinga, Tanzania	6 53	37 37
Nacala	14 33	40 40
Nacala, Porto de (*bay*)	14 31	40 39
Nacala-Velha	14 33	40 38
Nachingwea, Tanzania	10 23	38 46
Namacha	25 58	32 01
Namapa	13 43	39 50
Namialo	14 55	39 59
Nampula	15 07	39 15
Namuiranga	10 32	40 23
Nayuci, Malawi	14 58	35 52
Nova Freixo	14 49	36 33
Nove Sofala	20 10	34 44
Nyassa, Lake (*lake*)	12 00	34 30
Odzi, Southern Rhodesia	18 58	32 23
Odzi, Southern Rhodesia (*strm*)	19 47	32 24
Ponta Dobela (*point*)	26 31	32 54
Porto Amélia	12 57	40 30
Púngoè, Rio (*strm*)	19 50	34 48
Quelimane	17 51	36 52
Rescano Garcia	25 27	32 00
Revuè	19 25	33 22
Ricatla, Lagos (*lake*)	25 46	32 37
Rovuma, Rio (*strm*)	10 29	40 23
Salamanga	26 29	32 39
Salisbury, Southern Rhodesia	17 50	31 03
Save, Rio (*strm*)	21 00	35 02
Sena	17 28	35 02
Shire Bridge Siding, Malawi (*rr sta*)	15 18	35 04
Songea, Tanzania	10 41	35 39
Sunate	13 [illegible]	39 59
Tembe, Rio (*strm*)	[illegible] 00	32 29
Tete	16 10	33 36
Umbelúzi, Rio (*strm*)	26 01	32 28
Umpala	26 03	32 19
Umtali, Southern Rhodesia	18 58	32 40
Vila Cabral	13 18	35 14
Vila Caldas Xavier	14 24	33 01
Vila de António Enes	16 12	39 54
Vila de Mocímboa da Praia	11 20	40 21
Vila de Mocuba	16 51	36 56
Vila de Sena	17 26	35 02
Vila do Chinde	18 34	36 27
Vila do Dondo	19 36	34 44
Vila Fontes	17 49	35 23
Vila Franca do Save	21 09	34 33
Vila Gouveia	18 03	33 11
Vila Luísa	25 44	32 41
Vila Moatize	16 10	33 46
Vila Paiva de Andrada	18 41	34 04
Vila Pery	19 08	33 29
Xinavane	25 02	32 47
Zambezi River (*strm*)	18 50	36 17
Zóbuè	15 30	34 26

Selected Airfields

Beira	19 48	34 54
Lourenco Marques	25 55	32 34
Lumbo	15 02	40 40
Marrupa	13 14	37 33
Mocimboa da Praia	11 21	40 21
Mueda	11 40	39 34
Mutarara	17 22	35 02
Nacala	14 29	40 43
Nampula	15 06	39 17
Nova Freixo	14 49	36 32
Porto Amelia	12 59	40 31
Quelimane No. 2	17 51	36 52
Vila Cabral	13 17	35 15
Vila Coutinho	14 43	34 22
Tete/Moatize	16 06	33 36



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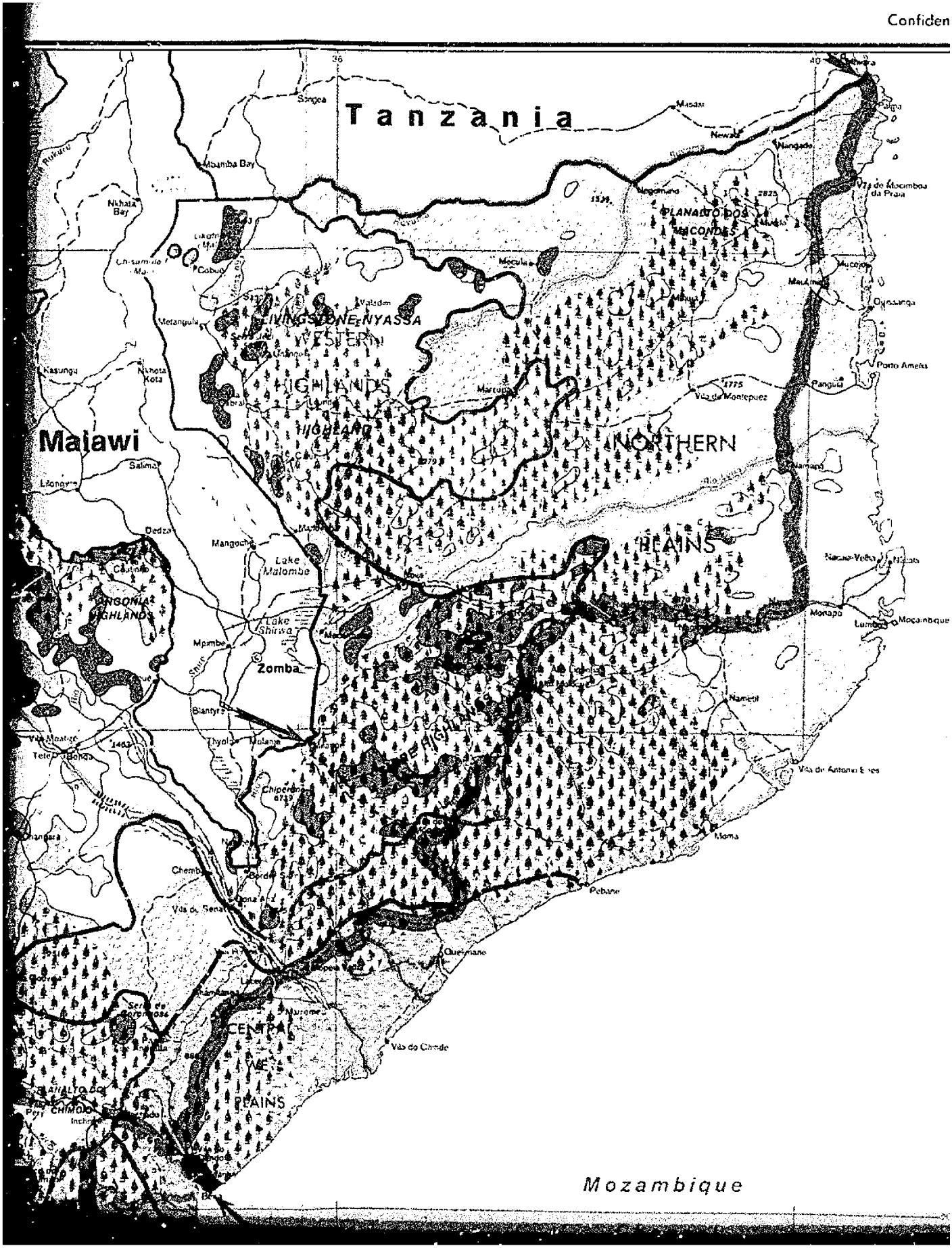

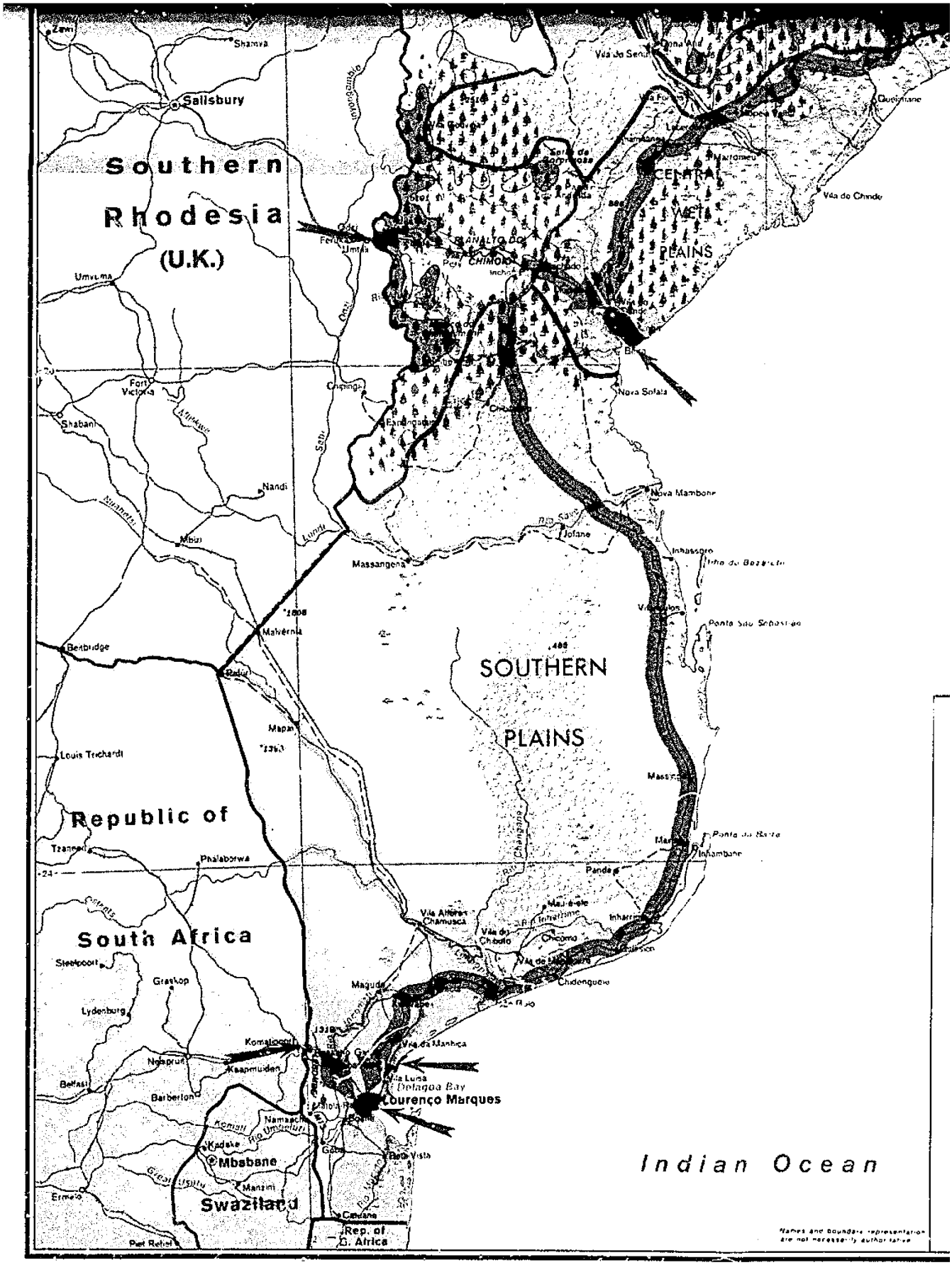

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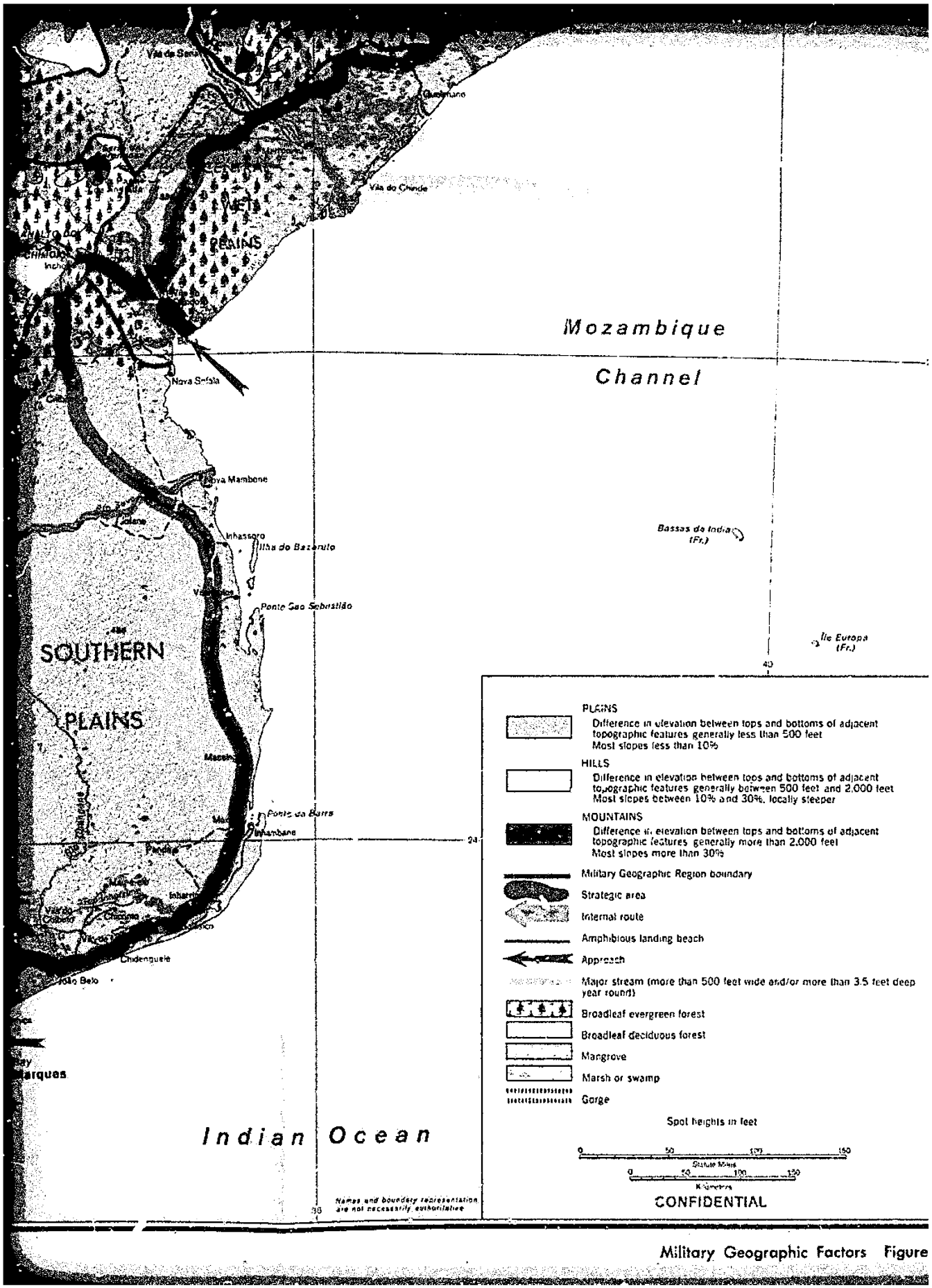

Military Geographic Factors Figure