

**CONFIDENTIAL**  
**32A/GS/MG**

# Yemen (Şan'a)

April 1973

NATIONAL INTELLIGENCE SURVEY

**CONFIDENTIAL**

Military Geography

## NATIONAL INTELLIGENCE SURVEY PUBLICATIONS

The basic unit of the NIS is the *General Survey*, which is now published in a bound-by-chapter format so that topics of greater perishability can be updated on an individual basis. These chapters—Country Profile, The Society, Government and Politics, The Economy, Military Geography, Transportation and Telecommunications, Armed Forces, Science, and Intelligence and Security, provide the primary NIS coverage. Some chapters, particularly Science and Intelligence and Security, that are not pertinent to all countries, are produced selectively. For small countries requiring only minimal NIS treatment, the *General Survey* coverage may be bound into one volume.

Supplementing the *General Survey* is the *NIS Basic Intelligence Factbook*, a ready reference publication that semiannually updates key statistical data found in the Survey. An unclassified edition of the factbook omits some details on the economy, the defense forces, and the intelligence and security organizations.

Although detailed sections on many topics were part of the NIS Program, production of these sections has been phased out. Those previously produced will continue to be available as long as the major portion of the study is considered valid.

A quarterly listing of all active NIS units is published in the *Inventory of Available NIS Publications*, which is also bound into the concurrent classified Factbook. The Inventory lists all NIS units by area name and number and includes classification and date of issue; it thus facilitates the ordering of NIS units as well as their filing, cataloging, and utilization.

Initial dissemination, additional copies of NIS units, or separate chapters of the *General Surveys* can be obtained directly or through liaison channels from the Central Intelligence Agency.

The *General Survey* is prepared for the NIS by the Central Intelligence Agency and the Defense Intelligence Agency under the general direction of the NIS Committee. It is coordinated, edited, published, and disseminated by the Central Intelligence Agency.

### WARNING

This document contains information affecting the national defense of the United States, within the meaning of title 18, sections 793 and 794 of the US code, as amended. Its transmission or revelation of its contents to or receipt by an unauthorized person is prohibited by law.

CLASSIFIED BY 019441. EXEMPT FROM GENERAL DECLASSIFICATION SCHEDULE OF E. O. 11652 EXEMPTION CATEGORIES 5B (1), (2), (3). DECLASSIFIED ONLY ON APPROVAL OF THE DIRECTOR OF CENTRAL INTELLIGENCE.

**WARNING**

The NIS is National Intelligence and may not be released or shown to representatives of any foreign government or international body except by specific authorization of the Director of Central Intelligence in accordance with the provisions of National Security Council Intelligence Directive No. 1.

For NIS containing unclassified material, however, the portions so marked may be made available for official purposes to foreign nationals and nongovernment personnel provided no attribution is made to National Intelligence or the National Intelligence Survey.

Subsections and graphics are individually classified according to content. Classification/control designations are:

- (U/OU) . . . Unclassified/For Official Use Only
- (C) . . . . . Confidential
- (S) . . . . . Secret

*This chapter was prepared for the NIS by the Defense Intelligence Agency. Research was substantially completed by November 1972.*



# YEMEN (SAN'A')

## CONTENTS

*This General Survey supersedes the one dated June 1970, copies of which should be destroyed.*

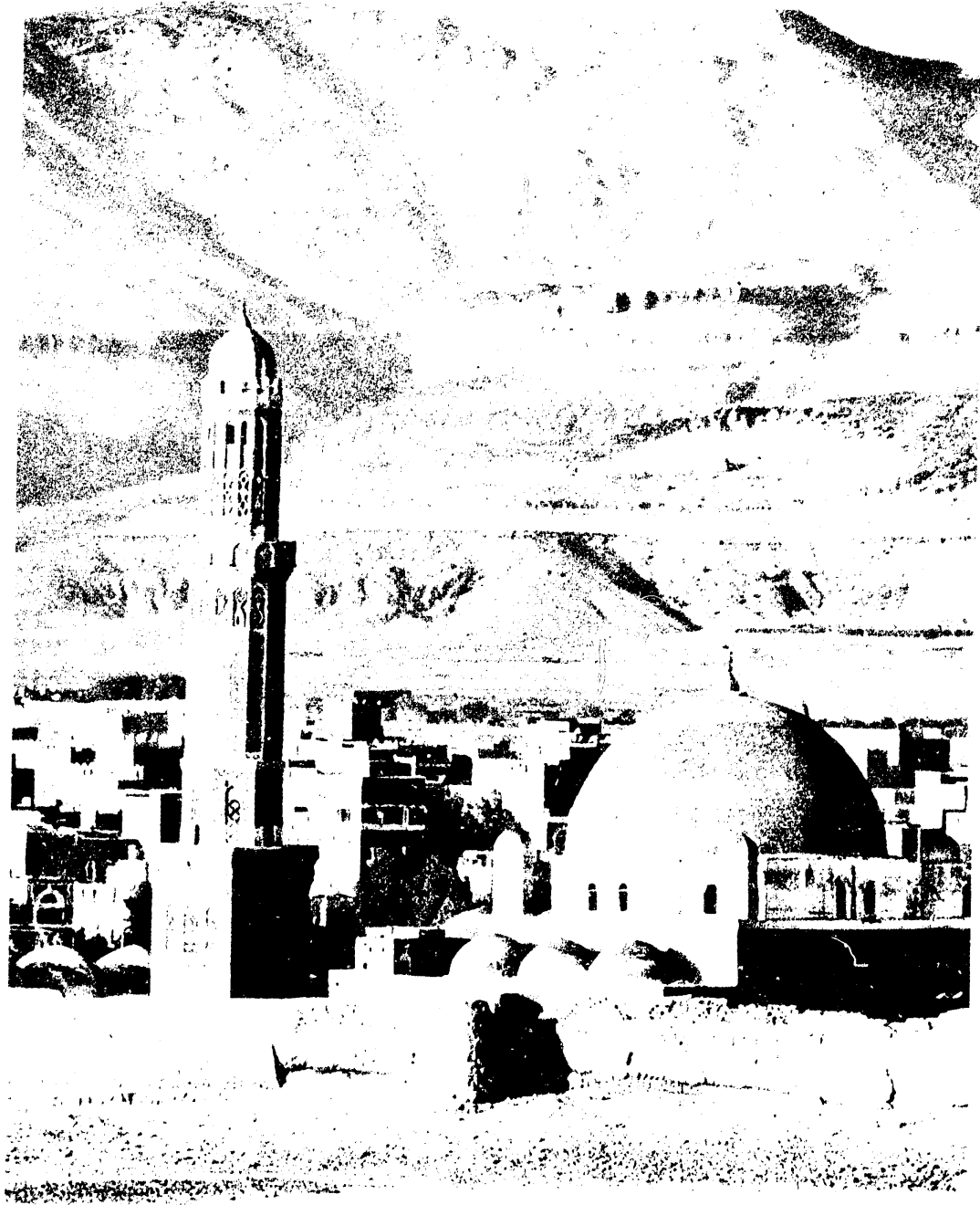
- A. Location and description** ..... 1
  - Importance of location, size of country, and number of people.
  - 1. Topography** ..... 1
    - Brief overview of landforms, vegetation, water supply, pattern and physical characteristics of settlements, and transportation network.
  - 2. Climate** ..... 4
    - Summary of climatic elements—temperatures, rainfall, cloudiness, relative humidity, winds, and visibility—in the eastern plains, hills and mountains, and the coastal plain.
- B. Military geographic regions** ..... 5
  - Effect of terrain on operations by conventional ground forces, airmobile and airborne forces, amphibious forces, and irregular forces in the following regions:
    - 1. Western Plains and Highlands** ..... 5
    - 2. Desert Plains** ..... 8

CONFIDENTIAL

	<i>Page</i>		<i>Page</i>
<b>C. Strategic area</b> .....	8	<b>1. Land</b> .....	10
Population, primary activities, significant industries, and key airfields in the San'a' strategic area and in another important area, Al Hudaydah.		Conditions for movement in the border zones, and description of terrain.	
<b>D. Internal routes</b> .....	10	<b>2. Sea</b> .....	11
Description of terrain, road characteristics, and conditions for off-road dispersal and cross-country movement along the land routes connecting the land approaches and the San'a' strategic area.		Conditions for amphibious approach to the coast.	
<b>E. Approaches</b> .....	10	<b>3. Air</b> .....	11
Data on land boundaries, coastline, and distance of offshore territorial waters.		Approach routes to Yemen and critical terrain and weather conditions en route.	

**FIGURES**

	<i>Page</i>		<i>Page</i>
<b>Fig. 1</b> Military geographic regions and terrain ( <i>map</i> ) .....	2	<b>Fig. 9</b> Strategic area, internal routes, and approaches ( <i>map</i> ) .....	9
<b>Fig. 2</b> Rugged mountains west of San'a' ( <i>photo</i> ) .....	3	<b>Fig. 10</b> San'a' strategic area ( <i>map</i> ) .....	10
<b>Fig. 3</b> Narrow stream valley in highlands ( <i>photo</i> ) .....	4	<b>Fig. 11</b> San'a' ( <i>photo</i> ) .....	11
<b>Fig. 4</b> Plains in the northeast ( <i>photo</i> ) .....	4	<b>Fig. 12</b> 26 September Street ( <i>photo</i> ) .....	11
<b>Fig. 5</b> Desert plains ( <i>photo</i> ) .....	5	<b>Fig. 13</b> Terrain along northern land approach ( <i>photo</i> ) .....	12
<b>Fig. 6</b> Street scene in Jisayn ( <i>photo</i> ) .....	6	<b>Fig. 14</b> Weather conditions in the air approaches ( <i>table</i> ) .....	12
<b>Fig. 7</b> Ta'izz ( <i>photo</i> ) .....	6	<b>Fig. 15</b> Terrain and transportation ( <i>map</i> ) .....	13
<b>Fig. 8</b> Climatic elements ( <i>chart</i> ) .....	7		<i>follows</i>



*San'a' (u/ou)*

# Military Geography

## A. Location and description (U/OU)

Yemen (San'a')—the Yemen Arab Republic—is located in the southwestern corner of the Arabian Peninsula, north of the strait connecting the Red Sea with the Indian Ocean. The northern boundary of the country is within 800 nautical miles of the principal Persian Gulf ports, about 1,000 nautical miles from Cairo, Egypt, and within 1,300 nautical miles of the U.S.S.R.

Yemen has an estimated area of about 75,000 square miles. The country's exact size is difficult to determine because Yemen has no established boundaries in the east. Using the boundary in the east recognized by the British, the country's size and shape is about the same as that of Illinois. Maximum dimensions are 340 miles<sup>1</sup> north-south and about 250 miles east-west. Yemen, less barren than most of the Arabian Peninsula, has a relatively high population density—an estimated 6,074,000 inhabitants.

### 1. Topography

Yemen consists of a coastal plain bordering the Red Sea, backed by a broad range of hills and high mountains which fall away eastward to a flat to dissected desert plain (Figure 1 and the map, Figure 15, at the end of the chapter).

The mountains and hills, 2,000 to 10,000 feet in elevation, are in wide ranges that extend across Yemen from the Saudi Arabia boundary in the north to Yemen (Aden)—the People's Democratic Republic of Yemen—in the south and southeast. A few mountains exceed 11,000 feet; the highest peak of the Arabian

<sup>1</sup>Distances are in statute miles unless nautical miles are specifically stated.

Peninsula, located west of San'a',<sup>2</sup> is 12,336 feet in elevation (Figure 2). The mountains and hills are part of an irregular belt of highlands extending along the entire west coast of the Arabian Peninsula. Slopes in the mountains and hills are commonly 30% to more than 45%. The mountain summits are at least 2,000 feet above adjacent valleys and frequently are 4,000 to 6,000 feet. The stony soils are shallow with numerous outcrops of bedrock. Hills, including numerous volcanic cones, are generally 500 to 2,000 feet above adjacent valleys. Small lava flows occur in some hill areas. The sandy coastal plain, mostly from 15 to 30 miles wide, is usually flat to gently sloping, but in places is deeply dissected by wadies. In some areas near the coast there are discontinuous, low sand dunes and scattered salt flats. The plain ranges in elevation from sea level to 2,000 feet, with slopes generally less than 5% except in areas of dissection, where they are 20% to 45%.

The mountains and hills are drained by several streams, which are perennial in the highlands but intermittent along their lower courses across the coastal plain. Upper and middle stream courses are commonly confined in narrow, steep-sided valleys (Figure 3) and gorges, and gradients are steep; lower courses are generally broad, with moderate to gentle gradients. Tributaries and most smaller watercourses in the mountains and hills are intermittent throughout the year and flow, generally for brief periods, only after occasional torrential rains. Flooding of valley bottoms may occur, although most of the runoff is caught by low, earthen dams. The water is diverted via irrigation ditches to many small terraced fields on slopes adjacent to stream valleys (see the Economy chapter, under Agriculture). The terraces, which have stone retaining walls 6 to 20 feet high, cover large

<sup>2</sup>For diacritics on place names see the list of names on the apron of the Terrain and Transportation map, the map itself, and maps in the text.



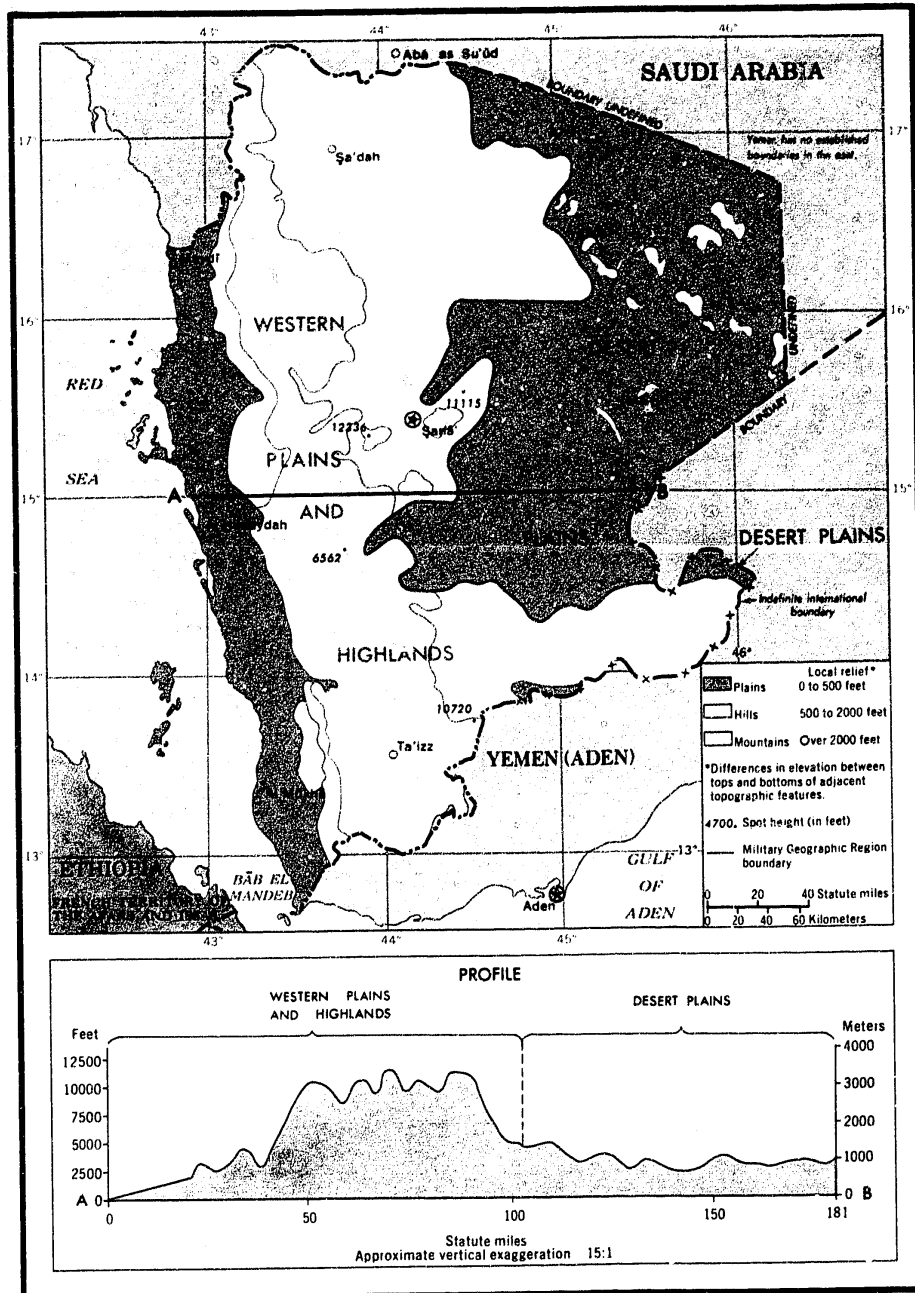


FIGURE 1. Military geographic regions and terrain (C)

areas of the western slopes of the highlands between 3,000 and 9,000 feet in elevation.

Extensive desert plains with scattered low hills occupy much of the interior of Yemen. The plains (Figure 4) are flat to dissected and have mainly sandy surfaces. Large areas of the plains adjacent to the mountains and hills are deeply dissected by steep-banked wadies. High sand dunes occur in the north, near the Saudi Arabia border, and low dunes cover a large area east of Ma'rib. Elevations in the plains range from about 9,000 feet in the southwest to 2,000 feet in the northeast. Local relief is usually 200 to 400 feet in dissected areas, about 500 feet near the scattered low hills, and from 40 to about 350 feet in areas of sand dunes. Slopes in dissected areas, sand dunes, and hills may exceed 30%; elsewhere slopes are generally less than 5%.

Vegetation is sparse throughout the greater part of Yemen. Most of the northern and eastern plains are barren. Parts of the southern and western plains are sparsely covered by low grass as well as deciduous bushes. A few small scattered oases, mostly located in wadies, have palm trees, grass, and bushes. Most of the western plains and the adjacent hill areas, from 5,000 to 10,000 feet in elevation, support cultivated

vegetation. Crops include grains and vegetables, and there are a few small fruit trees. Extensive areas of cultivated cropland cover much of the terraced western slopes of the hills and mountains. Crops grown on the terraces include grains, cotton (*qat* is mild narcotic), and coffee. The coastal plain west of the mountains and hills is virtually barren (Figure 5). A few oases with palm trees and small gardens are located in wadies, chiefly at elevations below 4,000 feet.

Water supplies are perennially available in most of the highlands, but scarce in the plains. Large amounts of water may be obtained from the upper and middle courses of several perennial streams in the hills and mountains. Other streams are intermittent, and their channels may contain water for only a few hours following rains. Throughout much of Yemen, surface water is generally lacking, and supplies must be obtained from ground water sources. Large quantities of ground water are generally available from shallow wells in the mountains and hills above 6,000 feet. Limited amounts of ground water can be obtained from wells less than 50 feet deep in the hills below 6,000 feet, in plains adjacent to the hills, and along the coastal plain. Only meager quantities of water at

FIGURE 2. Rugged mountains west of San'a' traversed by Chinese-built road (U/OU)



FIGURE 3. Typical stream valley in the highlands. Most streams are intermittent, but the upper and middle courses of some are perennial. (C)



depths which range seasonally from 100 to 700 feet are available in the northern and eastern desert plains, near the interior border with Saudi Arabia.

Most towns and villages in Yemen are small, old, and compact; some are surrounded by clay walls. Buildings are usually flat-roofed multistory structures constructed of mudbrick or stone (Figure 6). Streets are predominantly narrow and unpaved (Figure 7), and many are winding. The widely separated towns and villages are connected by a sparse network of surfaced and unsurfaced roads and tracks.

## 2. Climate

The climate of Yemen has marked contrasts, which result primarily from the variation of elevations and proximity to the Red Sea (Figure 8). The plains east of the mountains have a desert climate, and the central hills and mountains above about 7,000 feet have a moderate climate. The coastal plain has a tropical dry climate with uniformly high temperatures and humidity throughout the year.

The eastern plains have very high temperatures in summer (June through August); however, much more comfortable temperatures are experienced during the remainder of the year. Diurnal temperature variations are always large. Throughout the year, cloudiness and rainfall are scanty, relative humidity is low, days with thunderstorms are few, and surface winds are mostly light and variable. Occasionally, however, strong and gusty winds occur in June through September. Visibility is usually excellent but may be restricted at times by haze, or by blowing dust during strong winds.

The hills and mountains have the most pleasant climate on the Arabian Peninsula. Between about 7,000 and 9,000 feet, mean daily maximum temperatures in summer are mostly in the 70's and 80's (°F.). Mean daily minimum temperatures are lowest in November through January, when values are just

FIGURE 4. Plains in far northeastern part of the country (U/OU)



slightly above freezing near 8,000 feet. Maximum cloudiness occurs during summer afternoons, when cumulus clouds build up over the westward-facing mountain slopes. These clouds normally dissipate during the night, and early mornings are usually clear or partly cloudy. During the remainder of the year, cloudiness is scanty. Most rainfall occurs in April through October as afternoon and evening showers. Relative humidity seldom exceeds 70% throughout the year. Thunderstorms occur on 5 or fewer days per month in March through August, but are rare at other times. Surface winds are strongly influenced by topography and are generally light. Occasional strong winds occur in some mountain passes and during thunderstorms. Visibility is generally excellent.

The coastal plain has some of the most enervating climatic conditions along the Red Sea, caused by the warm temperatures and high humidity. Cloudiness all year is usually 30% or less during the afternoons, and only slightly more during the mornings. Rainfall is meager, averaging 5 inches or less per year, and usually in the form of showers. Thunderstorms occur as frequently as 4 days per month in July through September. Visibility is usually good in November through April but is occasionally reduced by blowing dust in other months. Throughout the year during the afternoon, sea breezes are very pronounced along the coast, where wind speeds of 11 to 21 knots are common. At night and in the mornings, land breezes are usually light, and calm conditions occur frequently.

## B. Military geographic regions (C)

Differences in the terrain are the basis for dividing Yemen into two military geographic regions—Western Plains and Highlands, and Desert Plains (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 the regions.

### 1. Western Plains and Highlands

This region comprises about 65% of Yemen and includes the rugged, mountainous western part of the country. The region contains highland mountain ranges, adjacent hills, and the narrow Red Sea coastal plain. The mountains and hills have steep slopes with extensive terraced areas on slopes adjacent to stream valleys. The coastal plain is flat to dissected, with some areas of salt flats and coastal dunes. There are a few perennial streams and a sparse transportation network.

In general, the region is unsuited for conventional ground operations. Cross-country movement would be severely restricted by steep slopes in the hills and mountains and by dissected areas, salt flats, and dunes on the coastal plain. Vehicular movement would be limited to flat areas of the coastal plain and to a few dry streambeds. Movement along bottoms of the winding, steep-sided valleys would be limited by periodic flooding, which is most frequent from April through October. Movement would be generally easy on the few surfaced roads crossing the region. Most of

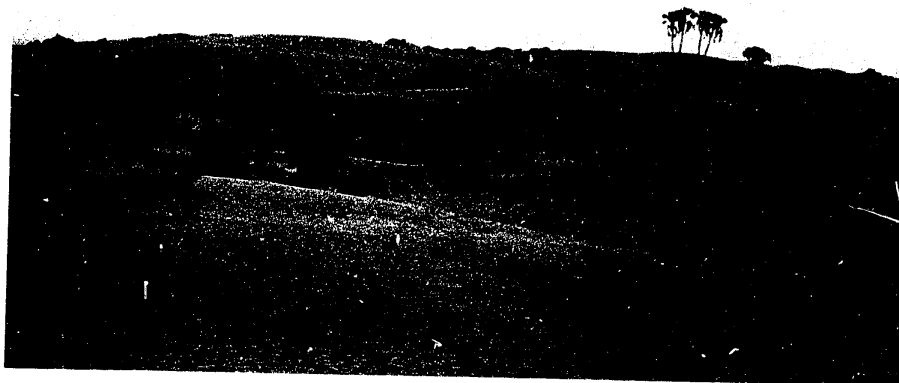


FIGURE 5. Desert terrain on the coastal plain near Bayt al Faqih (C)

the unsurfaced roads and tracks are in poor condition and would support only limited military traffic. Onroad movement on unsurfaced roads following heavy rains would be hindered by miry road surfaces and numerous washouts. Wadi crossings are potential bottlenecks during flash floods, when streams may be too swift and deep to cross. In most places, offroad dispersal would be severely restricted by steep slopes and rugged terrain. Road construction would be difficult in the hills and mountains; alignments would be severely restricted, and many steep grades, switchbacks, and sharp curves would be required. Conditions are favorable for road construction in the plains except in discontinuous areas along the coast, where sand dunes and salt flats are hindrances, and in places deeply dissected by wadies. Construction materials generally are available throughout most of the region, but water supplies are perennially available only in the highlands. Concealment from ground observation and cover from flat-trajectory fire would be provided by steep slopes and surface irregularities in the highlands, and by high wadi banks and sand dunes in the coastal plain. Trees, bushes, and cultivated crops provide some concealment from air and ground observation. Numerous sites are suitable for underground installations. Deep soils of the coastal plain provide many sites for bunkers, but drainage would be a problem, especially from April through October. The steep hills and mountains provide many sites for tunnels in granitic and basaltic rocks. Short entries are possible, and drilling and blasting would be required.

The region is largely unsuited for airmobile and airborne operations. Operations would be hampered by steep, rugged slopes in the highlands, by sand dunes, salt flats, and deeply incised wadies in parts of the coastal plain, and by strong winds and poor

visibility. Only the flat sandy surfaces of the plain are well suited for parachute drops, helicopter landings, and assault-type aircraft landing sites. Approaches to these sites, however, are restricted by the proximity of high mountains. In addition, strong winds occasionally occur along the coastal plain in June through September, and visibility may be reduced by haze and blowing dust. Existing airfields are located near San'a' and along the Red Sea coastal plain. Airfield construction would be limited to sites on the coastal plain, but runway orientations would be restricted, and access to the sites is generally limited to a few tracks and trails.

The region is moderately suited for irregular force operations. Concealment and cover would be available in most areas for small groups of irregular forces. Potable water supplies could be obtained from streams and wells, and food is seasonally available from crops in widespread terraced fields. Additional food may be obtained at widely spaced settlements in the region. Shelter materials are scarce. Supplies could be airdropped, but recovery would be difficult in the rugged highland terrain. Supply by sea is possible along a few short beaches, but nearshore approach conditions are generally hazardous. Mountains and hills of bordering Saudi Arabia and Yemen (Aden) afford concealment from ground observation of irregular forces crossing the border and could provide sanctuaries for forces operating in Yemen (San'a').

The coast of the region is unsuitable for large-scale amphibious operations because of fringing reefs, flat nearshore gradients, and poor exits. The offshore approaches are restricted in the south by the strait of Bab el Mandeb, which is divided into two passages by Perim Island, and are partly obstructed elsewhere by scattered volcanic islands. Nearshore approaches are partly obstructed by fringing reefs, rocks, islets, and

FIGURE 6. The town of Jisayn in Sa'dah province (U/OU)



FIGURE 7. Street scene in Ta'izz (C)



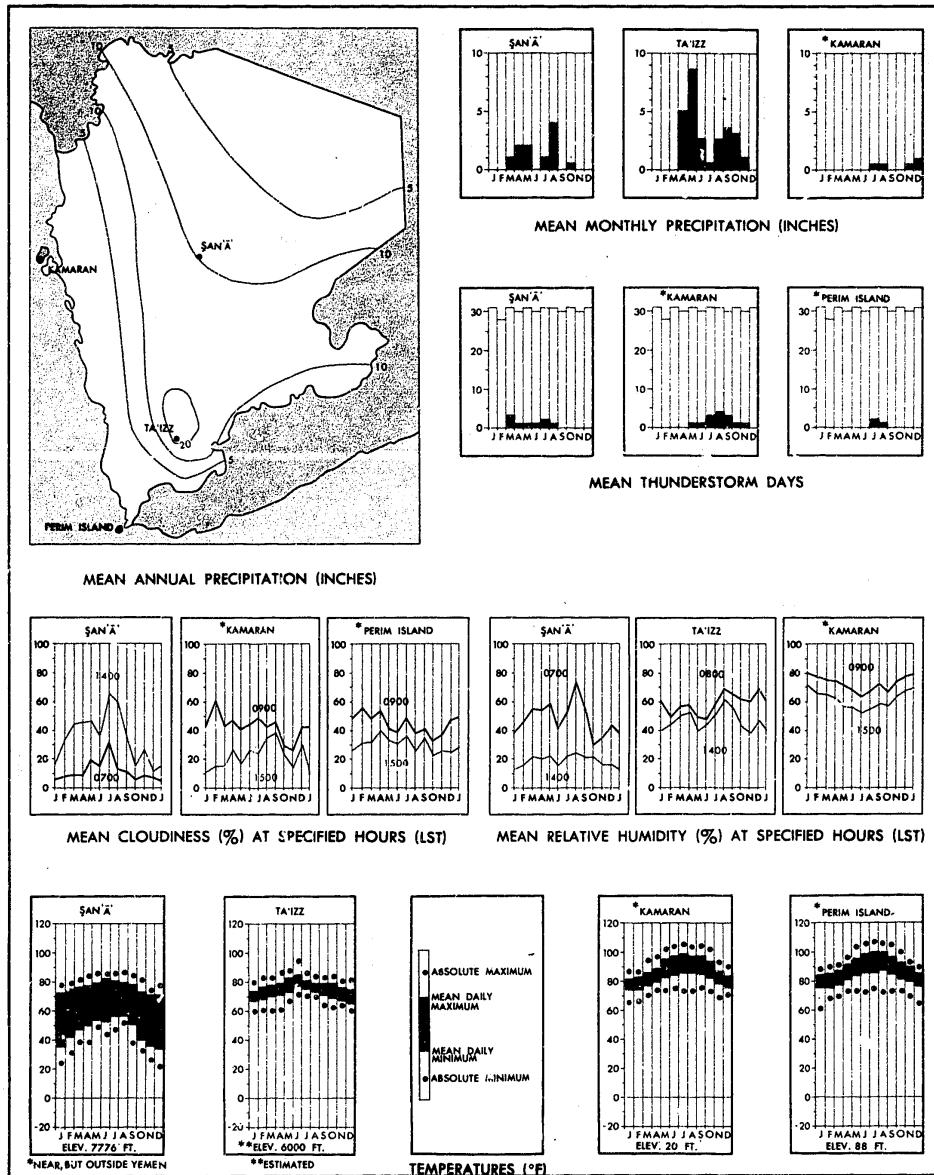


FIGURE 8. Precipitation, thunderstorms, cloudiness, relative humidity, and temperatures (U/OU)

shoals. The coastal terrain consists of sandy desert plains fronted by dunes and backed by rugged hills and mountains. A few scattered sandy beaches fringe the coast of Yemen, but most are short and approach conditions are hazardous. None of the beaches are suitable for large-scale amphibious landings.

**2. Desert Plains**

This predominantly arid region occupies the interior of Yemen, comprises about 35% of the area of the country, and includes several small areas of low hills. The plains are flat to dissected and in areas adjacent to hills, deep dissection by steep-banked wadies is common. Sand dunes occur in the north and east near the borders with Saudi Arabia and Yemen (Aden). The northern and eastern plains are generally barren; other parts support grass, bushes, cultivated crops, and a few small oases with palm trees.

The region is poorly suited for conventional ground operations. Cross-country movement would be restricted in direction by numerous wadies, which dissect large areas of the plains, and would be hindered in areas of sand dunes and by scattered low hills. Elsewhere, vehicles could generally move easily across the flat, sandy plains. Existing land routes across the region are limited to a few unsurfaced roads and numerous tracks and trails; a short segment of the surfaced road from San'a' to Ta'izz crosses the plains in the west. Vehicles could follow the tracks and trails across most areas; however, bypasses would be required at crossings of steep-sided wadies. In most areas of flat plains, roads could be constructed with fairly good foundations, mostly unrestricted alignments, low gradients, and gentle curves. Elsewhere, construction would be severely restricted by sand dunes and deeply dissected areas. Construction materials, except for water, are available locally, but high summer temperatures could hinder road construction. Concealment from air and ground observation in most of the plains would be generally scarce or lacking. Some concealment from ground observation and cover from flat-trajectory fire would be available locally from sand dunes, wadi banks, and low hills. The region is largely unsuited for the construction of underground or tunnel-type installations. Tunnel construction would be limited to the small areas of low hills, where tunnels with short entries could be excavated in granitic rock. Bunker construction would be limited by shallow or unstable soils and areas of sand dunes. Bunkers could be

constructed in part of the region, mostly in the east, where soils are stable.

Conditions in the desert plains are generally unfavorable for airmobile and airborne operations. Dissected areas, sand dunes, and hills are unsuited for landings with parachute, helicopter, and assault-type aircraft; these types of terrain are also unsuitable for construction of airfields. A few, widely separated airfields are located east of San'a', and near the border with Yemen (Aden). On the flat plains many landing sites are available. Large fields could be built on good foundations with little grading; approaches would be unrestricted; and construction materials, except for water, are generally available. However, the lack of water, poor cover and concealment, and high summer temperatures would make operations difficult.

The region is also unsuitable for irregular force operations because of poor concealment and an almost complete lack of water, food, and shelter materials. Although irregular forces could move on foot easily throughout most of the region, concealment from air observation would be lacking, and cover from flat-trajectory fire would be unavailable in most of the region. Supplies could be airdropped almost everywhere, although retrieval in dune and dissected areas would be difficult.

**C. Strategic area (C)**

The San'a' strategic area (Figures 9 and 10), the only one in this predominantly agricultural country, contains San'a', the capital, largest city (1972 estimated population 120,000), and the principal commercial and military center of the country. The ancient, partly walled city (Figures 11 and 12) is located at a major hub of the country's road system, and two airfields are nearby. San'a' military installations include a headquarters building, barracks, and an ordnance depot. Except for a large textile factory, San'a' does not contain any significant industrial installations.

The second largest city is Al Hudaydah (1972 estimated population 90,000), the country's chief general cargo port and the only port with facilities for alongside handling of oceangoing vessels. The city is a commercial center for much of the coastal area of Yemen and contains the only bulk refined petroleum products storage area in the country (storage for 56,000 barrels). The port city has small textile and wooden ship building industries, several small military depots, and an airfield.

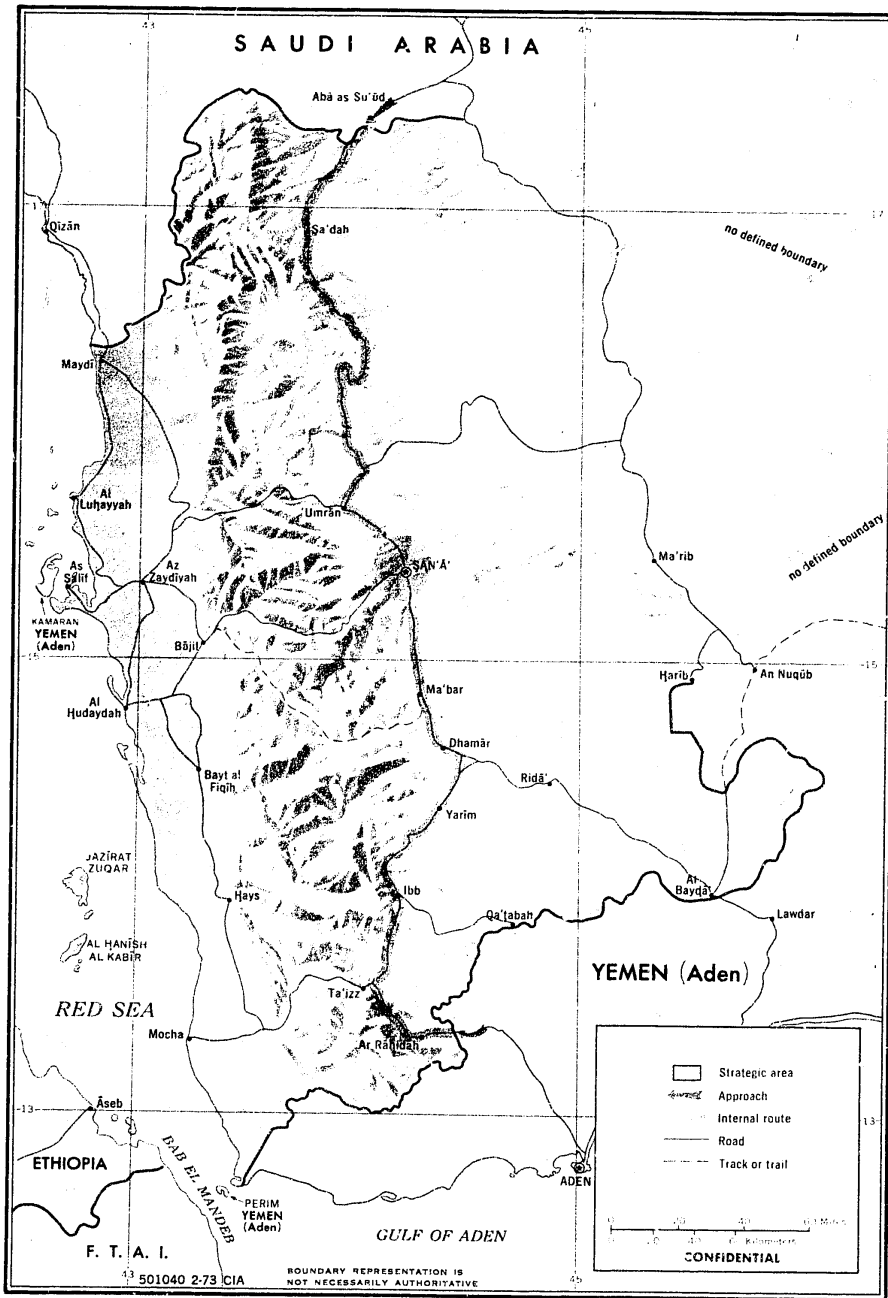


FIGURE 9. Strategic area, internal routes, and approaches (C)



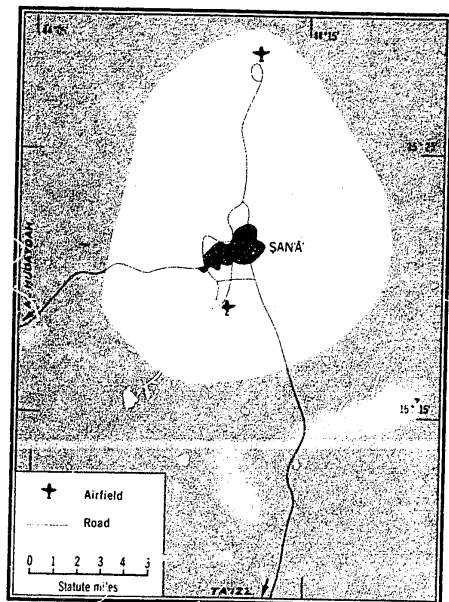


FIGURE 10. San'a' strategic area (C)

**D. Internal routes (C)**

The internal routes (Figure 9) provide the easiest avenues of movement between the land approaches and the strategic area.

The route connecting the approach from Aba as Su'ud, Saudi Arabia, with San'a' is across rugged hills and several wide wadi valleys. The road is 10 to 12 feet wide, earth, and in poor to fair condition except for 40 miles north of San'a', where it is 18 to 20 feet wide, has a bituminous treated surface, and is in good condition. The road is subject to flooding in valleys, and traffic would be stopped at times by water in some wadies. Conditions for offroad dispersal and cross-country movement are generally poor to unsuited because of steep slopes and rough surfaces.

The route connecting the approach from Aden with San'a' is across rugged hills and mountains and dissected desert plains. It is a two-lane, gravel-surfaced road in good condition. Offroad dispersal and cross-country movement would be easy in parts of the plains, but difficult elsewhere because of steep slopes. The road contains steep grades and numerous curves

in the mountains near the border with Yemen (Aden), and some segments are subject to flooding.

**E. Approaches**

Yemen has about 950 miles of land boundaries and about 325 miles of coastline. It claims territorial jurisdiction for 12 nautical miles offshore. The 450-mile boundary with Saudi Arabia is across barren coastal plains, hills and mountains with brush and scattered small trees, and interior desert plains. The western one-third of this boundary is demarcated and undisputed, and has ancient forts that are mostly in ruins; the remainder is undefined, disputed, and unfortified. The 500-mile boundary with Yemen (Aden) crosses the barren coastal plains, rugged hills and mountains with scattered small trees and bushes, and interior desert plains dissected by widely separated wadies. The southwestern third of the boundary is demarcated; the remainder is undefined. The boundary is unfortified except for ruins of a few ancient mud-walled forts. (U/OU)

**I. Land (C)**

Conditions for cross-country movement in the border areas generally are unfavorable for conventional forces because of rugged terrain and steep slopes. Rugged hills and mountains preclude movement along parts of the borders in the northwest and south; dissected plains and areas of sand dunes restrict cross-country movement along most of the remaining border areas. Only a few roads and trails cross the borders of Yemen. Roads entering Yemen from Saudi Arabia or Yemen (Aden) cross plains or are in winding wadi valleys.

The northern approach, from Aba as Su'ud, Saudi Arabia, is in a wadi valley, which crosses desert plains and hills (Figure 13). The approach contains a winding, one-lane trail in poor condition. Cross-country movement and offroad dispersal generally would be precluded by high, gravel wadi banks. The route is also subject to flooding following sudden downpours.

The southern approach, from Aden, crosses rugged hills and mountains and dissected coastal plains. The route contains a two-lane, partly gravel-surfaced and partly bituminous-surfaced road in good condition but with numerous sharp curves. Movement is slowed after heavy rains by slippery surfaces and washouts, and traffic is stopped at times by water in some wadies. Narrow, winding streets through scattered settlements are potential bottlenecks. Conditions for

offroad dispersal and cross-country movement are poor or unsuitable for the most part because of steep slopes and rocky surfaces.

**2. Sea (C)**

Sea approaches are through the Red Sea, via the Suez Canal in the north and the 16-mile-wide Bab el Mandeb in the south. Conditions are unfavorable for large-scale amphibious operations because of predominantly flat nearshore gradients and partly obstructed approaches. Offshore approaches are partly obstructed by islands; nearshore approaches are partly obstructed by fringing reefs, rocks, islets, and shoals. Nearshore bottom slopes are mostly flat. Nearshore bottom material is mostly sand, gravel, and rock. Surf 4 feet or higher occurs infrequently during all months. Tides range from 2.8 feet, springs, to 2.2 feet, diurnal.

**3. Air (U/OU)**

Air approaches<sup>3</sup> to Yemen are mostly over land. Approaches from the north and east are over the mountains, hills, and plains in southwestern Saudi Arabia and central Yemen (Aden). From 110 to 200 nautical miles north of the border, mountain peaks in Saudi Arabia reach elevations of about 10,000 feet. East of the border 140 nautical miles, maximum elevations of 8,100 feet occur in the hills of Yemen (Aden). Approaches from the southeast and south are over hills and mountains in the western part of Yemen (Aden), the Gulf of Aden, and the plains and hills in the northwestern part of the Somali Republic. Hills in Yemen (Aden) as high as 8,200 feet are within 15

<sup>3</sup>The discussion zone for air approaches extends approximately 200 nautical miles beyond the borders of Yemen (San'a').

FIGURE 11. San'a', the largest city, lies in an intermontane valley at an elevation of approximately 7,500 feet (U/OU)



FIGURE 12. 26 September Street, the only modern street in San'a' (U/OU)





FIGURE 13. The northern land approach is in a wadi with steep, dissected banks that may fill with water for short periods after a heavy rain (C)

nautical miles of the southern border. Hills in the Somali Republic of 8,500 feet are about 200 nautical miles south of Yemen. Approaches from the west are over plains and hills in the French Territory of the Afars and Issas (FTAI), plains, hills, and mountains in northeastern Ethiopia, and the Red Sea. Elevations are generally less than 3,000 feet in the FTAI; however, mountain peaks of almost 9,000 feet occur in Ethiopia, 200 nautical miles west of the Yemen coastline.

In general, weather conditions are favorable for flying in all approaches throughout the year. The northern and eastern approaches have the most

favorable weather conditions for flight. Here, mean cloudiness seldom exceeds 25%, and thunderstorms rarely occur on more than 1 day per month. There is little risk of aircraft icing because of scanty cloudiness. The mean freezing level remains near 15,000 feet throughout the year. Severe turbulence is seldom present except in thunderstorms or towering cumulus clouds, and visibility is seldom restricted. However, light to moderate turbulence is common in summer at low elevations over the hot desert approaches.

In the southeastern and southern and the western approaches, weather conditions are least favorable for flight during the southwestern monsoon, especially in

FIGURE 14. Weather conditions in the air approaches (U/OU)

ELEMENT	NORTHERN AND EASTERN APPROACHES	SOUTHEASTERN AND SOUTHERN APPROACHES	WESTERN APPROACHES
Cloudiness (%)	Maximum: Dec. thru May, 15 to 25. Minimum: June thru Nov., 10 to 20.	Maximum: Dec. thru April, 50 to 60. Minimum: May, June, and Sept. thru Nov., 15 to 40.	Maximum: Jan. thru Mar. and July thru Sept., 20 to 60. Minimum: May thru June and Oct. thru Nov., 20 to 40.
Thunderstorm days per month	Maximum: Sept. to Feb., 0 to 1. Minimum: May thru Aug., 0.	Maximum: Apr. thru Oct., 0 to 4. Minimum: Nov. thru Mar., 0 to 1.	Maximum: July thru Oct., 0 to 4. Minimum: Nov. thru Apr., 0 to 1.
Upper winds:			
Direction	Predominantly westerly above 20,000 feet except in June thru Aug., when easterlies prevail between about 20,000 and 54,000 feet.	Predominantly easterly June thru Nov. between 30,000 and 54,000 feet and westerly Dec. thru May. Easterlies prevail all year below 20,000 feet.	Predominantly easterly or southeasterly June thru Nov., between 30,000 and 54,000 feet and westerly Dec. thru May. Below 20,000 feet, directions are variable.
Speed	Maximum westerlies 50 to 60 knots, Dec. to Feb. 30,000 to 40,000 feet. Maximum easterlies 55 knots, June thru Aug., near 55,000 feet.	Maximum westerlies do not exceed 35 knots below 55,000 feet. Maximum easterlies 55 knots, June thru Aug. near 54,000 feet.	Maximum westerlies 50 knots, Dec. thru Feb. near 54,000 feet. Maximum easterlies 50 knots, June thru Aug., near 55,000 feet.

CONFIDENTIAL

July through October. Convective cloudiness may be intense and develop to great heights during this period. The primary hazards to flight are aircraft icing and severe turbulence within and near thunderstorms, the tops of which often extend above 40,000 feet. The mean height of the freezing level remains near 15,000

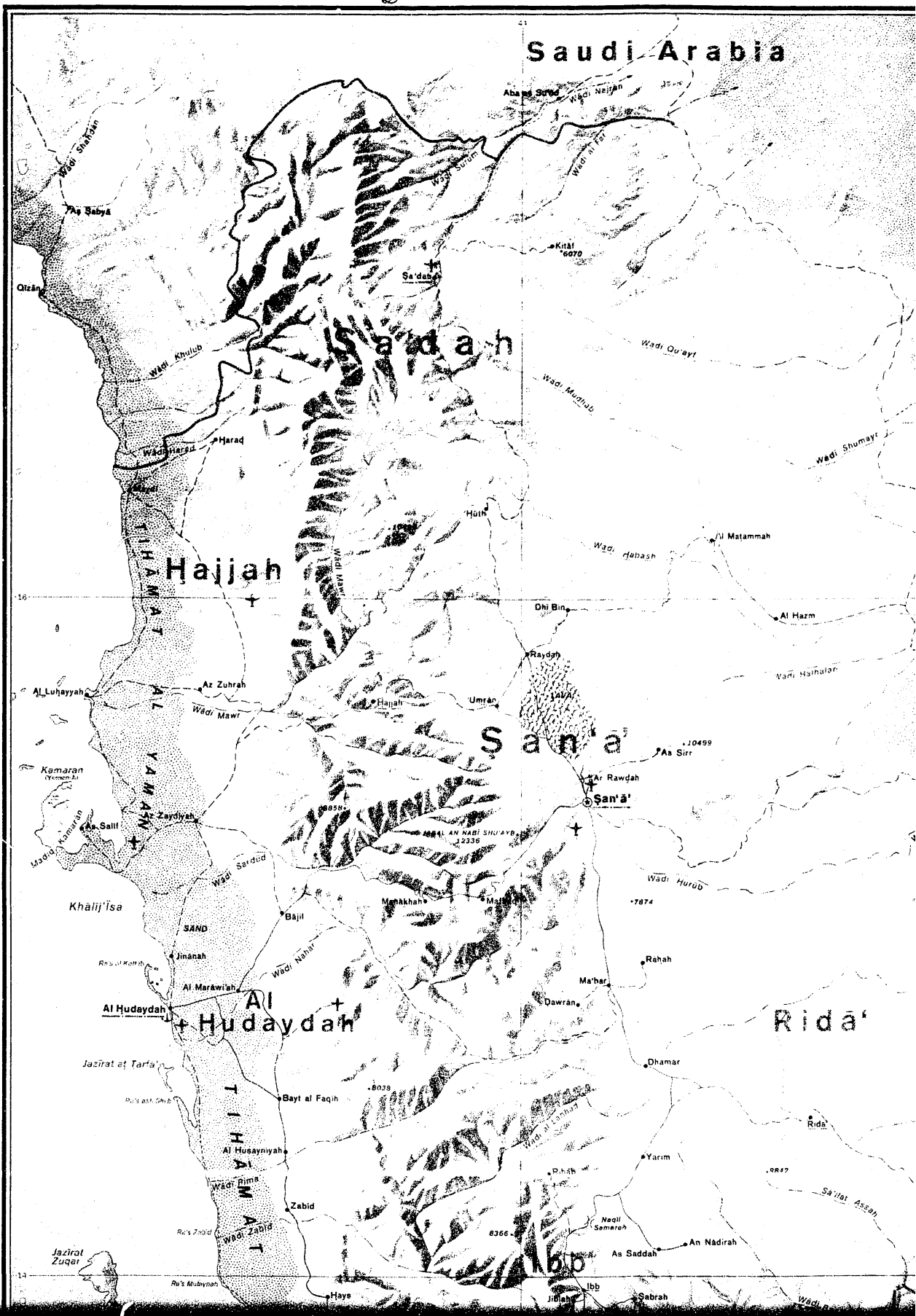
feet in both approaches throughout the year. Visibility is usually good except when reduced by blowing dust and haze over desert areas. These restrictions occur most frequently during the summer months. Additional climatic information for the air approaches is presented in Figure 14.

CONFIDENTIAL

18



5











only (9)

Terrain and Transportation Figure 15

**CONFIDENTIAL**

**CONFIDENTIAL**