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Project 30, 3889

5 AUG 1963

**MEMORANDUM FOR: Director, Office of Research and
Analysis for Africa
Bureau of Intelligence and Research
Department of State
Washington 25, D. C.**

**SUBJECT: Transmittal of Special Study of the Trans-
portation Systems of Southern Africa**

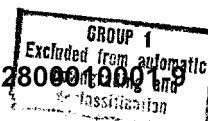
1. In February of this year, you requested a special study in depth of the transportation systems of southern Africa. We have now completed a preliminary study in response to your request entitled, Economic and Strategic Capabilities and Vulnerabilities of the Transportation Systems of Southern Africa, dated 10 July 1963, and are enclosing 25 copies.

2. You will note in the Foreword of this study that other Offices of CIA have contributed to its preparation. The findings are considered to be preliminary, even though the statistical base is probably not too old to support the principal conclusions of the report. More current data, particularly on the Congo, will give us greater confidence in the findings, and make the study more useful for reference purposes. There is also a great need for current information on railroad freight rates and ocean freight rates, as applicable to the principal exports of various territories of southern Africa, and the impact of these rates on the competitive position of their exports in world markets.

3. A general up-dating of this study in the field, including comments on the various political, economic, and military estimates would be most valuable. Particular attention to the railroad and ocean freight rate aspects is required for definitive analysis. Undoubtedly INR and other headquarters components of the Department

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SUBJECT: Transmittal of Special Study of the Transportation Systems of Southern Africa

could also be of great assistance by reviewing and commenting on the present draft.

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4. I suggest that [REDACTED] of this Office continue to work with Mr. Lewis of your organization in bringing this preliminary study along to a more definitive state.

FOR THE ASSISTANT DIRECTOR, RESEARCH AND REPORTS:

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[REDACTED]
Chief, Economic Research Area

Enclosures:

25 copies, Economic and Strategic Capabilities and Vulnerabilities of the Transportation Systems of Southern Africa

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Enclosure 2

30. 3889

ADDRESS OFFICE OF THE SECRETARY OF STATE
WASHINGTON 25, D. C.

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DEPARTMENT OF STATE
WASHINGTON



February 19, 1963

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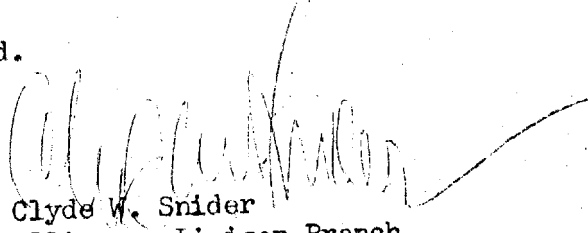
[Redacted]
Chief, Liaison and Collection Division
Office of Central Reference
Central Intelligence Agency

SUBJECT: Request for Special Study

If in a position to do so, the Agency is requested to undertake the preparation of a special study respecting strategic factors in central African transportation. The guidelines for such a study are contained in the attached copy of a memorandum from the Department's Office of Research and Analysis for Africa dated February 11, 1963.

No time limit is put on the completion of this study, since the Department is more interested in comprehensiveness than in speed.

Your cooperation will be appreciated.


Clyde W. Snider
Chief, Intelligence Liaison Branch
Bureau of Intelligence and Research

Enclosure:

Memo, INR/RAF to
INR/CS, Feb. 11, 1963

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27 FEB 1963

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INR/CS - Mr. Snider

February 11, 1963

INR/RAF - Robert C. Good

Request for Special Study Respecting Strategic Factors in Central African Transportation

Increasing nationalist activity in central and southern Africa highlights the vulnerability and growing strategic importance of transportation facilities in the area. Railroads, in particular, are both vital to the economic health of the area and popular targets for sabotage by guerrilla forces.

In order to establish a firm basis on which to estimate the impact of potential or actual disruption of such facilities, we should like to request that the CIA undertake a fairly extensive study focusing upon the following questions:

1) What is the economic and strategic (e.g., for troop movement) importance of the inter-territorial rail lines serving Angola, Mozambique, Federation of Rhodesia and Nyasaland, and Republic of South Africa? What would be the economic and strategic implications of a sustained disruption of traffic over these lines?

2) In the event of the disruption of any one line, would sufficient alternative facilities be available to sustain the present and projected traffic load? If not, what portion of present and projected traffic could be re-routed without major difficulty?

3) How significant are these lines as strategic levers -- i.e., to what extent could the local administrative power utilize control of the rail lines to force concessions from or retaliate against neighboring territories? (For example, Northern vs. Southern Rhodesia, Mozambique vs. Nyasaland, Angola vs. Congo-Katanga)

4) To what extent should we expect governments of the "white redoubt" (Portugal, Federation, South Africa) to assist each other in maintaining the integrity of transport facilities?

5) At what points are the lines most vulnerable to attack by a well-organized guerrilla force? Can we identify those portions of the rail complex, control of which might give a guerrilla force a decisive military advantage?

By way of illustration, we are interested in the following: How much income do Portugal and/or the Provincial administrations derive from the Beira and Benguela rail lines? What proportion (giving full statistical background) of Southern Katanga's and Northern Rhodesia's trade flow through Benguela? What is the projected capacity of the Congolese Voie Nationale to absorb Southern Katangan and Northern Rhodesian exports, thus relieving these areas of dependence on Portuguese facilities?

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In summary, it would be most useful to us to have a political-economic analysis, exploring the known economic factors in relation to such contingencies as are indicated in the preceding paragraph. We envision this as a fairly definitive study which would incorporate sufficient statistical data to provide benchmarks for future analysis.

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Analyst: [REDACTED] MS/TR

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CIA/RR EP 63-51
10 July 1963

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| THE ATTRIBUTION OF THIS REPORT TO AUTHOR IS | | | | | | | |
| APPROVED | | | DISAPPROVED | | | | |
| COMMENTS | | | | | | | |
| <p>1. It is recommended that the attached be published as a preliminary EP. Please see "Foreword".</p> <p>2. Working level coordination in process.</p> | | | | | | | |
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**ECONOMIC AND STRATEGIC CAPABILITIES AND VULNERABILITIES
OF THE TRANSPORTATION SYSTEMS OF SOUTHERN AFRICA**

(1)

CIA/RR EP 63-51

(ORR Project 30.3889)

10 July 1963

WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

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FOREWORD

This preliminary study has been undertaken by the Office of Research and Reports with the assistance of the Office of Current Intelligence at the request of the Department of State. The preliminary major findings and conclusions are concurred in by the staff of the Office of National Estimates. It is understood that the Department of State will disseminate this draft study to the field for additional review, emendation and updating, after which the Central Intelligence Agency will be requested to produce a definitive report on this subject.

The study is concerned primarily with the Portuguese provinces of Angola and Mozambique, the Republic of the Congo (Leopoldville), the Federation of Rhodesia and Nyasaland and the Republic of South Africa. Tanganyika is considered because an alternate transportation route for the trade of the Congo Republic and the Federation exists through that country. The high commission territories of Basutoland, Bechuanaland and Swaziland are included because of their economic dependence on South Africa and their transportation relationships with that country.

Department of State dispatches, official reports of the various territories, United Nations' publications, and military estimates produced by the Department of Defense [REDACTED] constitute the bulk of the source material used for the study. The specific sources are available in the files of this Office.

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THE ECONOMIC AND STRATEGIC CAPABILITIES AND VULNERABILITIES OF THE
TRANSPORTATION SYSTEMS OF SOUTHERN AFRICA

Summary and Conclusions

The white-dominated territories* of Southern Africa, through their command of the transportation outlets to the sea, derive considerable economic and strategic advantages over the independent and soon-to-be independent non-white dominated neighboring territories.** These advantages result from the high dependence of the market economies of both the non-white and the white territories on mineral and agricultural exports, and on the ability of the white-dominated territories to deploy and support substantial military and security forces on the inter-territorial and other transportation routes in Southern Africa. The white-dominated territories could affect the economies of the other territories materially by the imposition of embargoes on export and import traffic moving currently over the inter-territorial railroad system. This system, plus the roads, also has the capability of providing considerable mobility and substantial logistic support for military and security forces for use in combating uprisings, terrorist activities, and sabotage operations which may be inspired by African nationalism.

Although the economies of the white as well as the non-white dominated territories are highly vulnerable to adverse seizure and sabotage of the transportation system, particularly the railroads, several years will pass before non-white supported guerrilla forces will be able to hold temporarily parts of the inter-territorial transportation system. Small bands of well-trained saboteurs may soon have the capability, however, to operate against the railroad systems in Angola, Southern Rhodesia, Mozambique, and

*Angola, Southern Rhodesia, Mozambique and the Republic of South Africa.

** The Republic of the Congo (Leopoldville), Northern Rhodesia, and Nyasaland.

the Republic of South Africa, possibly supported by the Congo, Northern Rhodesia, Nyasaland and other non-white African countries. At least a year or two

will pass, nevertheless, before such bands will possess the skill to damage critically the key railroad routes.

The territories of Southern Africa possess an area roughly equal to the continental United States and a population one-third as large. The almost four million white residents control most of the modern economic enterprises which are based primarily upon the output of extractive industries. Agricultural products, minerals and metals, moreover, account for three-fourths or more of export earnings for each of the countries and territories in the area. The populous, developed countries^{of the West} constitute the most important markets and sources of supply. Trade with Western Europe alone involves nearly 60 percent of the exports and imports, and when trade with United States and Japan is also considered, almost 75 percent of exports and imports are accounted for. Only an estimated 10 to 12 percent of the foreign trade of the territories of Southern Africa is carried on with other countries of the area. Transportation within the area is underdeveloped except in the Republic of South Africa, but is more than adequate to support the market economies in their present stage of development. Only 10 percent of the 58 million native non-white Africans are involved in the market economies; the vast majority of the economically active Africans are engaged in subsistence agriculture.

The territories in the so-called "white redoubt" (the Portuguese provinces of Angola and Mozambique, Southern Rhodesia and the Republic of South Africa) have

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intelligence fields as overcome long-standing antipathies and have begun to cooperate in the defense and/ territories elsewhere have come under non-white control and as African nationalism inside their own boundaries has become more militant. There has been no indication, however, that they have given much thought to coordinated economic sanctions, and each government probably would embargo traffic with the interior only if directly and severely provoked by the non-white territory in question. If the "white redoubt" were to combine in an embargo of railroad traffic against the Congo, Northern Rhodesia and Nyasaland, the effect on the market economies of the latter territories would be devastating. The Republic of South Africa is a special case, for this country is not dependent on trade with the non-white territories and is not geographically situated so as to be able to impose an effective embargo on traffic with these territories. The vulnerability of South Africa to external pressures stems principally from the importance of trade with the West, primarily the United Kingdom and the United States.

The Portuguese provinces of Angola and Mozambique, although only nominal producers of minerals, lie astride major railroad routes over which the minerals of the Congo and Northern Rhodesia are exported to world markets. If the Portuguese provinces were to impose an embargo on traffic with the Congo and all or part of the Federation of Rhodesia and Nyasaland, the consequences for the market economies of the latter territories would be serious. By means of an embargo of traffic with Northern Rhodesia, Southern Rhodesia, acting alone, could effectively deny the railroad capacity needed for one-third of Northern Rhodesia's export-import traffic. The reluctance of the white-dominated territories to act together in imposing an embargo on traffic or to act independently will be influenced to some extent by the considerable revenues obtained from the transit traffic of the non-white territories and to a lesser extent by the trading relations which

exist between the two camps.

The fact that the vast majority of the native non-white Africans are engaged in subsistence agriculture could make the African nationalists willing to sacrifice the interests of the market economies of the area, and also poses problems in the formulation of goals for African nationalism. If African nationalism should have the choice to adopt as its goal the preservation of the market economies and the introduction of more and more of its members into these economies, it would not be rational to take actions which would invite embargoes on the traffic which normally moves over the inter-territorial transportation system or to support sabotage and guerrilla operations against this system. On the other hand, if African nationalism should by chance or by design adopt as a goal the complete control over all of Southern Africa in the shortest possible time regardless of economic consequences, seizure and sabotage of the inter-territorial transportation system will become an attractive target to use in furthering this goal.

In the event of a major uprising, the military and security forces of the white-dominated territories will be unable to maintain the integrity of the some 20,000 miles in the railroad system, but at the same time they will be able to operate against saboteurs and insurgents with only a slight reduction in capability even though the transportation system is no longer able to support normal economic activity. Thus the chief impact of a major uprising which succeeds in interrupting transportation service would fall on the market economies of the region, and it could also be serious enough to disrupt relations with the West. In this event normal trade would be interrupted from time to time and private investments required for the further development of the territories would probably be drastically reduced.

I. Introduction

A. Political Considerations

The area encompassed in this report ^{*} includes one independent, white-dominated republic (South Africa), one white-dominated British colony with a long history of self-government (Southern Rhodesia), two British protectorates whose governments are dominated by African nationalists (Northern Rhodesia and Nyasaland), two Portuguese "overseas provinces" whose white-controlled governments are closely supervised from Lisbon (Angola and Mozambique), one independent but chaotic African republic (Congo-Leopoldville), one territory governed by South Africa under a League of Nations mandate (South-West Africa), and three backward high commission territories which are governed by Britain but are economically dependent on South Africa (Basutoland, Bechuanaland, and Swaziland). The two Rhodesias and Nyasaland are joined at present in the Federation of Rhodesia and Nyasaland, but negotiations to begin the Federation's dissolution are underway. The whites in Southern Rhodesia are trying to persuade the British to grant them independence at the same time as the Federation's two African territories; Britain is holding out for greatly increased African representation in the colony's legislature but has to move cautiously for fear Southern Rhodesia will declare its independence unilaterally.

As territories elsewhere on the continent have come under African control and as African nationalism inside their own boundaries has become more militant,

*Includes: principally Angola, the Republic of the Congo (Leopoldville), the Federation of Rhodesia and Nyasaland, Mozambique, and the Republic of South Africa. The high commission territories and Tanganyika are covered predominantly in Appendix B and Appendix C.

the territories in the so-called "white redoubt" (South Africa, Southern Rhodesia, and the Portuguese territories) have overcome long-standing antipathies and now hold discussions in the defense and intelligence sectors. Formal treaties of cooperation -- much less such widely bruited amalgamations as that of Southern Rhodesia with South Africa -- are unlikely to occur. South Africa, whose strong and diversified economy includes a fairly substantial armaments industry, might furnish economic and military assistance, including "volunteers", to white governments to the north in an emergency; it probably would send uniformed troops out of the country only if its interests were directly affected, such as through the seizure of Lourenco Marques, and if it thought there was a chance of turning back an African advance. The other territories of the "white redoubt" lack the economic and military strength to indulge in large-scale military activity beyond their borders, although there is a remote possibility that Southern Rhodesia would feel constrained to intervene militarily if the port of Beira in Mozambique were endangered by African nationalist forces.

In their control of outlets to the sea, the white territories have considerable leverage over their independent and soon-to-be independent African neighbors. There has been no indication, however, that they have given much thought to coordinated economic sanctions, and each government probably would embargo traffic from the interior only if directly and severely provoked by the African territory in question (for instance, if the territory provided a safe-haven for continuous insurgent action which would win international notoriety for an insurgent group).

Insurgency and sabotage exists or is a possibility in much of the area.

The Angolan rebellion has persisted for two years in the northwestern corner of the

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territory; its chances of spreading are not good over the short term, but even at its present level it constitutes a drain on the Portuguese economy. A similar outbreak could occur in Mozambique, although Mozambique nationalists face serious problems of training and unity of a type which have long plagued the Angolans. Sabotage has occurred sporadically in South Africa and has also broken out in Southern Rhodesia. Both governments, by harsh laws and rigid enforcement, have sharply cut the number of incidents. Nevertheless, underground organizations in South Africa still probably possess some sabotage capability and saboteurs based in Northern Rhodesia might be able to do a certain amount of damage in Southern Rhodesia. Sabotage in Southern Rhodesia would be more likely if the current talks between the British and Southern Rhodesian governments break down. Sabotage forays from the Congo against the railways in Angola or from Nyasaland against the railway across Mozambique to Beira are possible. In both cases, the African governments in the host territories have been compelled to be cautious in their encouragement of the activities of anti-Portuguese militants, and the latter have shown no sabotage capability. Africans from the territories of the "white redoubt" are undergoing sabotage training abroad, however. Their training may be stepped up as a result of the May 1963 African "summit conference" in Addis Ababa, which took a militant stand against the remaining white and colonial territories and urged black African states to take positive measures to aid African nationalists from these areas. The Nationalists' ability to disrupt the market economies of the various territories is therefore likely to increase, although it will be several years before they constitute a serious challenge to the present governments.

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B. The Economy of the Area

The countries in Southern Africa possess an area roughly equal to the continental United States and a population about one-third as large. The almost four million white residents, i.e., those of European progeny, control most of the modern economic enterprises in the area. In contrast, only 10 percent of the 58 million native Africans are involved in the monetary sector; the vast majority of economically active Africans are engaged in subsistence agriculture. The Republic of South Africa has the highest population density of any major political unit in the area; Angola has the lowest. Table 1 presents the population, area and density of population in each of the territories.*

The economies of the area are based primarily upon the output of extractive industries; this is true even for South Africa, which has a substantial and diversified manufacturing industry. Moreover, extractive industries also form the backbone of foreign commerce: agricultural products, minerals, and metals account for three-fourths or more of export earnings for each of the countries and territories in the region.

Southern Africa produces significant quantities of strategic minerals as shown by the following tabulation.

Southern Africa
Production of Selected Minerals
Thousand Short Tons - 1961

| | <u>Production</u> | <u>Percent of Free World Production</u> |
|---------------------------------------|-------------------|---|
| Copper | 1,054.0 | 26 |
| Manganese | 858.0 | 29 |
| ^h Crome _A | 721.0 | 65 |
| Vanadium | 2.2 | 25 |
| Cobalt | 11.0 | 59 |
| Gold | 0.815 | 69 |

* Page 11 below.

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The populous developed countries constitute the most important markets and sources of supply for Southern Africa. Trade with Western Europe alone involves nearly 60 percent of the exports and imports of the region. When trade with the United States and Japan is also considered, almost 75 percent of exports and imports are accounted for. The relative importance of Western Europe and the United States in the total trade of selected countries is shown below.

Percent of Total Trade with Western Europe
and the United States in 1961 for
Selected Territories*

| | <u>Exports</u> | <u>Imports</u> |
|---------------------|----------------|----------------|
| <u>Angola</u> | | |
| Western Europe | 66 | 79 |
| United States | 21 | 10 |
| <u>Federation</u> | | |
| Western Europe | 72 | 46 |
| United States | 1 | 5 |
| <u>Mozambique</u> | | |
| Western Europe | 56 | 67 |
| United States | 5 | 7 |
| <u>South Africa</u> | | |
| Western Europe | 54 | 55 |
| United States | 8 | 18 |

The above data illustrate the almost complete dependence of this area on trade with West European powers and the United States, and the lever that these trading relations could represent against the market economies in the various territories. They also point out, however, that the lever held by the United States alone is not great. Moreover, as will be discussed more fully below, the existence of a transportation network connecting the various territories in the area and the established regional trade ties would probably make ineffective actual or threatened cessation of trade on the part of a group of western powers with a single territory in the area. The effect of such action could be circumvented by the simple expedient of having a close neighbor assume the role of trade agent.

An estimated 10 to 12 percent of the foreign trade of countries in southern Africa is carried on with other countries in the area. The relative importance of

* The Republic of the Congo is omitted from the tabulation because data are not available for this country. In 1959 Western Europe accounted for 76 percent of the Congo's exports and the United States, 11 percent. In the same year Western Europe supplied 67 percent of the Congo's imports and the United States, 13 percent.

intra-regional trade for selected countries is shown below.

Intra-regional Trade as a Percent of
Total Trade in 1961

| <u>Country</u> | <u>Exports</u> | <u>Imports</u> |
|----------------------|----------------|----------------|
| Angola | 7 | 4 |
| Congo (Leopoldville) | 34 | 21 |
| Federation | 10 | 34 |
| Mozambique | 10 | 16 |
| South Africa | 12 | 6 |

Quantitatively, the largest trade accounts are those between South Africa and the Federation, and between South Africa and the Congo.

Within the area under consideration, economic sanctions of a scope that would be politically possible may not create severe economic disruptions, but insurgent action by African nationalist groups might well prove more debilitating. The abrupt decline in investment and the consequent economic recession that followed the Sharpsville riots in 1960 suggest that a far more serious crisis in confidence could result from an organized and sustained insurgent campaign.

The prime casualty of prolonged insurrection would be the market sector, which provides the economic life blood of the white residents. The native non-whites who rely heavily on subsistence agriculture, are in a far better position to survive even the most severe economic repercussions.

Table 1

Population, Area, and Density of Population in Southern Africa^{a/}

| <u>Territory</u> | <u>Population</u> | | | <u>Area</u> | <u>Population</u> |
|---|---------------------------------------|------------------------------------|-----------------------------------|---|----------------------------------|
| | <u>Non-White</u> <u>(Millions)</u> | <u>White</u> <u>(Thousands)</u> | <u>Total</u> <u>(Millions)</u> | <u>(Square Mi.)</u> <u>(Thousands)</u> | <u>per</u> <u>Square Mile</u> |
| Angola | 4.6 | 200.0 ^{b/} | 4.80 | 480.0 | 10.0 |
| Congo (Leopoldville) | 13.8 | 140.0 | 14.0 | 900.0 | 15.5 |
| Federation of Rhodesia and Nyasaland | 9.18 | 310.0 | 9.49 | 484.0 | 19.6 |
| Northern Rhodesia | 2.50 | 77.0 | 2.58 | 288.0 | 9.0 |
| Southern Rhodesia | 3.70 | 223.0 | 3.93 | 150.0 | 26.2 |
| Nyasaland | 2.97 | 9.40 | 2.98 | 46.0 | 64.8 |
| Mozambique | 6.501 | 99.0 | 6.60 | 300.0 | 22.0 |
| Republic of South Africa | 13.0 | 2,800.0 | 15.8 | 472.0 | 33.5 |
| South-West Africa | .446 | 78.7 | .525 | 320.0 | 1.6 |
| Bechuanaland | .319 | 1.0 | .320 | 220.0 | 1.4 |
| Basutoland | .600 | 2.0 | .602 | 11.70 | 51.5 |
| Swaziland | .269 | 1.0 | .270 | 6.70 | 40.3 |
| TOTAL | 57.9 | 3,940.0 | 61.8 | 3,680.0 | 16.8 |

^{a/} All data are rounded to three significant figures. Totals and densities are derived independently from unrounded figures and do not always agree with rounded data shown.

^{b/} Includes some mulattoes.

C. Transportation of the Area

Transportation service within Central and Southern Africa is provided predominantly by several interconnecting, narrow-gauge railroad systems and some ten short, disconnected, narrow-gauge railroad lines.* Over 95 percent of the long-haul and intercity freight and a substantial share of the passengers are hauled by the railroads, most of which are owned by the governments of the various territories. All of the major railroads are operating at a profit. The railroads/ in the interconnected system consist of about 20,000 route miles, about double the length of the Southern Pacific Railroad in the United States, and more than a third longer than the Japanese National Railroad System. Almost two-thirds of the route mileage in the area is under the jurisdiction of the Republic of South Africa. Most of the rolling stock, about 3,700 locomotives, 133,000 freight cars, and 7,100 passenger cars in the area, is 3' 6" gauge and interchangeable between systems. In addition, there are about 600 electric locomotives which are not interchangeable.

The road network consists of 10,000 miles of paved, all-weather roads, 60,000 miles of gravel-surfaced, and another 350,000 miles of improved earth roads and tracks -- a total road mileage equivalent to that found in the States of Alabama, Arkansas, Georgia and Texas, but much inferior in quality. There are now at least 1,250,000 automobiles, 400,000 civilian motor trucks, and 24,000 buses, over three-quarters of which are registered in the Republic of South Africa. The trucks and buses are used primarily to provide local service and service to areas not served by the railroads.

* The gauge of the interconnected railroad system is 3' 6". The gauge of the railroads in the United States and in Western and Eastern Europe is 4' 8 1/2". Japan is the only modern, industrialized country that relies exclusively on a railroad system built to the gauge of 3' 6". The disconnected railroad lines are of varying narrow gauge.

Inland waterways are important only in the Republic of the Congo where, during normal times, an integrated inland waterway and railroad network is the principal form of transportation for long distance movements of freight. Coastal shipping is important for Angola and Mozambique but only small tonnages are moved by this form of transportation. There is only one pipeline in the area, a 200-mile double line of small diameter which carries gasoline and diesel fuel from the port of Ango Ango to Leopoldville in the Republic of the Congo. The Republic of South Africa has the bulk of the 11 well-developed seaports which have high capacity and cargo activity. In addition, there are nine seaports of secondary importance in the area as a whole. Some excess capacity exists in all of the ports above the requirements for current imports and exports. See Table 2 for the tonnage of cargo handled by the principal ports of Southern Africa.*

At least 30 different shipping companies provide liner service between Southern Africa and the United Kingdom and continental Western Europe including flag carriers of the United Kingdom, Belgium, the Netherlands, France, Sweden, Norway, West Germany, Ghana, Nigeria, and South Africa. In addition, a large number of carriers under various flags provide both liner and tramp service between Southern African ports and various other countries of the Free and Communist world. Three United States flag carriers provide liner services between the ports of Southern Africa and the United States.

Seven airlines, local to the area, maintain service between the principal inland cities and seaports. The South African Airways provides jet airline service to Europe, the Middle East and Australia. International Free World air carriers also provide

* Page 16 below.

service to various cities in the area, and Aeroflot, the Soviet carrier, has recently attempted to establish service to Stanleyville in the Congo. Nine of the 280 airfields in the area are capable of handling jet transports, but the remaining fields are suitable for at least DC-3 type aircraft. There are only slightly over 100 transport aircraft of all types owned by the airlines of the area.

The development and use of transport varies considerably from one zone to another in the area under consideration. See Table 3 for the route miles of railroads and improved roads in the territories of Southern Africa and the density by population and area.* In the northern tier -- Angola and the Congo (Leopoldville)

* See Page 17 below.

-- and considering Tanganyika for this purpose for it provides an alternate route to the sea for the Congo -- the rail and road systems are not well developed. Normally, however, they are able to support the needs of the economy and there is some excess in capacity in all forms of transport including port operations. The railroads have adequate and reasonably well-maintained equipment, although the roadbeds are of relatively light construction and do not support heavy loads and high speed trains. Currently, in the Congo, the integrated rail and inland water network has been disrupted because three railroad bridges were damaged some time ago and have not yet been restored to support traffic. Moreover, motor trucks and roads, as well as the railroads, have deteriorated because of little or no maintenance. The lack of spare parts has also immobilized a large number of motor trucks. Transportation in the Congo, therefore, is currently not supporting the economy. The rail links to Angola and Northern Rhodesia are well-maintained but the railroad to Lake Tanganyika, where steamers and barges connect with the Tanganyika railroads providing access to the Indian Ocean, is not being used extensively.

The middle tier, consisting of the Federation -- Northern Rhodesia, Southern Rhodesia and Nyasaland -- and Mozambique, has heavier and well-maintained railroad systems with some advanced technology installed to increase capacity. Most of the freight traffic in this tier, taken as a whole, is internal, but the economy is supported largely by railborne exports to the seaports of Mozambique. For practical purposes, there is only one good main highway which extends in a north-south direction with a branch leading to the Mozambique coast. A small amount of local inland waterway traffic moves along the Zambezi River on the separate stretches which are separated by waterfalls and cataracts.

The final tier is represented by the transportation under the control of the Republic of South Africa. Some examples of modern technology are apparent on the railroad system, but for the most part the technology of the system is comparable to that which existed on the U. S. railroads in the early 1930s. Even so, the railroads are well-built, well-maintained, and are capable of supporting heavy loads moved at relatively high speeds. The main divisions on the system are seldom overloaded even at seasonal peaks in traffic. The road system, the other major form of transportation, is also relatively well-developed and maintained. Road freight and passenger services, however, are regulated so that they supplement rather than compete with the services provided by the railroad system.

Data on the relative development of railroad transportation in the territories of Southern Africa are presented in Table 4.* These data and the data contained in Table 3** also characterize the development of railroads in the three tiers mentioned above. The northern tier has less railroads per area than that found in the other two tiers. Even in normal times, the freight traffic density per route mile of railroad is less than that found to the south. The low ratio of freight cars to locomotives points up the light construction of the railroads where short trains with small loads are operated. The progressive improvement of the ratios in areas to the south emphasize the existence of better track, equipment and operations in the middle and final tiers.

* Page 17, below.
** Page 17, below.

Table 2

Cargo Handled by the Principal Ports of Southern Africa ^{a/}
 (Thousand Short Tons)

| <u>Port</u> | <u>Inbound</u> | <u>Outbound</u> | <u>Transshipped</u> | <u>Total</u> |
|------------------|----------------|-----------------|---------------------|---------------|
| Durban | 4,584 | 5,888 | 139 | 10,611 |
| Lourenco Marques | 3,221 | 4,598 | N.A. | 7,819 |
| Cape Town | 3,047 | 2,293 | 43 | 5,883 |
| Beira | 1,624 | 2,003 | N.A. | 3,627 |
| Port Elizabeth | 1,553 | 1,047 | 8 | 2,608 |
| Lobito | N.A. | N.A. | N.A. | 1,890 |
| Matadi | 927 | 598 | N.A. | 1,525 |
| East London | 999 | 354 | 3 | 1,356 |
| Walvis Bay | 316 | 589 | N.A. | 905 |
| Luanda | N.A. | N.A. | N.A. | 848 |
| Mossel Bay | 149 | 15 | N.A. | 164 |
| TOTAL | N.A. | N.A. | N.A. | 36,736 |

^{a/} Data are for the highest yearly tonnage recorded during the period 1957 - 1962.

Table 3
Route Miles of Railroads and Improved Roads g/ in Southern Africa
and the Density by Population and Area

| Territory | Route Miles of Railroads | | | | | Route Miles of Roads | | | | |
|------------------------------------|--------------------------|-------|------------|-----------------------|----------------------|----------------------|-----------------------|----------------------|--|--|
| | Interconnected System | Other | Total | Per 10,000 Population | Per 100 Square Miles | Total | Per 10,000 Population | Per 100 Square Miles | | |
| Angola | 879 | 907 | 1,786 | 3.72 | 0.37 | 8000 | 16.67 | 1.67 | | |
| Congo (Leopoldville) | 2260 | 927 | 3,185 | 2.28 | 0.35 | 25400 | 18.14 | 2.82 | | |
| Federation of Rhodesia & Nyasaland | 2568 | Nil | 2,568 | 2.7 | 0.52 | 16250 | 17.10 | 3.36 | | |
| Northern Rhodesia | 666 | Nil | 666 | 2.56 | 0.23 | 3000 | 11.54 | 1.04 | | |
| Southern Rhodesia | 1586 | Nil | 1,586 | 4.07 | 1.06 | 12700 | 32.56 | 8.47 | | |
| Nyasaland | 316 | Nil | 316 | 1.05 | 0.69 | 650 | 2.15 | 1.41 | | |
| Mozambique | 1044 | 667 | 1,711 | 2.59 | 0.57 | 5800 | 8.79 | 1.93 | | |
| Republic of South Africa | 11754 | 440 | 12,194 | 7.72 | 2.58 | 101000 | 63.92 | 21.40 | | |
| South-West Africa | 1453 | Nil. | 1,453 | 26.91 | 0.46 | 4000 | 80.00 | 1.25 | | |
| Bechuanaland | 400 | Nil. | 400 | 13.33 | 0.18 | 2500 | 83.33 | 1.14 | | |
| Basutoland | Negligible | Nil. | Negligible | Negligible | Negligible | 900 | 15.00 | 7.69 | | |
| Swaziland | 140 <u>b/</u> | Nil. | Nil. | Nil. | Nil. | 1100 | 40.00 | 16. | | |
| Total | 20498 | 2941 | 23297 | 4.18 | .703 | 181,300 | 34.14 | 20.29 | | |

a. Includes roads surfaced with bitumen, or consisting of gravel or improved earth.
b. About 140 miles currently under construction.

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Table 4
Relative Development of Railroad Transportation in the Territories of Southern Africa

| Territory | Railroad Route Miles | Locomotives (Units) | Freight Cars (Units) | Annual Ton Miles of Freight a/ (million) | Route Miles per Locomotive | Freight cars per Route Miles | Ton Miles of Freight per Mile of Route | Ratio of Freight cars to Locomotives |
|------------------------------------|----------------------|---------------------|----------------------|--|----------------------------|------------------------------|--|--------------------------------------|
| Angola | 1786 | 180 | 2405 | 1,130.1 | 9.92 | 1.35 | 632,754 | 13.36 |
| Republic of the Congo b/ | 3100 | 464 | 8615 | 1,985.4 | 6.68 | 2.78 | 640,452 | 18.56 |
| Federation of Rhodesia & Nyasaland | 2968 | 456 | 12,630 | 5,025.6 | 6.51 | 4.26 | 1,693,261 | 27.70 |
| Northern Rhodesia | 666 | N.A. | N.A. | N.A. | - | - | - | - |
| Southern Rhodesia | 1986 | N.A. | N.A. | N.A. | - | - | - | - |
| Total Rhodesias | 2652 | 424 | 12,247 | 4,934 | 6.25 | 4.62 | 1,860,482 | 28.88 |
| Nyasaland | 316 | 32 | 383 | 91.6 | 9.87 | 1.21 | 289,973 | 11.96 |
| Mozambique | 1711 | 220 | 5568 | 1,386.4 | 7.77 | 3.25 | 810,391 | 25.31 |
| Republic of South Africa d/ | 13207 | 3300 | 110,000 | 25,600 | 4.00 | 8.33 | 1,938,366 | 33.33 |
| Total | 22,772 | 4620 | 139,218 | 35,127.5 | 4.60 | 6.25 | 1,560,000 | 30.00 |

a. Highest annual freight traffic in last five years.
 b. Excludes Boma-Tchela railroad, 85 miles.
 c. Includes 400 miles in Bechuanaland.
 d. Includes all 3 feet 6 inch gauge railroads in South Africa and South West Africa, but excludes 440 miles of lesser gauge.

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II. The Economic and Military Significance of the Transportation Routes of the Area *

A. Angola

1. Economic Significance of the Transportation System

The transportation system of Angola is not well developed and is designed primarily to provide routes for the export of Angolan production rather than to facilitate the over-all growth and development of the domestic economy. Almost all of the transportation routes are oriented in an east-west direction. The north-south movement of goods is virtually impossible in the eastern part of the country and these movements are largely dependent upon coastal shipping in the western part of the country.

The railroads are the backbone of the transportation system and provide the only significant means for the movement of commercial freight traffic between the major producing and consuming areas and between the seaports and the interior of the country. The railroads consist of four basic narrow-gauge, single track, unconnected routes which are described in detail in Appendix C. All railroads are oriented in an east-west direction, a direction designed primarily to facilitate the export of Angolan products and, in the case of the Benguela Railroad which is the only international route, to earn the considerable revenues from transit traffic from and to the Congo and Northern Rhodesia.

The Benguela Railroad Company is a privately owned enterprise registered

* See Appendix C for a detailed analysis of transportation in the various territories. For details on the military and security forces and logistic requirements for the forces in the various territories, see Appendix D.

in Portugal and with headquarters in Lisbon. The African office for management of the railroad is in Lobito, Angola. Stock in the railroad company consists of 3,000,000 shares with a value of \$23,073,600. Almost 90 percent of the stock, 2,693,750 shares, are owned by Tanganyika Concessions, Ltd., which is registered in the United Kingdom but with headquarters in Salisbury, Southern Rhodesia. About 10 percent of the stock is owned by the Portuguese government and the remaining shares, less than one percent, are held by 15 private individuals in varying amounts. The railroad is operated on a 99-year concession granted to the railroad by the Decree of 28 November 1902.*

The Benguela Railroad provides the shortest and the most economical route between the southern part of the Congo and the Atlantic Ocean. About 75 percent of the railroad's revenues are believed to be derived from transit traffic of freight and passengers between Katanga and Northern Rhodesia and the Angolan port of Lobito. Revenues from mineral traffic alone from the Congo and Northern Rhodesia in 1960 and 1961 represented 45.6 and 35.6 percent respectively of the total revenues of almost 21 million dollars earned by the Benguela Railroad during each of those years. The Angolan government does not subsidize the Benguela Railroad and neither does it guarantee a profit to the railroad. However, government policy prohibits competition from other modes of transport which tends to insure profitable operations. As a concessionaire, the Angolan government receives a share of the

* Tanganyika Concessions, Ltd. also obtains royalties from the exploitation of mineral deposits by the Union Miniere du Haut Katanga.

profits of the railroad. It appears, therefore, that a diversion of Congo traffic away from the Benguela Railroad would mean not only financial distress for the railroad company but a considerable loss of revenue to the Angolan government unless, of course, the Benguela Railroad could obtain a sufficient amount of traffic from another source, say Northern Rhodesia, to offset the loss of Congo traffic. Apart from the financial effects on the railroad, the loss of the transit traffic normally handled by the railroad to and from the port of Lobito would result also in a considerable financial loss in port fees. Over 40 percent of the traffic through Lobito is Congo and Rhodesian transit traffic. Moreover, the loss in railroad and port tonnage and revenue would result in a considerable reduction in employment in the market economy.

Apart from the importance of the Benguela Railroad from an international viewpoint, the railroads of Angola are the principal carriers of export goods. Agricultural products account for 60 percent and minerals 25 percent of the value of Angola's exports. The producing areas are in the interior of the country and the railroads carry almost all of the export goods produced to the ports. Inbound traffic to the interior of the country is very light and, in the case of the Benguela Railroad, represents about one-sixth of the total traffic carried including international transit traffic.

An examination of the Angolan budget for 1962 reveals that about 13

percent of the total government revenues are derived from receipts from ports, railroads and other transportation.

Excluding those areas of Angola which are served by the railroads or which are near the sea, large areas of the country are entirely dependent upon earth-surfaced roads and tracks as the only means of freight transport. There are 22,000 miles of roads in the country, a density of about 1.67 miles per 100 square miles of area, and about 16.67 miles per 10,000 head of population. In the southeastern area referred to by the Portuguese as the "fin do mundo" or end of the world, there are no roads at all. The only north-south roads are in the western third of the country and only about 100 miles of these are paved. During the rainy season which lasts from November until May, the major portion of the road net becomes virtually impassable to commercial motor vehicles and some areas are completely isolated for days at a time. Motor vehicles registration amounts to about 43,000 vehicles or 1 to 107 head of population.

There is no developed inland waterway system as most of the streams are remote from the centers of the economy and serve only as local transport arteries for primitive river craft. In the absence of north-south railroads or even adequate north-south highways, a considerable amount of traffic is carried by coastal vessels and in 1962, coastal traffic through the port of Lobito alone amounted to almost 100,000 tons.

The three principal seaports of Luanda, Lobito and Mocamedes are fairly well developed and adequate for the current needs of the economy. Lobito is rated

among the best ports on the Atlantic coast of Africa and it is currently operating at well below capacity. Its capacity to handle mineral ore is believed to be at least 100 percent greater than the ore traffic currently moving through the port.

The one international airport is at Luanda on the Atlantic coast. Practically all of the other airports are located in the western half of the country. Some of these have landing strips 6,500 feet in length and the rest of the country is served by smaller airports with limited capacity capable of handling DC-3 and smaller liaison type aircraft. The single airline in Angola (DTA) owns 14 aircraft of which three are DC-3s and the remainder are smaller.

2. Military Significance of the Transportation System

The transportation system of Angola is believed to be capable of supporting a far greater military force than the Portuguese will be able to muster in the country in the foreseeable future. This is particularly true of the railroads and the ports. There would be some difficulty in supplying large forces in the areas remote from the railroads during the rainy season because of the inadequacy of the road net; however, the effects of bad weather are not as significant to a military force with four-wheel drive, military-type vehicles as it is to commercial type vehicles. Nevertheless, the employment of engineering troops capable of repairing and maintaining roads and road bridges would be necessary to insure uninterrupted movement of heavy motor vehicles.

The Portuguese army strength in Angola is in excess of 40,000 troops. Air Force personnel number about 1,700, and the Angolan Naval Command has

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about 400 officers and men. In addition, there is a local civilian volunteer corps which provides defense for individual plantations in the part of Angola where insurgents operate.

The general construction of the railroads is sound and the maintenance of routes and equipment is good. The Benguela Railroad is the most important railroad route because it traverses the very heart of the country from Lobito on the Atlantic coast to Dilolo on the Congo border, a distance of 838 miles. The estimated through put capacity of the route for military traffic is 1,800 tons per day which is sufficient to supply a Portuguese security force of 144,000 men.* Moreover, the present commercial traffic flow is heavily weighted from east to west at a ratio of 5 to 1. As a consequence, much of the eastbound traffic is made up of trains of empty freight cars. It is therefore apparent that a major portion of the military supplies could be moved without seriously disrupting commercial traffic over the route.

The estimated capacity of the Luanda Railroad which runs from the port of Luanda to Malanje, a distance of 265 miles, is 960 tons per day, an amount sufficient to support a force of about 77,000 at Malanje. The estimated capacity of the Mocamedes Railroad from Mocamedes to Vila Serpo Pinto, 469 miles, is about 1,160 tons per day, an amount sufficient to supply a force of about 93,000. Commercial traffic flow over these routes is also heavily weighted from east to west.

* Computed on the basis of a logistic requirement of 25 pounds per man per day.

gear alone is even greater than the capacities of the railroads which serve them.

The highway which parallels the Benguela Railroad from Lobito to the Congo border is capable of handling about 550 tons per day which is adequate to supply a Portuguese security force of about 44,000 troops. Another example of road route capacity is the route leading north from the port of Luanda to the Congo border near Matadi, passing directly through the area of recent rebel activity. In fair weather, the route is capable of sustaining about 140 vehicles carrying three tons each per day. This is adequate to support a force of about 33,000 troops. However, sections of the route may become virtually impassable during the rainy season to anything other than four-wheel drive vehicles, and difficult even for them.

The international airport at Luanda has considerable military significance particularly for the airlift of troops from Portugal, and for airlifting troops' supplies to the other airfields in the country from which supplies can be further distributed by air drops.

B. Congo (Leopoldville)

1. Economic Significance of the Transportation System

Prior to independence in 1960, the transportation system of the Congo was well-organized and managed, and adequate for the needs of the economy in the stage of economic development existing at that time. The system was a good example of coordinated railroad and inland waterway system with one mode complementing but not competing with the other. Public motor vehicle transport served primarily as

a feeder service to the railroads and inland waterways although many of the larger farms and even some mines operated considerable fleets of motor vehicles over private and public provincial roads to deliver their production to markets and to railheads and river ports. The disturbed conditions which have existed since independence in 1960 have not changed the basic pattern of the transportation system, but the wanton destruction of railroad bridges, inadequate maintenance of route facilities, rolling stock and locomotives, a shortage of spare parts, and an almost complete disregard for highway maintenance, have reduced the system to an uncoordinated, disconnected and relatively inefficient system.

The Congo River and its tributaries forms the backbone of the system with railroads providing by-passes for unnavigable portions of the river. The main network of railroads is in the southern area of the country where through rail routes provide connections with the railroads of Angola and the Atlantic Ocean, and with the Rhodesias and through Mozambique or South Africa to the Indian Ocean. Also, the BCK Railroad, running from the border of Northern Rhodesia, connects with the Congo River services at Port Francqui which, in turn, connects with a railroad at Leopoldville running to Matadi, the principal seaport on the lower Congo River. This route is commonly known as the "Route Nationale" and is the only through route entirely within the Congo giving access to the sea for traffic from and to the industrial area in Katanga Province. The length of the Route Nationale from Elisabethville to Matadi is 1,713 miles. At present, damaged railroad bridges prevent through traffic on the route and almost all export-import traffic from Katanga and

parts of Kasai Provinces is routed over the Angolan Railroad to the Atlantic Ocean port of Lobito. However, small quantities of freight from Katanga Province are also moving over the Rhodesian railroads to Indian Ocean ports.

In 1961, the first full year after independence, the transportation system carried only 60 percent of the tonnage carried in 1959, the last pre-independence year. Moreover, traffic through the port of Matadi dropped from 1.5 million tons in 1959 to only 850 thousand tons in 1961, a reduction of more than 45 percent. The decline in freight traffic no doubt reflects, to some degree at least, a concurrent decline in the over-all economic posture of the country.

An effort is currently underway to repair damaged bridges on the railroads in Katanga Province and thus restore service over the "Route Nationale", and it is probable that the route will be restored in the late summer of 1963. However, other problems will continue to plague the Congolese for some time to come. Silting of the lower Congo River between Matadi and the sea is a serious problem, and the Congolese have not been able to obtain a sufficient supply of spare parts to adequately maintain the dredges used to keep the channel clear. If this is not done, access to the sea will be limited and large petroleum tankers may not be able to deliver fuel, all of which is imported. Channel markers and buoys on the Congo River above Leopoldville have not been maintained and some have even been removed. In many areas, jungle growth is reportedly taking over some of the roads in rural areas. A shortage of spare parts and general neglect of maintenance has resulted in many motor vehicles being withdrawn from service. In general, it will probably

take a long time, even years, to restore the transportation system to its pre-independence state of efficiency.

2. Military Significance of the Transportation System

When the transportation system is functioning properly, the access routes to the Congo and the railroad and river routes leading to the principal population centers within the country are capable of supporting a far greater military force than would conceivably be deployed in any given area in the immediate future. Some difficulty will be encountered in rural areas remote from the railroads and the principal inland waterways because of the inadequacy of the highway net. This is particularly true during the rainy season, not only because the road surfaces are washed away but also because of the washing away of primitive timber bridges which predominate in the remote areas. Therefore, large-scale military operations in parts of the country that are dependent on roads for ground transportation, cannot be conducted without the employment of engineering troops capable of restoring, repairing and maintaining the roads so that they will support heavy traffic by trucks.

The Congolese National Army consists of about 25,000 troops organized into 24 battalions. The Katangan Gendarmerie, which totaled 19,000 in December 1962 has in large part been dispersed as the result of conflicts with UN forces since that date. Congolese Air Force personnel number only 300 non-whites and 60 whites. As of May 1963, United Nations' forces in the Congo numbered 11,000, but the current plan calls for a reduction of these forces to 7,000 by 1 July 1963 and their complete removal by the end of 1963.

The estimated military capacity of the railroad route leading from the seaport of Matadi to Leopoldville, 227 miles, is 3,300 tons per day, sufficient to support a force of about 264,000* in the Leopoldville area. Upstream on the Congo River to Stanleyville, a distance of 1,082 miles, the through put capacity for military traffic is 3,500 tons per day, adequate to supply a force of at least 270,000. From Leopoldville to Port Francqui, the Congo and Kasai Rivers could carry about 3,000 tons per day and support a force of 240,000. In the southern part of the country, the military capacity of the railroads from the border of Northern Rhodesia to Port Francqui, 1,138 miles, is 1,860 tons per day, adequate for a force of about 149,000 at Port Francqui. From Dilolo on the Angolan border to Tenke, a distance of 324 miles, a force of 124,000 could be supported, as the military capacity of this railroad is estimated at 1,500 tons per day. The railroad between Kamina in Katanga Province, and Albertville on Lake Tanganyika, a distance of 447 miles, is capable of supporting a force of about 72,000.

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C. The Federation of Rhodesia and Nyasaland

1. Economic Significance

Transportation services in the Federation, both domestic and international, are provided principally by railroads (almost 3,000 route miles). There is some increasing dependence on airlines and buses for passenger transport, but little dependence on trucks for long-distance freight transport. There is generally adequate service between all main centers of economic activity in the Federation, between those centers and adjoining territories, and through those territories with major seaports of Southern Africa. Transport and communications account for about 10 percent of white and 3 to 4 percent of African employment in the Federation and in each of its component parts. The revenues of the Rhodesia Railways represent about 6 percent of Gross National Product (GNP) of the Federation, and their operating expenditures about 5 percent. The Rhodesia Railways are especially essential to the movement of copper, which is the major foreign exchange earner of the Federation. Copper sales in 1961 totaled more than 20 percent of the Federation's GNP. Copper traffic (over a million tons in 1961 or about 8 percent of total tons carried) is also the most important earner of revenue for the Rhodesia Railways, having furnished more than 27 percent of gross revenues in 1961. The copper traffic is even more important when the additional revenues from the movement of copper concentrate, the largest component of the "other minerals" category, is taken into account.

Highway development, while of secondary importance as compared to railroads in the Federation, has furthered economic development in areas where lack of

rail facilities was a limiting factor. The development of the highway network has been considerable relative to the small number of people in a position to contribute to the cost. Motor vehicle registrations in the Federation in 1961 totaled 193,798, or about 45 persons per vehicle.

The Federation is land-locked and only inland water services of minor importance are operated on a few lakes and rivers serving Northern Rhodesia and Nyasaland. A few steamers and barges carry passengers and freight on the larger lakes, but there are mostly small native craft in use on the rivers.

Both domestic and regional air service is provided by Central African Airways Corporation (CAA). The "Rhodesian Comet" service to London is operated for CAA by the British Overseas Airways Corporation (BOAC). The domestic network serves 16 points in Northern Rhodesia, 4 in Southern Rhodesia, and 10 in Nyasaland. Most of the domestic scheduled service in 1961 was performed by DC-3 type aircraft. Air service has been especially important for rapid movement of passengers and of high value - low bulk goods to remote areas such as Barotseland.

Continued supranational operation of the transportation facilities of the Federation will be desirable in order to derive the maximum economic benefits from the transportation system.

(a) Southern Rhodesia

Both railroads and highways in Southern Rhodesia, in keeping with its more diverse and advanced economy, are better developed than in the rest of the Federation (1,986 route miles of railroad, as compared with 666 in Northern

Rhodesia and 316 in Nyasaland). The lion's share of modernization of the Federation's railroads has taken place in Southern Rhodesia in order to serve the growing industrial sector. Centralized traffic control (CTC) has been installed on virtually all of the single track mainline network of Southern Rhodesia, and a few short stretches are double track. New diesel locomotives are also being gradually introduced to further improve the service and increase capacity.

Railroads of Southern Rhodesia, as well as the transportation and commercial centers of Bulawayo and Salisbury, are very dependent on the volume of transit traffic between Northern Rhodesia and the ports of Mozambique. This transit traffic accounted for more than 25 percent of all tonnage carried by the Rhodesian Railways in 1961* and about 35 percent of the revenues. Exports in transit are composed principally of copper, cobalt, lead, zinc and manganese, and imports of machinery, transport equipment and other manufactured goods. Part of Northern Rhodesia's copper export shipments have been carried by the Benguela Railway in the past. Under an agreement entered into in 1956, 20 percent of the territory's copper export traffic was to be assigned to this route. Other parties to the agreement were the Rhodesia Railways and the Congo Railway authority. This agreement was over-ruled by the Federal Government early in 1960 when it imposed a limit of 36,000 tons (or little more than 6 percent of 1962 exports of 560,000 tons) on the copper tonnage which could be exported via the Benguela Railroad in any one year. A new agreement assigning a greater percentage to the Benguela Railroad or the Congolese "Route Nationale" is a possibility

*Table 6, Appendix C.III, p. 215.

Southern Rhodesia contains about 52 percent of the 55,267 miles of maintained roads in the Federation, 73 percent of the miles of bituminous or strip roads, and 71 percent of the registered motor vehicles. Total motor vehicle registrations amount to 138,168 or about 23 persons per vehicle.

(b) Northern Rhodesia

Both railroads and highways become more scarce in Northern than in Southern Rhodesia. The dependence on railroads becomes even greater here because of the proportionately greater tonnage of heavy ore and mineral traffic transported. The copper industry, for example, which in recent years has contributed about 44 percent to the net domestic product of Northern Rhodesia, could not function without railroad service. Railroad capacity continues to be improved by the installation of modern signaling, although not yet to the extent that this has taken place in Southern Rhodesia. There is also considerable interest in Northern Rhodesia in the proposed extension of the railway to connect with the Tanganyikan railway system.

About 39 percent (21,517 miles) of all the regularly maintained roads of the Federation are located in Northern Rhodesia, and 43,934 vehicles or 23 percent of the registered motor vehicles. This amounts to about 57 persons per vehicle. The Great North road provides a highway link with Tanganyika* and there is also a good road connection with Elisabethville in the Congo.

* See Appendix C.VI, p. 267.

The inland water service on the few navigable lakes of Northern Rhodesia is small, and only of local significance to the various areas. Civil air is of relatively greater importance here than elsewhere in the Federation, largely for convenient access to areas otherwise relatively inaccessible by other modes of transport.

(c) Nyasaland

Transportation services in Nyasaland are primarily in support of the commercial agricultural economy which provides most of the foreign exchange of the country and in 1961 accounted for about 80 percent of the value of Gross Domestic Product. Low cost and rapid transportation must be provided from the various producing centers to distant markets.

In Nyasaland, as in the rest of the Federation, primary dependence is on railroads, with other modes acting as feeders or providing service to more remote areas. The railroad system needs to be expanded and modernized to meet growing traffic requirements although it is adequate for current traffic requirements. Now wholly steam-operated, single track and manually signaled, it is completely dependent on imported coal, mostly from Wankia in Southern Rhodesia. A few diesel locomotives are on order from the UK.

Regularly maintained roads in Nyasaland amount to 5,150 or 9 percent of the total mileage of such roads in the Federation. Motor vehicles registered in Nyasaland number about 11,696 or 6 percent of the Federation total, and there are about 250 persons per vehicle.

The navigable lakes and waterways provide some service of mostly

local significance. Steamer service on Lake Nyasa provides the only commercial link between the railroad and many towns and farm areas along the lake. Civil air is a small but necessary service to otherwise relatively inaccessible areas.

2. Military Significance

The transportation system of the Federation would almost certainly be able to move and support any military or security force which could be mustered, particularly on the railroad. Some difficulty would be experienced in remote areas because of inadequate highways, but poor highways are not so significant to military as to commercial vehicles.

Total active ground forces (5,171) and police (10,945) number only about 16,000 men and there is an available reserve of about 6,000 men. The active military forces are well-equipped and completely mobile. The Rhodesian air force has about 600 men and 182 aircraft of various types including 14 transport aircraft with a total airlift capacity of more than 70 tons or about 350 troops. There are a total of about 150 airfields in the entire Federation, of which probably only about 50 could handle sizeable military movements. The only international airports capable of receiving sizeable movements of men and supplies from abroad are at Salisbury, Bulawayo, Livingstone and Gwelo, all in Southern Rhodesia; Ndola and Lusaka in Northern Rhodesia; and Blantyre in Nyasaland.

Since only Southern Rhodesia has a white-dominated government, it is here that disturbances would be likely to occur generated by African Nationalists

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and requiring the rapid movement of men and supplies to troubled areas. It is here also that both the railroad and highway networks are relatively well developed and could support movement of far greater forces than the relatively small but efficient military and security forces in being in the area. Here also are all of the major air force bases and airports capable of receiving additional supplies and "volunteer" reinforcements from abroad.

Africans struggling among themselves for power in the Copperbelt area of Northern Rhodesia could lead to demands for UN, UK or US intervention along the lines of (1) the UN operation in Katanga; (2) the UK use of troops in Swaziland; or (3) US troop landings in Lebanon. Should such action be required, the main Rhodesian approach routes to the Copperbelt would be capable of supporting a much greater force than would conceivably be employed. The Rhodesian railroad alone could transport about 5,500 tons per day, which is the estimated requirement to support a force of about 220,000 men.* The main highways northward from Bulawayo and Salisbury could carry 240 through tons per day, enough to support a force of about 9,600 men.

* Requirements calculated on the basis of 50 tons per man per day, estimated for the modern, well-equipped US or UK type force envisioned here.

D. Mozambique

1. Economic Significance

The inland transportation system of Mozambique is almost completely dominated by the railways, due in large measure to the inadequacy of the existing roads, the scarcity of roads in some areas, and the relatively minor use made of inland waterways. The complete absence of any north-south railroads in the country and the poor quality of north-south highways makes coastal shipping an important segment of the transportation system. In addition to their significance to the local economy, the railroads and the ports are of considerable international importance because they offer the shortest routes to the sea for the Rhodesias and the northeastern areas of South Africa, and the only railroad route to the sea for Nyasaland. Transit traffic from and to these countries and the seaports in Mozambique represents almost 90 percent of the total traffic carried by the railroads. Moreover, revenues from international transit traffic over the railroads and through the seaports accounts for upward of 30 percent of the Mozambique government revenues.

The railroad system is composed of eight railroads, three of which do not connect with any other system. Only three of the railroads are international in character and these account for 94 percent of the traffic carried on all of the railroads combined. In 1960, the last year for which complete statistical data are available, the eight railroads^{with} a total of 1,711 route miles, carried a total of 11.2 million tons. The three international systems are: the Lourenco Marques Railroad, the Beira Railroad, and the Trans-Zambesia Railroad. An analysis of financial reports indicates that these international railroads are consistent

money earners with operating ratios in 1960 of about 39 percent, 51 percent, and 33 percent respectively.* All the other railroads are operated at a loss with operating expenses exceeding their revenues by a wide margin. Taken as a whole, the railroad system earned a net profit after operating expenses of \$20.5 million in 1960. The Lourenco Marques Railroad is government-owned so the net profits would accrue to the government of Mozambique. The Beira and Trans-Zambesia Railroads are privately owned and the government's share in their profits is not known. The money losing railroads are all government owned, but the profits of the Lourenco Marques Railroad were adequate to off-set those losses and still return a net profit of \$9.3 million to the government in 1960. These data point up the economic significance of international transit traffic which represents about 90 percent of the revenues earned by the railroads.

The capacities of the international railroad routes in Mozambique are believed to be considerably above the traffic currently moving over them. For example, the short, single track, 55 mile route from Lourenco Marques to Ressano Garcia on the South African border, is currently carrying about 4 million tons per year. Single track routes in the Congo were carrying 6.6 million tons per year in 1957. Moreover, the Ressano Garcia route in Mozambique is equipped with CTC signalling whereas the Congo route is equipped with only a manual block system. The Beira and Trans-Zambesia Railroad routes are also operated at well below the traffic density in either Angola or the Congo.

Despite the importance of highway transport to the economy of Mozambique, the highway network is seriously inadequate. There are no adequate north-south

*An operating ratio is the percentage ratio of operating costs to total revenues.

routes through the country and transport in this direction is often compelled to take routes through the neighboring countries of South Africa and Rhodesia. During the long, rainy season, wooden bridges are often washed away by flood waters and the dirt-surfaced roads which predominate become impassable. A program is underway to improve the highway network, but a lack of funds has delayed its implementation. However, recent political unrest, with its internal security problems, has emphasized the need for a more adequate system and the government has accelerated the highway construction program and incorporated it in the Second Development Plan for the period 1959 - 1964.

The highway network consists of about 22,840 miles of roads. Only 720 miles have a waterproof surface, mostly bitumen, and 620 miles of rolled stone surface, while the remaining 21,500 miles are natural earth-surface roads. Highways are classified according to their relative importance and not according to the type of construction. First class or national routes link the capitals of the nine administrative districts with each other and with the seaports and neighboring countries. Second class roads link the outlying towns and cities in each district with the district capitals. Other classified roads are designated as regional or third class roads. Unclassified roads are generally nothing more than tracks which are practically impassable for motor vehicles.

Rainfall in Mozambique varies from 39 inches per year in the north to 60 inches in Beira and 30 inches in Lourenco Marques. During the long rainy season, October to March, transport by road is virtually impossible. Traffic is disrupted for long periods at a time through heavy rains washing away road surfaces, destroying wooden bridges and closing ferries. During the dry season, unsurfaced roads corrugate

badly and are subject to wind erosion, while sand surfaces in the coastal regions are unstable.

Almost all commercial highway transport services are owned and operated by the State Roadways, a Department of the Mozambique Administration of Harbors, Railways and Transport Services. This government-owned service does not compete directly with the railroads and is, in fact, prohibited from doing so. The service operates primarily to feed traffic to and from the railroads or between producing and consuming areas which are remote from the railroads. During 1961, the most recent year for which statistics are available, State Roadways carried about 308 thousand tons of freight. In 1960, the State Roadways owned about 280 trucks and buses, 9 tractors, and 60 trailers. The average carrying capacity of the trucks was about 3 tons each and the trailers 5 tons each. There are an estimated 18 to 19 thousand trucks of all sizes registered in Mozambique but most of these are believed to be small units not suitable for long distance transport of heavy cargo.

The two principal and five minor ports in Mozambique handled a total of 10.0 million and 11.5 million tons in 1960 and 1961. The major ports for international transit traffic are Lourenco Marques and Beira, and these two ports handled more than 95 percent of the total traffic through all the seaports. Lourenco Marques, the largest and busiest port in the country, handles about 64 percent of Mozambique's seaborne commerce. More than 67 percent of the tonnage handled in 1960 was transit traffic. Mineral and coal traffic from South Africa represented nearly 2 million tons or 60 percent of the total outbound tonnage through the port in 1960, and mineral traffic from Rhodesia was 687,391 tons or almost 28 percent. The port is

one of the best equipped in southern Africa, with deep water berths for twelve vessels. Ample cranes and other handling equipment are available and there is storage space for 50,000 tons of coal and 160,000 tons of mineral ore. Net profits in 1960 were almost \$2.5 million. The port is undergoing expansion in order to cope with additional traffic and, in particular, an additional 1 million tons of mineral ore expected to move over a new railroad route presently under construction in Swaziland and connecting with the Mozambique railroad near Goba.

Beira, the second largest port, handled 3.2 and 3.6 million tons in 1960 and 1961. About 56 percent of the total tonnage handled through the port is transit traffic from and to Rhodesia. Rhodesian traffic in 1960 amounted to 983,000 tons outbound and 835,000 tons inbound. The port is well-equipped with deep water berths for 6 vessels. Two new wharves completed in 1962 will become operable as soon as cranes and other cargo-handling equipment are installed.

Civil air transport has little economic significance in Mozambique. The government-owned carrier, DETA, provides passenger service to 14 points in Mozambique and to Salisbury in Southern Rhodesia, and to Johannesburg and Durban in South Africa. Also, the Portuguese flag carrier TAP, links Mozambique with Portugal and with Angola. During 1961, DETA carried 36,500 passengers. No scheduled air freight service is available in Mozambique.

2. Military Significance

The transportation system of Mozambique is capable of supporting a considerably greater military force than the Portuguese will be able to deploy in the area in the foreseeable future. As of 1 January 1963, the strength of the army of Portugal was 102,000. More than 55 percent of it was employed in the defense of overseas provinces and colonies. Portuguese ground strength in Mozambique consists of about 17,000 troops organized into 14 infantry battalions, and a battalion each of armor, artillery, engineering and signals. A small air force unit also provides some air transport capability.

The railroad systems are the most important mode of transport for

the supply of military forces from Indian Ocean ports to major concentration areas inland. In Northern Mozambique, the Mocambique Railroad extends from the minor ports of Nacala and Lumbo to ^{Congerenga} ~~the~~, a distance of 402 miles. This route is capable of delivering about 4 trains per day to Nova Freixo, 334 miles, with sufficient tonnage to support a force of 120,000*. From Nova Freixo to Congerenga, a distance of 68 miles, the route is newly constructed and may have a tendency to settle, thus forcing a reduction in the speed and weight of trains during heavy rains. Nevertheless, it is believed to be capable of supporting about 60,000 troops at Congerenga, near the Nyasaland border.

From the port of Beira, the Trans-Zambesia Railroad running north to the Nyasaland border, about 205 miles, can support a force of about 136,000. The Tete Railroad which branches off of the Trans-Zambesia Railroad at Donana and runs to Benga on the Zambezi River, can handle 4 trains per day with tonnage for about 136,000. These two routes have been considered in isolation and the Tete Railroad is dependent upon the Trans-Zambesia for a connection with Beira. Therefore, only 136,000 troops could be supported at Donana and 68,000 at each of the terminals of the routes.

The Beira Railroad extending from the port of Beira to Machipanda on the Southern Rhodesia border, connects with the Rhodesian Railroad route which serves Salisbury, the capital of Southern Rhodesia. This route has a military capacity of about 3,200 tons per day, adequate to support a force of about 256,000. The port of Beira is capable of handling about 5,600 tons per day using ship's gear only for unloading military cargo. At that rate of discharge, the port could support a force of 448,000.

* Computed on the basis of a logistic requirement of 25 pounds per man per day.

In southern Mozambique, two main railroads extend inland. The most southerly of these runs from the port of Lourenco Marques to Ressano Garcia on the border of South Africa, a distance of 55 miles, and connects with the South African railroad which serves Pretoria and the Johannesburg area. This route is capable of delivering enough tonnage from the port to the South African border to support a force of about 840,000 or, 10,450 tons per day.

The northern route extends from Lourenco Marques to Malvernia on the border of Southern Rhodesia where it connects with the Rhodesian railroad route which serves Bulawayo, Wankie and Salisbury. From Lourenco Marques to Malvernia, the route is 332 miles in length. The estimated military capacity of the route is 3,300 tons per day, sufficient to support a force of 264,000.

The capacity of the port at Lourenco Marques is adequate for the tonnage involved, but if a debarking force should be compelled to use ship's gear only, the port capacity would be sufficient to supply a force of about 756,000.

The highway network in Mozambique is capable of supporting a considerable force during fair weather, but during the long rainy season, most of the roads become virtually impassable for commercial vehicles and extremely difficult even for four-wheel drive military vehicles. An example of a highway which serves a remote area not served by a railroad is the highway leading from the minor port of Quelimane to Milange near the border of Nyasaland, a distance of 215 miles. In good weather, this route could support a force of 36,000. Assuming a reduction of 75 percent during the rainy season, a force of 9,000 could be supported. The highway from Beira to Machipanda on the Southern Rhodesia border parallels the

railroad route. In fair weather this highway could support a force of 613,000.

The highway from Lourenco Marques to Ressano Garcia on the South African border could support a force of 267,000.

The international airports at Beira and Lourenco Marques have considerable military significance, particularly for the airlift of troops from Portugal and for the airlifting of troops and supplies to other airfields in the country from which supplies could be further distributed by airdrops.

E. South African Republic

1. Economic Significance

The railway system of South Africa provides more support to the economy than any other mode of transportation. It provides service between the completely separate and widely dispersed centers of production and consumption of which the Witwatersrand is the focal area. Thus it facilitates production for local consumption and for export as well as the distribution of essential imports to the interior. Foreign trade moves by rail to and from the ports and by interchange of traffic with the railroad systems of the Federation and Mozambique. The basic wealth of the country is still derived from its output of valuable minerals, chiefly gold and diamonds, which can be moved easily by air, but the effort involved in their production entails large movements of iron ore, steel, machinery and coal for electric power. Minerals other than coal and iron ore which are moved and exported in substantial amounts include chrome ore, manganese, asbestos, phosphate rock, limestone and copper.

Agricultural products also figure prominently on the transportation system of the country. Corn, raised in various parts but mostly in the belt of the southern Transvaal and Orange Free State, moves in large tonnages both for local consumption and for export. Sugar cane and sugar are traffic items of importance on the Natal Coast. Cattle and animal products are collected in South-West Africa and the northeastern Cape area and moved both to ports and domestic consuming centers. Cattle are also moved from one grazing area to another by railroad when

their well-being is threatened by drought in grazing regions. Other important railborne agricultural products are citrus and deciduous fruits, grapes, potatoes and other vegetables, and fish. Timber is imported in order to supplement the insufficient domestic supply.

All petroleum and its products are imported by sea and the portion consumed at interior points moves from the ports by rail. Large amounts of machinery, consumer goods and general merchandise are also imported and are moved to the hinterland by railroad.

In addition to inter-city passenger service the railways also perform an unusually extensive commutation function in the carrying of passengers between the large cities and their places of residence. The government is promoting the movement of urban residents to all-white and all-African communities at some distance from the cities in order to implement its policy of race separation. Much new railway equipment is being added and modernization of plant is being undertaken for this purpose. The addition of new facilities and equipment, in itself, is a considerable stimulus to the economy as most of it is being produced within the country from indigenous materials. Modernization of the freight as well as the passenger plant, is under way and through this program the South African Railways contribute importantly to the living standard of the population and the pace of the economy as a whole.

Highways and highway transport are important to the economic life of

South Africa, both where there are no railways and in concentrated

collection and distribution centers such as cities, ports and mining areas. Highways are built with local funds within the provinces, but the inter-regional highways some of which are bituminous surfaces, are built with revenues derived from a national gasoline tax.

Air transport serves the national economy through expediting internal and external trade in high value and perishable goods and through more expeditious planning, coordination and decision making resulting from fast passenger and mail service. Regional trunk services are provided largely by jet aircraft in addition to the conventional piston type. The transport aircraft inventory consists of 28 aircraft of which 3 were Boeing 707s, 20 were 4-engine piston or turbo-prop aircraft, and 5 were DC-3s. The three major airports in South Africa at Johannesburg, Durban and Capetown, are adequate for present traffic requirements.

2. Military Significance

The transport facilities within South Africa would almost certainly be able to handle all traffic needed to support the military and internal security forces of the country. The role of ground transport in a military crisis conceivably would fall into two phases, i.e., mobilization and sustained logistical support. The first phase would involve a rapid assembly and delivery of essential types of equipment through clearing the railroads and highways for priority movement of personnel and materiel with the consequent delay of less pressing economic traffic. The second phase would represent at least a partial return to normal operations, but with extra trains and vehicles moving in addition to those needed by some areas which would have to be expanded while others would temporarily be reduced or suspended. The type of transport pattern which would develop in either phase would depend upon a combination of circumstances, but most particularly upon whether or not the Republic were or were not threatened by a major world power or combination of powers possessing sea or air strength.

The South African Army has a strength of 12,000 men organized into a mobile watch unit, a parachute battalion and 10 training units. In addition, more than 50,000 men are enrolled in militia-type units known as Commandos. The regular air force personnel number 3,885 and there is a reserve force numbering 10,000. Naval personnel total about 1,700. The police force consists of 28,000 men of which 14,500 are non-whites, and would be of questionable value in suppressing racial violence.

Should events build up to a combination of pressures from the Bantu and other native African tribes only, there might come into being a combination of two fronts, one to the north, and a more fluid one among Bantus within South Africa. If the railroads can be secured so that they are comparatively free of sabotage, they should be able to meet the requirements of both military phases with facility. If a Bantu uprising included a wholesale abandonment of normal employment by the non-whites, and flight to the north or to the protectorates ensued, difficulty might soon be faced in obtaining sufficient coal to keep steam and electric powered motive power in operation on the railroads. The diesel locomotives and motor transport, barring economic sanctions on imports of fuel, could probably keep essential military and a minimum of economic traffic moving, but lack of coal and power could cause transportation supporting industries to shut down and maintenance as well as the availability of supplies may not be sufficient.

In the initial phases of a localized front line conflict with native African forces to the north, the logistical supply lines would probably extend as

far as the Zambezi River. Extra heavy loads can be handled by both rail and motor transport so that ample special military equipment could also be moved with dispatch to the combat zone. A possible weak link in the line of communications which might well need to be supplemented by air, road and sea transport, however, is the rail connection with Southern Rhodesia. Normal economic traffic on this route is light, and so there should be ample excess capacity for military supplies, but there could conceivably be international political complications inasmuch as the line extends for much of its length through the Bechuanaland Protectorate.

An alternate to this route for the movement of South African forces to the Southern Rhodesian border and into Southern Rhodesia exists, however, by rail to Beitbridge on the border, and thence by road to Bulawayo in Southern Rhodesia. The road from Beitbridge to Bulawayo would represent the limiting capacity for the supply of South African forces but it has the capacity to supply a force of at least 25,000.

In a long, drawn out conflict of resistance, purely African in character, the erosion on the white forces would probably take its toll in loss of life and productive time on both sides, and in reduced economic output rather than in attrition to transport. Employment on the railroads is about 50 percent white, and conceivably both railroad and road transport could operate on reduced schedules with sufficient capacity to support military operations even with the departure of a high percentage of the non-whites. Thus the greatest threat to the South African military forces lies not in the insufficiency of transport and the lack of ability of transport to support forces holding militant African nationalism, but in possible economic sanctions or intervention on the part of a non-African power or group of powers.

III. Consequences of the Imposition of Various Potential Controls on the Transportation Routes

A. Embargoes on Traffic

1. Following the imminent split of the Federation of Rhodesia and Nyasaland, it is conceivable that Southern Rhodesia would consider an embargo of traffic with Northern Rhodesia and Nyasaland as a countermeasure to the support by Northern Rhodesia and Nyasaland of nationalist movements within Southern Rhodesia or as a result of disagreements concerning tariffs, customs and other international arrangements. Such action would have the following consequences:

(a) Southern Rhodesia would retain its access routes to the sea through Mozambique and South Africa, but would be denied the existing market for about 30 percent of its manufactured goods (mostly consumer durables and non-durables) and over one-third of its coal (about 1 1/4 million tons). It would also lose the valuable transit traffic on the Rhodesia Railways which moves to and from Northern Rhodesia and the Congo. In 1961 this traffic* amounted to an estimated 25 percent of the total tonnage carried by the Rhodesian railroads and an estimated 35 percent of gross revenues for the railroads. Loss of these substantial portions of the markets for industrial goods and transportation services would result in large scale unemployment, at least until the Southern Rhodesian economy were reoriented, having increased its trade with other trading partners. Access routes to South Africa and Mozambique would remain open and trade would still continue with the UK and South

* See Table 6, Appendix C.III, p. 215 and section II.C.1, p. 29.

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Africa, the most important trading partners, as well as with the rest of the world. The net effect of the embargo, however, might be more unacceptable to Southern Rhodesia than to Northern Rhodesia or Nyasaland where standards of living are relatively lower.

(b) Northern Rhodesia would suffer rather serious consequences. Denied its principal access routes to the sea through Mozambique ports via Southern Rhodesia, the most logical alternate route is the all-rail (BCK-Benguela Railways) route through the Congo and Angola. The distance is not significantly greater via the alternative route but the necessary additional capacity is lacking to handle all of the tonnage that would have to be diverted (about 3 million tons) in addition to current traffic (about 3.6 million tons). The railroad carried nearly 4 million tons during the peak year 1960, and is believed capable of accepting at least 600,000 tons in excess of current traffic, without substantial improvement. The port of Lobito is also believed to have at least this much excess capacity.* Since this is a nearly equidistant rail route with no transshipment, there should be little if any additional transportation cost.

The next most logical alternate routing for Northern Rhodesian exports and imports would be via the Congo's Route Nationale (rail-water-rail) which is expected to be restored as a through route to and from the port of Matadi by September 1963. Its reliability is questionable, however, because of the areas of tribal unrest through which the traffic must pass. Capacity of this route is

* See Appendix C.I., p. 172.

probably limited by the capacity of Port Francqui to about 1 million tons per year.

Traffic through Port Francqui in 1959, the last year of normal operations, was about 412,000 tons. Additional capacity available is probably not over 600,000 tons without substantial improvement to the port and the segment of the BCK railroad which serves it.

Another possible alternative is to route the traffic via the Congo railways to Albertville, transship over Lake Tanganyika to Kigoma for further movement by the Tanganyika railroad to Dar es Salaam. Maximum capacity of this route for commercial traffic would probably be limited by the Lake Tanganyika service between Albertville and Kigoma to nearly 600,000 tons per year. The most heavily used segment of the route, however, is the Tanganyika railroad between Kigoma and Dar es Salaam which carried over 540,000 tons in 1961 and is probably operating at near-capacity. It is therefore doubtful whether more than 60,000 tons additional could be accepted for through movement under present conditions. Introduction of diesel motive power however would substantially increase the capability.

Another alternate possibility is the shipment of some freight over the highway from Northern Rhodesia to Dar es Salaam. This highway is considered an all-weather route but is limited to about 650 tons per day (nearly 240,000 tons per year) in both directions by low-capacity bridges on the 70 mile stretch just south of the Rhodesia-Tanganyika border. Through traffic is believed to be very light and the estimated capacity may be considered available if a fleet of vehicles could be operated and maintained.

Additional capacities available on all feasible alternate routes

between Northern Rhodesia and the sea are therefore estimated to be as follows:

| Port* | Route | Capacity | (millions of tons) | |
|---------------|--|----------|--------------------|-----------------|
| | | | Traffic (1961) | Unused Capacity |
| Lobito | ECK-Benguela RR | 4.5 | 3.9** | .6 |
| Matadi | Route-Nationale | 1.0 | 0.0 | 1.0 |
| Dar es Salaam | Congo RR-Lake Tanganyika- Tanganyika RR (via Albertville-Kigoma) | .6 | .54 | .06 |
| Dar es Salaam | Rhodesia-Dar es Salaam Highway | .24 | neg. | .24 |
| Total | All feasible alternatives | 6.34 | 4.44 | 1.90 |

It may be concluded, therefore, that a Southern Rhodesian embargo of Northern Rhodesian traffic would prevent the movement of one million tons or more of export-import traffic, about 1/3 of the current export-import traffic. The effects of such a reduction in foreign trade to a country so greatly oriented to trade as is Northern Rhodesia would be serious. The copper industry alone accounts for over 50 percent of the Net Domestic Product of Northern Rhodesia, and it exports nearly all of its production.*** There would also be a reduction in the volume of other exports such as ^{cobalt,} lead and zinc (See Appendix B.III, Table 2 below). In addition, Northern Rhodesia would be cut off from its only supplier of coal, the Wankie mines in Southern Rhodesia. Modern industry

* The capacity of the port is not believed to be the limiting factor on any of these routes.

** Includes about 150,000 tons which might normally be expected to move via the Route-Nationale to Matadi, if it were open.

*** The Benguela railroad, since most of its excess capacity is available for imports (See Appendix C.I), could accept not more than 20 percent of the Northern Rhodesian copper exports unless it were relieved of some of the Katanga copper (about 600,000 tons) which it now carries.

and transportation, almost totally dependent on this source of power, would be seriously crippled after existing reserves were exhausted, although it would be possible to import considerable coal (at much greater cost) over the inadequate alternative routes. (Over 80 percent of estimated excess capacity is probably available for imports.)

Adding to the monstrous unemployment problem inherent in the above situation would be the probable deportation of over 40 thousand Northern Rhodesian migrant laborers who are normally employed in Southern Rhodesia.

(c) An embargo on trade between Southern Rhodesia and Nyasaland would force the latter to adjust trading patterns but would have only marginal effects on the generally subsistence economy. Of its total market for agricultural exports, Nyasaland would lose less than 10 percent which is marketed in Southern Rhodesia and South Africa. Of more serious consequence, however, would be the deportation of Nyasas working as migrant laborers in Southern Rhodesia, a number in excess of 130,000. These workers would have to be incorporated into an economy where the rate of growth is already barely adequate to keep up with population expansion.

The rail line to the Mozambique port of Beira would remain open, unless Portugal also embargoed, and imports of railroad rolling stock, vehicles and accessories, fuel oil, coal and construction materials could continue. A limited additional amount of coal might be imported on this line to substitute for Wankie coal. The railroad, however, is only a single track, steam operated, manually signaled line with light axle loadings. It is operated at slow speeds and capacity

is estimated at about 3,000 tons per day in both directions (about one million tons per year). Traffic in 1961 was about 973,000 tons, but dropped to about 936,000 tons in 1962.*

Considering the magnitude of the detrimental effects of such a blockade on all concerned, such action especially by the conservative government of Mr. Field would probably be taken only as a last resort short of all-out conflict.

2. In support of African Nationalism, it is conceivable that the Republic of the Congo might consider an embargo on traffic with Angola. Such action would have the following consequences:

(a) Angola would lose the valuable mineral and ore traffic which moves from Northern Rhodesia and Katanga to the port of Lobito over the Benguela railroad. This traffic has furnished 35 to 45 percent of total ton miles on the railroad and about 38 percent of tonnage handled at the port of Lobito in recent years. The Benguela railroad is believed to derive some 75 percent of its revenues from transit freight and passengers to and from Katanga. Although 90 percent of the Benguela railroad is owned by Tanganyika Concessions Ltd., a British company (10 percent is owned by the Portuguese Government), it is nevertheless of great importance to Angola as its principal link to the interior. In addition, the port revenues to the government from this traffic are considerable.

Angola's foreign trade would be little affected. Access routes to all major trading partners would remain open. Trade with the Congo accounts for no

* See Appendix C.III, Table 7, p. 216.

more than one percent of Angola's imports and about four percent of its exports.

The principal effect, then, would be the serious disruption of the financial position of the Benguela Railroad and the Port of Lobito together with decreased revenues for an already hard-pressed government.

(b) The Congo, by such action, would be virtually committing economic suicide. Having denied itself a major access route to the sea for the important Katanga traffic, the Congo would be faced with probable retaliatory action by the Portuguese who are in a position to cut off their only other Atlantic outlet by refusing to allow dredging of the Matadi channel, part of which lies within Angolan territory. A negligible amount of traffic might possibly be diverted through Brazzaville to Pointe Noire, which route is believed to be operated at near-capacity. Some traffic from Katanga might conceivably be routed over the Rhodesian Railways for further shipment to South African ports, but only a limited amount in excess of current traffic could probably be handled by the railroad to Bulawayo -- the distance would be over 40 percent greater. The only other outlets remaining would be the low-capacity, costly routes through Tanganyika discussed in 1(b) above, since the Portuguese would also deny the Congo the use of Mozambique ports. Additional capacity on these routes through Tanganyika, which in 1961 handled only about 90,000 tons of export-import traffic for the Congo is estimated to be only some 300,000 tons per year (see 1(b) above). The serious effect on the economy is apparent when it is realized that, excluding diamonds, which move by air, the total exports for 1959, the last year for which reasonably reliable totals are available, were

approximately 1.7 million tons worth about \$423 million. Imports for the same year were roughly \$185 million. The money economy of the Congo is largely oriented to foreign trade, and a major disruption of the money economy would doubtless ensue.

Considering the above, it is understandable that the Congolese government has thus far adopted a cautious attitude towards the support of nationalist insurgency in Angola. It is believed that such an attitude is likely to continue and economic blockade is not in the cards.

3. A more unlikely turn of events such as coordinated and concurrent sabotage or insurgent action against the white dominated governments of Southern Rhodesia, Angola, Mozambique and South Africa, supported by and based in the black dominated territories of Northern Rhodesia, Nyasaland, and the Congo, might precipitate a general embargo on traffic with these countries imposed concurrently by Southern Rhodesia, Portugal and South Africa. The Portuguese under these circumstances would also be expected to interdict the channel at Matadi. Consequences of such action would be as follows:

(a) The effects on Southern Rhodesia would be the same as described in 1(a) above.

(b) Northern Rhodesia would experience the same effects mentioned in 1(b) above, but these effects would be magnified by the additional loss of the two other alternative access routes to the sea which are estimated to have the most excess capacity. That is to say that, in addition to being denied access to Mozambique and South Africa through Southern Rhodesia, Northern Rhodesia would now also

be denied access to Lobito, Angola and Matadi, Congo. Only the completely inadequate routes through Tanganyika (see 1(b) above) with only some 300,000 tons of excess capacity per year would remain open to handle the 3 million tons of Northern Rhodesian export-import traffic in competition with Congo and Nyasaland traffic also looking for an exit to the sea.

(c) The Congo and Angola would experience the same effects hypothesized in part 2 above, except that the Congo's situation, already described as disastrous, would be slightly worsened by competition from Northern Rhodesia and Nyasaland for use of the low-capacity costly routes through Tanganyika.

(d) Nyasaland would experience the same serious effects described in 1(c) above, worsened to the degree that it would now be virtually isolated by the denial of its rail connection to Beira via the Trans-Zambesia railroad. Only low capacity roads connect Nyasaland with Tanganyika, the only remaining route to the sea. Under a total embargo by all white-dominated governments, it would not even be possible to import the small amounts of vehicles, railroad rolling stock and fuels which were possible if Portugal did not embargo.

(e) Mozambique would be affected in very much the same way as Angola. Trade routes with all major trading partners would remain open, and it would experience the loss of less than 5 percent of its exports and less than 2 percent of its imports which are accounted for by the Federation of Rhodesia and Nyasaland and the Congo. The principal effect (and this would occur even if only Southern Rhodesia embargoed) would be the serious disruption of the financial position of the

railroads and the port of Beira because of the loss of the lucrative transit traffic originating and terminating in Northern Rhodesia, the Congo and Nyasaland. Here, as in Angola, in the face of decreased government revenues from lost traffic, additional expenditures would be required from an already hard-pressed government to maintain and operate transportation services necessary to keep the rest of the economy functioning. Nearly 30 percent of Mozambique's revenue is derived from port and rail operations and about 40 percent of the development budget has been devoted to transportation and communications facilities since 1956. Export-import traffic through Beira for Northern Rhodesia, Nyasaland and the Congo amounted to an estimated 2.2 million tons in 1961, 61 percent of total traffic through the port, and 69 percent of the tons carried on the Beira railroad. The traffic moving between Nyasaland and Beira represents one-third of the traffic on the Trans-Zambesia railroad. During 1960, of the total of over 4 million tons carried by the railroad serving Lourenco Marques, however, over 90 percent was transit traffic between South Africa and the port, earning perhaps 95 percent of the revenue. The port of Lourenco Marques therefore should not be seriously affected by the hypothesized embargo.

(f) South Africa would be affected least of any country in the area, unless outside countries imposed boycotts or sanctions. The US and the UK together account for more than 40 percent of South Africa's foreign trade and this trade as well as that with all other major trading partners would continue. Trade with all of the embargoed countries amounts to less than 4 percent of exports and less than 3 percent of imports, all of which could be obtained or marketed elsewhere. The

principal role of South Africa in such an embargo would be to substitute insofar as it would be able for markets and sources of supply lost to the other countries of the "white redoubt." South Africa would also be expected to render extensive emergency aid to its suffering partners in the blockade.

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B. Sabotage by Insurgents

An objective of insurgents engaging in sabotage frequently is to disrupt the economic life of a country to such a degree that chaotic economic conditions will contribute to the overthrow of existing governmental authority. The disruption of traffic between producing and consuming centers, including export and import traffic, is a principal means to this end and the transportation facilities are a prime target for sabotage. Insurgents also attack transportation targets for the purpose of attempting to deny their use to governmental military and security forces, and to destroy these forces and their logistic support in transit.

The transportation systems of the countries of Southern Africa are highly vulnerable to sabotage. The effects of sabotage of transportation facilities upon the economy or the security of a country or a region within a country depends largely upon the availability of alternate transportation routes and facilities, and the recuperability of the transportation system after sabotage. In the territories of Southern Africa, the railroads are the backbone of the transportation system and neither the highways nor the inland waterways are capable of providing either an adequate alternate or a substitute means of transport for commercial traffic. Moreover, with the exception of the railroad system of South Africa, all trunk line railroads are single track and alternate rail routes over which traffic can be diverted are non-existent. For these reasons, the railroads could be a most profitable economic target for sabotage by insurgents, and the loading and unloading facilities of major seaports would be a close second to the railroads. The highways

may also become a target for saboteurs, but damage to highway facilities would not have as serious economic consequences as damage to the railroads, because frequently they serve only as feeders to the railroads, and in any event their capacities are much lower than those of the railroads. The inland waterways should not represent priority targets for sabotage because there are few physically vulnerable targets along rivers and lakes, but damage to selected river and lake port facilities could have considerable economic consequences in the Congo and certain other parts of the area.

The key bridges on the railroads offer some of the most profitable targets for sabotage, as do power stations which supply current to electrified sections of the railroads. The bridges and power stations on the railroads are listed and discussed in Appendix E and their locations are mapped on Figures 3 through 8.

The effective sabotage of a major bridge of steel or concrete construction requires a relatively high degree of training in the use of explosives and also some training and skill is required to gain access to the target. The demolition of a major bridge on a route for which there is no alternate in the area could nevertheless stop traffic for an extended period of time - a time period of from one month to a year depending upon the repair resources of the territory in which it is located. With the exception of South Africa, and to a lesser degree Southern Rhodesia, none of the countries under consideration here are capable of producing the structural steel bridge components with which to repair such a structure. Neither is there any evidence

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of the storage of structural steel bridging material in these countries which would facilitate repairs. It is probable that engineers in some of these countries may have the technical know-how to effect temporary repairs using timber instead of steel, but this capability has not been evident in the Congo, however, because some key bridges which have been damaged have not been restored to service for months although timber there is plentiful. It is estimated, therefore, that the recuperability from railroad sabotage in any of these countries except South Africa and Southern Rhodesia is very low, and considerable time - extending up to a year - may be required to repair major structures. The transloading of traffic using makeshift ferries or temporary bridges to by-pass damaged permanent structures is possible. Nevertheless, even with the use of such an expedient, traffic movement would be drastically reduced during the period of time the permanent structure is unusable.

Sabotage targets are not limited to the major structures on a railroad route. Motive power also represents a profitable target for the sabotage of a railroad system. With the exception of South Africa, none of the countries under consideration are capable of producing locomotives or their major parts, and even South Africa has purchased large amounts of such equipment in America and Europe. Some replacement parts will be available in each of these countries. However, the well-trained saboteur will concentrate on the consecutive damage to only one or a very few identical component parts, which are difficult to replace, thus effectively reducing the capability of the railroad shops to repair damage to locomotives and to keep them operational.

Concurrent with the sabotage of locomotives a well organized operation would also attempt to sabotage the machinery in the repair shops. Access to locomotives and repair shops is, however, difficult and access may require the recruitment of railroad employees as saboteurs or at least require the cooperation of such employees. Recruitment of these employees may prove difficult, however, because the railroad is the employee's source of livelihood. Therefore, railroad employees would have to be motivated by a strong sympathetic attitude toward the objectives of the insurgents or they will be reluctant to accept the risks involved. Also, a strong sense of loyalty to the railroad is frequently found among railroad employees, particularly in the less developed countries. The railroad workers have a status not shared with common laborers. The railroad is a visible symbol of modern progress and railroad employees are proud of it. They may not even know the name or the politics of national government officials, and care even less, but they know the railroad officials and are frequently quite loyal to them and to other railroad employees.

The probability of sabotage and the courses of action which may be expected in Southern Africa varies from country to country. The insurgents in being in the various countries are discussed in I-A, above, and in Appendixes A and D. An examination of these dissident forces, their current assets and state of training for sabotage balanced against military and security forces in the various territories, discussed in Appendix D, suggest that they are unlikely to be able to engage in critical sabotage against transportation for some time - at least a year and possibly two years.

1. Angola

The African rebellion which broke out in March 1961 under the leadership of Holden Roberto has just barely managed to maintain itself and is presently confined to a relatively small area in the northwest section of the country bordering on the Congo. Its spread to other areas has been and continues to be hampered by the rebels' inadequate equipment and training, and the lack of outside support necessary to obtain additional equipment and to train a cadre with which to recruit and train additional followers. So far, his following has been limited to members of the Bakongo tribal group of northern Angola, and tribal differences between this group and other tribal elements in Central and Southern Angola has obstructed the spread of the rebellion to other areas. The rebel group does not appear to have the degree of sophistication necessary to establish a sabotage net in all target areas or, for that matter, to engage in any action other than sporadic raids on rural farming communities and acts of terrorism in the limited area in which they are presently confined. It is unlikely that any appreciable effort to sabotage the railroads and ports can be expected from this rebel group until there is a substantial improvement in its capability.

Roberto has close ties with Congolese Premier Adoula and other members of the ruling group in the Congo. They have given him a limited amount of aid and have permitted him to set up a training camp about 70 miles south of Leopoldville. Roberto has also received money and arms from Tunisia and some of his militants have been trained there and in Algeria. Material and equipment from these sources has been kept to a trickle by the problem of transportation from North Africa. If and

when Roberto's group acquires the training and equipment which will enable him to act, he may attempt to engage in sabotage activity against the Luanda Railroad in northern Angola with or without the blessing of his supporters in the Congo. The Congolese may attempt to restrain him from acts of sabotage against the Benguela Railroad, at least initially, because even in normal times over 75 percent of the mineral traffic from Katanga Province moves over that route and the alternate route over the Congo's "Route Nationale" is none too secure. Should both of these routes be sabotaged, the Congo's access to the sea would be limited to the more circuitous route through the Rhodesias to ports in Mozambique or South Africa, or the low capacity route through Tanganyika to the Indian Ocean. The remoteness of the region in which the Mocamedes Railroad in southern Angola is located suggests that it will not be quickly affected by insurgency in the north.

2. Congo

With the end of military action in January 1963 and the reuniting of the break-away province of Katanga with the rest of the Congo, organized rebel activity has practically ceased. Railroad structures which were sabotaged or deliberately destroyed by direct military action are in the process of being restored, and the same groups who have been carrying out acts of sabotage since independence in 1960 now appear to be, at least temporarily, aligned with governmental security forces to protect against sabotage. Barring another attempted secession by Tshombe and the Katanganese and greater political unrest than currently exists, it is improbable that organized sabotage activity will occur in the Congo. However, the railroads and in

particular the "Route Nationale", which is the Congo's principal route of access to the sea entirely under Congo control, runs through an area populated by a hodgepodge of tribal groups which are frequently at loggerheads and these tribal groups may be able to cause derailments or they may, through terrorist activity, create so much fear among railroad personnel that serious disruption will occur through failure of the staff to function properly. None of these tribal groups are currently believed to possess the materials or the skills necessary for the destruction of major railroad structures, however.

3. The Federation of Rhodesia and Nyasaland

With the dissolution of the Federation, which is imminent, Northern Rhodesia and Nyasaland will be governed by authority with which the populace will be sympathetic. In the absence of internal dissident groups, it is unlikely that sabotage to the railroads of Northern Rhodesia and Nyasaland will occur. In Southern Rhodesia, some acts of sabotage have occurred in the past but there is no organized group currently within Southern Rhodesia capable of critical acts of sabotage. Moreover, sabotage from African nationalists operating from Northern Rhodesia against the railroads in Southern Rhodesia would not be in the best interests of Northern Rhodesia because this territory needs the Southern Rhodesian railroads to provide the traditional route to the sea as well as to facilitate trade with Southern Rhodesia, South Africa and Nyasaland. In spite of these considerations -- and in spite of the relatively mild attitude toward Southern Rhodesia taken at the Addis Ababa conference,--the possibility of sporadic acts of sabotage against the railroads of Southern Rhodesia cannot be ruled out. The non-white leaders may conclude that the railroads are of so little importance to the vast majority of the non-whites

who are a part of the subsistence economy that they can be sacrificed in the cause of African nationalism. Such a conclusion would be encouraged if Britain and Southern Rhodesia reached a stalemate on the colony's constitutional development.

4. Mozambique

Currently there are no active dissident groups or insurgency forces in being within the country capable of critical acts of sabotage. Insurgents operating from Nyasaland could conceivably mount a sabotage operation against northern Mozambique, but that is unlikely because Nyasaland needs the railroads in Mozambique for access to the sea as well as for trade with Mozambique, the Rhodesias and South Africa. In this connection, however, the same conclusion by non-white leaders suggested in B.3. above, regarding Southern Rhodesia, may also apply to Mozambique. There is also a possibility of sabotage to the railroads between South Africa and Mozambique by insurgents operating from South Africa. That possibility is discussed in B.5. below.

5. South Africa

In the absence of well-organized and trained insurgents in being in South Africa at present, and considering the efficiency of the South African security forces, it is improbable that large scale sabotage of railroads and port facilities will occur in South Africa within the next two years. Some acts of sabotage have occurred to power stations on electrified routes, but these sporadic incidents have only served to alert the security forces to the need for guarding transportation

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facilities, thus making a repetition of such incidents even more unlikely and considerably more hazardous for the saboteurs. Moreover, the existence of alternate routes over which traffic can be diverted, coupled with the capability of the railroad repair organization to restore damaged installations and equipment, indicates that a major sabotage program requiring a high degree of sophistication would be required to seriously disrupt traffic in South Africa. There is a possibility that South African insurgents might attempt to infiltrate into Mozambique for the purpose of sabotaging the railroad route which runs from the South African border through Mozambique to the port of Lourenco Marques. Almost four million tons of South African freight traffic yearly moves over this route, and its sabotage would require the diversion of a considerable amount of export mineral traffic originating in the area of Johannesburg and import traffic destined for the same area. In the event of such an attempt at sabotage in Mozambique, the South African security forces and the Portuguese in Mozambique would probably cooperate to the fullest extent possible to secure the route against sabotage. South Africa needs the route, and Mozambique needs the considerable revenue from the traffic over the route.

C. Seizure of Parts of the Transportation System by Insurgent Forces

1. General

While there may be attempts on the part of non-white insurgent (guerrilla) forces to seize parts of the inter-territorial transportation system, it does not appear that a military advantage can be obtained thereby. There are also other considerations that would not make such action propitious.

Normally, guerrilla forces wish to establish their operations in areas that (1) are advantageous from the standpoint of terrain, (2) are adjacent to safe havens, preferably across international borders in sympathetic territories where training can be conducted, and from which forces can be deployed or to which guerrillas can retreat in safety when pressed by opposing forces, and (3) are connected by some form of transportation to a source of logistic support and manpower reinforcements. There are no parts of the area under consideration that combine outstanding terrain advantages for guerrilla operations with the other two desirable requirements for guerrilla warfare. Outstanding terrain advantages would include mountains with dense jungles or forests with underbrush covering the egress and access routes to the mountains.

If insurgents should seize parts of the inter-territorial transportation system, even though lacking outstanding terrain advantages, the logistic supply capability of the routes in the hands of government forces would make it possible for them to deploy currently an overwhelmingly large force against the uprising. In addition, seizure of parts of the system by insurgents, and the

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conflict that would ensue, could deny the territories which may be hosts to the insurgents their traditional trade routes to the sea. The consequences of such action would be virtual stagnation in the market economies of these host territories. It appears, therefore, that insurgents cannot expect to gain a military advantage by seizure of parts of the inter-territorial transportation, and furthermore that the non-white governments which may be called upon to serve as hosts to guerrilla forces should urge them to operate in parts of the area somewhat removed from the inter-territorial transportation system.

2. The Physical Setting for Insurgency

In the area under consideration, railroad and highway routes which traverse relatively isolated, partially wooded countrysides, are found from Kolwezi in the Katanga, across Angola to the port of Lobito; south from the Copperbelt to Livingstone, Northern Rhodesia; and east from Salisbury, Southern Rhodesia, to the port of Beira, Mozambique. Grassland areas are traversed by rail routes in the vicinity of Bulawayo, Southern Rhodesia; between Kamina and Port Francqui; and between Leopoldville and Matadi, both in the Republic of the Congo. Grasslands between forests and deserts are subject to air observation during the day, but wooded stream valleys could afford protection from observation by day, and cross country travel at night under the open sky is practical and is difficult for security forces to control. Very dry areas, such as parts of South-West Africa or Bechuanaland, however, offer few opportunities for concealment, present better operating conditions for military and security forces, and are generally less favorable to insurgents in terms of unassisted survival. Dry areas, nevertheless, offer more suitable conditions for air support than do wooded areas for both dissidents and security forces. Heavily populated areas can be vulnerable to actions of dissident groups

if the general population is unsympathetic to the mission of local security forces. The semi-skilled industrial worker by day could very well be the man security forces seek after dark. Nevertheless, industrialized areas of the Republic of South Africa, the Copperbelt of Northern Rhodesia, and the Katanga of the Congo, and most ports are not suitable areas of operation for large bands of dissidents, but rather offer opportunities for small well-trained groups that can mingle undetected with the local population and engage in sabotage operations. In fact, most of the parts of the transportation system do not contain the conditions normally regarded as important for guerrilla operations in force.

3. The Congo-Angola Route

The most promising part of the transportation system which could be used by a large scale guerrilla operation is the territory along the railroad line from Kolwezi in the Katanga, across Angola to the port of Lobito. With the consent of the government of the Republic of the Congo, training bases for insurgents for use against Angola could be expanded. Volunteers from other African countries could be infiltrated and substantial logistic support could move into the Congo through Matadi, Point Noire, and Dar es Salaam by sea and thence by rail, highway and water transportation to training and staging bases, and by air transportation to the principal airfields in the Congo. Insurgents and their supplies could be dispersed along the railroad and road between Kolwezi and the Angolan border, and then traditional guerrilla operations could be mounted along the Benguela Railroad and the parallel highway. A reliable transportation route from the Congo for insurgent

reinforcements and logistic support would be available as well as a safe haven into which the guerrillas could retreat if necessary.

The railroad and parallel highway in Portuguese hands would also support logistically a tremendous force for the capacity of the Benguela Railroad, and the road in Portuguese hands, would supply over 150,000 troops engaging in a security type of operation against guerrillas. Although such a force is far in excess of one that Portugal can deploy against insurgents (See Appendix D) there are other considerations which would place Portugal in a favorable position to counter insurgency in this territory. The chief current outlet to the sea for Katanga's exports -- the Benguela Railroad -- would be denied the Congo. The Portuguese could also counter by blocking the channel in the Congo River between Matadi and the sea, and thus deny the Congo the second most important outlet when the "Route Nationale" has been restored. Further, the Portuguese could deny the Congo the use of the Indian Ocean ports of Beira and Lourenco Marques which are reached from the Congo by rail via the Rhodesias. The only remaining outlets for Congolese exports and the receipt of imports would be the low capacity, circuitous and costly route by way of Albertville, Lake Tanganyika, and Dar es Salaam; the long-distance route to South African ports via the Rhodesias; the "Route Nationale" using the port of Brazzaville rather than Leopoldville; and the railroad and highway from Brazzaville to Point Noire rather than the routes from Leopoldville to Matadi.

The extent to which Southern Rhodesia and the Republic of South Africa would cooperate with the Congo in the face of impressive Congo-supported insurgency

against Angola is questionable. Moreover, the low capacity of the port of Brazzaville and the current use of the Brazzaville-Point Noire route by the Brazzaville Congo would not make this route an adequate substitute for the Leopoldville-Matadi route. In view of these considerations the Congo may find available only one route to the sea -- Albertville, Lake Tanganyika, Dar es Salaam -- as a consequence of the support provided the insurgency along the Benguela Railroad.

4. The Tanganyika-Mozambique Route

There is a second transportation route which could be used by a large guerrilla force and from which operations could proceed against the Portuguese. This route extends by road from Tanganyika into the northeast corner of Northern Rhodesia, and thence to the railhead of the Nyasaland Railroad at Salima. Insurgents and logistic support could be deployed from Tanganyika, a safe haven could be provided in Nyasaland and Tanganyika, and operations could proceed along the railroad against the Portuguese forces in Mozambique, although terrain in this area is even less favorable than that available for the first route and is more open than that normally regarded as favorable for guerrilla warfare. The capacity of the road leading to the railhead is low, but could, nevertheless, supply a considerable force of insurgents - say in excess of 30,000*. Logistic support provided by the road could also be augmented considerably by the use of an airlift in support of

* It is very difficult to quantify the size of this force. First, we have very little information on the average daily capacity of the route, but believe it to be in excess of 200 tons. Secondly, we have very little information on the daily supply requirements of insurgents. Assuming, however, that the former is 200 tons and the latter one ton per day for 160 men or 12½ pounds per man per day, then the insurgents that could be supported would be in excess of 30,000.

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the insurgency. The Trans-Zambesia Railroad and the Nyasaland Railroad, to the extent that they are held by Portuguese forces, and the road that leads from Mozambique to Nyasaland would support a force in opposition to the insurgents numbering also in excess of 150,000 men. Nyasaland, the host to the insurgency, would be denied the traditional and most economical route to the sea at Beira. Moreover, normal and important trade by rail with the Rhodesias would also be interrupted. The long, poor highway route from Nyasaland to Tanganyika would not provide the alternate support needed for the economy of Nyasaland, even though new trading partners could be developed and access to world markets could be obtained through Dar es Salaam.

5. The Northern Rhodesia - Southern Rhodesia Route

The rail and road routes leading from the Congo through Northern Rhodesia into Southern Rhodesia might also be used by guerrilla forces. Here again, the Congo and Tanganyika, as well as Northern Rhodesia, could be used as troop training and staging areas as well as sources of logistic support. The transportation systems involved would provide impressive logistic support for both insurgents and opposing forces. Here also the cost to the market economy of the host country of such massive insurgency operating along the transportation routes of Northern Rhodesia into Southern Rhodesia would be great. Northern Rhodesia would be denied its traditional access to the sea and trade with Southern Rhodesia, the Republic of South Africa, and Nyasaland. The railroad route from Northern Rhodesia through the Congo to the Benguela Railroad and thence to Lobito

would provide an alternate access route to the sea if the Portuguese were to

cooperate with Northern Rhodesia. It is doubtful that the Portuguese would cooperate,

but even if they were to do so, lack of coal from Southern Rhodesia would make it

impossible for the Northern Rhodesian railroads to move sufficient tonnage to meet

the requirements of the economy as well as the transportation requirements of the

insurgency.

6. Outlook

If insurgents decide to use the inter-territorial routes for their purposes, parts of the same routes can be used by the better trained and equipped military and security forces of the various governments. As a consequence, the same or greater capacity for logistic support will be available to these forces. It would therefore appear to be a matter of years before insurgent forces can seriously attempt to seize and hold parts of the inter-territorial routes. The inability to seize and hold, however, would not preclude small bands of guerrillas operating out of the Congo, Nyasaland and Northern Rhodesia from conducting sabotage operations against the routes leading into Angola, Mozambique and Southern Rhodesia. Operations to seize and hold or to affect the routes through critical sabotage would both have serious consequences on the market economies of the territories ^{which} may be hosts and sponsors of the insurgency. These consequences for the market economies will be so great that it would be logical for these territories to insist that no operations be conducted against the inter-territorial routes. If the tide of African nationalism becomes great enough, nevertheless, the non-white governments may be

unable or unwilling to prevent such operations. In this event they will have to suffer the consequences which will fall predominantly on the market economies rather than the subsistence economies.

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APPENDIX A

POLITICAL CONSIDERATIONS WITHIN THE AREA

I. ANGOLA

A. Internal

Angola is a Portuguese "overseas province", tightly governed from Lisbon by a policy which smacks of old-fashioned mercantilism. Occasional efforts to give an appearance of liberalization notwithstanding, the Salazar regime has refused to grant any significant autonomy to the province. Lisbon's attitude has stimulated occasional thoughts of separatism, particularly among the 190,000 Angolan whites; its heavy-handed control of the 43,000 Portuguese troops in the territory has aroused discontent among them in the past. There has been some talk of an anti-Salazar alliance including oppositionists in Portugal, Angolan white separatists, elements of the military, and perhaps some of the more sophisticated Angolan mulattos and Africans. Such a multiracial alliance has a better chance of developing in Angola than in South Africa or Southern Rhodesia, where racial feelings are much more intense. However, pressure from African rebels on all these discontented Angolan elements seems likely to keep them from uniting, and the chance of effective active opposition to Lisbon from these sources fairly remote.

The official Portuguese racial policy is one of complete assimilation.

Although it is true that race relations are better under Portuguese rule than they are in Southern Rhodesia or South Africa, in practice there is still a deep gulf

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between white Portuguese and the mass of backward Africans. Mulattos and the few educated Africans occupy an ambiguous position, but most of the politically articulate representatives of these communities appear to be identifying themselves with African nationalism.

The African rebellion which broke out in March 1961 is barely maintaining itself. After an initial rash of fairly widespread and largely spontaneous outbreaks, it was confined to one relatively small area in extreme northwest Angola; its spread to other areas has been hindered by the rebels' inadequate equipment and training, by lack of sympathetic tribal support outside the present disturbed area, and by the fact that much of the rest of the territory lacks the rough terrain and dense ground cover which aids guerrillas in northwestern Angola. This situation appears unlikely to change appreciably until Portuguese military and economic resources are weakened by this and other rebellions, or until the rebels have gradually acquired enough training and field experience to alter the military balance.

The group behind the rebellion is Holden Roberto's Union of Angolan Peoples (UPA), which is essentially the political and military organ of the Bakongo tribal group of northern Angola. Roberto has close ties with Congolese Premier Adoula and other Congolese leaders; they have given him a limited amount of aid and have permitted him to set up a training camp about 70 miles south of Leopoldville. Leopoldville has also recognized Roberto's government-in-exile -- the only government to do so thus far.

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Roberto has received small amounts of money and arms from Tunisia and Algeria and his militants have been trained in both countries. Aid from these latter sources has been kept to a trickle by the problem of transportation between North Africa and the Congo, however. In addition, Roberto -- as well as the Congolese in Leopoldville -- has been reluctant to respond too favorably to offers of massive aid from Algeria for fear of the influx of Algerian military men into the Congo and Angola which would presumably follow. Thus a rapid increase in the UPA's military capability is unlikely. Roberto opened an office in Elisabethville as soon as central government authority was established there, but he has not managed to spark an uprising in neighboring parts of Angola. The UPA has so far shown no capability for sabotaging the Benguela Railroad.

The UPA's rival, the Popular Movement for the Liberation of Angola (MPLA), seems to have no effective following inside Angola. Its leaders, however, especially such intellectuals as Agostinho Neto and Mario de Andrade, cut a more impressive figure in foreign capitals than does the provincial and rather poorly educated leadership of the UPA. Many of the top MPLA figures are mulattos (Neto, the president, is an African), and several of them were educated at Portuguese universities where they gravitated into Communist-influenced movements. The MPLA is still tinged with Communism, although Neto seems to have been trying to move it toward neutralism since he became president a year ago. Roberto, by contrast, was educated in Protestant missions in the Congo and Angola and seems to have a genuine distrust of Communists. There have been recent indications of a split within the MPLA following the Congolese government's recognition of Roberto's government-in-exile.

Most of the MPLA's training and material support has come from Morocco and Algeria. So far, with the Congolese government favoring the UPA and with the most easily accessible area inhabited by UPA sympathizers, it has not been able to move its followers into Angola. If it should manage to do so, and if it can overcome the handicap of its factionalism and its predominantly mulatto hierarchy, the more cosmopolitan nature of its leadership might give it a somewhat broader base of potential support than the UPA.

B. Foreign Relations

The Portuguese maintain an embassy in Leopoldville which serves mainly as a listening post. They probably will try to preserve at least a minimum of official contact with the Adoula government. At the same time, however, Angola has allowed thirty or more Katangan mercenaries to camp just over the border in eastern Angola ever since the fighting stopped in January 1963. Portugal clearly stands to benefit as long as elements unsympathetic to the Angolan rebels have some say in Congolese affairs, and it presumably will try to support these elements to the best of its limited potential.

Angola holds considerable economic leverage over both Katanga and Northern Rhodesia in its control of the Benguela Railroad and the port at Lobito. There have been no signs that Africans in either territory have worked out any feasible way of exporting their minerals except via Lobito, Matadi, Beira, or Lourenco Marques, although the Northern Rhodesians are trying to promote the idea of a rail line to Dar es Salaam. Portugal would be reluctant to forego an important

source of revenue by closing the rail line, but the mere existence of the threat will probably inhibit the support which Africans such as Kenneth Kaunda give to Angolan exiles.

Angolan authorities have joined in defense and intelligence talks with other white-dominated governments in the area. These consultations will probably become more comprehensive as African nationalist pressure increases.

C. Treaties Affecting Transportation

Most of Angola falls in the free trade area defined by the Congo Basin Treaty of 1885. However, since Lisbon exercises tight control over Angolan trade, by currency restrictions and other measures, the treaty is of little value. The treaty, if faithfully followed, would prevent the Portuguese from interfering with navigation on the lower Congo River, whose channel at one point passes through Angolan territory. Portugal presently seems to lack the will or the ability to interfere seriously with river traffic, however. All dredging, in Portuguese as well as in Congolese territory, is carried out by Belgians. No other treaties affecting transportation are known to exist.

II. REPUBLIC OF THE CONGO (LEOPOLDVILLE)

A. Internal

Since the end of the fighting in January 1963, the Adoula government, with UN aid, has established a presence of a kind in Elisabethville. As is the case over most of the rest of the country, central authority can only be exercised through local leaders, most of them tribally based and few of them with any inherent

sympathy for the Leopoldville government. The Katangans, like other Congolese, lack the power to rebel against Leopoldville and the UN; at the same time, the central government and the UN cannot establish an effective provincial government on their own. For these reasons the cast of characters in Katanga is changing only slowly, and the new faces are unlikely to ameliorate Adoula's problems.

In the past few months, with Elisabethville and Leopoldville politics working directly on each other, each has become somewhat more unstable and unpredictable. Tshombe appears to have failed in his efforts to carve out a niche for himself in national politics, and he is under attack from younger elements in the Katangan legislature. In his efforts to stay on top, Tshombe apparently has tried to line up the support of everyone from radical Congolese to the Verwoerd government in Pretoria. The Leopoldville government knows something of his activities and may try to arrest him. Adoula, who recently has shown no decisiveness or initiative, has nevertheless managed to weather a series of parliamentary attacks on himself and his associates. An end to the drift in central government policies is not in sight.

In this morass, Union Miniere and other mining companies seem to be trying merely to go about their business with as little fuss as possible. Union Miniere is now paying all of its taxes to Leopoldville, and Adoula appears to recognize the importance of this contribution. He has been highly reluctant to incur the displeasure of the mining companies, as he presumably would do if he insisted that a significant part of their production be shipped out via the "Voie Nationale"

to Matadi (in any case, this route reportedly will not be open until late August 1963 when two key bridges are scheduled to be replaced). The Angolan rebels presumably would like to persuade him to undermine the Angolan economy by diverting traffic from the Benguela Railroad, but so far they have had no success whatever. If nationalist radicals in parliament continue to attack Adoula, he might require a partial rerouting of traffic as soon as the route to Matadi is open. He probably would not try to impose on Union Miniere complete dependence on the "Voie Nationale", however.

B. Foreign Relations

Adoula has proclaimed a policy of non-alignment, but he is clearly pro-Western. He is usually preoccupied with local problems, however, and has not given much attention to foreign affairs. He maintains close ties with Holden Roberto of the UPA, but partly out of governmental inefficiency and partly because the Congolese are unwilling to see the Angolan rebels become too powerful, material assistance to the rebellion has been strictly limited. Roberto and his

followers are also faced with the resistance of powerful Bakongo leaders in the Congo, including President Kasavubu, who would like to keep the Angolan Bakongo weak in hopes of eventually forming a unified tribal state.

C. Treaties Affecting Transportation

The Congo is, of course, within the area of the Congo Basin Treaty, but customs is one of the government's main sources of revenue. Tariffs thus tend to be higher than the treaty would permit. The government's tariff policy is chaotic, and its application is vitiated by smuggling, both into and out of the country. Financial experts advising the government hope to set up a more ordered customs regime, one which will discourage the import of luxury goods, for instance. No progress in this direction seems likely in the near future. No other treaties affecting transportation are known to exist.

III. FEDERATION OF RHODESIA AND NYASALAND

A. Internal

The Federation is a complex and unique constitutional phenomenon. Set up in 1953 over African objections, it amalgamates the two British protectorates of Northern Rhodesia and Nyasaland with Southern Rhodesia, a colony which has had almost complete internal autonomy since 1923. The Federation is not independent, even though the federal prime minister attends Commonwealth conferences; in practice, however, Britain has very little direct influence on the policies of either the federal or the Southern Rhodesian governments. In both cases it remains theoretically the supreme authority, but it has never exercised this authority without at least the acquiescence of the governments concerned.

Africans (who number 3.7 million in Southern Rhodesia and almost 3 million in each of the other two territories) have long held that the Federation was set up to subordinate them to the some 225,000 whites in Southern Rhodesia. They have, therefore, never become reconciled to it despite its obvious economic advantages. Britain has allowed African-dominated governments to take office in the two northern territories, and by the spring of 1963, it had acknowledged the right of both of them to secede from the Federation as a further step toward their full independence. These concessions presaged the end of the Federation as presently constituted, and the process of dissolution is now scheduled to be completed by 31 December 1963.

Dismantling the Federation will be a complex and difficult job. At present only the bare outlines of future interterritorial relationships can be indicated with any assurance. It seems likely that Nyasaland will break its financial ties almost completely. A few financial and transport links (such as the railways and airline, the power complex at Kariba Dam, and perhaps a common currency) may be preserved between Northern and Southern Rhodesia, but the African nationalists who will control Northern Rhodesia will probably try to limit imports from Southern Rhodesia. Independence dates for the three territories cannot be predicted. Southern Rhodesia is demanding independence no later than either of the other territories. Britain insists that substantial concessions to Africans are a prerequisite to independence, but its room for maneuver is limited by the possibility that the white-supremacist government of Winston Field will declare itself independent unilaterally. At present it appears probable that Field will back away

from his independence demand for the time being. Britain hopes to grant independence to all three territories at about the same time, but it may have to pull out of Nyasaland before the other two territories are completely disentangled.

At present, railways and airlines come under the jurisdiction of the federal government (the railways in Nyasaland, a complex of privately-owned companies, are a special case). Road construction and maintenance is a joint responsibility of the federal and territorial governments, with the territories doing most of the field work. When the Federation is dissolved, the railways in Northern and Southern Rhodesia probably will retain some kind of unified administration, and responsibility for roads will probably revert to the territories. Political uncertainty will probably continue to limit the railways' revenue and restrict road construction and repair expenditures.

Kenneth Kaunda and many of his lieutenants in Northern Rhodesia have been relatively moderate in their approach to the question of economic relations with Southern Rhodesia. They appear to hold better economic cards than the Field government, however; these are discussed in Appendix B. Thus, even if the federal breakup proceeds peacefully, and the greatest possible number of economic ties is retained, it seems doubtful that Southern Rhodesia will be permitted to hold all the commercial privileges it now enjoys in Northern Rhodesia.

Southern Rhodesia has been the scene of occasional acts of sabotage, most of it even more poorly organized than that in South Africa. The Field government, by harsh legislation and strict enforcement, has sharply reduced the incidence of sabotage. It has also exposed the weakness and indecision of the present African nationalist leaders, most of whom recently fled the country. Southern Rhodesian Africans are receiving training in subversion abroad, but their effective employment inside the territory probably will have to await a shake-up and streamlining in the nationalist movement. The extent to which the nationalists resort to sabotage and other violence will also depend on the degree to which they believe their desires are being protected by Britain in its dealings with the Field government; a breakdown in these negotiations could lead to a resumption of violence, especially if it were accompanied by a Southern Rhodesian declaration of independence. If the nationalists are able to initiate sabotage and terrorism, they might have a greater effect than in South Africa, since Southern Rhodesia lacks South Africa's economic and military strength.

B. Foreign Relations

Formally, none of the three territories has any competence in the foreign relations field, and the Federation itself exercises only such responsibilities as are delegated by Britain. Informally, however, each group of importance in the Federation has ties abroad, particularly with neighboring countries.

The white-dominated federal and Southern Rhodesian governments (whose officials usually are members of the same "Establishment" or ruling group)

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have been in unofficial contact with defense and security organizations in South Africa and the Portuguese territories for the past few years. These contacts are likely to increase in the future, particularly since Southern Rhodesia occupies a strategic position for intelligence-gathering purposes. Documents recently captured by the Congolese government in Elisabethville reportedly indicate that there have been vague attempts at coordinated covert action involving federal Prime Minister Welensky, Katanga President Tshombe, and Portuguese and South African officials. As African nationalism moves southward, activities such as these will probably become more intensive, but there is little likelihood that they will be particularly effective.

Nyasaland occupies a unique position among African-dominated countries, since it is almost completely dependent on its outlet to the sea through Mozambique. Nyasaland Prime Minister Hastings Banda, essentially a provincial figure who has few ambitions outside his own territory, has worked out a correct and even cordial relationship with Portuguese authorities in both Lisbon and Lourenco Marques. To preserve his access to the sea he can be expected to restrict Mozambique African activities, although he could not discourage them entirely without tarnishing his reputation as an African nationalist. His principal lieutenants are far more radical and ambitious than he, and if he left the scene (he is 57), Nyasaland's attitude toward Mozambique would probably become more belligerent.

Africans in Northern Rhodesia have a complex array of ties with outside groups. Harry Nkumbula of the African National Congress was subsidized for many months by Tshombe and tried to promote the cause of Katanga secession; his current partner in

the Northern Rhodesian coalition government, Kenneth Kaunda, has long favored Katanga's integration with the rest of the Congo. Kaunda is currently president of the Pan-African Freedom Movement for East, Central and Southern Africa (PAFMECA), which is trying to foster federal ties throughout eastern and southern Africa. Nkumbula has few ties with Africans outside of Northern Rhodesia. This dichotomy, with Kaunda favoring federations in general and the Leopoldville central government in particular, while Nkumbula takes a narrower outlook, is likely to continue until a new constitution is worked out in six months or a year; thereafter, Kaunda's majority in the legislature will probably be large enough to allow him to form a government of his own and Nkumbula's importance will decline.

Both Northern Rhodesia and Nyasaland would like to form ties with African states to the north and east, thereby reducing their dependence on Southern Rhodesia and Mozambique. They have found an eager collaborator in Tanganyika President Julius Nyerere, who has long been agitating for a federation which would include much of east and central Africa. Kaunda in particular has close ties with Nyerere; Banda himself has shown little interest, but some of his lieutenants seem to be getting involved in the Tanganyika president's project. Formation of close economic ties presumably would lag far behind the establishment of a loose political federation.

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C. Treaties affecting transportation

The federation is a member of GATT, and its trade agreement with South Africa is mentioned below. The Congo Basin Treaty of 1885 and subsequent years, which forbids the establishment of hindrances to trade and transportation in the treaty area, technically applies to all land between the Zambezi and latitude 5°N.; however, it has not been applied to Northern Rhodesia and Nyasaland (which otherwise would be governed by it) since 1957. Details of treaties covering construction and maintenance of an oil pipeline which is to transport crude oil from Beira to Umtali have not been divulged. No other government-to-government agreements regulating transport are known to exist.

IV. Mozambique

A. Internal

Mozambique, like Angola a Portuguese "overseas province," is one of the most backward territories in Africa. Even more than in Angola, the 6.5 million Africans lack the sense of national identity which is present to a significant extent in South Africa and the territories of the Federation.

Of all the Africans in Mozambique, some of the least advanced are those who inhabit the borders near Tanganyika and Nyasaland, the two territories most often named as potential safe havens for a rebellion like Angola's. Moreover, Mozambique's economically important areas and its concentrations of white population are in the southern half of the territory; this contrasts with northern Angola, which contains the territorial capital and is also an important coffee-growing area. In addition,

most of Mozambique's terrain, including almost all of that along the northern frontiers, is too open for guerrilla warfare. Finally, Mozambique ports are important to the white-dominated inland areas of the Transvaal and Southern Rhodesia; Beira and Lourenco Marques, together with Lobito in Angola, are the only economic outlets for Northern Rhodesian copper (although the reverse is also true, that Mozambique profits greatly from the Northern Rhodesian copper that it handles) and Nyasaland is completely dependent on its rail line to Beira. Thus, a nationalist rebellion has been even harder to stir up in Mozambique than it was in Angola; support is not likely to be wholehearted from some of the Africans who dominate the neighboring territories and who would be fearful of Portuguese reprisals and whites in inland areas can be expected to be deeply involved in the defense of the territory, or at least of its southern half.

Mozambique African exiles are generally a disunited, unprepossessing lot.

Their organizations have undergone many metamorphoses. but the most durable group is probably the Mozambique Liberation Front (Frelimo), whose president is Eduardo Mondlane, the only Mozambique African with a doctor's degree. Frelimo members are undergoing military training abroad. Their capability for stirring up a rebellion is highly questionable, but they might be able to disrupt service on the Beira railroad(or on the soon-to-be-built oil pipeline to Untali, which will follow roughly the same route) if they could persuade Banda to let them use Nyasaland as a base for sabotage forays to the south. So far Banda has been extremely circumspect in his relations with the Portuguese authorities, but he presumably will feel constrained

to conform to the canons of African nationalism and permit some exile activity.

Similar operations ^{might} be mounted, although with far more difficulty, from Northern Rhodesia; again, however, economic consideration will limit the willingness of even a radical African government to countenance such activity.

B. Foreign relations

Mozambique's external relations are similar to those of Angola, with the proviso that its strategic importance for neighboring territories is much greater. Hence it is more closely tied to these territories. Defense ^{and} intelligence coordination with South Africa and the Federation may be somewhat more intensive in Mozambique than in Angola.

C. Treaties affecting transportation

The transportation treaty with South Africa is discussed below. As noted in the section on the Federation, details of the agreement covering construction of the Beira-Umtali pipeline are unavailable. That part of Mozambique north of the Zambezi is technically subject to the Congo Basin Treaty, but as in the case of Angola, the treaty has little practical value.

V. Republic of South Africa

A. Internal

South Africa is an independent republic of nearly 16,000,000 persons (1960 census), whose political, social, and economic life is controlled by the white community of almost 3 million. The other principal racial ^{groups} are the Bantu or Africans (11 million), the Asiatics (430,000), and the Coloreds or persons of mixed

blood (1.5 million). Under the doctrine of apartheid (separate racial development), the South African government has enshrined each of these broad racial groupings in law and is trying to separate them as completely as possible in fact. At the same time, there are cultural divisions within each group which have had almost as profound an effect on the country's history as have the racial divisions. Thus the tension between Afrikaners (60 percent of the whites) and English-speaking South Africans (40 percent) was for years the most important fact in politics. Cleavages within the Colored community have ^{rendred} it disunited and impotent. Rural Africans, who comprise some two thirds of the African population, are usually politically inarticulate and are concerned mainly with local and tribal problems. Urban Africans, although far more sophisticated than any group of comparable size anywhere else in Black Africa, are still divided, poverty-stricken, and generally incapable of presenting a united front.

In formal structure, South Africa is a parliamentary democracy modelled on Great Britain, with a ceremonial president replacing the queen as head of state. In fact, since 1948 the parliamentary structure has become little more than a shell, with real power concentrated in the executive. Through a combination of good organization, appeals to community solidarity, and gerrymandering in the constituencies, the Afrikaner community's Nationalist Party has achieved an overwhelming parliamentary majority (currently 105-51 in the all-important lower house). It is now using this majority to pass measures which transfer authority to the executive and insulate the administration from interference, either from parliament or from the independent

and highly respected judiciary. It justifies these measures partly on the ground of necessity, following the recent upsurge in African nationalist activity, and partly on the fundamental tenets of its apartheid policy.

The program of apartheid aims at setting up selfsufficient areas in which Africans will have progressively greater amounts of autonomy. (Apartheid policy for the other non-white groups has been equivocal, since these communities are too small or too scattered to be administered in their own territorial units). African workers in the cities, on whose cheap labor most of the economy is based, will be allowed to remain, but reliance on them is to be reduced and they are to be encouraged to help develop their own "homelands" or "Bantustans." Although the government has recently stepped up its development programs, full implementation of the "Bantustan" policy would cost far more than the whites appear willing to spend and would also drastically change the country's economic fabric. Nevertheless, the Verwoerd government, glossing over these economic difficulties, is putting the political aspects of the program into effect as quickly as possible. By November 1962 six territorial governments out of a planned seven or eight had been set up in the "Bantustans;" in the spring of 1963 the most advanced of these, the Transkei, received a new constitution which granted a severely limited amount of internal autonomy and provided for an African prime minister.

Africans in the "Bantustans" have not accepted the political and economic changes in their traditional way of life with complete docility; there are, in fact, periodic attempts to assassinate the government-appointed chiefs, and the Transkei

has been governed under emergency regulations since mid-1960. Security problems in the rural areas have also been complicated by the presence of hoodlums and African nationalists whom the government has been expelling from the cities for the past three years. The "Bantustans" are remote, backward areas, however, whose main importance to the national economy is their value as a labor reservoir for the mines and cities. Unrest in these areas keeps part of the security forces tied down and provides ammunition for opponents of apartheid; otherwise it has little bearing on politics in the rest of the country.

In the cities, active opposition to the government is largely underground. Most of the activists are non-whites, aided by the illegal and largely white Communist Party and by some members of the anti-Communist Liberal Party. There are two groups of activists: the African National Congress (ANC), principal component of the Communist-dominated, multiracial "Congress Movement" and advocate of a moderate approach to racial questions; and the Pan-Africanist Congress (PAC), an anti-Communist group which makes a strong appeal to African racism. Both these groups in the past two years have been involved in acts of violence. The ANC, operating through an action arm called "Spear of the Nation," has emphasized secure conspiratorial techniques, tries to husband its resources, and concentrates on sabotage with minimum danger to human life. It escaped police counteraction until mid-July 1963, when its headquarters near Johannesburg were raided. The PAC, whose activist wing is named Poqo, stresses terrorism above sabotage. Its call for racial violence has great appeal for the mass of semi-educated Africans, but so far it has been less well-disciplined than "Spear of the Nation"

and can do no more than stimulate short-lived, semi-spontaneous local outbreaks.

Neither group has any chance of overthrowing the government at present.

Nevertheless, both groups, and "Spear of the Nation" in particular, do have some sabotage capability. Bombings, arson, cable-cutting, and similar acts have been taking place sporadically since 1961, and in the past few months some of these efforts--such as the blowing up of the offices of a pro-government newspaper in Durban last January and the sabotage of military vehicles in March--have been effective enough to increase white uneasiness. The main target of the saboteurs seems to be government installations, but there have been reports that "Spear of the Nation" and Poqo have also designated key targets in the transportation system, such as power stations and road and railway bridges. On two or three occasions earlier this year, rail traffic in the Johannesburg area was disrupted by explosions in power substations. At one time the main line from Johannesburg to Durban was disrupted briefly by a similar explosion.

Sabotage of targets outside the transportation system has occurred fairly frequently in Johannesburg and somewhat less frequently in Durban, Port Elizabeth, and Cape Town; there have also been a few amateurish attempts in most of the other urban areas. Members of both PAC and ANC reportedly are taking sabotage training abroad, notably in Ghana, Morocco, Algeria, Tanganyika, and possibly some countries of the Sino-Soviet bloc. Outside assistance presumably will be stepped up following the recent Addis Ababa conference. There have been reports that trainees from

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both movements are beginning to return to South Africa. Anti-government groups are still no match for the country's security forces, however, and are likely to lack the ability to coordinate a widespread sabotage effort for several years. Over the next three or four years, therefore, although occasional instances of terrorism and sabotage are likely to continue, the government is not likely to be seriously threatened by internal subversion.

B. Foreign Relations

While South Africa's official ties with the Afro-Asian and Sino-Soviet blocs have long been bad or nonexistent and its relations with the West are steadily becoming more strained, the threat of militant African nationalism is forcing it into cooperation with white-controlled governments in neighboring territories.

The Afrikaners who dominate the South African government have little in common with either the Portuguese in Angola and Mozambique or with the whites of British extraction in the Federation of Rhodesia and Nyasaland. Indeed, the ostensible Portuguese policy of complete racial assimilation and the Federation's widely proclaimed multiracialism--however much they are contradicted in practice--are diametrically opposed to the aims of apartheid. Moreover, the black-white ratios in the other territories (almost 5 million to 200,000 in Angola, 3.7 million to about 225,000 in Southern Rhodesia, 6.5 million to nearly 100,000 in Mozambique) are far from attractive to South African whites.

It is only in the past two or three years, when most of the other territories on the continent have come under African control and have stepped up their agitation

against the "white redoubt" in the south, that the various white governments have overcome their antipathies. They all appear reluctant to conclude a formal defensive treaty; nevertheless, informal consultations among defense and security officials have occurred with increasing frequency. It seems likely that South Africa would provide considerable assistance to the white governments in the north from its own armaments industry if these governments were endangered by a serious outbreak of insurgency. It probably would also acquiesce or connive in the recruitment of "volunteers," as it did during at least part of the Katanga secession struggle. If there is a prospect of African advance without a prolonged breakdown in the security situation, as may still happen in Southern Rhodesia, Pretoria would find it hard to intervene decisively and might have to withdraw to defensive positions south of the Limpopo. In any event, South African troops in uniform and major pieces of materiel would be sent out of the country only if the government thought that its own interests were directly affected and that overt intervention would reverse a deteriorating situation (for instance, if African nationalists appeared likely to seize the port of Lourenco Marques, if a full-scale rebellion were to develop in Southern Rhodesia, or just possibly if an African takeover appeared likely in Angola.

The Three High Commission Territories (Basutoland, Bechuanaland, and Swaziland) are administered directly by the British Colonial Office but are integrated economically with South Africa. All three are dependent to varying degrees on South Africa, and they all serve as safe-havens for African nationalists from the Republic. The Verwoerd government has made vague hints that it will invoke economic

sanctions unless these nationalist exile activities are curbed. Sanctions would paralyze the economies of all three territories, except possibly Swaziland. It seems likely, however, that the important rail line across Bechuanaland (operated partly by South African Railways and partly by Rhodesia Railways) would be seriously affected.

C. Treaties Affecting Transportation

South Africa is a member of GATT, and it also has a special trade treaty with the Federation of Rhodesia and Nyasaland. The only agreement directly affecting transportation is a treaty between South Africa and Portugal, first signed in 1909 and renegotiated in 1928. Under this treaty 47.5 percent of the sea-borne goods imported to the Johannesburg, Pretoria, and Vereeniging areas are routed through Lourenco Marques. In return, the mines in the Transvaal recruit a large percentage of their African labor from Mozambique. South Africa has long been trying to reduce the Lourenco Marques traffic quota, and the treaty is presently being renegotiated.

THE ECONOMY OF THE AREAI. ANGOLAGENERAL

Angola is populated by 4.6 million uneducated and unskilled Africans, living for the most part in tribal societies on the subsistence level -- and by 0.2 million largely uneducated, very conservative and rather unimaginative Portuguese and mulattoes. At least until recently, the Angolan economy has been shaped to serve the interests of Metropolitan Portugal, producing primary export commodities and importing nearly all the manufactured goods which it consumes. Based thus on the production of a small number of agricultural and mineral commodities, the country is extremely vulnerable to fluctuations in the world market prices and to the policies of Metropolitan importers. The government has restricted the entry of non-Portuguese capital, erected barriers against competitive foreign imports, and largely ignored development of the economy. It is still without the infrastructure necessary for a self-sustaining economic activity.

Some of the results of these measures can be seen from an examination of their effect on Angola's currency and balance of payments. Angola customarily runs favorable trade balances with non-Portuguese areas, e.g., the United States and the United Kingdom; but these surpluses are usually cancelled out by the Province's huge negative trade balance with Portugal. In addition, a large volume of invisible transfers are made each year to Portugal in the form of profits, freight charges, and personal remittances. Thus, Angola's over-all balance of payments is usually very unfavorable -- a situation which recently has resulted in the imposition of severe import and exchange restrictions by the Province.

About 480,000 square miles in area, Angola is thinly populated -- about 10 inhabitants per square mile -- and the population is growing at a little more than one percent a year. The greatest concentration of Portuguese and mulattoes are found in the main cities and along the Benguela and Luanda rail lines which serve the sisal, cotton and coffee producing areas. The principal cities are Luanda, the capital, Lobito, Benguela, and Mocamedes, all on the Atlantic coast. The only inland towns of any importance are Malanje, Nova Lisboa, Silva Porto, and Sa da Bandeira, all of which are sited on railroad lines. About 8 percent of the total population lives in urban areas, with approximately 5 percent of the people residing in Luanda, the largest city.

Since 1959 Angola has been experiencing an economic recession; since 1961 this has been complicated by a persistent native rebellion centered in the north and supported by men and supplies entering from the Republic of the Congo. Direct and indirect costs attributable to the rebellion are estimated at more than \$200 million annually. The rebellion has resulted in an accelerated road building program, and in somewhat greater Portuguese efforts to develop the economy and improve the condition of the native Angolans. Recovery from the recession, however, is far from complete and the economic prospects for this primitive and unsettled economy are cloudy.

Sectoral Description of the Economy

Agriculture is by far the most important sector of the Angolan economy and will continue so into the foreseeable future. It provides sustenance for both African and European farmers and is the source of nearly two-thirds of Angola's

export earnings. In 1961, agricultural products accounted for more than 60 percent of total exports and light manufactures for about 15 percent. See Table 1.* As may be expected for an economy based largely on extractive industries, Angola's main imports consist of manufactured goods -- textiles, machinery and foodstuffs. In addition, a shortage of locally produced fuels requires the importation of coal.

The main agricultural products are coffee, corn, sugar, palm oil and palm kernels. Lesser crops include cotton, wheat, tobacco, cocoa, sisal, and wax. Approximately 2 percent of the total land area is used for cultivated field and tree crops which produce about three-fourths of Angola's export earnings. Coffee is the single largest export; European plantations and farms produce around 80 percent of the entire crop. The European producers also are responsible for all the sugar, sisal and wheat produced for export. Corn, cotton, beans and cassava are produced mainly on African farms.

Agricultural export production is concentrated in the hinterland of the Luanda port area; this region accounts for more than two-thirds of the coffee, more than one-third of the sugar, and nearly all of the cotton produced. About 168,000 tons of coffee were harvested in 1961, a year in which somewhat less than 20 percent of the crop was lost through rebel activities. Output rose to around 200,000 tons in 1962. The cotton crop also increased in the same period, production rising from 13,000 tons in 1961 to 22,000 tons in 1962.

Minerals account for a small but growing share of Angola's exports and offer some opportunities for the development of local industry. See Table 2.**

* Page 109 below.
** Page 110 below.

Diamonds have long been and still are the most important mineral export, but iron ore, copper and manganese are becoming increasingly important. In addition, oil has recently been found in economic quantities and crude production in 1962 amounted to 489,000 tons. A refinery established at Luanda is currently producing 11,000 tons of gasoline a year in excess of local demand, but gas-oil output is 20,000 tons short of annual requirements. These imbalances are being overcome by barter trade with Katanga.

The locus of oil production is the Tobias reserve which was tapped in late 1961 by Petrofina. Nine wells have been drilled, two are in production, and the other seven are expected to be brought in when the 8-inch pipeline linking Tobias to the Luanda refinery is completed.

Transport facilities for iron ore improved in 1962 when the 41-mile branch rail line linking the Cuima mines with the Benguela Railroad was opened in August. Iron is mined at the Lobito Mining Company's mines at Cuima, Cassinga, Andulo and Bailundo, as well as at the Angolan Manganese Company's mine at Quitota near Malanje. The current annual production of iron ore from these mines in short tons is as follows: Cuima mines, 551,150; Quitota mine, 220,460; Cassinga mines, 143,299. The annual output of the Cassinga mines is expected to increase to between 3 and 4 million short tons.

Other mineral production and the principal locations of significant mining operations include: diamonds from mines near Portugalia in the northeast; manganese ores from the Quitota mine; copper ores from mines at Bembe. See Table 2.*

* Page 110 below.

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Industry in Angola is confined largely to the processing of primary products.

The most important "industrial export" is fish meal. Other industrial exports of note are dried fish, canned fish and fish oil, vegetable oil, and sugar. In addition, small quantities of locally produced cigarettes and cement are exported.

Population and Labor Force

The available labor force in 1960 consisted of 56,400 Europeans including mulattoes, and slightly more than 2 million Africans. Of the total, approximately 310,000 workers, most of them completely unskilled, had been drawn into the monetary economy by 1962. Somewhat more than a million are thought to be self-employed on farms which produce some surplus for sale in good years. The rest -- nearly three-quarters of a million -- are completely immersed in the subsistence economy.

Portugal has been severely criticized for its long-held policy of forcing the Africans to work for at least six months of the year on plantations, roads and other establishments of the monetary economy. This policy of forced labor has been relaxed, in principle, in recent months. Unemployment both of Europeans and Africans has been severe since the onset of the recession in 1959, and the problem also has been exacerbated by the rebellion. At the same time, plantations in the north have been forced to import harvest labor for the last two years because a sizeable part of the local labor force has fled the troubled areas. Plans to resettle these people and to improve the state of African agriculture are now being put into effect, but their impact on employment and agricultural output is not yet clear. Aside from the shortage of capital and skills, one of the most serious impediments to enlarging the monetary sector of the economy is the reluctance of the African population to

work with or for the Portuguese. This reluctance could become extremely important if the rebellion spreads or any other situation develop in which Portugal must depend on the help and support of the native Angolans.

Transport Facilities

The inadequacy of Angola's transport facilities is a problem of paramount importance to further economic development and to the maintenance of security. The lack of an adequate highway network or of other suitable transport facilities proved to be a severe obstacle to the effective conduct of the military operations against the rebels. Military needs and the high level of unemployment have combined to place a priority on investment in transport facilities. Road construction is expected to be most important, at least until the goal of 9,900 miles of all-weather roads is reached; air transport facilities are second in importance; railroad expansion and improvement fall into third or fourth place with port improvements. New additions to the railroad network are designed to open new areas to export trade and to tap recent finds of minerals.

Slightly more than 20 percent of government expenditures were to be devoted to transport facilities in the 1962 budget and 18 percent in the 1963 budget.* A Road Board has been created to improve, repair and construct new motor roads. Allocations to this alone were planned at over \$15 million annually in 1962 and 1963. Other investments in transport facilities provided in the development plan are shown below.

*Page III below.

Funds for Communication and Transport
(in thousand US dollars)

| | <u>1962</u> | <u>1963</u> |
|-----------------------------|---------------|--------------|
| Total | <u>10,907</u> | <u>8,391</u> |
| Of which: road construction | 5,244 | 5,593 |
| railroad construction | 2,167 | 1,224 |
| port improvements | 2,657 | 734 |

Further details on the 1962 and 1963 budgets are shown in Table 3. See Table 3.*

Trade

The previous sections have indicated the importance of trade to the Angolan economy. Production for export forms a very important part of the monetary economy's activity, and the whole transport system has been designed to facilitate overseas trade. Revenues from import and export duties together accounted for around 15 percent of government receipts in 1962. See Table 3.*

Angola's major trading partner is Portugal from whom it gets over 40 percent of its imports and to whom it sends about 20 percent of its exports. Portugal's role in Angolan trade and finance has been treated earlier in the paper. The other major trading partners are the United Kingdom, the United States (which buys more than one-half of Angolan coffee exports), the German Federal Republic, and the Netherlands. Trade with other Portuguese territories, mainly Mozambique, accounts for roughly 3 percent of Angolan trade. The only other African country which provides a significant share of Angolan trade is the Republic of the Congo. Imports from the Congo account for no more than 1 percent of Angolan imports; however, about 4 percent of Angola's 1961 exports were destined for the Congo. In the main,

* Page III below.

such exports consisted of food items such as fish, beans, manioc, corn, rice and salt.

Exports to all of Africa in the last few years ranged from \$9.6 million in 1959 to \$11.8 million in 1961; thus, exports to other countries on the continent represented less than 10 percent of the total export. Imports from African countries in the same years ranged from \$3.6 million to \$4.4 million.

Principal Angolan exports by value and by volume are shown in Table 1.

See Table 1.* Major imports by category in 1960 were as follows: machinery and transport equipment, 33 percent; other manufactures, 22 percent; food beverages and tobacco, 20 percent; and textiles, 12 percent.

Summary

The Angolan money economy, created and maintained largely for the benefit of the Metropole, is heavily dependent on a railroad system designed to facilitate the export of primary products. Interdiction or total disruption of the railroads would thus lead to a breakdown of the money economy. Internal trade, however, appears to be a relatively unimportant factor in the monetary sector. The very large proportion of Africans in Angola still attached to the subsistence sector would not be greatly affected, in the short run, by a collapse of the Portuguese-run economy. In the long run, however, a disruption of transport and, with it, of trade would undoubtedly cause great discontent among that part of the African population which makes individually small sales of surplus cash-crops for consumer goods. The effect of economic disruption, especially if combined with a full-scale rebellion, on Portugal's revenues from Angola, would be undoubtedly serious.

* Page 109 below.

Table 1

Angolan Agricultural and Industrial Exports 1960-61

| <u>Agricultural Products</u> | <u>1960</u> | | <u>1961</u> | |
|--|-------------------|------------------|-------------------|------------------|
| | <u>Short Tons</u> | <u>US\$ '000</u> | <u>Short Tons</u> | <u>US\$ '000</u> |
| Coffee | 96,139 | \$44,188. | 130,206 | \$48,890. |
| Sisal | 63,868 | 13,127. | 64,791 | 11,034. |
| Corn | 129,086 | 5,766. | 178,115 | 7,860. |
| Wood | 100,696 | 3,414. | 81,632 | 2,588. |
| Beans | 12,995 | 1,178. | 10,435 | 996. |
| Cotton | 10,097 | 5,146. | 4,541 | 2,413. |
| Beeswax | 865 | 769. | 757 | 697. |
| Oleaginous Products | 15,940 | 1,827. | 19,763 | 1,984. |
| Beef | 685 | 245. | 2,619 | 851. |
| Manioc | 64,395 | 2,714. | 63,233 | 3,140. |
| Others (Rice, tobacco, cocoa and hides) | 6,980 | 1,327. | 6,116 | 1,114. |
| <u>TOTAL</u> | 501,746 | 79,701. | 562,208 | 81,567. |
| <u>Industrial Products</u> | | | | |
| Dried and Fresh Fish | 15,358 | 2,705. | 21,783 | 4,207. |
| Fishmeal | 49,697 | 3,788. | 55,489 | 4,713. |
| Canned Fish & Fish Oil | 8,624 | 1,444 | 5,056 | 1,150. |
| Vegetable Oil | 19,195 | 3,707. | 21,958 | 4,125. |
| Sugar | 41,197 | 3,276 | 40,353 | 3,435. |
| Others (Seed cake, cigarettes, cement) | 15,448 | 767. | 19,490 | 884. |
| <u>TOTALS</u> | 149,519 | 15,687. | 164,129 | 18,514. |
| Mineral Products(Total) * | | 29,279. | | 29,537. |
| <u>GRAND TOTAL</u> | | 124,667. | | 129,618. |

*Excluding cement, see Table 2, page 110, below for volume, by type of mineral.

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Table 2

Production and Export of Principal Minerals in Angola 1961-1962

(short tons - 000 US dollars)

| | 1961 | | 1962 | |
|-------------------|----------------------|-----------------|----------------------|-----------------|
| | Production Volume | Export Value | Production Volume | Export Value |
| Diamonds (carats) | 1,147,539 | 21,227 | 1,081,104 | 21,930 |
| Iron Ore | 895,228 | 2,039 | 830,714 | 2,034 |
| Crude Oil | 115,113 | 1,484 | 519,448 | 6,698 |
| Copper | 10,302 | 718 | 18,815 | 537 |
| Manganese | 22,695 | 299 | 14,089 | 165 |
| Cement | 172,537 | NA | 186,727 | 4,025 |
| | | | | 985,887 |
| | | | | 503,133 |
| | | | | 144,668 |
| | | | | 973 |
| | | | | 5,937 |
| | | | | NA |

* The apparent discrepancy between production and export cannot be explained.

Table 3Angolan Budget - 1962-1963

(thousand US dollars)

| | <u>1962</u> | <u>1963 (est.)</u> |
|----------------------------|-------------|--------------------|
| Ordinary receipts | 77,391 | 114,980 |
| Ordinary expenditures | 76,812 | 114,900 |
| Extraordinary receipts | 27,238 | 29,873 |
| Extraordinary expenditures | 27,793 | 29,873 |
| Total Receipts: | 104,629 | 144,853 |
| Total Expenditures: | 104,625 | 144,773 |
| Balance | +24 | +80 |

Revenues From and Expenditures On Selected Items

(thousand US dollars)

| | <u>1962</u> | <u>1963 (est.)</u> |
|--------------------------------------|-------------|--------------------|
| <u>Revenue From:</u> | | |
| Import duties | 10,034 | 8,565 |
| Export duties | 5,769 | 6,084 |
| Benguela Railroad - share of profits | 770 | 944 |
| Ports, Railroads & Transport | 10,173 | 11,142 |
| <u>Expenditures:</u> | | |
| Ordinary expenditure on Transport | 10,173 | 11,142 |
| Road Board & Road Fund | 15,627 | 15,627 |

II. The Republic of the Congo (Leopoldville)

The Congo has an area of about 900,000 square miles, about equal to the area of the United States east of the Mississippi River. The population is estimated to be about 14 million of which Europeans constitute roughly 1 percent.

The Congo is potentially a wealthy country. It possesses an eighth of the worlds known copper reserves, four-fifth of its located industrial diamonds and much of its cobalt. Most of the land is fertile and it is not over populated. The economy of the Congo is highly developed by African standards. The Belgians built an extensive infrastructure including an integrated railroad and river transportation system, a large and modern mining and mineral refining industry, a commercial agriculture and a well founded base of light industry. Despite three years of political turmoil since the country received its independence in June 1960, the Belgian-built economy has continued to function. A few big companies do most of the business and earn most of the foreign exchange.

The mineral wealth of the Congo is concentrated in Kasai and Katanga Provinces although some tin is mined in Kivu Province. Most of the mines and refineries are operated by the Union Miniere du Haut Katanga in Katanga Province. In 1960 Katanga received 44 million dollars from this company, a sum equal to about half of the budgetary income of the Congo during that year. In 1962 approximately US\$ 250 million worth of minerals were shipped from the Katanga area and presumably the royalties from that revenue accrued to the Katangan government as the province had succeeded from the Republic at that time. The production of minerals in 1959-1962

and the location of the principal producing areas are shown in Table 1. See Table 1*. It is notable that production has remained fairly constant and in some cases has increased since independence. The rather sharp drop in tin production is due to the fact that the smaller mines are remote from the railroads and dependent upon truck transport to carry their production to the rail head. With the deterioration of the road net, largely due to a lack of maintenance and tribal warfare in the producing areas, some of the mines have ceased production. Coal production in the Congo 1960 was only 195 thousand tons all of which is used domestically by the railroads and the cement plants.

Before independence about a third of the ^{Congo's} foreign exchange was earned by agricultural products, chiefly palm oil, coffee and cotton. Most of the larger plantations are owned by Europeans while the smaller plantations and farms are owned by Congolese. The large plantations are self sufficient and maintain their own roads, schools and medical facilities. Moreover, most of these are located along the major rivers which have continued to provide an export route for production. As a consequence the large plantations have managed to maintain production at pre-independence levels but the smaller farms are out of production for lack of European assistance and trading facilities.

The production of selected agricultural products and the location of the principal producing areas is shown in the following table:

* Page 115, below.

Production of Selected Agricultural Products
and Location of Principal Producing Areas in
the Republic of the Congo 1959-1961

| Product | Location of Producing Area | (short tons) | | |
|----------|---|--------------|-------------|-------------|
| | | Production | | |
| | | <u>1959</u> | <u>1960</u> | <u>1961</u> |
| Coffee | Equator, Orientale and Kasai Provinces | 59,300 | 66,900 | 66,140 |
| Cotton | Equator, Orientale, Kasai and Katanga Provinces | 54,000 | 60,140 | 41,880 |
| Palm oil | Leopoldville, Equator and Orientale Provinces | 248,128 | 270,280 | 264,550 |
| Rubber | Equator and Orientale Provinces | | 44,200 | 39,240 |

During the first year of independence, exports of agricultural products declined sharply as shown in the following table.

Exports of Selected Agricultural Products
Republic of the Congo 1959-1960
(short tons)

| | <u>1959</u> | <u>1960</u> |
|----------|-------------|-------------|
| Coffee | 101,000 | 66,580 |
| Cotton | 55,115 | 45,745 |
| Palm oil | 202,710 | 184,300 |
| Rubber | 44,310 | 38,600 |

Reliable data for exports in more recent years is not available but it is reported that smuggling, increasingly widespread since 1959, has become a major drain on the foreign exchange earnings from agriculture. Corrupt and inefficient customs officials allowed most of the 1962 coffee crop and much of the cotton crop to be smuggled out of the country.

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Table 1

Production of Minerals and Metals and Location
of Producing Areas in the Republic of the Congo
1959 - 1962

| Mineral or Metal | Producing Area | (short tons except as noted) | | | |
|-------------------------------|--|------------------------------|---------|---------|---------|
| | | 1959 | 1960 | 1961 | 1962 |
| Copper - (smelted) | Katanga Province - Elisabethville south to border of Northern Rhodesia | 310,955 | 333,175 | 325,400 | 325,178 |
| Cobalt - (in concentrates) | Elisabethville area, Katanga Province | 9,294 | 9,063 | 9,259 | N.A. |
| Tin - (in concentrates) | Elisabethville, Central Katanga Province and Kiru Province | 11,028 | 10,680 | 7,884 | 8,060 |
| Manganese - (ore concentrate) | Southwestern Katanga Province | 425,694 | 412,154 | 344,185 | 337,868 |
| Zinc - (in concentrates) | Elisabethville area, Katanga Province | 77,130 | 120,352 | 109,692 | 183,073 |
| Zinc - (smelted) | Elisabethville area, Katanga Province | 60,418 | 58,817 | 62,799 | N.A. |
| Gold ^{a/} | Northeastern Orientale Province | 347,965 | 316,195 | 232,611 | N.A. |
| Diamonds ^{b/} | Kasai Province | | | | |
| Industrials | | | 13,040 | 17,738 | 14,393 |
| Gem stones | | | 413 | 405 | 263 |

a. Troy ounces.

b. 1,000 karats

Part III. The Federation of Rhodesia and Nyasaland

The Federation includes three territories: Northern Rhodesia and Nyasaland, British protectorates likely to get complete independence in the near future; and Southern Rhodesia, a self-governing colony since 1923. The total population of about 9.5 million is growing at an annual rate of 3 percent in Nyasaland and 2.5 percent in the Rhodesias. Landlocked, and mainly a plateau area, the Federation is 486,109 square miles in area, roughly one-half the size of the United States east of the Mississippi. It possesses a generally mild climate suitable for many types of agriculture, and is largely self-sufficient in food production.

Southern Rhodesia, the most economically advanced of the three territories, has a growing and diversified manufacturing sector, a well-developed and efficient European agricultural sector which produces corn and tobacco for export, and a relatively small but growing mineral industry. Southern Rhodesia serves as the commercial, manufacturing, and financial hub of the Federation, deriving much of its income from such services to the other territories. In addition, around 30 percent of its manufactured goods are sold to Northern Rhodesia and Nyasaland. Salisbury, the capital of Southern Rhodesia and also of the Federation, and Bulawayo are the major transport and communications centers of the Federation and are also the only two cities with population in excess of 100,000.

Northern Rhodesia, the richest and least densely populated area of the Federation, is still almost a one-product economy. Its copper mining and refining industries provide nearly one-half of the Net Domestic Product of the territory; almost

one-half of the wage earning Africans in Northern Rhodesia work in the Copper Belt --a narrow 200-mile long area running northwest from Luanshya in Northern Rhodesia into Katanga.

Nyasaland is the smallest, poorest, and most densely populated of the Federation territories. Its chief sources of foreign exchange earnings are tea and tobacco exports, and migrant workers who go to the two Rhodesias and into South Africa. Remittances for the services of these workers form a significant share of Nyasaland's Net Domestic Product--nearly 10 percent in 1957.

The economies of the Federation components are complementary in that Southern Rhodesia supplies services and manufactured goods to the others, Northern Rhodesia supplies much of the trade surplus and attracts much of the foreign capital entering the Federation, and Nyasaland supplies labor and some foodstuffs for the other two. With the advent of independence, the Federation is expected to dissolve. Retention of economic ties, at least between Southern Rhodesia and the other two regions, is not certain. Although Nyasaland would be adversely affected, Southern Rhodesia itself would experience the most serious repercussions from a dissolution of economic bonds with its present federal partners.

The creation of the Federation in 1953 is said to have resulted in a certain saving in administrative costs and to have enhanced the credit-worthiness of the area in terms of attracting foreign capital. To the extent that these advantages may have developed, dissolution of the Federal structure will result in additional costs to the component countries. The national airline -- Central African Airways

-- the railroads, foreign commerce, defense, banking and currency, posts and telegraphs, and the interterritorial road system are all the present responsibility of the Federal government.

After experiencing a relatively rapid rate of growth in the 1950's, the economy of the Federation is currently rather stagnant. The drop in copper prices since 1957, the slackening pace of investment and construction following completion of the first stage of the great Kariba dam, and the general loss of confidence in the political future have acted as dampers on economic growth.

The high rate of European immigration that prevailed from 1953 to 1958 slowed down so markedly that by 1961-1962 it turned into a net emigration. This trend is expected to continue, at least until the future policies of the new African governments become clear. The European segment of the population is small -- about three percent of the total -- and accounts for an enormous share of the investment and production of the Federation. To illustrate: Gross Domestic Product attributable to non-African agriculture in 1961 amounted to \$149 million or about 47 percent of total agricultural output. The non-African share of total wages and salaries in the same year was 60 percent. In addition, nearly all technical and managerial personnel in mining, manufacturing, and large service institutions are Europeans. Thus any series of events leading to the exodus or immobilization of this small segment of the population would have proportionally great effects on the functioning of the Federation's monetary economy.

At the same time, a large majority of the African population probably could

feed itself and survive even if a total disruption of the monetary economy should occur. Nearly 80 percent of the economically active population is engaged in agriculture, and almost one-fifth of Gross Domestic Product is derived from the production of African rural households for their own consumption.

Nevertheless, economic disruption would have severe effects on the Africans too: about one million are employed in the monetary economy and many are migrant laborers who might be forced to return to already overcrowded "tribal" areas. The extent of labor migrations among the Federal territories and neighboring countries is illustrated by the following employment statistics for 1956.

| | (in thousands) |
|-----------------------------|---|
| <u>In Northern Rhodesia</u> | 217.8 Northern Rhodesians 2.2 Southern Rhodesians 20.7 Nyasas |
| <u>In Southern Rhodesia</u> | 42.3 Northern Rhodesians 300.2 Southern Rhodesians 132.6 Nyasas 125.2 Portuguese Africans, mostly Mozambicans |

Nyasas abroad totalled 200,000. Of this number, 20,700 were working in Northern Rhodesia, 132,600 in Southern Rhodesia, about 40,000 in the Union of South Africa, and 4,000 in Tanganyika.

Although unemployment has increased, African employment for the past three years has remained fairly steady and has been distributed as follows: about 32 percent in agriculture, mainly on European farms, and about 3 percent in transport and communications. In the component territories, it has been as follows:

| <u>Total Employment</u> | <u>Percent in Agriculture</u> | <u>Percent in Transportation and Communications</u> | |
|--------------------------|-------------------------------|---|----------|
| <u>Federation</u> | | | |
| 1960 | 1,045,000 | 32 | 3 |
| 1961 | 1,009,000 | 32 | 3 |
| 1962 | 1,000,000 est. | 32 (est.) | 3 (est.) |
| <u>Southern Rhodesia</u> | | | |
| 1960 | 647,000 | 37 | 3 |
| 1961 | 624,000 | 38 | 3 |
| 1962 | 610,000 est. | 38 (est.) | 3 (est.) |
| <u>Northern Rhodesia</u> | | | |
| 1960 | 246,000 | 15 | 4 |
| 1961 | 238,000 | 16 | 4 |
| 1962 | 230,000 est. | 17 (est.) | 4 (est.) |
| <u>Nyasaland</u> | | | |
| 1960 | 152,000 | 39 | 4 |
| 1961 | 147,000 | 39 | 4 |
| 1962 | 134,000 est. | 40 (est.) | 4 (est.) |

During the same period, a fairly constant 10 percent of the non-Africans were working in the transport and communications industries.

Investment in transport, storage, and communications has accounted for an average of 9 percent of gross domestic capital formation by use in the period, 1958-60. From 1958 through 1961, transport and communications have accounted for about 7 percent of Gross Domestic Product -- \$80.6 million in 1958 and \$106.4 million in 1961.

The economy of the Federation is highly dependent on foreign trade. Exports usually account for about 40 percent of Gross Domestic Product. Copper, tobacco, asbestos, corn, tea, and chrome ore together account for over 80 percent of total

exports. Copper, the leading product of Northern Rhodesia and the Federation as a whole, accounts for more than 50 percent of all export earnings.

A very large share of the exports of the Federation are primary products, but it is more fortunate than many similar economies in that it exports both mineral and agricultural commodities and is thus not quite as vulnerable to price fluctuations for single products. The mineral industry is the most dominant in the economy of the Federation, though this is not the case for each territory.* In 1961, this industry consumed about one-third of the available coal and coke, paid around one-half of the direct taxes levied by the government, provided for more than one-half of the railroad freight tonnage, consumed about two-thirds of the electricity produced, and accounted for approximately two-thirds of the total value of exports.

For the period, 1954-62, the copper industry alone accounted for between 30 and 55 percent of the Net Domestic Product of Northern Rhodesia, and for between 10 and 24 percent of the Net Domestic Product of the whole Federation; in 1962, these proportions were 44 and 16 percent respectively. Statistical tables on mineral production and exports by volume and value are shown in Tables 2 and 3 below.

Most of the minerals produced, with the exception of Southern Rhodesian coal, are exported. Southern Rhodesian industry is beginning to consume a small share of minerals produced, especially iron ore; nearly all of the coal mined is consumed domestically by the copper refineries, the railroads, and the electric power plants.

* See Table 1 below for notes on the location and concentration of commerce, mining, industry and agricultural cash crops.

Nyasaland, which currently produces no minerals, and Southern Rhodesia generate most of the agricultural exports of the Federation; tea and some tobacco are grown in Nyasaland, whereas most of the tobacco, meats, and corn exported are produced in Southern Rhodesia.

The Federation's major trading partner for many years has been the United Kingdom which buys over 40 percent of its exports and sells the Federation around one-third of its imports. The Republic of South Africa is the second most important trading partner of the Federation, accounting for about one-third of imports but only 6-8 percent of Federation exports. The principal commodities exchanged in their order of importance are general goods, minerals and iron and steel. Trade with other African countries is minimal, the most important "commodity" being migrant labor. Data showing major trading partners by value, the value of total imports and exports, and major export and import commodities, by volume and value are shown in Tables 2, 4 and 5 below. Until a change in trade arrangements was effected in the late 1950's, South Africa was a more important trading partner than it is now; between 1950 and 1957, it accounted for slightly more than one-fourth of the Federation's total trade. Exports to the Republic of Congo have risen since the 1960 disturbances in that country but still do not account for more than 2 percent of the Federation's exports or one percent of its imports.

The Federation's imports have been declining since 1959 and in 1962 dropped still further. Thus, despite a very unsettled chrome market and a reduction in sales of copper, the Federation has experienced a favorable balance of trade over the

last few years. Machinery and transport equipment constitute the largest category of imports; this also holds true for imports from the United States. About one-half of the copper exports are sent to the United Kingdom as are most of the Federation's tea exports. The United States has been the major buyer of chrome ore, although Rhodesian chrome is now suffering from competition from Russian chrome in this market. In addition to sales to the United Kingdom, a substantial portion of the food exports of the Federation, especially corn, are sold to neighboring countries -- Bechuanaland, Tanganyika, the Republic of the Congo.

Table 1Location and Concentration of Commerce, Mining,
Industry and Agricultural Cash CropsNotes

| | |
|-----------------------------|--|
| Coal | Found in several places in Northern and Southern Rhodesia. Produced only at Wankie (2 collieries) in Southern Rhodesia. Production declining with dieselization of the railroads and the decreasing number of thermal electric plants as Kariba production increases. About 12 percent of coal raised is exported. |
| Copper | Mined in Southern Rhodesia in the area around Sinolia; in Northern Rhodesia in the copperbelt. Mines are mainly along the road from Luanshya to Bancroft. |
| Cobalt | Found at Chibuluma and Nkana mines in the copperbelt. |
| Uranium | Found at Khana. |
| Lead, Zinc, and Manganese | Found at Broken Hill, Northern Rhodesia. |
| Asbestos | Southern Rhodesia, mainly in a belt running NE-SW from north of Gwanda to Fort Victoria. |
| Chrome | Mined near Kildonan, Gwelo, and Fort Victoria. |
| Iron | Found at Redcliff near Que Que in Southern Rhodesia. |
| Tea | Most is grown in Nyasaland in the Mlanje-Cholo area. |
| <u>European Agriculture</u> | In Northern Rhodesia mainly along the rail line; in Southern Rhodesia, cultivation is dispersed but generally concentrated along the Salisbury-Bulawayo axis. |

Industrial and Commercial Centres:

| | |
|------------------------------|--|
| Salisbury, Southern Rhodesia | Capital of the Federation. Industries include food, beverages and tobacco, clothing, steel, concrete and asbestos. Population of more than 250,000 contains more than one-fourth of all Europeans resident in the Federation. |
| Bulawayo, Southern Rhodesia | Principal industrial and commercial centre of the Federation; main communication junction (for rail, roads and air). Industries include steelworks, tires, asbestos, cement, concrete, food, clothing, steel rolling and fabricating facilities. |
| Lusaka, Northern Rhodesia | Capital of Northern Rhodesia. Industries include fertilizer, construction materials, and grain storage. |
| Ndola, Northern Rhodesia | Main commercial and industrial city of the Northern Rhodesia area; main distributive center for the copperbelt. Factories produce mining equipment, sheet metal products, refined sugar, copper and special steels. |

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Table 2

Value and Tonnage of Selected Exports, Federation of Rhodesia and Nyasaland, 1961 - 1962

| | Value and Tonnes of Selected Mineral Exports | | | Value per ton (US Dollars) |
|--------------------------|--|-------------------------|---------------------------|-------------------------------|
| | 1961 | 1962 | 1962 | |
| | Volume (Thousand tons) | Value (Million \$US) | Volume (Thousand tons) | Value (Million \$US) |
| Copper ^{a/} | 610 | 313.6 | 601 | 310.8 |
| Zinc ^{a/} | 28 | 5.3 | 46 | 6.7 |
| Lead ^{a/} | 12 | 2. | 16 | 2.0 |
| Cobalt ^{a/} | .6 | 1.7 | 1 | 3.1 |
| Manganese ^{a/} | 47 | 1.4 | 51 | 1.4 |
| Asbestos ^{b/} | 134 | 23.5 | 145 | 21.3 |
| Chrome ore ^{b/} | 476 | 8.4 | 432 | 7.3 |
| Tea ^{c/} | 15 | 12.3 | 14 | 10.1 |
| Tobacco ^{b/} | 105 | 117.6 | 108 | 114.8 |
| Corn ^{b/} | 311 | 12.6 | 450 | 17.6 |
| Peanuts ^{c/} | 26 | 4.2 | 45 | 6.7 |
| Meats ^{b/} | 16 | 9.2 | 16 | 10.1 |

Value and Tonnes of Major Agricultural Exports

| | Volume (Thousand tons) | Value (Million \$US) | Volume (Thousand tons) | Value (Million \$US) |
|--------------------------|---------------------------|-------------------------|---------------------------|-------------------------|
| Copper ^{a/} | 610 | 313.6 | 601 | 310.8 |
| Zinc ^{a/} | 28 | 5.3 | 46 | 6.7 |
| Lead ^{a/} | 12 | 2. | 16 | 2.0 |
| Cobalt ^{a/} | .6 | 1.7 | 1 | 3.1 |
| Manganese ^{a/} | 47 | 1.4 | 51 | 1.4 |
| Asbestos ^{b/} | 134 | 23.5 | 145 | 21.3 |
| Chrome ore ^{b/} | 476 | 8.4 | 432 | 7.3 |
| Tea ^{c/} | 15 | 12.3 | 14 | 10.1 |
| Tobacco ^{b/} | 105 | 117.6 | 108 | 114.8 |
| Corn ^{b/} | 311 | 12.6 | 450 | 17.6 |
| Peanuts ^{c/} | 26 | 4.2 | 45 | 6.7 |
| Meats ^{b/} | 16 | 9.2 | 16 | 10.1 |

^{a/} Originates mostly in Northern Rhodesia. In addition, 787 thousand tons of high bulk-low value copper concentrate were exported from Northern Rhodesia for which the value is not available.

^{b/} Originates mostly in Southern Rhodesia.

^{c/} Originates mostly in Nyasaland.

Table 3

Mineral Production, Federation of Rhodesia
and Nyasaland, 1958-62

(in thousand short tons)

| | <u>Total Federation</u> | <u>Total Northern Rhodesia</u> | <u>Total * Southern Rhodesia</u> | <u>Southern Rhodesia Coal</u> |
|------|-----------------------------|------------------------------------|--------------------------------------|-----------------------------------|
| 1958 | 93,570 | 68,238 | 25,332 | 3,897 |
| 1959 | 143,968 | 118,965 | 25,003 | 4,143 |
| 1960 | 154,772 | 128,392 | 26,380 | 3,923 |
| 1961 | 148,717 | 121,501 | 27,216 | 3,387 |
| 1962 | 142,505 | 117,416 | 25,089 | 3,115 |

* Including coal.

Table 4

Federation of Rhodesia and Nyasaland, Total
Imports and Exports, 1958-62

(in million US\$)

| | <u>Exports</u> | <u>Imports</u> |
|------|----------------|----------------|
| 1958 | 380 | 441 |
| 1960 | 577 | 439 |
| 1961 | 580 | 434 |
| 1962 | 586 | 400 |

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Table 5

Federation of Rhodesia and Nyasaland, Major Trading
Partners and Trade with Neighbors, 1958-62

| | <u>Percent of Total Exports to</u> | | | | | |
|------|------------------------------------|---------------------|--------------------|--------------------------|--------------|-------------------|
| | <u>United Kingdom</u> | <u>South Africa</u> | <u>Congo (Leo)</u> | <u>Portuguese Africa</u> | <u>Kenya</u> | <u>Tanganyika</u> |
| 1958 | 48 | 10 | 1 | 1 | Neg. | Neg. |
| 1960 | 44 | 8 | 1 | Neg. | Neg. | Neg. |
| 1961 | 47 | 8 | 2 | Neg. | 0.6 | Neg. |
| 1962 | 42 | 8 | 2 | Neg. | Neg. | Neg. |

| | <u>Percent of Total Imports from</u> | | | | | |
|------|--------------------------------------|---------------------|--------------------|--------------------------|--------------|-------------------|
| | <u>United Kingdom</u> | <u>South Africa</u> | <u>Congo (Leo)</u> | <u>Portuguese Africa</u> | <u>Kenya</u> | <u>Tanganyika</u> |
| 1958 | 37 | 32 | 1 | 1 | Neg. | Neg. |
| 1960 | 33 | 33 | 1 | 1 | Neg. | Neg. |
| 1961 | 33 | 31 | 1 | 1 | Neg. | Neg. |
| 1962 | 33 | 30 | 1 | 1 | Neg. | Neg. |

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IV. Mozambique

Mozambique, with an area of approximately 297,700 square miles, is the second largest overseas province of Portugal and has the largest number of Portuguese inhabitants outside of Metropolitan Portugal. Africans comprise about 97 percent of the 6.6 million population, Europeans 1½ percent, and Asians (including Indians*) 1½ percent.

The economy of Mozambique is basically agricultural and is one of the least developed in central and southern Africa. Climate, topography and transportation are such that many parts of the country are inaccessible during the rainy season or accessible only by air. As a result, exploitation of mineral resources and establishment of local industries are seriously impeded. Some 600,000 Africans, less than 10 percent of the total population, are thought to be incorporated in the monetary economy. Somewhat more than two million people comprise the economically active population; of this total, well over three-fourths are engaged in agriculture, which is by far the dominant sector of the economy.

Export crops are raised mainly on Portuguese-owned plantations, some of which were brought under Portuguese government control as late as 1942. This plantation economy is based on cheap labor and depends on subsidized prices and protected markets. The main export crops are cotton, sugar, tea, sisal, copra, and cashew nuts. Food crops for local consumption include corn, rice, peanuts, beans and bananas. Mozambique

* After India occupied Goa, all the Indians were deported from Mozambique.

appears to be largely self-sufficient in food production, but imports relatively small quantities of flour and rice.

Coal is the most important mineral product of Mozambique. Mined at Tete, output does not meet domestic consumption requirements. Coal production during 1959-1962 was as follows:

| | <u>Short Tons</u> | | | |
|--|-------------------|-------------|-------------|-------------|
| | <u>1959</u> | <u>1960</u> | <u>1961</u> | <u>1962</u> |
| | 282,870 | 297,210 | 353,840 | 385,800 |

Gold, graphite, iron ore, and radioactive minerals are produced and exported, but in relatively small quantities.

Industry in Mozambique is mostly concerned with processing locally produced materials such as sugar, cotton, tobacco, and asbestos. Timber is produced in quantities sufficient for local needs and is exported to Rhodesia and Nyasaland, and to the Republic of South Africa.

Apart from coal, Mozambique imports manufactured and semi-manufactured goods including textiles, railroad materials, agricultural and industrial machinery, iron and steel, motor vehicles, gasoline, hardware and footwear. As in Angola, duties on imports from Portugal are lower than those from other suppliers by as much as 50 percent.

Mozambique consistently runs a deficit in her balance of trade, as is illustrated by the table below.

| | <u>(in million US dollars)</u> | | |
|---------|--------------------------------|-------------|-------------|
| | <u>1958</u> | <u>1959</u> | <u>1960</u> |
| Imports | 119 | 122 | 127 |
| Exports | <u>76</u> | <u>78</u> | <u>73</u> |
| Balance | -43 | -44 | -54 |

Six agricultural commodities account for 66 percent of total export earnings in 1962 .

The production and export of these commodities are shown in Table I.*

The most recent data on Mozambique's trade with countries in southern Africa indicate a substantial imbalance.

Trade With Countries in Southern Africa^{s/}

(in Million US dollars)

| Country | 1961 | | 1960 | |
|---------------------------------------|---------|---------|---------|---------|
| | Exports | Imports | Exports | Imports |
| South Africa | 3.2 | 14.2 | 7.0 | 18.6 |
| Angola | 1.4 | 2.4 | 0.6 | 2.6 |
| Federation of Rhodesia & Nyasaland | 3.8 | 2.0 | 2.4 | 2.4 |

s/ January-June at annual rates.

Trade with African countries comprises less than one-fifth of Mozambique's total trade. Her single largest trading partner is Portugal; the common market countries provide some 8 percent of her imports and buy around 20 percent of her exports, the United States accounts for about 6 percent of both imports and exports, and the United Kingdom for some 14 percent of Mozambique's imports and 8 percent of her exports.

One of the most important revenue producing "exports" of Mozambique is the movement of laborers to South Africa and the Federation of Rhodesia and Nyasaland. A contractual arrangement between the Government of Mozambique and the Republic of South Africa provides up to 90,000 Mozambicans for gold and coal mines on the Rand in return for routing via the port of Lourenco Marques about 50 percent of the seaborne traffic destined for the Transvaal-Swaziland area.

* Page 131 below.

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Table 1
Production and Export of Selected Agricultural Commodities
Mozambique, 1961-1962

| Commodity | Production | | Export | | Value of Exports (Million US Dollars) | |
|-------------|------------|---------|------------|------------|--|--------|
| | 1961* | 1962** | 1961* | 1962** | 1961* | 1962** |
| | | | Short Tons | Short Tons | | |
| Cotton | 124,835 | 138,559 | 34,725 | 28,848 | 20.36 | 17.48 |
| Sugar | 102,903 | 209,437 | N.A. | 133,119 | 11.20 | 11.00 |
| Cashew Nuts | 99,207 | 99,207 | 82,415 | 78,160 | 8.58 | 7.58 |
| Copra | 88,184 | 88,184 | 59,859 | 54,727 | 8.41 | 6.61 |
| Tea | 8,564 | 11,240 | 10,680 | 10,518 | 8.12 | 5.89 |
| Sisal | N.A. | N.A. | N.A. | N.A. | 5.58 | 5.33 |

* Calendar year.

** January-November 1962

V. Republic of South Africa

A. General

South Africa consists in the main of a narrow coastal strip near sea level, with a high interior table land separated from the coastal strip by mountains which rise from a mile to almost two miles in height. The climate is relatively dry, but in the Transvaal and Orange Free State, seasonal rainfall in the summer occasionally is so heavy as to cause flash floods. There are extensive areas of poor soil with very little vegetation. The few rivers, none navigable, provide main supplies of water, but a shortage of water is frequently a threat to the economy.

The Republic of South Africa possesses the most developed economy in the entire continent: it has the largest industrial establishment, the highest per capita income, and the greatest degree of urbanization. Nevertheless, this developed and highly integrated economy is vulnerable to a disruption of its essential domestic and foreign transportation links.

Internally, reliable long distance transportation is vital in linking widely separated industrial, agricultural, and commercial centers. Externally, an estimated 15 to 20 percent by volume of South Africa's commodity trade moves by way of foreign railways and ports. Most of this tonnage goes through the port of Lourenco Marques, which handles a large part of the external traffic of the

northeastern region.

Although a significant part of South Africa's external trade transits Mozambique, only a minor and declining portion of its total trade by value is carried on with other African countries. Most of the Republic's commerce is with Western developed countries; the United Kingdom and the United States together account for 40 percent. These two countries plus those in the European Common Market supply two-thirds of South Africa's imports and purchase well over one-half of its exports.

The Republic usually runs a deficit on merchandise account. This, however, is more than offset by heavy sales of gold, which provide between 30 and 40 percent of total export earnings. As a result, the favorable balance in its current trade account is sizeable.

The diversified and substantial output of its industry and agriculture enables South Africa to satisfy much of its internal demand. Nevertheless, it must import many products, some of which are critical in nature. As in other developed countries, industrial growth requires the acquisition of some types of specialized machinery and equipment from abroad. On a more elementary level, South Africa is completely dependent upon foreign sources for crude oil and aviation gasoline.

B. Population and Labor Force

The population of South and South-West Africa is usually divided into four main groups: White, Colored, Asian, and Bantu. South Africa has by far the largest white population on the continent -- almost one-fifth of the 15.8 million

reported in the 1960 population census. The percentages of other groups were: Bantu, nearly 70; Colored, nearly 10; Asian, about 3. In South-West Africa, the total population was about 525,000 of which the Bantu accounted for 80 percent, the Whites for 15 percent and the Colored for 5 percent.

South Africa has a number of large cities: the population of Johannesburg numbers 1.1 million; Cape Town, 730 thousand; Durban, 655 thousand; Pretoria, 415 thousand; Port Elizabeth, 270 thousand; Germiston, 205 thousand. These and other urban areas contain more than 40 percent of South Africa's population. The greatest concentration of Whites is in Johannesburg, but Pretoria has the highest ratio of Whites, roughly 50 percent. The country is divided into four provinces: Natal, the most densely populated; Transvaal; The Orange Free State; and The Cape. In addition, South-West Africa, a League of Nations Mandated Territory, is now administered virtually as a fifth Province.

The population of these provinces, as recorded in the 1960 census, was as follows:

| | <u>Total population (in millions)</u> | <u>Non-whites as a percent of total</u> |
|-----------------------|---|---|
| The Cape | 5.3 | 81 |
| Natal | 2.9 | 88 |
| Transvaal | 6.2 | 77 |
| The Orange Free State | 1.4 | 80 |

The 1951 census of the economically active population showed that Whites made up 21 percent and Bantu 68 percent. The number active in various sectors

and the proportion of this number consisting of Bantu is shown below.

| <u>Economic sector</u> | <u>Number active (in millions)</u> | <u>Bantu as a percent of number active</u> |
|--|--|--|
| All sectors | <u>4.6</u> | <u>68</u> |
| Agriculture, forestry, and fishing | 1.5 | 83 |
| Mining | 0.5 | 88 |
| Manufacturing | 0.5 | 45 |
| Commerce | 0.3 | 31 |
| Transport, storage, and communication | 0.2 | 36 |
| Other | 1.6 | 69 |

The Bantu population is about equally distributed among those working in urban areas, those working on rural farms owned by Whites, and those residing on Native Reserves that are not economically self-sufficient and are now considered to be overpopulated. It is the policy of the South African Government to reduce the ratio of Bantu to Whites in urban and industrial areas, and to return many Bantu to the Reserves. Industry is being encouraged to locate on the borders of the Reserves in order to provide employment for the returnees. A recent survey, however, indicates that about half of the Bantu now working in urban areas have long resided in the cities and consequently have lost all land rights in the Reserves. In addition, the wage earnings of most urban Bantu households are at or below the minimum subsistence level. Thus, any significant decrease in the level of employment is apt to cause great hardship and consequent unrest among this segment of the population. In the 1960-62 recession, unemployment

among both the Bantu and the Whites increased. The recovery, fully underway by late 1962, seems to have reduced the level of unemployment, but at the expense of "foreign" workers from Mozambique, the Federation, and the High Commission Territories. It is government policy to reduce the number of these migrant workers, except in the gold fields. These migrants form a substantial part of the labor force in South Africa's mines; in 1957, for example, they outnumbered native South Africans 2 to 1 in the gold and coal mines.

C. Economic Sectors

The National Income of the Republic of South Africa has doubled in the past decade. Output in manufacturing increased faster than in agriculture and mining as the economy became more diversified. Now, with the exception of a few imported commodities, it has become a self-sufficient and well integrated economy. The shares of Net Domestic Product as shown below have remained fairly constant for the last three years.

Net Domestic Product for Selected Sectors, 1961/62

| | (in billion US dollars) | |
|----------------------------|-------------------------|-------------------------|
| | <u>Value</u> | <u>Percent of Total</u> |
| Total | <u>7.01</u> | <u>100</u> |
| Private manufacturing | 1.69 | 24 |
| Mining | 0.94 | 13 |
| Of which: gold | (0.72) | (10) |
| Trade | 0.88 | 13 |
| Agriculture | 0.75 | 11 |
| Transport | 0.56 | 8 |
| Of which: Rails & Harbours | (0.47) | (7) |
| Private Transport | (0.09) | (1) |

An atmosphere of growing tension over nationalist activity and the

possibilities of repeated sabotage and violence is reflected in the 1963/64 budget. The most outstanding feature is a further increase in defense expenditure -- up 28 percent from 1962/63 and now equal to nearly 13 percent of the total budget. The Police budget, which is not included in the defense budget, is greater for 1963/64 than total allocations for Bantu Administration and Development.

For the economically active Bantu, agriculture is the most important occupation. It is almost the only activity in the Reserves and employs about 40 percent of all working Bantu. The most important single crop is corn; yields are usually sufficient to provide a surplus for export. In recent years, corn surpluses have become burdensome. About one-third of the white-owned farms raise corn. European farmers produce nearly 85 percent of the total crop, while nearly all the rest is grown by Africans who work subsistence plots on white-owned farms.

The main areas in which the principal crops are grown are shown below.

| <u>Crop</u> | <u>Area</u> |
|-------------|---|
| Corn | Transvaal, Cape, Natal, Orange Free State |
| Wheat | Cape (southwestern region) |
| Sugar | Natal (coast), Zululand |
| Fruit | Cape |
| Tabacco | Transvaal (Rustenburg area) |

Wool, which accounts for nearly 17 percent of total exports by value, is the largest single agricultural export and the second most important in the

whole economy. Some 65 percent is produced in Cape Province, and about one-fifth in the Orange Free State. Cape Province also leads in numbers of cattle, and is by far the most important province in terms of agricultural output.

Although it employs fewer people than agriculture, mining is of great importance to the South African economy. Gold is the single largest export, and the most important mineral in terms of its contribution to national income. Statistics on the production and export of gold and other minerals may be found in the Appendix. Most of the "foreign" workers in the Republic are employed in the mining industry, usually under short-term contracts.

Private manufacturing is the fastest growing and most important sector in the South African economy; nearly every major form of industry is represented. Industrial production is concentrated in four areas: (a) southern Transvaal, (b) Durban - Pinetown, (c) western Cape, (d) Port Elizabeth - Uitenhage. In 1956/57, they accounted for 41, 16, 13 and 5 percent respectively of industrial output. Over half of the metal working and engineering industry is located in the Transvaal; industries in Durban and Pinetown include chemical, paint, paper, and pulp factories, sugar refineries, hardware and furniture plants; western Cape specializes in clothing, textiles, canning and food processing, distilling, printing and boat-building. Port Elizabeth-Uitenhage specializes in footwear, automotive assembly, tyres, and wood-processing.

There are three oil refineries in the Republic, none of which produce aviation gasoline: one is located at Sasolburg, and produces oil from coal; the

others are in Durban and Boksburg. Total input in 1962 amounted to 476 million imperial gallons of crude oil.

Transportation in the Republic of South Africa is characterized by the fact that its principal industrial area -- Witwatersrand, in the Transvaal -- is located far from the ports, from the major livestock areas and from other industrial centers. In these circumstances the railroad network is the primary means for moving bulk traffic. Consequently, investment in transportation has formed a large share of public investment in the last decade.

Average Annual Public Development Expenditure by Sector, 1946/47 - 1956/57

| <u>Sector</u> | <u>Percent of total</u> |
|-------------------------------|-------------------------|
| Transportation facilities | 40 |
| Agriculture | 14 |
| Education and Social Services | 14 |
| Industry | 8 |
| Communications | 9 |
| Other | 15 |

Total investment in motor roads and bridges outside of urban areas is estimated at about \$1.05 billion. National expenditure, however, has been devoted primarily to constant expansion and improvement of the railroads.

D. Foreign Trade

The United States and the United Kingdom together account for more than 40 percent of South Africa's foreign trade and about 70 percent of total foreign investment. The Federation of Rhodesia and Nyasaland has been an important outlet

in the past, but recent increases in Federation tariffs on manufactures and semi-manufactures have significantly reduced South African sales in this market. The following tabulation gives a comparison of shares of South African import and export for 1959-61/

South African Foreign Trade

(in billion US dollars)

| | Imports | | | Exports | | |
|-------------------------|---------|------|------|---------|------|------|
| | 1959 | 1960 | 1961 | 1959 | 1960 | 1961 |
| Total World | 1.4 | 1.6 | 1.4 | 1.2 | 1.2 | 1.3 |
| <u>Percentage with:</u> | | | | | | |
| United Kingdom | 31 | 28 | 29 | 25 | 25 | 26 |
| Common Market | 18 | 19 | 20 | 21 | 24 | 21 |
| U S A | 17 | 19 | 18 | 8 | 6 | 7 |
| Federation of R & N | 2 | 3 | 3 | 12 | 12 | 10 |

In terms of value, the principal South African export is gold; other important export commodities include wool, diamonds (both cut and uncut), radioactive minerals, asbestos, machinery, and fruits. The major imports are wood and wood products, gasoline, motor vehicles and parts, and cotton textiles.

With respect to trade with the Federation of Rhodesia and Nyasaland and with the Congo, the following values were reported for 1961.

South Africa

| | | Imports from | Exports to |
|----------------|----------|--------------|--------------------------------|
| Congo | | \$33,200,000 | \$9,600,000 |
| consisting of: | Metals | 5,600,000 | Foodstuffs & Agr. \$4,500,000 |
| | Minerals | 26,200,000 | Machinery & Mfg's. 700,000 |
| Federation | | \$44,400,000 | \$135,000,000 |
| consisting of: | Metals | 20,000,000 | Mfg. and machines \$60,600,000 |
| | Minerals | 4,600,000 | Foodstuffs & Agr. 19,200,000 |
| | Tobacco | 3,900,000 | Fibres 13,600,000 |

Most of the traffic was handled overland, but owing to the high unit value of the commodities, the tonnage involved was relatively low.

E. Vulnerability of the South African Economy

South Africa is vulnerable to external economic pressure in at least three forms: (1) interdiction of rail links with Lourenco Marques; (2) denial of foreign sources of crude oil and aviation gasoline; and (3) institution of a general trade embargo by the UK and the US. Interdiction of rail links between the northeastern region and Lourenco Marques would require re-routing this large volume of traffic over railroads in Transvaal and Natal Provinces, thus greatly increasing the transport costs.

Imports of crude oil and aviation gasoline are essential to the domestic transportation system. Denial of crude oil to the Republic would shut down two of its refineries (the other converts coal to liquid hydrocarbon fuels). In addition to losses resulting from idle plants, South Africa would be forced to purchase, at a greater total import cost, the refinery products it could no longer produce itself. If no supplier could be found, the availability of fuel oil for industrial and railroad use and gasoline for motor transport would be sharply reduced. Cessation of aviation gasoline imports would force domestic air service, including police aircraft operations, to draw upon stocks already on hand. When such stocks were depleted, these services would cease.

Institution of a trade embargo by the UK and the US would have even more serious effects. At the very least, it would require the development of new export markets -- a feat that would require considerable time, if it could be accomplished.

If a redirection of trade could not be accomplished, South Africa would lose nearly one-half of its export earnings and would have to do without about one-third of the goods now purchased abroad.

A collapse of this magnitude in its foreign commerce would seriously weaken its external financial position, curtail new foreign investment in South African industry, and lead to a deterioration of the economy. An embargo that could produce such effects, however, would exact a heavy toll from UK and US investors who presently account for an estimated 70 percent of total foreign investment in the Republic.

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Basutoland

A. General

Basutoland, the poorest of the High Commission Territories, is an enclave of about 11,716 square miles entirely surrounded by the Republic of South Africa. The western region is a continuation of the Orange Free State Plateau and has an average altitude of 5,000 feet. The eastern part is even higher with peaks in the Maluti mountains rising above 11,000 feet.

Basutoland is under the control of the British Colonial Office, and has a Legislative Council which makes laws for the territory; excepted are spheres such as defence and external affairs which are reserved for the British High Commissioner. The Basutoland Congress Party is pressing for early independence, although the territory may never be economically independent. The capital is at Maseru, 92 miles east of Bloemfontein, with which it is connected by rail.

B. Population and Agriculture

Basutoland depends mainly on peasant agriculture and on the export of labor to the Republic of South Africa. Taking into consideration the habitable areas only, Basutoland is the most densely populated area in South Africa, and all arable land is under cultivation. The European or white population consists mainly of government officials, missionaries, traders, and labor-recruiting agents. The 1956 census reported about 2,000 Europeans, over 600,000 Africans and nearly 900 other residents in the territory. The census also reported that more than 150,000 Basutos

were working abroad; this migrant labor force is one of the greatest economic assets of the country. Remittances from the 100,000 to 150,000 Basutos working in the Republic of South Africa amount to about \$2.8 million annually.

Land is held communally and there are no European landowners or settlers.

The principal crops are corn, wheat, and sorghum. Other grains and vegetables also are grown. Animal husbandry is one of the most important economic occupations.

There are no forests, and no mineral production, but diamond prospecting is continuing and some stones have been found. A geological survey is being made, but development plans concentrate on the improvement of agriculture and livestock. In 1962, twelve small industrial establishments were being planned; the Basutoland Development Corporation is expected to supply the necessary capital.

C. Transport

A railroad, built by South African Railways, 16 miles long connects Maseru with the Bloemfontein - Natal line. Only one mile of this line lies within Basutoland. There are about 560 miles of gravel surfaced roads along the western border of the country. In addition, there are about 340 miles of lesser roads leading to trading stations and villages. The mountains of the interior are accessible only by jeep and pack animals, but air transport is becoming increasingly important. Basutoland has long been a refuge for defeated tribes and fugitives, and in recent years has given asylum to many fleeing from South Africa.

D. Trade and Finance

Basutoland customs are administered for the Territory by South Africa, which

gives it .85575 percent of annual South African customs revenues. This amounts to nearly one-half of Basutoland's total revenues; domestic sources account for a relatively small share, sometimes as low as 10-15 percent. Revenues and expenditures in recent years are shown below. The annual deficit has been covered by United Kingdom grants-in-aid.

| <u>Fiscal Year</u> | <u>Revenues and Expenditures</u> | | |
|--------------------|----------------------------------|---------------------|----------------|
| | <u>Revenues</u> | <u>Expenditures</u> | <u>Deficit</u> |
| 1959/60 | 5,812 | 6,554 | 742 |
| 1960/61 | 6,628 | 6,970 | 342 |
| 1961/62 | 5,599 | 8,971 | 3,372 |

South Africa provides nearly all of Basutoland's technical services and transportation, and is its most important trading partner. Imports and exports in thousand US dollars are shown below.

| | <u>Imports</u> | <u>Exports</u> |
|------|----------------|----------------|
| 1958 | 8,252 | 4,044 |
| 1959 | 8,103 | 4,626 |
| 1960 | 8,800 | 4,125 |

While the most important "export" by value is probably Basuto labor, commodity exports in 1960 included wool valued at two million dollars, mohair worth almost one million, cattle worth more than one-half a million, and peas valued at \$147,045. Imports consisted mainly of blankets, ploughs, clothing, tin ware, and food stuffs. General merchandise imports in 1960 were valued at over six million dollars, corn at more than one million, wheat at \$324,900, and sorghum at \$44,300.

Bechuanaland

About 220,000 square miles in area, much of it desert, Bechuanaland is the largest and most sparsely populated of the High Commission Territories. The 1956 census recorded a population of 320,000 of which 4,000 were Europeans and Asians. The country is a protectorate ruled through the British Commonwealth Relations Office, and administered by a Resident Commissioner, assisted by an Executive and a Legislative Council. Government headquarters are at Mafeking in the Republic of South Africa.

Most of the population is concentrated along the eastern and northwestern borders, and more than one-half live in villages of 1,000 or more inhabitants. Stock raising and agriculture occupy almost 90 percent of the population. The few African wage earners are employed mainly in trade and in the small processing industry.

Wage earners in 1959 were distributed as follows:

| | |
|---------------------|-------|
| Government services | 2,500 |
| Agriculture | 3,000 |
| Trade and industry | 2,000 |
| Domestic services | 2,000 |
| Construction | 500 |

In addition, nearly 22,000 worked in the Republic of South Africa in 1959; their remittances totaled more than \$800,000. By 1961, the number of these workers had risen to around 30,000.

Animal husbandry and dairying are the chief occupations of the Bechuanas; inasmuch as rainfall is low, the country is more pastoral than agricultural. Corn,

sorghum, beans, pumpkins, and melons are grown, and in good years a considerable surplus has been available for export. Bechuanaland has a small mining industry, concentrated mainly in the Tati concession area where gold, some copper, and other base minerals are found. Asbestos is mined near Kanye; manganese also is mined in the southeastern part of the country.

Most bulk traffic is carried on the single track railroad, nearly 400 miles long, which passes through Bechuanaland parallel to the eastern border at an average distance of 50 miles inland. South African Railways administers and staffs that part of the line south of Mahalapye; the northern part is managed by the Rhodesian railway system. A through road, parallels the railroad, and branches connecting the rail line to points in the hinterland extend inland an average of some 40 miles.

Livestock, as well as meat and other animal products are the main exports of Bechuanaland. In 1960, these constituted 86 percent of total exports by value. The Republic of South Africa and the Federation of Rhodesia and Nyasaland are the chief markets for Bechuanaland's exports. As in the other High Commission Territories, customs are administered by South Africa which forwards .27622 percent of its total import and excise duties to Bechuanaland; in 1958/59 this amounted to over \$700,000, or about 23 percent of total government revenues in Bechuanaland.

In 1960, imports totalled more than \$9 million and exports amounted to \$7.9 million. The main imports are grain, blankets, clothing, and foodstuffs; the chief exports, aside from meat and animal products, are asbestos and manganese.

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The value of major export and import categories for 1960 are shown below in thousands

of US dollars.

| <u>Imports</u> | | <u>Exports</u> | |
|---------------------|-------|-----------------|-------|
| General merchandise | 2,962 | Carcasses | 4,417 |
| Vehicles | 1,557 | Hides and skins | 947 |
| Textiles | 1,366 | Meat byproducts | 772 |
| Corn | 1,223 | Cattle | 422 |
| | | Asbestos | 370 |
| | | Manganese | 198 |

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Swaziland

A. General

Of the High Commission Territories, Swaziland is the smallest, wealthiest, and the least dependent on South Africa. It is 6,700 square miles in area (about the size of Connecticut) and has a population of 270,000, of which only 3 to 4 percent are white. Swaziland is administered by the British Government through the Colonial Office and has recently been granted a constitution providing for internal self-government; however, no date has been set for implementing this provision. As in the other two territories, there is a considerable demand for independence.

B. The Economy

Swaziland's basic wealth lies in its rich and varied mineral deposits. Of these resources, asbestos is the most important; the Havelock mine in north-western Swaziland is one of the world's largest asbestos mines, providing almost 60 percent of the government's revenues from income taxes. The asbestos is moved by cable-car across the Transvaal to the railroad at Barberton. Very rich kaolin deposits also are present; several companies are planning to set up ceramics plants. Small quantities of tin are currently being mined, and there are encouraging prospects for the development of coal and iron mining. Iron ore deposits of very high quality are to be exploited in connection with a purchase agreement with Japan calling for deliveries in 1964. A \$27 million rail line is being built to link the iron mines with Lourenco Marques, this line will be operated by the Mozambique railway system.

result, trade statistics are incomplete. Principal imports are general merchandise, mining stores, construction materials, motor vehicles and spare parts. Total exports in 1960 amounted to about \$12.5 million; the chief items were asbestos (32,026 short tons), slaughter stock, hides and skins, tobacco (480 short tons), seed cotton, rice, and sugar (36,500 short tons); asbestos alone accounts for nearly one-half of the territory's export earnings.

South Africa is probably Swaziland's most important customer, and a number of major products, including fruit, asbestos and sugar, are marketed through South African organizations. For its sugar purchases, South Africa offers an 80,000 ton quota at higher than world prices.

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Part VI. Tanganyika

Summary

The economy of Tanganyika is heavily dependent on foreign trade. About 40 percent of the money income is derived from exports, and 80 percent of the export earnings are from agriculture and livestock. Most agricultural exports are bulk products grown in remote and widely separated areas. These areas are served partially by road but mostly by rail. Important cotton growing areas are located along the southern shores of Lake Victoria and there are other cotton ^{development plans} / lo- cated 100-200 miles inland from Dar es Salaam. The port of Tanga serves the coffee growing regions around Arusha and Moshi near the Kenya border and the sisal plantations along the Pangani River. Mtwara is the chief port for the soya and cashew crops grown in the Masasi-Lindi-Mtwara triangle.

General

Tanganyika covers an area of 341,150 square miles, roughly 30 percent larger than Texas. The land, however, is largely arid bush; more than 60 percent is rendered virtually useless by the endemic animal-killing -- and sometimes man-killing -- tsetse fly. Thus, much of the population is concentrated along the lower reaches of Lake Victoria, the upper shores of Lake Nyasa, and the northeast and southeast corners of the country along the Indian Ocean. There is also a relatively dense population belt along the Central Railroad, which connects Dar es Salaam with Mwanza, the capital of the Lake Province. Africans constitute 98 percent of the total population of 9.5 million; most of the remaining two percent consist of 22,000

Europeans, 87,000 Indians and Pakistanis, and 25,000 Arabs.

Peasant farmers and semi-nomadic herdsmen form the largest part of the population; in 1962, less than 500,000 Africans, only five percent of the population, were listed as wage earners. Trade is dominated by Indians, Pakistanis, Goans, and Arabs; Europeans hold most of the administrative and technical positions, own the large agricultural estates, and are also active in business and industry.

Despite the disadvantages of land, climate, and insect pests, agriculture is the mainstay of the Tanganyika economy in both the monetary and subsistence sectors. Agricultural and livestock products together account for about 80 percent of export earnings; mineral exports, while slowly increasing in importance, contribute less than 15 percent.

Although subsistence farming and marginal animal husbandry occupy a major portion of the populace, such activity has declined in importance. The subsistence sector, which accounted for about 80 percent of the Gross Domestic Product (GDP) in 1955, generated less than 65 percent in 1961. In absolute terms, output in the subsistence sector increased about 13 percent, while output in the monetary sector increased almost 40 percent between 1955 and 1961. The Gross Domestic Product for 1962 is estimated at \$544.3 million, or 4 percent above 1961. Most of this increase was the result of higher wages and an improvement in earnings from certain export crops. The slight decline in mineral production, especially diamonds, was more than offset by the sale of larger tonnages of sisal and cotton at higher prices than in 1961.

Foreign Trade

In 1962, Tanganyika recorded exports of \$156.2 million and imports of \$144.2 million in trade with all areas. Commerce with Kenya and Uganda, which are Tanganyika's partners in the East African Trade Zone, accounted for five percent of total exports and 23 percent of total imports.

The composition of Tanganyika's export trade is dominated by agricultural commodities, primarily sisal, cotton, and coffee. Mineral products, consisting almost entirely of diamonds and gold, represented only 12 percent of total exports in 1962. A decline in mineral exports below the 1961 level was wholly the result of a decision not to work the less profitable diamond mines. The major exports by tonnage and value are shown in Tables 1 and 2 below.

Import trade in 1962 was characterized by an increase in most consumer items coupled with major decreases in investment items such as farm tractors, railway track material, building material, and machinery for commercial establishments. The only investment item to show a significant increase was railroad rolling stock. For political reasons South African products were boycotted by important groups and imports from this source dropped to \$1.2 million last year compared with \$3.4 million in 1959. The major components of export trade by value and tonnage are included in attached tables.

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Table 1

Tanganyika: Principal Agricultural Exports a/
Selected Years, 1951-62

| Year | Sisal | | Cotton | | Hulled Coffee | | Cashew Nuts | | Tea | |
|------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|
| | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 |
| 1951 | 142.2 | 66,180 | 8.3 | 7,750 | 18.4 | 19,312 | 18.2 | 2,433 | 1.7 | 1,498 |
| 1955 | 173.7 | 27,877 | 20.4 | 15,495 | 19.5 | 15,985 | 33.2 | 4,239 | 2.7 | 2,159 |
| 1959 | 208.8 | 36,560 | 30.7 | 18,640 | 25.1 | 20,513 | 36.7 | 5,953 | 3.2 | 3,223 |
| 1960 | 207.2 | 43,238 | 38.9 | 24,716 | 24.6 | 18,934 | 40.0 | 5,054 | 3.2 | 3,744 |
| 1961 | 200.9 | 39,278 | 29.7 | 19,023 | 25.7 | 18,410 | 59.0 | 6,538 | 3.9 | 4,514 |
| 1962 | 219.5 | 44,080 | 32.6 | 20,700 | | | | | | |
| | | | Peanuts | | Castor Seed | | Sunflower Seed | | | |
| | | | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 | 1,000 Long Tons | \$1,000 | | |
| 1955 | | | 5.6 | 969 | 7.9 | 868 | 12.5 | 1,056 | | |
| 1959 | | | 12.1 | 2,198 | 14.2 | 1,725 | 5.7 | 479 | | |
| 1960 | | | 14.6 | 2,948 | 18.4 | 2,447 | 12.4 | 927 | | |
| 1961 | | | 3.4 | 650 | 10.7 | 1,537 | 10.7 | 935 | | |
| 1962 | | | 6.4 | 1,103 | 13.4 | 1,677 | 11.8 | 988 | | |

a. Excluding exports to Kenya and Uganda.

APPENDIX C

THE TRANSPORTATION OF THE AREA

I. ANGOLA

A. Transportation System

The transportation system of Angola is oriented in an east to west direction connecting the interior of the country with Atlantic Ocean ports. The principal Angolan ports, because of their proximity to the main ocean trade routes, provide an Atlantic coast outlet for Angola and for other countries of Central Africa. The absence of good north - south land transportation routes makes coastal traffic by sea one of the main avenues of domestic north - south transportation. A large portion of the traffic passing through Lobito, the principal port, is transit, consisting principally of mineral traffic from the Congo and Northern Rhodesia, but local exports and imports are increasing. The railroads and highways extend inland from the Atlantic ports and provide access to the agricultural and mineral areas of the interior. There is no developed inland waterway system in Angola. The principal waterways are coastal rivers extending only short distances inland and other navigable streams are remote from the centers of the economy and serve only as local transport arteries. Civil air transport serves a number of localities in Angola and also provides a scheduled service to Leopoldville in the Republic of the Congo. All public transport services are under the administration and control of the Department of Ports, Railways and Transport Services.

B. Railroads

The railroads are the backbone of the transportation system in Angola and consist of four unconnected basic routes, 1,786 miles in length, extending inland

from Atlantic Ocean port terminals to agricultural and mineral areas in the interior. See Table 1*. In 1961 they carried 4.5 million tons of freight and almost 800 thousand passengers. See Table 2.** Two of these routes, the Luanda and the Mocamedes railroads, are government-owned, 3'6" gauge routes extending inland for 265 and 469 miles respectively. A third route, the Amboim Railroad, is privately owned. It is a 2' gauge route extending inland from the port of Amboim to Gabela, a distance of 76 miles, and is of slight importance, handling less than 40,000 tons of coffee and palm oil per year. The fourth route, the Benguela Railroad, is also privately owned and is the only international railroad route in Angola. It is by far the most important railroad in Angola and handles more than five times as much freight traffic as all the other Angolan railroads combined. For the purpose of this report, the Benguela Railroad is the only Angolan railroad which is studied in detail.

1. Benguela Railroad

The Benguela Railroad is a privately owned company. Ten percent of the company's stock is owned by the Portuguese government and ninety percent is owned by Tanganyika Concessions, Ltd., a British company which also operates the railroad. The head office of the company is in Lisbon, Portugal, but the African office for management of the railroad is located in Lobito, Angola.

The Benguela Railroad provides the Atlantic Ocean link in an extensive trans-Africa network of 3'6" gauge routes. It extends from the Atlantic Ocean port of Lobito eastward for 838 miles through Nova Lisboa, Silva Porto, Munhango and Vila Teixeira de Sousa to the border of the Republic of the Congo. At Dilolo

* Page 169 below.

** Page 170 below.

on the Congo border, it connects with the Bas Congo - Katanga Railroad (BCK) which is also a part of the trans-Africa network of 3' 6" gauge routes linking Angola, the Republic of the Congo, the Federation of Rhodesia and Nyasaland, Mozambique and the Republic of South Africa. A 41-mile branch line runs south from the main line at Vila Robert Williams, 248 miles east of Lobito, to the principal iron ore deposits at Cuima. This line was opened to traffic on 9 August 1962. Prior to its opening, iron ore was carried by truck from the mines to Vila Robert Williams and thence by rail to Lobito for export to Europe.

The entire route of the Benguela Railroad is single track. Passing tracks with an estimated minimum length of 1,600 feet, are located at all stations along the route and the maximum distance between passing tracks is 17 miles. The manual block system of signaling is used to dispatch trains. Under this system, the stationmaster must obtain permission by telephone or telegraph from the next station in the direction of travel before permitting a train to enter a block. The maximum grade on the route is 2.5% and the maximum axle load is 14 short tons. There are 130 bridges and numerous culverts along the route. The longest bridge is 512 feet in length and is located about 14 miles east of Vila General Machado crossing the Cuanza River. This is a combined rail - road bridge of steel truss construction and may be considered a critical point in the railroad and highway routes. Other major bridges are the 340 foot bridge and the 380 foot bridge located 2 and 10 miles respectively from Benguela. There are no tunnels on the Benguela Railroad.

All main line locomotives are steam powered and the principal fuel used is wood which is obtained from tree farms located along the route and owned by the

railroad, but it is believed also that a few steam locomotives have been converted to burn fuel oil. Water stations are spaced at 30 mile intervals along the route and are essential to the operation of the railroad. The main shops for the maintenance and repair of locomotives and rolling stock are located at Nova Lisboa. Power to operate these shops and also for the city of Nova Lisboa is provided by a hydro-electric plant using water from a dam which was built by the railroad company on the Cuando River about 30 miles from Nova Lisboa. The rolling stock consists of about 1,500 freight cars, over 50 percent of which are open gondola cars of 40-ton capacity.

The total staff employed by the Benguela Railroad in 1961 was 17,629. No late statistics are available regarding the color of the employees. However, during 1959, official reports listed 3,000 as senior and junior employees and 11,600 as "African" employees. If the term "African" as mentioned in reports connotes colored African employees, then almost 80 percent of the employees are colored. Should black African nationalism become a factor in the stability of Portuguese authority in Angola, the predominantly native railroad labor force could effectively disrupt railroad operations if there should be a desire to do so.

Freight traffic on the Benguela Railroad is increasing, but passenger traffic has declined rapidly during the past four years. Selected statistical data for the period 1958 through 1961 are presented in Table 2. See Table 2.* Westbound traffic is about five times as heavy as eastbound traffic and consists predominantly of mineral and ore traffic. In fact, mineral and ore traffic from Angola, Katanga and Rhodesia represents 28 - 30 percent of all tonnage handled by the railroad as reflected in the following table:

*Page 170 below.

Mineral and Ore Traffic

| | <u>1958</u> | | <u>1959</u> | | <u>1960</u> | | <u>1961</u> | |
|----------|---------------|-------------------------------|---------------|-------------------------------|---------------|-------------------------------|---------------|-------------------------------|
| | Tons | % of total tons carried | Tons | % of total tons carried | Tons | % of total tons carried | Tons | % of total tons carried |
| Angola | 217,273 | 7.0 | 270,866 | 9.0 | 484,887 | 12.0 | 419,565 | 11.0 |
| Katanga | 459,207 | 15.7 | 476,671 | 15.6 | 640,051 | 16.0 | 660,742 | 17.0 |
| Rhodesia | <u>52,050</u> | <u>1.3</u> | <u>90,255</u> | <u>3.0</u> | <u>69,594</u> | <u>2.0</u> | <u>22,850</u> | <u>.05</u> |
| Totals | 728,530 | 24.0 | 837,792 | 27.6 | 1,194,532 | 30.0 | 1,103,157 | 28.5 |

In terms of ton miles, mineral and ore traffic from Katanga and Rhodesia in transit through Angola amounted to 45.6 percent of the total traffic in 1960 and 35.6 percent in 1961. Assuming that revenue per ton mile on mineral traffic is equal to average revenue per ton mile, then revenues from Katanga and Rhodesia mineral traffic were also 45.6 and 35.6 percent in these years. It is apparent, therefore, that diversion of this transit traffic to another route would seriously impair the financial position of the Benguela Railroad.

The Benguela Railroad appears to be efficiently operated and fully adequate for the needs of the economy it serves and for the international traffic currently moving over the route. In fact, it is not intensively used. In 1961, traffic density on the route was only 1.2 million net ton miles per mile of route. By comparison, the Beira Railroad in Mozambique, which is also a single track, steam-operated railroad, had a traffic density more than twice as high or 2.5 million net ton miles per mile of route. This comparison suggests that the Benguela Railroad is operating at well below the capacity of the route although an investment in locomotives and rolling stock may be required to improve performance substantially.

The standard military formula for estimating the capacity of railroad routes for military traffic yields an estimate of about 1,800 tons per day for the one-way military capacity of the Benguela Railroad in either direction. However, analysis

of statistical data indicates that at a ratio of 1 ton eastbound to 5 westbound, the railroad carried an average of 1,760 tons eastbound per day during 1961. Moreover, considering the fact that a large number of empty freight cars move eastbound to compensate for the heavy loaded movement in the opposite direction, the military estimate should be considered as a minimum capacity for military traffic.

There are no known inter-governmental agreements between Angola and the Congo pertaining to traffic or transportation. However, an agreement exists between the Benguela Railroad and the BCK in the Congo providing for the interchange of rolling stock between the two systems. Moreover, the BCK provides the Benguela Railroad with advance notice of the movement of mineral traffic so that adjustments can be made in the assignment of empty freight cars. Also freight cars of the Rhodesian railroads operate over the Benguela Railroad and are treated as BCK rolling stock.

C. Highways

The road network of Angola is underdeveloped and consists of about 22,000 miles of various classes of roads and tracks. For administrative purposes these classes are 1st, 2nd, 3rd, and unclassified. However, only about 100 miles of roads are paved with a thin coating of asphalt, and the standard of surfacing over the entire system varies considerably even along a single route. Most of the system has a dirt surface, and the entire system may be considered fair-weather system because various segments of any given route become impassable during the rainy season which lasts from November until May.

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Two main routes traverse the country from west to east, and these routes converge at Vila Teixeira de Sousa on the Congo border. At that point these routes connect with the Congo highway system. The northern route, 821 miles in length, originating at Luanda, has a military capacity of up to 4,000 short tons per day for the first 40 miles to Catete which is paved. However, other sections along the route have a capacity of only 500 short tons daily, thereby limiting through put capacity to the Congo border to 500 short tons per day. The southern route, 697 miles in length, which roughly parallels the Benguela Railroad, is also limited to about 550 short tons daily. Thus the two west - east highways are capable of delivering 1,050 short tons daily of military traffic from the ports of Luanda and Lobito to the Congo border. During the rainy season, this capacity may be reduced to zero for from 1 to 7 days at a time. In the event of a partial or complete disruption of railroad traffic in the Congo and in Rhodesia, these highways could conceivably handle an equal amount of commercial traffic in westbound transit through Angola. At the rate of 1,050 short tons daily, a total of about 190,000 tons of cargo could be carried during the six month period of fair weather, May to November,-- provided, of course, that a sufficient number of trucks are available. The policy of the government of Angola has been to restrict truck transportation that would compete with the railroads for traffic.

Highway transport of goods and passengers in Angola does not appear to be organized into large-scale commercial enterprises. Trucking rates are controlled by the government and they are increased, if necessary, when truck routes parallel the railroad routes. The government policy regarding truck transport is set forth

in a government decree which states that the Port, Railroad and Transport Services are to propose means of protecting the railroads against competition from other means of transport, having in mind the capital investment of the State and the danger to this investment from "parasite" services serving the same region. Nevertheless, highway transport is the only means of transport in areas remote from the railroad. However, in the absence of a network of all-weather roads, it is doubtful that highway transport can play a significant role in international transport. Statistical data on the amount of freight carried by motor vehicle in Angola are not available. In 1962, the motor vehicle census was about 43,500 of which 12,000 were trucks and buses. Details of the size and capacity of trucks are not available but it is doubtful that the number of heavy duty trucks available for long distance transport of commercial cargo would be adequate to provide a significant substitute for railroad services.

D. Ports

The three principal ports serving Angola are Lobito, Luanda, and Mocamedes, located about 250 to 300 miles apart along the Angolan coast line. Cabinda, a small port on the coast of the Angolan enclave north of the Congo River, and Noqui, a small port on the Congo River, are of minor importance. Selected data on the operations at the three principal ports in Angola are shown in Table 3. See Table 3.*

1. Lobito

Lobito is the most important of the Angolan ports and is the western terminus of the Benguela Railroad, the only railroad connecting with any other system. It is located about midway between the northern and southern boundaries of the country. The harbor, which covers two square miles, is protected by a natural (sandspit) break-

* Page 172 below.

water three miles long. The port handles between 55 and 66 percent of the country's seaborne commerce (65.8% in 1961). Specific data on inbound vs. outbound tonnage is not available; however, mineral and ore traffic for export constitutes almost two-thirds of the total tonnage handled at the port. Moreover, during 1961 and 1962, mineral and ore traffic from Katanga and Northern Rhodesia in transit through Angola via the Benguela Railroad made up about 38 percent of the total tonnage handled at the port. Ore loading equipment at this port consists of a conveyor gallery with a capacity of 400 tons per hour. With a 25 percent factor of down time for maintenance of the conveyor and berthing and dispatch of vessels, capacity would be reduced to 300 tons per hour or about 2.6 million tons per year. This is about 138 percent more than the total mineral and ore traffic handled by the port in 1961. The port is well equipped with berthing facilities for 7 to 8 vessels, so it is probable that it operates at well below actual capacity. The capacity of the port to off-load military cargo is estimated about 5,000 short tons per day. This estimate is predicated on the utilization of ship gear only and discounting the potential of port equipment such as cranes. Port labor consists of about 1,000 Africans; also a force of about 500 Portuguese supervisors and semi-skilled Africans operate the port's mechanical equipment.

2. Luanda

Luanda, the second largest port in Angola, is located about 325 miles north of Lobito and handles about 30 percent of the country's seaborne commerce. The port is served by a railroad which extends eastward to Malanje, a distance of 265 miles. A main highway extends eastward through Malanje to the Congo border,

a distance of 821 miles. The port is well equipped with about 4,000 feet of usable wharfrage with alongside depths ranging from 8 to 33 feet, and a total of 23 cranes of up to 100-ton capacity. The port employs about 200 African stevedores. Military capacity is estimated at 4,000 short tons per day.

3. Mocamedes

The port of Mocamedes handled about 3 percent of the seaborne commerce in 1961. The port is situated about 235 miles south of Lobito and is served by a railroad which extends eastward to Vila Serpa Pinto, a distance of 469 miles. The port is undergoing expansion and at the present has alongside berthing facilities for vessels of up to 10,000 tons. Berths for 10 to 12 vessels are available with alongside depths of 10 to 34 feet. The port employs about 250 African stevedores. Military capacity is estimated at about 3,400 short tons per day.

E. Civil Air

There is only one civil air carrier in Angola engaged in domestic air transportation. This carrier is the Air Transport Operations Division (DTA). The DTA is operated by the Civil Aeronautics Service as a division of the Department of Ports, Railways and Transport Services of the government of Angola. The Civil Aeronautics Service constructs and operates airports, licenses pilots, establishes standards and regulates the operations of airlines operating in Angola. With the approval of Lisbon authorities, it establishes rules for Angola but, more often, it is consulted by Lisbon authorities before Lisbon promulgates regulations so that changes will be adaptable to conditions in Angola. The Angolan government does not give a direct subsidy to DTA but lends funds to DTA either interest free or at low interest rates. Moreover, the Department of Ports, Railways, and Transport

Services of the Angolan government maintains a contingency fund out of profits from the operations of all modes of transport which the DTA may draw upon as required.

The only international airport is located at Luanda. Its 6,000 foot landing strip is being supplemented by a new 12,000 foot landing strip which is under construction. The new landing strip will be completed in 1963, at which time the airport will be capable of handling long range jet aircraft. Also, 6,500 foot landing strips were completed in 1962 at Negave, Henrique de Carvalho, Nova Lisboa, Lobito and Benguela. Practically all of the major airports are in the western half of the country, while the rest of the country is served by airports with a limited capacity capable of handling C-47 or liaison-type aircraft.

Despite limited facilities, the importance of civil air service to isolated areas in Angola was, according to various reports, dramatically emphasized during the rebellion in the northern districts in March 1961. Rebel activity combined with the rainy season's usual effect on the dirt roads to cut land routes to various communities. Supplies were carried to those communities and casualties were evacuated from them by civil aircraft. Statistical data on those operations are not available but it is probable that air transport is the only means of transport available during the rainy season to many remote areas not served by the railroads.

The DTA does not operate a regular air freight service. Such cargo as is carried consisting of perishables, medicine, spare parts and other light cargo, is carried as an adjunct to regular passenger service. As of March 1962, DTA operated a total of 14 aircraft. The fleet consisted of 7 DC-3s, 4 Beechcraft D-188s, 1 Dragon Rapid and 2 PT-26As.

It is doubtful that DTA could make a significant contribution to the movement of commercial cargoes as an alternate to the railroads and highways.

It could, however, contribute significantly to the movement of troops and light military cargo from the ports to the interior. Statistical data on the DTA traffic are presented in Table 4. See Table 4.*

* Page 173 below.

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Table 1

Railroads of Angola (1962)

| | Miscellaneous Data | | | | |
|---|---------------------|--------|------------------|---------------------|-------|
| | Benguela | Luanda | Mocimedes | Amboim ¹ | Total |
| Total Track Miles | N.A. | N.A. | N.A. | N.A. | N.A. |
| Total Route Miles ^{a/} | 879 | 265 | 566 | 76 | 1,786 |
| Gauge: | | | | | |
| 3' 6" | 879 | 265 | 469 | None | 1,613 |
| Other | None | None | 97 | 76 | 173 |
| Maximum Grade (%) | 2.5 | 3.2 | 2.8 | N.A. | |
| Weight of Rail (pounds per yard) | 60 | 40-60 | 40-60 | N.A. | |
| Maximum Axle Load (short tons) | 14 | 14 | 14 | N.A. | |
| Maximum Distance between passing tracks | 17 | 27 | 17 | N.A. | |
| Locomotives (units) | 102 ^{b/} | 37 | 31 ^{c/} | 10 | 180 |
| Freight Cars (units) | 1,553 ^{d/} | 501 | 303 | 48 | 2,405 |
| Passenger Coaches | 46 | 55 | 25 | 3 | 129 |
| Passenger Motor Cars | None | 15 | 6 | N.A. | 21 |

a. All railroads in Angola are single track, steam operated and with manual bloc signaling.

b. Includes two diesel hydraulic switchers.

c. Includes 23 steam, three diesel-electric, and five steam locomotives for narrow gauge track.

d. Includes 800 open freight cars.

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Table 2

Railroads of Angola

Selected Statistical Data, 1958 - 1961

| | <u>1958</u> | <u>1959</u> | <u>1960</u> | <u>1961</u> |
|---------------------------------|-------------|-------------|-------------|-------------|
| TOTAL ALL RAILROADS | | | | |
| Passengers Carried (number) | | 1,059,615 | 1,031,393 | 799,363 |
| Passenger Miles | | NA | NA | NA |
| Tons Carried (short tons) | 4,019,885 | 4,019,885 | 4,769,788 | 4,529,167 |
| Ton Miles (000 short ton miles) | 989,266 | 989,266 | 1,130,143 | 1,130,104 |
| Revenues (\$US) <u>1/</u> | 18,099,314. | 18,099,314. | 23,164,004. | 23,237,376. |
| Expenses (\$US) | NA | NA | NA | NA |
| Operating Ratios | NA | NA | NA | NA |

| | | | | |
|---------------------------------|-------------|-------------|-------------|-------------|
| Benguela Railroad | | | | |
| Passengers carried (number) | 765,196 | 725,705 | 725,500 | 622,271 |
| Passenger Miles | 36,238,203 | 37,445,702 | 36,242,927 | 31,092,088 |
| Tons Carried (short tons) | 2,980,333 | 3,023,196 | 3,985,108 | 3,870,334 |
| Ton Miles (000 short ton miles) | 786,795 | 824,797 | 1,018,846 | 1,039,979 |
| Revenues: (\$US) <u>1/</u> | 529,330. | 563,867. | 546,750. | 449,723. |
| Passenger | 14,020,912. | 14,734,081. | 19,687,291. | 20,165,465. |
| Freight | 435,193. | 441,339. | 470,282. | 297,103. |
| Other | 14,985,435. | 15,739,314. | 20,704,323. | 20,912,291. |
| Total Revenues | 9,122,498. | 9,609,455. | 11,362,682. | 12,496,666. |
| Operating Expenses (\$US) | 60.8 | 61.0 | 54.9 | 59.7 |
| Operating Ratio (percent) | 14,495 | 14,703 | 16,100 | 17,629 |
| Personnel | | | | |

| | | | | |
|---------------------------------|------------|------------|------------|----|
| Luanda Railroad | | | | |
| Passengers Carried (number) | 244,550 | 221,941 | 108,301 | |
| Passenger Miles | NA | NA | NA | NA |
| Tons Carried (short tons) | 448,605 | 491,597 | 440,853 | |
| Ton Miles (000 short ton miles) | 47,552 | 52,107 | 46,730 | |
| Total Revenues (\$US) <u>1/</u> | 1,624,000. | 1,709,020. | 1,456,399. | |
| Expenses (\$US) | NA | NA | NA | NA |
| Operating Ratio (percent) | NA | NA | NA | NA |
| Personnel | NA | NA | NA | NA |

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Table 2 (continued)

Railroads of Angola
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|-------------------------------------|------|----------|----------|----------|
| <u>Mocamedes Railroad</u> | | | | |
| Passengers Carried (number) | | 79,339 | 73,706 | 62,443 |
| Passenger Miles | | NA | NA | NA |
| Tons Carried (short tons) | | 511,133 | 255,597 | 186,767 |
| Ton Miles (000 short ton miles) | | 115,516 | 57,765 | 42,209 |
| Total Revenues (\$US) ^{1/} | | 565,000. | 559,115. | 670,428. |
| Expenses (\$US) | | NA | NA | NA |
| Operating Ratio (percent) | | NA | NA | NA |
| Personnel | | NA | NA | NA |
| <u>Amboim Railroad</u> | | | | |
| Passengers Carried (number) | | 10,021 | 10,246 | 6,348 |
| Passenger Miles | | NA | NA | NA |
| Tons Carried (short tons) | | 36,951 | 37,506 | 31,213 |
| Ton Miles (000 short ton miles) | | 1,401 | 1,425 | 1,186 |
| Total Revenues (\$US) ^{1/} | | 171,000. | 191,546. | 198,258. |
| Expenses (\$US) | | NA | NA | NA |
| Operating Ratio (percent) | | NA | NA | NA |
| Personnel | | NA | NA | NA |

^{1/} = Revenues and Expenses converted from Escudos at the rate of 1,000 Escudos = 1 Conto = \$34.96

Table 3

Seaports of AngolaTraffic and Revenue

| <u>Ports</u> | <u>1960 (% of total)</u> | <u>1961 (% of total)</u> |
|-------------------------------------|--------------------------|--------------------------|
| <u>LOBITO</u> | | |
| Number of ships entering | 1,056 | 1,013 |
| Tons handled (short tons) | 1,889,526 (66.8%) | 1,784,405 (65.8%) |
| of which coastal traffic was | 95,116 | 105,625 |
| Receipts (\$US) ^{1/} | 2,887,172. (57.0%) | 2,755,512. (53.9%) |
| <u>LUANDA</u> | | |
| Number of ships entering | 1,015 | 1,007 |
| Tons handled (short tons) | 847,948 (30.0%) | 837,884 (39.9%) |
| Receipts (\$US) ^{1/} | 2,046,628. (40.4%) | 2,224,470. (43.5%) |
| <u>MOCAMEDES</u> | | |
| Number of ships entering | 622 | 497 |
| Tons handled (short tons) | 90,759 (3.2%) | 86,667 (3.2%) |
| Receipts (\$US) ^{1/} | 130,925. (2.6%) | 130,366. (2.6%) |
| Total Tonnage Handled (short tons) | 2,828,233 (100%) | 2,708,956 (100%) |
| Total Receipts (\$US) ^{1/} | 5,064,725. (100%) | 5,110,348. (100%) |

^{1/} Converted from Escudos at the rate of
1,000 escudos = 1 Conto = \$34.96

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Table 4

Selected Statistical Data of
Angolan Airlines, 1959-1961

| | <u>1959</u> | <u>1960</u> | <u>1961</u> |
|---------------------------|--------------|--------------|--------------|
| Passengers Carried | 40,662 | 44,024 | 53,964 |
| Tons Carried (short tons) | 631.8 | 576.5 | 895. |
| Mail Carried (pounds) | 316,468 | 555,335 | 685,637 |
| Revenue (\$US) <u>a/</u> | \$1,188,000. | \$1,370,397. | \$1,640,603. |
| Miles Flown | 1,412,902 | 1,374,660 | 1,606,909 |
| Flight Hours | 9,383 | 8,809 | 10,149 |

a. Converted from Escudos at rate of 1,000 escudos = 1 conto - \$34.96.

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II. Republic of the Congo*

A. Transportation System

The inland transportation system of the Congo is a closely integrated system of railroad and river routes in which highway transport provides a feeder service to and from river ports and rail terminals. Almost all of the freight traffic originating in the interior of the country must move over a combination of railroad and water routes to reach a Congo seaport. The only alternatives to a combination of railroad and water routes are direct railroad services through Northern and Southern Rhodesia to seaports in Mozambique and South Africa, or through Angola to the Atlantic Ocean port of Lobito. The main transportation artery is the rail-river-rail route from the northern Rhodesian border through Elisabethville and Port Francqui to Leopoldville and Matadi, often referred to as the Route Nationale. However, the shortest route to the sea is the rail route from Elisabethville through Tenke and Dilolo to Lobito in Angola. Before 1962, about 75% of the Katanga mineral traffic reached the sea over this route and the remainder by way of the longer and less convenient Route Nationale. Since independence, almost all of the Katanga traffic has been diverted to the route through Angola because of the destruction of railroad bridges in north Katanga and in Kasai provinces, but a small amount has moved through Northern and Southern Rhodesia to Mozambique.

All public transportation services are under the jurisdiction of the Ministry of Transport and Communication of the Government of the Congo at Leopoldville.

* Formerly the Belgian Congo

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All public transportation services, except air service, are provided by four transportation companies, one of which is government-owned, and the other three are owned by private Belgian interests. The four transportation companies are as follows:

1. Office d'Exploitation des Transports au Congo (OTRACO).

OTRACO is a government-owned company with headquarters in Leopoldville. It operates the Matadi-Leopoldville Railroad (CFML), the Boma-Tschela Railroad, and about 8,000 miles of river routes on the Congo River and its tributaries.

2. Compagnie du Chemin de Fer du Bas Congo au Katanga (BCK)

BCK is a privately owned Belgian company with Congo headquarters in Elisabethville. It is entirely a railroad operation.

3. Compagnie du Chemin de Fer du Congo Supérieur aux Grands Lacs

Africains (CFL).

CFL is a privately owned Belgian company, but the Congo government owns 25 percent of the stock. Its Congo headquarters are in Albertville. The CFL is primarily a rail road operating company but it also operates river and lake services in conjunction with the railroad operations.

4. Societe des Chemins de Fer Vicinaux du Congo (VICICONGO).

VICICONGO is a Belgian Company with Congo headquarters in Aketi. It operates rail, river and road services. VICICONGO serves only a small area of the country and is almost completely isolated from the other transportation systems.

It is not considered in detail in this report.

The total staff employed by these four companies in 1959 was about 32,500, of which only 1,252 were Europeans and the remainder Congolese.

B. Railroads

There are five railroads in the Congo with a total route length of 3,186 miles. One of these is a short, 85-mile, 2' gauge route running from Boma on the lower Congo River to Tshela, an agricultural community near the border of Cabinda which is an Angolan enclave on the Atlantic Ocean. It is a part of the OTRACO system but does not connect with any other railroad and neither does it connect with the main inland water system of the Congo. In the absence of reliable data pertaining to the Boma-Tshela route, it is not considered further in this report. The other railroads consisting of 3,100 miles of various gauges* (see Table 1) comprise the main railroad system and in 1961 they carried about 5.7 million tons of freight and 1.6 million passengers. (see Table 2**)

1. CFML (OTRACO system)

The CFML is a part of the OTRACO system and its headquarters are at Thysville. It is a 3'6" gauge route 242 miles in length which connects Leopoldville with the lower Congo River and the port of Matadi. Although the CFML is the shortest of the 3'6" gauge routes in the Congo, it is one of the most important segments of the entire Congo transportation system because it provides the final link in the system's

* Page 190, below.

** Page 191, below.

only outlet to the sea which is entirely under the control of the Congo. It is, in effect, the neck of the funnel that is the Congo transportation system. In 1957 this railroad handled over 3 million tons of cargo for a daily average of about 8,000 tons.* In 1959, the first full year after independence, tonnage dropped to 974 thousand tons -- just over half of the pre-independence tonnage and only one-third of the 1957 figure. Moreover, all of the Katanga copper which represented about 14 percent of the revenues earned by the railroad in 1959, was diverted to other routes in 1960 and 1961 and where the railroad had been a money maker in earlier years, it was reportedly operating at a loss of between 400 and 600 thousand dollars per month in 1960. The principal reason for the drastic reduction in tonnage handled by the CFML was the destruction of some of the bridges, particularly the Lubilash bridge on the BCK railroad in Katanga Province.

Under normal conditions, a large portion of the freight traffic originating in the southern half of the Congo is delivered to Port Francqui for movement by river to Leopoldville and thence via the CFML to Matadi for export. Most of that traffic has been diverted to the rail route through Angola. With the restoration of the bridges mentioned above, that traffic which included about 660 thousand tons of mineral traffic in 1961, could be diverted to the Route Nationale. The CFML is fully capable of handling the traffic from Leopoldville to Matadi because the mineral traffic from Katanga combined with other traffic presently moving over the CFML would amount to only about 1.5 million tons yearly, well below the 3 million tons handled in 1957 and about equal to the tonnage handled in 1959.

* Page 191, below.

The CFML has 136 locomotives of which 28 are diesel. It is believed, however, that current train service over the route is almost entirely diesel operated, with steam locomotives being used as switch engines or held in reserve. The railroad owns 3900 freight cars of various types.

The control of the CFML by Congolese forces is absolutely essential if the Congo is to maintain its own outlet to the sea. Otherwise, all traffic would be forced to routes passing through Angola, Northern and Southern Rhodesia, Mozambique, South Africa, or Tanganyika.

2. BCK

The BCK, with headquarters in Elisabethville, operates 1,661 miles of 3'6" gauge route of which 328 miles in Katanga are electrified. The BCK runs from Sakania on the Rhodesian border, where it connects with the Rhodesian railways, in a northwesterly direction through Elisabethville, Tenke and Kamina to Port Francqui, where it connects with the river services of OTRACO and thence to Leopoldville. At Kamina, a branch line extends northeast to Kabongo where it connects with the CFL serving Albertville on Lake Tanganyika. At Tenke, the line branches west to Dilolo on the Angolan border where it connects with the Benguela Railroad serving Lobito on the Atlantic Ocean. The BCK is the only railroad route in the Congo which connects directly with the railroad systems of neighboring countries. Rolling stock is interchanged with the railroad systems of Angola and Rhodesia. The Dilolo (Angolan border) to Sakania (Rhodesian border) line is the Congo link in the trans-African network of railroads serving Angola, Congo, Rhodesia, Mozambique and South Africa.

The BCK provides the shortest route to the sea through Angola (Elisabethville-Lobito, 1,309 miles) (Elisabethville-Matadi via Route Nationale, 1,713 miles, about 1/3 longer). Moreover, the rail-river-rail route to Matadi is much slower and requires two transloading operations. The cost of transporting cargo by river is usually less than by rail; however, the cost of the transloading required in this instance would probably negate any savings realized on the water portion of the movement, so it is probable that the longer Route Nationale would, from an out-of-pocket cost standpoint, be more costly than the shorter route through Angola. Even before independence the government appears to have acknowledged the cost differential, because over 75 percent of the mineral traffic used the shorter route through Angola. Imports, however, were in large part funneled through Matadi and over the Route Nationale by the expedient of compelling the BCK to assess a 12.5 percent surcharge on freight rates on cargo routed inbound through Angola.

Statistics on the total tonnage handled via the Route Nationale in recent years are not available. However, some order of magnitude can be obtained by analysis of the traffic handled at Port Francqui, the point at which traffic on the OTRACO river system is interchanged with the BCK railroad. The following data indicates the tonnage handled at Port Francqui during the period 1959-1962:

| <u>Year</u> | <u>Short Tons Handled</u> |
|-------------|---------------------------|
| 1959 | 412,213 |
| 1960 | 288,945 |
| 1961 | 82,256 |
| 1962 | 132,276 |

The drastic reduction in tonnage handled in 1961 is explained by the fact that some

of the railroad bridges on the route serving Port Francqui were destroyed during that year. In October 1962, the Lubilash bridge was restored, which may account for the increase shown in 1962. However, the bridge was again damaged in January 1963, and no Katangan traffic is reaching Port Francqui at present.

Total traffic handled by the BCK in 1961 was 4.2 million tons, about 3 times as much tonnage as was handled by all other Congo railroads combined. (see Table 2*) The military traffic capacity of the segment of the BCK railroad which serves Port Francqui is estimated at 6 trains each way per day with an average of 330 tons per train. At that rate the railroads could deliver about 723 thousand tons per year to Port Francqui for movement by river to Leopoldville. This is well above the 660 thousand tons of mineral traffic which was carried on the BCK railroad and through Angola in 1961. The port capacity of Port Francqui is estimated at about 3,000 tons per day or in excess of 1 million tons per year. It is conceivable therefore, that the Route Nationale could accept and handle the traffic presently moving through Angola, in the event that the Angolan route should be denied and provided that bridge damages are repaired.

3. CFL

The CFL is a combined river-rail operating company serving the eastern part of the Congo. A 78 mile 3'3/8" gauge line connects with the river services of CTRACO at Stanleyville and provides a portage around the Stanley Falls section of the Lualaba River to Ponthierville. A river service is operated from Ponthierville to Kindu at which point it connects with the main CFL railroad route.

* Page 191, below.

The CFL railroad is a 3'6" gauge route 598 miles in length. It connects with the BCK railroad at Kabongo. At Kabalo, a section of the main route runs eastward to Albertville on Lake Tanganyika. A lake service operated by the CFL provides a connection with the railroads of Tanganyika at Kigoma and thence to the Indian Ocean port of Dar es Salaam.

The destruction of a major bridge at Kongolo, north of Kabalo, has brought through traffic on that section of the route to a virtual standstill, and it is expected that two years will be required to restore the bridge. Other sections of the CFL route, including the route from BCK system terminal at Kabongo, to Albertville, are expected to be fully operable by August 1963. The importance of the CFL route connecting with the BCK at Kabongo and running to Albertville lies in the fact that it offers an alternate to the Route Nationale, the route through Angola, or the route through Northern and Southern Rhodesia to Mozambique. Should the use of these routes be denied by either political or military action, the Kabongo-Albertville route offers the only railroute for the export of Katanga mineral traffic.

The throughput capacity of the route for military traffic is estimated at 3 trains and a total of 900 tons per day. At that rate, 328,500 tons of Katanga traffic could be transported to Albertville yearly. This is only slightly over half of the mineral traffic presently moving over the Angola route. The estimated military capacity of the port at Albertville is 1,500 tons per day. However, the largest amount of traffic handled at Albertville in recent years was in 1958 when about 250 thousand tons were recorded inbound and outbound (an average of

685 tons per day). The tonnage has declined steadily since 1958 and in 1962, only an estimated 50 thousand tons were handled.

4. VICICONGO

The VICICONGO is a combined rail-river-road operating company serving the northeastern areas of the Congo. Its only connection with the rest of the Congo is via the Itimbiri River which connects with the OTRACO system at Yambinga on the upper Congo. The railroad segment of the VICICONGO is a 1' 11-5/8" gauge route about 522 miles in length and is not considered in detail in this report.

C. Inland Waterways

The inland waterway system of the Congo is comprised of a vast network of rivers and lakes extending into all sections of the country. In many areas, river transport is the only means of transport available throughout the entire year. The Congo and the Kasai rivers and their tributaries, and Lake Tanganyika, form the backbone of the system. The routes which carry most of the all-water traffic are, in order of importance:

The Congo River from Leopoldville to Stanleyville.
The Kasai River from Leopoldville via the Congo to Port Francqui.
The Upper Congo (Lualaba) from Ponthierville to Bukama.
Lake Tanganyika.

Upstream from Stanleyville on the Lualaba, navigation is interrupted on two sections of the river by rapids, and railroad service provide a by-pass for those sections. A similar situation prevails below Leopoldville on the Congo River where the rapids are by-passed by the Matadi-Leopoldville railroad.

The principal companies monopolize the transportation services on the

waterways. They are ^{the}OTRACO and ^{CFL}* OTRACO operates services on the Congo from Leopoldville to Stanleyville and on the Kasai from the Congo River junction to Port Francqui. It also operates the Matadi-Boma-Banana services on the lower, maritime reaches of the Congo.** The CFL operates all service on the upper reaches of the Congo above Stanleyville, and the services on Lake Tanganyika.

The capacities of the various waterways varies because of the different types of river craft assigned to the various sections and the limitations imposed by the capability of river ports to load and unload the cargo carried. It is estimated that the Leopoldville-Stanleyville route can handle 3,500 tons of military cargo each way per day, and port capacities at each end of the route are believed to be adequate for that tonnage. The through military capacity of the Leopoldville-Port Francqui route, which is the Kasai River portion of the Route Nationale, is limited to 3,000 tons per day which is the maximum capacity of Port Francqui. The capacity of Port Francqui is, however, greater than the capacities of railroads and highways to clear the port. In any event, the throughput capacity of the route between Port francqui and Leopoldville is well above the 660,000 tons of Katangan mineral traffic presently moving from Katanga Province over the rail route through Angola.

The capacity of the Lake Tanganyika services to transport cargo between Albertville and Kigoma, the lake port in Tanganyika, is estimated at 1,500 tons per day which is well above the papability of the Congo railroad services (CFL) to deliver

* See Section A, page 175 above.

** See Table 4, page 19 below.

cargo to the lake port at Albertville.

D. Highway

The highway network of the Congo consists of about 100 thousand miles of all types of roads of which about 95 percent have only a natural dirt surface. Less than 1,500 miles have a waterproof, all-weather surface, and about 3,900 miles have a rolled gravel surface. Numerous bridges of low capacity restrict through movements and during the rainy season from October through April, most of the road net becomes virtually impassable for extended periods of time. As late as March 1963 qualified American observers reported that the condition of the net and truck fleet in the former province of Kasai could only be regarded as disastrous, and that extreme difficulties were experienced even in distributing food supplies. Similar conditions have been reported as existing throughout all of the Congo. Some of the smaller mines and isolated agricultural enterprises which are dependent upon highway transport to market their production, have almost ceased production since independence due to a shortage of trucks and the deterioration of the road net. About half of the VICI-CONGO fleet of 525 trucks are inoperable for lack of repairs due to inadequate maintenance and a shortage of spare parts.

Detailed statistical data on commercial freight traffic over the highways in recent years are not available for analysis. However, in 1958, commercial highway transport accounted for only 375 thousand tons of freight. No doubt this was increased substantially up to 1960 because a major effort was made to improve the highways and to build bridges. Since 1960 little has been done, and it is doubtful that commercial highway transport offers anything more than limited farm-to-market service for

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agricultural products or a short haul feeder service to and from railroad and river terminals.

The truck inventory in 1963 is estimated at about 31 thousand vehicles of all sizes and types as compared with about 36 thousand registered in the state of Rhode Island, USA. Many of these are reportedly inoperable for lack of adequate maintenance and a shortage of spare parts. Although additional vehicles could be imported, it is doubtful that the road net could be brought up to the standards necessary to sustain heavy commercial freight over long distances without a major, time-consuming construction program.

It is concluded, therefore, that with few exceptions, highway transport does not offer a potential substitute for railroad or river transport of commercial cargo within the Congo or for international transport of commodities in import or export traffic. One exception is the 680 mile highway leading from Elisabethville to Albertville on Lake Tanganyika. This route could conceivably be made to supplement the railroad services between these points and offers a limited capability for export-import traffic over Lake Tanganyika and to Dar es Salaam.* The capacity of the highway is estimated at about 160 trucks each way per day or about 800 tons per day at 5 tons per truck. The limiting factor on this route at present is a ferry over the Luvua River near Kiambi which requires 20 minutes for the round trip, carrying only one truck, thus limiting the route to 72 trucks each way per day. An increase in the capacity of the ferry at this point could bring the daily capacity of the route up to its limit of 160 trucks and 800 tons in each direction.

* In this connection, consider also the highway from Elisabethville to Dar es Salaam via Rhodesia which is discussed in the Tanganyika section of this appendix, page .

A second exception is the 241 mile route between Leopoldville and Matadi.

This all-weather route was recently improved and is believed to be capable of sustaining about 600 trucks each way per day or from 1,500 to 3,000 tons depending upon the nature of the cargo carried.

In spite of the limitations imposed by the highway network for the movement of commercial cargo, it is probable that highway transport is capable of contributing significantly to the support of military operations in the Congo. Modern military vehicles with 4-wheel drive and high horsepower in relationship to load capacity permit operations over highways which could not sustain large scale commercial operations with conventional commercial vehicles.

E. Ports

The lower reaches of the Congo River provide the only access to the sea for the Congo. Matadi, the principal port, is the upstream terminal for all navigation on the lower or maritime reaches of the Congo, and is the only port which provides rail and road clearance to or from the interior of the country. About 90 percent of the port traffic of the Congo excluding petroleum products, is handled at Matadi. About two miles downstream from Matadi is the port of Ango Ango, which is used primarily as a receiving port for petroleum products. Other ports are Boma, Banana, Bindu, Malita and Moanda, all in the Congo River estuary but none of these offer direct railroad or road connections with the principal inland areas of the Congo and are therefore not considered in this report.

Matadi is located about 87 miles upstream from the mouth of the Congo River and about 227 miles (by railroad) downstream from Leopoldville. The capacity

of the port for the discharge of military cargo is estimated at about 7,900 tons per day utilizing ships' gear only for cargo handling. The real capacity of the port is probably well above that figure however. There is a usable wharfage of about 6,000 feet, with berths available for 10 vessels of 460 feet each in length. The minimum depth of the approach channel is 28 feet, but vessels must be capable of a speed of at least 10 knots because of strong current in the river leading to the port. Numerous cranes are available, the maximum capacity of which is 50 tons. About 4,000 laborers are available regularly for cargo handling at the port.

Ango Ango, the petroleum port, has about 1,000 feet of usable wharfage. It has a storage capacity for about 860 thousand barrels of petroleum products.

During 1959, the Matadi port handled 1.5 million tons, and an average of about 5,250 tons per day consisting of 1,640 tons (31.1%) outbound and 3,610 tons (68.9%) inbound. See Table 3*. The total has dropped consistently since independence and in 1962, the estimated annual total based on a three month average was only 921,180 tons. Moreover, the direction of flow has changed to 53.3% outbound and 46.7% inbound. The capacity of the port is believed to be well above the tonnage handled in recent years (1959-1962)

An interesting, and what could prove to be a significant aspect of navigation in the Lower Congo, is the location of the Angolan and Congo borders in relation to the navigable channel of the Congo River. In 1891, the Belgian and Portuguese governments agreed to use the then-existing navigable channel of the river as the boundary between the Provinces of Angola and the Belgian Congo. It

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* Page 193, below.

was further agreed that the boundary would remain fixed regardless of changes in or to, or the relocation of the navigable channel. The agreement was never ratified by either government. At present, at least three sections of the navigable channel lie within Angolan territory and these sections require constant dredging to maintain a satisfactory depth for ocean shipping. At present this dredging is accomplished by Congo Hydrographic Services which maintains the entire channel from Matadi to the sea. There is little or no possibility of relocating a channel entirely within Congo waters. The Portuguese are, therefore, in a position to restrict or disrupt dredging operations in those waters controlled by them, and in so doing could effectively disrupt sea traffic to and from the Congo ports of Matadi and Ango Ango. Such action would, however, abrogate an international treaty since the Portuguese are signatories to the Congo Basin Treaty of 1895 which prohibits restrictions on commerce in the Congo Basin.

F. Civil Air Transport

Civil air transport in the Congo is conducted by three air carriers. These three carriers are: Air Congo, Sobelair and Air Brousse. Air Congo was established in June 1961 as the national airline of the Congo with headquarters at Leopoldville. Sabena, the Belgian airline, provides technical assistance, personnel, and equipment. Aircraft are on lease-purchase from Sabena. The Congo government has subscribed 65 percent of the capital, Sabena 30 percent, and Sobelair and Air Brousse jointly 5 percent. Statistical data on operations are not available. The

aircraft operated by Air Congo consist of 2 DC-6s, 5 DC-4s and 8 DC-3s.

Sobelair operates a charter service in the Congo with 3 Cessna 310 aircraft.

Operational data are not available. Air Brousse operates charter and local scheduled service in the Congo. The head office of the company is in Leopoldville. During 1961, the company carried 13,455 passengers. Aircraft consist of 6 Beechcraft D-18s, 4 Rapide, 2 Aztec, 2 Apache and 1 Piper Pacer.

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Table 1

Railroads of the Congo

Miscellaneous Data 1962 ^{a/}

| | <u>CPML (Otraco)</u> | <u>BCK</u> | <u>CPL</u> | <u>VICICONGO</u> | <u>Totals</u> |
|---|----------------------|-------------------|------------|--------------------|---------------|
| Total track miles | NA | NA | NA | NA | 3,101 |
| Total route miles | 242 | 1,661 | 676 | 522 | 3,052 |
| Single track | 193 | 1,661 | 676 | 522 | 49 |
| Double track | 49 | None | None | None | |
| Multiple track | None | None | None | None | |
| Type of traction: | | | | | |
| Steam | None | 1,333 | 676 | 522 ^{b/} | |
| Electric | None | 328 | None | None ^{b/} | |
| Diesel | 242 | None | None | 522 ^{b/} | |
| Gauge: | | | | | |
| 3' 6" (standard) | 242 | 1,661 | 598 | None | 2,501 |
| Other | None | None | 78 | 522 | 600 |
| Maximum grade (percent) | 3.2 | 2.3 | 2.0 | 4.0 | |
| Signaling: | | | | | |
| Manual bloc | 199 | 1,661 | 676 | 522 | 3,058 |
| CNC | 43 | None | None | None | 43 |
| Weight of rail (pounds per yard) | 36 - 67 | 88 | 48 - 60 | 33 - 67 | |
| Maximum axle load (short tons) | 8 - 18 | 16 - 20 | 11 - 16 | 8 | |
| Maximum distance between passing tracks | 10 - 15 | 17 | 19 - 33 | 32 - 40 | |
| Locomotives: | | | | | |
| Steam | 62 | 115 | 36 | 8 | 221 |
| Electric | None | 33 | None | None | 33 |
| Diesel | 28 | 2 | 10 | 11 | 51 |
| Other ^{c/} | 46 | 66 | 33 | 14 | 159 |
| Total | 136 | 216 | 79 | 33 | 464 |
| Freight Cars: | | | | | |
| Box | 1,454 | 1,471 | 344 | 151 | 3,420 |
| Open | 1,607 | 2,280 | 163 | 17 | 4,067 |
| Tank | 191 | 26 | 2 | 7 | 226 |
| Other | 417 | 318 | 91 | 76 | 902 |
| Total | 3,669 | 4,095 | 600 | 251 | 8,615 |
| Passenger Cars | 107 ^{d/} | 115 ^{d/} | 42 | 27 ^{d/} | 351 |

^{a/} Excluding the Boma-Tshela Railroad, 85 miles long and 2' gauge.
^{b/} Diesel and steam.
^{c/} Switching locomotives.
^{d/} Includes: CPML - 3 railcars; BCK - 3 railcars; and VICICONGO - 1 railcar

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Table 2

Railroads of the Congo
Selected Statistical Data, 1957 - 1961 a/

| | <u>1957</u> | <u>1958</u> | <u>1959</u> | <u>1960</u> | <u>1961</u> |
|--|-------------|-------------|-------------|-------------|-------------|
| <u>TOTAL ALL RAILROADS</u> | | | | | |
| Passengers Carried (number) | 1,905,943 | NA | 1,985,057 | 1,866,838 | 1,597,490 |
| Passenger Miles | 258,460,578 | NA | 264,071,623 | 251,049,857 | 162,262,524 |
| Tons Carried (short tons) | 10,735,127 | NA | 9,044,293 | 7,383,934 | 5,678,463 |
| Ton Miles (000 short ton miles) | 1,985,496 | NA | 1,581,317 | 1,318,126 | 858,737 |
| <u>OTRACO (Matadi - Leopoldville Railroad)</u> | | | | | |
| Passengers Carried (number) | 615,139 | 606,868 | 522,626 | 574,962 | 842,843 |
| Passenger Miles | 46,025,910 | 47,684,150 | 39,719,576 | 43,697,112 | 64,056,068 |
| Tons Carried (short tons) | 3,000,997 | 2,561,851 | 2,345,425 | 1,675,963 | 974,676 |
| Ton Miles (000 short ton miles) | 432,916 | 410,435 | 230,373 | 170,948 | 114,548 |
| Revenues: (\$US) ^{b/} | | | | | |
| Passenger | 750,200. | 737,040. | NA | NA | NA |
| Freight | 13,872,180. | 12,171,140. | NA | NA | NA |
| Other | 369,620. | 796,980. | NA | NA | NA |
| Total Revenues | 14,992,020. | 13,705,160. | NA | NA | NA |
| Operating Expenses (\$US) | 9,079,040. | 9,148,720. | NA | NA | NA |
| Operating Ratio (percent) | 60.05 | 66.80 | NA | NA | NA |
| Personnel | NA | NA | NA | NA | NA |
| <u>BCK Railroad</u> | | | | | |
| Passengers Carried (number) | 1,071,651 | NA | 1,147,560 | 994,000 | 493,000 |
| Passenger Miles | 179,248,113 | NA | 190,865,374 | 166,682,889 | 66,380,275 |
| Tonnage Carried (short tons) | 6,621,167 | NA | 5,631,312 | 4,845,710 | 4,261,492 |
| Ton Miles (000 short ton miles) | 1,242,332 | NA | 1,088,917 | 950,781 | 687,090 |
| Revenues (\$US) ^{b/} | | | | | |
| Passenger | 1,594,640. | NA | 1,905,640. | 1,750,140. | NA |
| Freight | 39,988,920. | NA | 36,959,020. | 35,692,940. | NA |
| Other | 2,046,000. | NA | 1,693,220. | 1,654,320. | NA |
| Total Revenues | 43,629,560. | NA | 40,552,480. | 39,097,400. | NA |
| Operating Expenses (\$US) | 36,651,680. | NA | 33,630,020. | 33,196,880. | NA |
| Operating Ratio (percent) | 84.1 | NA | 82.93 | 84.91 | NA |
| Personnel | 16,528 | NA | 14,438 | 13,574 | NA |

SECRET/NO FOREIGN DISSEM

Table 2 (continued)
Railroads of the Congo
Selected Statistical Data, 1957 - 1961

| | 1957 | 1958 | 1959 | 1960 | 1961 |
|------------------------------|-------------|------|------------|------------|------------|
| <u>CFL Railroad</u> | | | | | |
| Passengers Carried (number) | 138,305 | NA | 221,214 | 204,647 | 154,347 |
| Passenger Miles | 21,492,804 | NA | 20,502,597 | 27,450,158 | 14,672,842 |
| Tons (short tons) | 774,319 | NA | 678,854 | 526,593 | 256,557 |
| Short ton miles (000) | 256,408 | NA | 206,200 | 147,478 | 31,700 |
| Revenues (\$US) ^b | | | | | |
| Passenger | 373,900. | NA | 460,160. | NA | NA |
| Freight | 8,888,020. | NA | 7,561,360. | NA | NA |
| Other | 74,800. | NA | 486,120. | NA | NA |
| Total | 10,016,720. | NA | 8,507,640. | NA | NA |
| Operating Expenses (\$US) | 9,545,920. | NA | 8,398,640. | NA | NA |
| Operating Ratio (percent) | 95.3 | NA | 98.72 | NA | NA |
| Personnel | 12,252 | NA | 9,110 | NA | NA |

VICTORINGO

| | | | | | |
|--------------------------------|------------|----|------------|------------|------------|
| Passengers Carried (number) | 80,848 | NA | 93,657 | 93,229 | 107,300 |
| Passenger Miles | 11,693,751 | NA | 12,984,076 | 13,219,688 | 17,153,339 |
| Tons Carried (short tons) | 338,644 | NA | 388,702 | 335,668 | 185,738 |
| TonMiles (000 short ton miles) | 53,840 | NA | 55,828 | 48,918 | 25,399 |
| Total Revenues (\$US) | NA | NA | NA | NA | NA |
| Total Expenses (\$US) | NA | NA | NA | NA | NA |
| Operating Ratio (percent) | NA | NA | NA | NA | NA |
| Personnel | NA | NA | NA | NA | NA |

a/ Excluding the Boma-Tshela Railroad, 85 miles long and 2' gauge.

b/ Revenues and Expenses converted to \$US at rate of 1,000 Escudos = 1 Conto - \$34.96

SECRET/NO FOREIGN DISSEM

Table 3

Port of MATADI
Traffic and Revenue 1959-62

| | <u>1959</u> ^{a/} | <u>1960</u> ^{a/} | <u>1961</u> ^{a/} | <u>1962</u> ^{b/} |
|--|---------------------------|---------------------------|---------------------------|---------------------------|
| Tonnage Handled Inbound (short tons) | 926,796 | 748,812 | 516,048 | 429,516 |
| Tonnage Handled Outbound (short tons) | 598,615 | 342,792 | 334,428 | 491,664 |
| Total | 1,525,411 | 1,091,604 | 850,476 | 921,180 |

^{a/} Estimate based on monthly average for the year.

^{b/} Estimate based on first quarter monthly average.

SECRET/NO FOREIGN DISSEM

Table 4

OTWAGO (Railroad - River - Highway Transport Service)

Selected Statistical Data, 1957 - 1961

| | <u>1957</u> | <u>1958</u> | <u>1959</u> | <u>1960</u> | <u>1961</u> |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|
| Traffic: | | | | | |
| Passengers Carried (number) | 768,997 | NA | 718,561 | 704,501 | 1,000,296 |
| Passenger Miles | 91,314,147 | NA | 93,961,908 | 95,618,042 | 122,511,341 |
| Tons Carried (short tons) | 5,301,858 | NA | 4,687,505 | 3,392,025 | 2,086,572 |
| Ton Miles (000 short ton miles) | 1,730,559 | NA | 1,676,831 | 1,189,272 | 767,098 |
| Personnel | 29,341 | NA | NA | NA | NA |

~~SECRET/NO FOREIGN DISSEM~~

III. THE FEDERATION OF RHODESIA AND NYASALAND

A. Transportation System

Railroads are the principal means of transport for both freight and passengers in the Federation. There is increasing competition from both the airline and the buses for passenger traffic, but little competition from trucks for long-distance freight hauls. Some supplemental truck and bus services are operated by the railroads. Transportation services are provided between all the present main centers of economic activity in the Federation, between those centers and adjoining territories, and through those territories with the major seaports of southern Africa on both the Indian and Atlantic Oceans.

B. Railroads

Railroads in Northern and Southern Rhodesia are operated by the Rhodesia Railways Co. Ltd., which is government owned. The railroads in Nyasaland, however, are privately owned and operated by the Nyasaland Railway Co. Ltd., and the Central African Railway Co., a wholly-owned subsidiary of the Nyasaland Railway. In view of the imminent split in the Federation, proposals have been made to continue the integrated operation of the railroads and other transportation services on a supranational basis. Table 1 below^{*} summarizes the traffic volume on the Rhodesia and Nyasaland Railroads, 1958 - 1962.

1. Rhodesia

The Rhodesia Railways Company owns about 2,650 miles of route, all 3'6" gauge, and rolling stock is interchangeable with connecting railroads in the Union of South Africa, Mozambique, Republic of the Congo, and Angola via the Republic of the Congo.

* Page 219 below.

All lines are single track except for a 21-mile stretch from Bulawayo to Heany, a 5-mile section from Salisbury westward to Lochinvar, and an 8-mile section from Livingstone northward to Natebe. The rail system of the Rhodesias is based on a mainline running northeast from Vryburg in the Union of South Africa, to a fork at Bulawayo. A branch continues through the important coal center at Wankie and the city of Livingstone by a zigzag route to Ndola in the copperbelt on the Belgian Congo border. Another branch from Bulawayo passes through the industrial and agricultural areas of Gwelo and Salisbury before connecting with the Beira Railroad near Umtali on the Mozambique border. A relatively new branch from Somabula, near Gwelo, to Malvernia connects with the railroad in Mozambique serving the port of Lourenco Marques.

Nearly half of the Rhodesia Railways' 2,650 route miles is being equipped with centralized traffic control (CTC)*, at a cost of \$11.2 million, instead of further double tracking. Much of the mainline track has also been relaid with heavier rail in recent years, allowing more powerful locomotives to be used. There has also been some track realignment and easing of curves. Selected track statistics are included in Table 2 below.

Motive power policy was thoroughly reviewed in 1956 and a case was made for electrification from Nkana to Kafue (270 miles) and from Salisbury to Bulawayo (303 miles). The recommendation was never implemented, however, and a program of gradual acquisition of new diesel locomotives is now underway. In 1961, however, 80 percent of total engine miles were still run by steam locomotives. The locomotive

*CTC is a modern means of train control which increases the train handling capacity on a single track line by at least 50 percent on most railroad systems.

~~SECRET/NO FOREIGN DISSEM~~

and rolling stock inventory at the end of June 1961 is shown in Table 2 below. It is believed to be in good condition and adequate for existing needs. Selected operating statistics are presented in Table 3 below.

Traffic and financial statistics for 1958-61 are presented in Table 4 below.*

Increased revenue from freight traffic has been offsetting decreases in passenger revenue as competitive bus services have continued to divert fourth class passengers especially along the routes operating directly from principal cities to the reserves on weekends and holidays. Copper, other minerals, and general goods traffic made substantial gains. Copper alone accounted for 27 percent of the total revenues for rail transport in 1961. Principal commodities carried are shown in Table 5 below.**

Over-all traffic remained rather static even though the volume of transit traffic increased during the last 3 years. About 25 percent of total tons carried was traffic to and from Mozambique in 1961, over 15 percent via Beira and nearly 10 percent via Lourenco Marques. See Table 6 below*** Traffic to and from South Africa in 1961 amounted to 7 percent of total tons carried. Copper tonnage exported through the ports of Beira and Lourenco Marques in ^{fiscal} 1961 from Northern Rhodesia (572,100 tons) and Katanga (153,700 tons), was 725,800 tons or about 6 percent of total tons carried by the Rhodesia Railways. Only 21,708 tons of copper from Northern Rhodesia moved through Lobito, Angola via the Congo.

Estimates of 1961 traffic and estimated military capacity for principal sectors of the railroad system are shown in the following tabulation:

* Page 213 below.
** Page 214 below.
*** Page 215 below.

~~SECRET/NO FOREIGN DISSEM~~

| <u>Rail Line</u> ^{a/} | <u>Tons Carried, 1961</u> (thousands) | <u>Military Capacity</u> (thousand tons per year) |
|--------------------------------|--|--|
| Ndola - Livingstone | 4,850 | 4,015 |
| Livingstone - Bulawayo | 4,860 | 8,432 |
| Bulawayo - Gwelo | 5,000 | 5,782 |
| Gwelo - Salisbury | 3,645 | 5,782 |
| Salisbury - Umtali | 3,200 | 3,431 |
| Bulawayo - Mahalapye | 2,455 | 3,212 |
| Somabula - Malvernia | 2,000 | 2,409 |
| Rhodesia Railways (total) | 12,242 | NA |

2. Nyasaland

Railroads in Nyasaland are owned and operated by two associated companies, the Nyasaland Railway Ltd., and the Central African Railway Co. Ltd.. There is a connection with the Mozambique railroad serving the port of Beira. Rail service is provided to the southern parts of Nyasaland and there is a connection at a port on the south shore of Lake Nyasa with the Nyasaland Railways' lake steamer service for cargo and passengers.

The Nyasaland Railway system (see Figure 5 below) consists of a 316-mile, single track, 3'6" gauge line running from Salima in the Central Province near the west shore of Lake Nyasa, to the Mozambique border south of Port Herald. The Central African Railway Company, a subsidiary operated by the Nyasaland Railway, owns 16 miles of line from the cotton growing district of Port Herald to the Mozambique border; this line continues 26 miles to Sena in Mozambique. Connection is made at Sena with the Trans-Zambesia Railway which continues south to Dondo and has running rights over the Beira Railway from Dondo to the port of Beira. The distance from Salima to Beira is 515 miles and Beira is 374 miles from Salisbury. This line is the

^{a/} See Map, Figure 5.

only connection between Nyasaland and an ocean port and is the only one joining Nyasaland to the rest of the Federation and to southern Africa generally. Capacity of this route without substantial improvement is estimated at about 1 million tons per year, and 1962 traffic was over 90 percent of estimated capacity.

There is no rail service in the northern half of Nyasaland, but the Nyasaland Railway Company operates a passenger and cargo service on Lake Nyasa which connects with the railroad at the port of Chipoka, 17 miles south of the railroad terminal at Salima. The railway serves only eight of Nyasaland's 17 administrative districts directly.

The light track structure on the Nyasaland railway supports axle loads from 10 tons on the northern 142 miles to 16.5 tons on the southern section. Rails weigh 40 to 75 pounds per yard. Steel ties are used throughout and placed 2,040 to the mile under the 60-pound rail and 1,940 per mile under the 40-pound rail. Ballast is stone, sand or earth. The ruling grade varies between 1.4 percent and 2.3 percent. There are about 120 bridges, the longest being the 575 foot long structure over the Shire River at Chilomo.

The Nyasaland railway traverses a variety of terrain. It enters the protectorate 16 miles south of Port Herald, which is 120 feet above sea level, and proceeds along the lower Shire plain until it begins to climb near Sankulani. The ascent of the Shire Highlands through the Cholo-Mlanje important tea producing area and Blantyre (one of the main industrial and commercial centers) districts is steep and tortuous -- a climb of more than 3,500 feet in less than 70 miles being achieved between Sankulani and Limbe. The line then passes through the Shire Highlands to

Mpimbe, where it crosses the Shire River at an altitude of 1,554 feet. From there to Sharpevale, the route is moderately easy. From Sharpevale to its Salima terminus the line proceeds along the comparatively narrow western lake littoral, escarpments hindering the road approaches to the line from the west. In the lower Shire River area the railway is vulnerable to local, seasonal floods which occur from time to time; the track has been damaged occasionally by washaways and traffic delays have resulted.

Since the railway companies of Nyasaland operate as an integrated system, locomotives and rolling stock are interchangeable. The number of rolling stock, including the locomotives, is adequate for existing needs with some reserve capacity available, although a large percentage of the locomotives are rather old and will have to be replaced in the near future. Five new 1,200 h.p. diesel-electric locomotives, the first in Nyasaland, are soon to be acquired from the UK. Inventory of rolling stock and locomotives is presented in Table 2 below.

Both freight and passenger traffic have been increasing rapidly on the Nyasaland Railways (see Table 8 below). Further improvements and expansion are hampered by a shortage of capital. The single track system is completely steam operated with manual block signaling, although diesel operation is soon to have a meager beginning.

C. Highways

1. General

The importance of road transport in the movement of both passengers and goods has grown considerably in the Federation with the development of the economy, the improvement of the road network, and the constant technical advancement of

the road vehicle. Road development in the Federation has enabled economic expansion to take place in areas where previously the lack of rail facilities was a limiting factor. The development of the road system in the Federation has been significant considering the distance involved and the relatively small number of people in a position to contribute to the cost. In 1960 there were 11,100 miles of main roads in the Federation, of which 4,400 miles are classified as inter-territorial. The inter-territorial network of tarred and of single-lane or wider amounts to 1,600 miles. In addition, a considerable mileage of the inter-territorial roads in Southern Rhodesia is provided with two tarred running strips, each two feet wide with a distance of 2' 9" between strips, while a proportion of the 6,700 miles of main road which are the responsibility of the Territorial Governments is tarred or provided with tarred strips.

Traffic volume varied from 3,000 vehicles per day on the important national system near the larger cities, to less than 10 vehicles per day in the more remote areas in 1958. Most of the traffic consists of agricultural products and finished goods being hauled to points of distribution, and mineral and agricultural products being exported. The Rhodesian Railways Company operates a trucking service in areas without rail service. The following data for 1961 indicate the magnitude of the service involved:

| | |
|-------------------------|---------|
| Length of Route (miles) | 5,702 * |
| Inventory | 301 |
| Diesel trucks (units) | 142 |
| Trailers | 159 |
| Traffic | |
| Tons Carried (thousand) | 490 |

* Includes 548 miles of rail substitution service.

| | |
|--------------------------------------|-----|
| Passengers Carried (thousand) | 370 |
| Net Revenue (thousand US dollars) | 65 |
| Revenue/Vehicle mile (US cents) | 63 |
| Expenditure/Vehicle mile (US cents) | 61 |
| Net Revenue/ Vehicle mile (US cents) | 2 |

2. Southern Rhodesia

In comparison with the railroads, highway transport plays a minor role in the economy of Southern Rhodesia. Highways, developed for light vehicles and low traffic volume, were originally constructed to provide feeder service from agricultural and mining areas not serviced by railroads. Use of heavy vehicles and traffic volumes in recent years have caused rapid deterioration of surfaces and higher maintenance costs.

The inadequate highway system of Southern Rhodesia radiates from the cities of Salisbury and Bulawayo. Available routes permit access to industrial centers and to all neighboring countries. Through routes are scarce and some roads extend only to the mining and agricultural areas.

Southern Rhodesia has approximately 28,600 miles of maintained highways which are classified as follows: National (5,300 miles), District and Municipal (11,500 miles), and Native (11,800 miles). About 1,230 miles on the National system have bituminous surfaces 9 to 21 feet wide, with only 500 miles 21 feet wide. Another 1,200 miles have bituminous surface strips. Most of the District or Municipal highways have gravel or earth surfaces, but there are a few bituminous sections. Surface widths on these roads are usually 12 feet or less. Native roads are earth. Highway density of improved roads is about 8.47 miles of highway per 100 square miles of area.

In January 1961, a total of 138,168 motor vehicles (90,989 passenger cars, 47,179 trucks and buses) were registered in Southern Rhodesia.

Most bridges on the highway network in Southern Rhodesia are low-level, narrow, low-capacity structures. Reinforced concrete girder bridges predominate on the National system. In recent years, bridges have been built to higher standards and have roadway widths of 20 feet and capacities of about 35 tons. Work in recent years has included the widening of roads and the constructing of heavier bases and surfaces. Many of the low-level bridges are to be replaced. Restrictions to highway transport movement include sharp curves and steep grades, particularly in the east and north; narrow, low-level bridges which become flooded during the rainy season, especially on the strip roads; and dust during the dry season.

3. Northern Rhodesia

Highway transport routes in Northern Rhodesia serve as important feeders to the railroads and provide transport facilities in areas not served by rail. Highway improvements have been directed toward providing bituminous surfaces on the most important main roads and the construction of new bridges. The highway network of Northern Rhodesia is sparse, nevertheless, especially in the western and northeastern parts of the country. There are not sufficient east-west connecting routes in the eastern section, and no north-south routes in the western section. Northern Rhodesia has highway connections with the Congo, Tanganyika*, Nyasaland and Southern Rhodesia, but none with Angola or South-West Africa. The principal highway network centered around Lusaka, has routes extending north, northeast, southeast and southwest. Subsidiary networks of important roads are located in the

* See section on Tanganyika, p. 267 for information on the highway between Dar Es Salaam and Elizabethville via Rhodesia.

copperbelt mining area near the Congo Republic and in the Northern Province.

Highway density of improved roads is 1.04 miles per 100 square miles of area.

Northern Rhodesia has about 21,517 miles of maintained highways. About 753 miles of highway have bituminous surfaces; 2,236 miles have gravel or improved earth surfaces; 18,528 miles have low-type earth surfaces. Bituminous surface widths are from 10 to 24 feet; gravel surface widths vary from 10 to 41 feet; and earth roads are one or two lanes. Surface conditions are poor to fair.

There are only a few bridges over 200 feet in length on the highway system and most structures are only one lane. The predominant type is timber with individual spans less than 20 feet long. There are steel girder spans less than 40 feet in length. Steel bridges are generally in good condition. Many bridges are low-level types which become impassable during the rainy season from November to April.

Highway transport restrictions include sharp curves, steep grades, and narrow bridges. There are ferries on a few roads, but not on the principal routes. During the rainy season, unimproved earth roads become soft and often impassable, and gravel-surfaced roads sustain serious damage and loss of capacity. Highway traffic is concentrated on the principal routes. Livingstone, Lusaka, Fort Jameson, Broken Hill and the Copperbelt area are the most important centers of transport and traffic movement. Traffic volume was generally less than 150 vehicles per day but reached 2,600 per day at some important centers in 1958. Highway transport operations are conducted primarily by private firms and are regulated so that the services supplement the railroad.

In January 1961, a total of 43,934 motor vehicles (38,172 passenger cars, 5,762 trucks and buses) was registered in Northern Rhodesia. All motor vehicles are imported, mostly from the United States, United Kingdom, and Canada. The official policy on highway development in Northern Rhodesia is to develop and improve the main inter-territorial routes to at least two lanes with bituminous surfaces, and to develop other inter-territorial routes to the same design standards but having gravel surfaces. Rural roads are being developed to standards determined by local traffic requirements.

4. Nyasaland

The highways of Nyasaland are integrated with the railroads and inland waterways to provide a thinly spread transportation network in most of the areas. Trucks are used for most short hauls to and from railheads and distribution centers in the southern agricultural region; in the central and northern sections, highway facilities are combined with water transport. The Nyasaland Railway Company operates supplemental truck services. Bus transport on regular schedules serves all areas of the country. In January 1961, a total of 11,696 motor vehicles (6,355 passenger cars, 5,341 trucks and buses) was registered in Nyasaland.

The highway network is sparse and only one through route (north-south) traverses the country. Other important roads link this north-south route with the railroad and Lake Nyasa to the east, and northern Rhodesia and Mozambique to the west. The 5,150 miles of maintained highway in Nyasaland are classified as Public Works Department main roads (1,072 miles), Public Works Department secondary roads (1,616 miles), and Provincial and District Administration roads (2,462 miles)*.

* Date is for the year 1958.

About 145 miles of the main roads have bituminous surfaces, and a limited mileage has gravel or sand-clay surfaces; all other roads have earth surfaces. Surfaces are from 10 to 24 feet wide. Density of improved roads is 1.41 miles to 100 square miles of area. Improvements in recent years include increasing the mileage of bituminous surfacing, new equipment, and the use of more effective maintenance practices.

The highway bridge capacities range from 8 to 35 tons. Steel girder and reinforced concrete girder are the principal types of structure. Restrictions to highway traffic movement include numerous narrow, low bridges; sharp curves and steep grades; impassable roads (only about 3 percent have bituminous surfaces) during the rainy season (November to April); dust during the dry season (May to October) which hinders operations and reduces the traffic capacity of roads; and ferry crossings over the Shire River.

D. Inland Waterways

There are a few isolated lakes and rivers that are navigable in the Federation. Navigable waterways of merely local importance consist of the Zambezi River, Lake Bangweulu, Lake Mweru and the Luapula River, a part of Lake Tanganyika, and Lake Nyasa. The full capabilities of the waterways have not been fully utilized, although efforts have been made to exploit the waterways and to promote navigation. Falls, frequent stretches of rapids, and shoals hinder development of through water routes in the Federation. Transportation systems on the larger lakes are somewhat developed with a few modern steamers and barges, whereas craft used on the Zambezi River are mostly native vessels.

The Zambezi, which rises near the juncture of the borders of Angola, the Congo, and Northern Rhodesia, flows through the Rhodesias for 900 miles, on through Mozambique and empties into the Mozambique channel. It has a total length of about 1,700 miles and navigation is possible on several widely separated sections. On the Zambezi above Victoria Falls, a regular barge service operates serving Barotseland

Lake Bangweulu located in the northeastern part of Northern Rhodesia, is 50 miles long and has channels which connect with the Luapula River in the south and the Chambeshi in the east.

Lake Mweru, 80 miles long and fed by the Luapula River, forms a part of the boundary between Northern Rhodesia and the Congo. Navigation is possible from Pweto in the Congo, to Kasenga by crossing the lake and traveling up the Luapula River.

The extreme southern tip of Lake Tanganyika (about 124 miles of the total shoreline of 1,087 miles) is within the territorial limits of Northern Rhodesia. Transport services are provided by two organizations, the East African Railways and Harbors Administration (EAR&H) and the Compagnie des Chemins de Fer du Congo Superieur aux Grands Lacs Africains (CFL) which also operates the Lake Mweru services.

A nominal amount of high value and low bulk traffic can be transported from Lake Nyasa through the Shire River, including a 60-mile portage bypassing cataracts, and via the Zambezi to the sea. On the lake itself, however, the transport service operated by the Nyasaland Railroad is based at Monkey Bay and connects with the railroad at Chipoka. A modern, 620-ton, mixed passenger and cargo vessel, two smaller cargo vessels, and a number of tugs and barges constitute the operating fleet.

E. Civil Airlines

Central African Airways Corporation (CAAC) was formed in 1946 by the governments of Northern and Southern Rhodesia and Nyasaland. CAAC succeeded the wartime Southern Rhodesia Air Services and the pre-war Rhodesia and Nyasaland Airways, Ltd., which commenced operations in 1933. CAAC operates both domestic and regional services, the latter calling at Elisabethville, Mbeya, Durban, Nairobi, Dar es Salaam, Johannesburg, Lourenco Marques and Beira. There is also the "Rhodesian Comet" service to London operated for CAAC by the British Overseas Airways Corporation. The domestic network provides an extensive coverage of the Federation, serving 16 points in Northern Rhodesia, 4 in Southern Rhodesia and 10 in Nyasaland.

The CAAC aircraft inventory as of April 1963 consists of 20 transports, of which one DC-6B is leased from Alitalia. The inventory includes 4 Viscount 748s, 1 Viscount 754, 6 DC-3s, and 6 Beaver aircraft. Two BAC-111 aircraft have recently been ordered. The Viscounts were the predominant aircraft on the regional routes while the DC-3s still carried the greatest share of traffic on domestic scheduled routes in 1961. The utilization of the DC-3 on all routes in terms of ton-miles flown increased by 31 percent, whereas the Viscount utilization rate decreased by 14 percent.

In 1961* a decrease of 9 percent in passenger miles hauled was recorded by CAAC, as compared with 1960. The number of passengers carried increased, however, indicating a decrease in the average length of trip. The total cargo and passenger load factor decreased from 66 percent to 61, although the service provided remained essentially the same. Nevertheless, for the second consecutive year, CAAC had

* Year ending 30 June 1961

earned a profit. Net profits increased by 7 percent in 1961 over 1960. Cargo revenues provided the largest portion of the increase, and revenue derived from cargo charter flights represented the largest relative increase during the year.

It is anticipated that the role of air transportation will continue to be very important in the territories which now constitute the Federation. The movement of high value - low bulk goods to remote areas such as the Kariba Dam site at relatively fast speeds, is only one example of the value of this form of transportation to the area. Interdependence between territories now in the Federation in air transportation will be desirable, since no one territory alone generates sufficient volume of traffic to justify the quality of service now provided unless it is willing to sustain substantial financial losses for such services. Moreover, operating costs of air transport are relatively higher in this part of southern Africa compared to other more developed nations. Speed and comfort in local service are sacrificed for durability of aircraft and characteristics which permit short landings and take-offs. Short hauls with aircraft that meet these requirements increase the cost per ton-mile substantially. Therefore, both rates and passenger and freight load factors must be somewhat higher than in other areas in order for CAAC to have profitable operations.

SECRET/NO FOREIGN DISSEM

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Table 1

Federation of Rhodesia and Nyasaland, Railroad Traffic, 1958 - 1962

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|--------------------------------------|---------|---------|---------|---------|---------|
| Tons Carried (thousand) | | | | | |
| Rhodesia Railways | 12,024 | 11,160 | 12,180 | 12,242 | 11,838 |
| Nyasaland Railways | 740 | 739 | 870 | 973 | 936 |
| Total | 12,764 | 11,899 | 13,050 | 13,215 | 12,774 |
| Tom Miles (million) | | | | | |
| Rhodesia Railways | 4,435 | 3,918 | 4,607 | 4,934 | 4,510 |
| Nyasaland Railways | 69.8 | 69.6 | 79.7 | 91.2 | 91.6 |
| Total | 4,504.8 | 3,987.6 | 4,686.7 | 5,025.2 | 4,601.6 |
| Passengers Carried (thousand) | | | | | |
| Rhodesia Railway | 4,531 | 4,644 | 4,241 | 4,177 | 4,094 |
| Nyasaland Railways | 494 | 493 | 507 | 549 | 613 |
| Total | 5,025 | 5,137 | 4,748 | 4,726 | 4,707 |

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SECRET//NO FORN DISSEM

SECRET AND FOREIGN DISSEM

Table 2

Federation of Rhodesia and Nyasaland, Railroad Route and Rolling Stock, 1961^{a/}

| | <u>Nyasaland Railways</u> | <u>Rhodesia Railways</u> | <u>Total</u> |
|-------------------------------------|---------------------------|--------------------------|--------------|
| Total Route (miles) ^{b/} | 316 | 2,652 ^{c/} | 2,968 |
| Single track | 316 | 2,618 | 2,934 |
| Double track | 0 | 34 ^{d/} | 34 |
| Centralized Traffic Control | 0 | 966 | 966 |
| Manual Block signaling | 316 | 1,886 | 2,002 |
| Maximum grade on mainline (percent) | 1.4 to 2.3 | 2.5 | 1.4 to 2.5 |
| Weight of rail (pounds per yard) | 40 to 75 | 60, 80 or 91 | 40 to 91 |
| Maximum axle load (short tons) | 10 to 16.5 | 15 to 18 | 10 to 18 |
| Locomotives (units) | | | |
| Steam | 32 | 424 | 456 |
| Diesel | 32 | 385 ^{e/} | 417 |
| Freight cars (units) | 0 | 39 ^{f/} | 39 |
| Box | 383 | 12,247 | 12,630 |
| Open | | 1,824 | 1,824 |
| Tank | | 9,570 | 9,570 |
| Other | | 357 | 382 |
| Coaches | 25 | 496 | 515 |
| Dining and buffet cars | 19 | 657 | 699 |
| Coaches, guard and baggage cars | 42 | 511 | 511 |
| Diesel rail cars | 2 | 22 | 22 |
| | | 124 | 124 |
| | | 0 | 2 |

^{a/} June 1961 for Rhodesia and December 1961 for Nyasaland except as otherwise noted.

^{b/} All railroads in the Federation are 3'6" gauge.

^{c/} Includes 400 miles of single track, all-manual block signaling control with diesel electric locomotives in service, in the Bechuanaland Protectorate. Of the total route miles, 1,986 miles are in Southern Rhodesia and 666 miles in Northern Rhodesia.

^{d/} Information as of 1 January 1963. Of the total, 690 miles are in Southern Rhodesia and 276 miles in Northern Rhodesia.

^{e/} Diesel locomotives are so far based exclusively in Southern Rhodesia.

^{f/} About 11.6 percent of the total are 2-axle types; including 20.4 percent of the box cars, 10 percent of the open tops, 8.1 percent of tank cars, and 14.1 percent of other freight cars.

SECRET/NO FOREIGN DISSEM

Table 3

Federation of Rhodesia and Nyasaland, Selected Railroad Operating Statistics, 1959 - 1962

| | Rhodesia Railways a/ | | | Nyasaland Railways | | | |
|--|----------------------|-----------|-----------|--------------------|-------|-------|-------|
| | 1959 | 1960 | 1961 | 1962 b/ | 1960 | 1961 | 1962 |
| Train miles (thousand) | 10,887 b/ | 13,789 b/ | 14,679 b/ | 13,161 | 685 | 743 | 773 |
| Train engine hours (thousand) | 669 b/ | 817 b/ | 833 b/ | 729 | 61 | 74 | 76 |
| Train miles per train engine hour | 16 b/ | 17 b/ | 18 b/ | 18 | 11 | 10 | 10 |
| Gross ton-miles (million) | 8,951 | 9,896 | 9,875 | 10,602 | 230 | 256 | 252 |
| Gross-ton miles per train engine hour | 13,379 | 13,827 | 14,560 | 14,543 | 3,771 | 3,460 | 3,316 |
| Percentage of net to gross ton-miles | 43.8 | 43.8 | 45.3 | 42.5 | 34.6 | 33.7 | 35.8 |
| Average gross tons per train | 822 | 831 | 848 | MA | MA | MA | MA |
| Average net tons per train | 360 | 364 | 383 | MA | MA | MA | MA |
| Average tons per loaded freight car | 28 | 28 | 29 | 28 | 19 | 20 | 19 |
| Ratio of empty to loaded freight car miles | 50.22 | 50.91 | 45.21 | MA | MA | MA | MA |
| Average freight haul (miles) | 372 | 370 | 376 | 381 | MA | MA | MA |

a/ Statistics for the area north and east of Bulawayo unless otherwise indicated.

b/ Statistics cover all sectors.

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Table 4

Rhodesia Railways, Performance and Personnel, 1958 - 1962 ^{a/}

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|--|------------------------|----------------------|---------|----------------------|---------|
| Traffic: ^{b/} | | | | | |
| Tons carried (thousand) | 12,024 ^{c/} | 11,160 ^{c/} | 12,180 | 12,242 | 11,838 |
| Tom Miles (million) | 4,435 | 3,918 | 4,607 | 4,934 | 4,510 |
| Passengers Carried (million) | 4,531 | 4,644 | 4,241 | 4,177 | 4,094 |
| Gross Revenue: (thousand \$US) | | | | | |
| All Railroad Services | 102,455. ^{d/} | 74,489. | 87,800. | 89,957. | 86,579 |
| Freight Service | 92,352. ^{d/} | 66,199. | 78,938. | 81,426. | NA |
| Passenger Service | 7,233. ^{d/} | 5,854. | 6,087. | 5,965. | NA |
| Other | 2,870. | 2,436. | 2,775. | 2,566. | NA |
| Operating Expenses: (thousand \$US) ^{e/} | 83,748. ^{d/} | 68,407. | 70,249. | 72,223. | 82,481. |
| Operating Ratio (Operating Expenses/Gross Revenue) | 81.7 | 91.8 | 80 | 80.3 | 95.2 |
| Personnel (number of employees) | | | | | |
| African and Asian | 30,876 | 30,921 | 31,659 | 31,909 ^{f/} | NA |
| European | 20,981 | 21,146 | 21,772 | 22,168 | NA |
| Wages and Salaries (thousand \$US) | 9,895 | 9,775 | 9,887 | 9,741 | NA |
| | 38,913. | 39,291. | 41,951. | 45,049. | NA |

^{a/} Statistics are for fiscal year ending 30 June. Excludes the operations of the Ramatlabama-Mahalapye section of the Rhodesia Railways administered by the South African Railways.

^{b/} The totals in freight traffic include livestock at an estimated weight per head of 900 pounds using average length of haul for all freight.

^{c/} North of Bulawayo only. There was no data available for the volume of ton-miles on the Mahalapye-Bulawayo section of route for 1958-1959.

^{d/} On 1 December 1959, the Rhodesia Railway took over operations of this section from the South African Railways and Harbors Admin.

^{e/} 15 months ending 30 June 1958.

^{f/} Includes provisions for renewals.

^{g/} Estimated.

Table 5

Rhodesia Railways: Tons Carried by Commodity a/
(thousand tons)

| | 1958 | 1959 | 1960 | 1961 | 1962 |
|---------------------------------|--------|--------|--------|--------|----------|
| General Goods | 5,226 | 4,783 | 4,919 | 5,235 | 5,556 b/ |
| Including: Corn | NA | 484 | 516 | 551 | 590 b/ |
| Petroleum | 416 | 426 | 427 | 468 | 515 b/ |
| Tobacco | NA | 118 | 142 | 187 | 235 |
| Coal and Coke | 3,742 | 3,429 | 3,734 | 3,270 | 2,833 |
| Other Minerals c/ | 1,375 | 1,296 | 1,544 | 1,663 | 1,532 |
| Copper - 3/4 refined | 640 | 698 | 906 | 1,025 | 975 |
| 1/4 blister | 701 | 567 | 608 | 633 | 510 |
| Chrome Ore - concentrates | 141 | 202 | 258 | 185 | 200 |
| Livestock | 126 | 112 | 139 | 159 | 160 |
| Asbestos - bag fibbers | 73 | 73 | 72 | 72 | 72 |
| Lead, Zinc and Vanadium - metal | 12,024 | 11,160 | 12,180 | 12,242 | 11,878 |
| Total | | | | | |

a. Statistics are for fiscal year ending 30 June.

b. Estimated.

c. Nearly half of this category is copper concentrates, and about 30 percent is limestone. The remainder is composed of lithium, manganese concentrates and pyrites.

Table 6

Export-Import Traffic on Rhodesia Railways, 1960 and 1961 ^{a/}

| | Thousand Tons Carried | | % of Total Tons Carried | |
|---------------------------------------|-----------------------|-----------------------|-------------------------|------|
| | 1960 | 1961 | 1960 | 1961 |
| <u>To Beira</u> | 983.0 | 1,035.9 | 8.3 | 8.5 |
| Tobacco | | 101.8 | | |
| Copper (N. Rhodesia) ^{b/} | | 268.8 | | |
| Copper (Katanga) | | 153.7 | | |
| Copper (S. Rhodesia) | | 5.2 | | |
| <u>To Lourenco Marques</u> | 686.4 | 786.8 | 5.8 | 6.4 |
| Copper (N. Rhodesia) | | 303.3 | | |
| <u>Total to Mozambique</u> | 1,669.4 | 1,822.7 ^{c/} | 14.0 | 14.9 |
| <u>From Beira</u> | 825.4 | 818.1 | 6.9 | 6.7 |
| <u>From Lourenco Marques</u> | 365.1 | 423.0 | 3.1 | 3.5 |
| <u>Total from Mozambique</u> | 1,190.5 | 1,241.0 | 10.0 | 10.1 |
| <u>Total to and from Mozambique</u> | 2,859.9 | 3,063.7 | 24.0 | 25.0 |
| <u>To South Africa</u> | 291.0 | 312.8 | 2.4 | 2.6 |
| Chrome Ore | | 54.3 | | |
| Copper (N. Rhodesia) | | 16.8 | | |
| Copper (Katanga) | | 10.4 | | |
| <u>From South Africa</u> | 573.9 | 550.7 | 4.8 | 4.5 |
| <u>Total to and from South Africa</u> | 864.9 | 863.5 | 7.3 | 7.1 |

^{a/} Statistics are for the fiscal year ending 30 June and differ somewhat from South African Railway statistics for the fiscal year ending 31 March.

^{b/} Northern Rhodesian copper mines also exported 21,708 tons via Lobito, Angola in 1961. Total tonnage of copper hauled in 1961 was 1,024,786 tons, of which 244,898 tons were local hauls.

^{c/} Includes most of the 74,312 tons of iron which moved through Beira, Lourenco Marques and Sakania Border (Congo) in 1961. Specific distribution is not available.

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Table 7

Nyasaland Railways: Performance 1958 - 1962

| | 1958 | 1959 | 1960 ^{a/} | 1961 ^{a/} | 1962 ^{a/} |
|------------------------------------|--------|--------|--------------------|--------------------|--------------------|
| Traffic: | | | | | |
| Tons carried (thousand) | 740 | 739 | 870 | 973 | 936 |
| Ton Miles (million) | 69.8 | 69.6 | 79.7 | 91.2 | 91.6 |
| Passengers carried (thousand) | 494 | 493 | 507 | 549 | 613 |
| Gross Revenue (thousand \$US): | | | | | |
| All Rail Services | 6,103. | 6,007. | | | |
| Freight Service | 5,096. | 5,049. | | | |
| Passenger Service | 797. | 754. | | | |
| Other | 210. | 204. | | | |
| Operating Expenses (thousand \$US) | 4,988. | 5,059. | | | |
| Operating Ratio | 81.7 | 84.2 | | | |

^{a/} Financial statistics for 1960 - 62 are not available.

IV. MOZAMBIQUE

A. Transportation System

The inland transportation system of Mozambique is almost completely dominated by the railroads because of the inadequacy of the highway net and the relatively minor use made of the extensive inland waterway system. Coastal shipping plays an important role because there are no direct north-south railroad services between the ports on the Indian Ocean. The railroads and the two major ports of Lourenco Marques and Beira are important to all of southern Africa because they provide access to the sea for the landlocked Federation of Rhodesia and Nyasaland and also facilitate the movement of goods to and from the north-eastern part of the Republic of South Africa and the Protectorate of Swaziland.

The economy of Mozambique is dependent to a large degree on the revenue obtained from the transit traffic through the ports of Lourenco Marques and Beira, virtually all of which is moved to and from the ports by rail. Transit traffic accounts for almost 90 percent of the total railroad traffic. According to an unofficial estimate, as much as 30 percent of the revenues of the Province of Mozambique are derived from railroad and port operations.

The Administration of Harbors, Railways and Transport Services of Mozambique controls and coordinates railroad, port and air transportation facilities, and through representation on the Highway Control Board, exercises considerable control over highway transport. Railroad transport is subject to strict supervision of rates and fares, construction, safety and railroad labor legislation. Legislation protects the railroads from extensive competition. All applications to establish

highway transport services must be approved by the Highway Control Board and the Board normally rejects applications for service that would compete directly with the railroads.

The only governmental agreement directly affecting inland transportation in Mozambique is a treaty between Portugal and South Africa, first signed in 1909 and renegotiated in 1928. Under this treaty, 47.5 percent of the seaborne goods imported to the Johannesburg, Pretoria and Vereeniging areas of South Africa are routed through Lourenco Marques. In return, the mines in the Transvaal recruit a large percentage of their African labor from Mozambique. Also, agreements exist between the railroads of Mozambique and the railroad of Rhodesia and South Africa for an interchange of rolling stock in international traffic.

B. Railroads

All railroads in Mozambique are government-owned except the Beira Railroad and the Trans-Zambesia Railroad. The former is owned by the Portuguese Government in Lisbon, Portugal. It is operated, however, by the Administration of Harbors, Railways and Transport Services of Mozambique. The Trans-Zambesia Railroad is owned by private British interests but is regulated by the Mozambique government. There are eight railroad systems in Mozambique with a total of 1,711 route miles, all of which are single track and, with one exception, all are 3' 6" gauge. See Table 1.* During 1960, the last year for which reliable data are available, the eight railroads carried about 11.2 million tons of freight and 2.6 million passengers. See Table 2.** Only three of the eight systems are international in character. All

* Page 229 below.

** Page 230 below.

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International routes employ the 3' 6" gauge. The eight systems and the areas served by them are described below.

1. Lourenco Marques Railroad

Headquarters of the railroad are at Lourenco Marques. The railroad serves the port of Lourenco Marques and is composed of three trunk routes and one minor route as follows:

a. Lourenco Marques - Goba

This route extends from the port of Lourenco Marques through Goba to the Swaziland border where it terminates, a distance of about 45 miles. At present it is of minor importance and handled only 312 thousand tons in 1960. However, a railroad is under construction in Swaziland which, when completed in 1964, will connect with this route. It will originate about 3,500 tons of iron ore per day for export through Lourenco Marques.

b. Lourenco Marques - Ressano Garcia

The route extends from the port of Lourenco Marques to Ressano-Garcia on the South African border where it connects with the railroad system of South Africa. Total route distance is 55 miles. During 1960, this route carried over 4 million tons of freight of which almost 3.8 million tons, about 90 percent, was transit traffic between South Africa and the port of Lourenco Marques. In terms of ton miles, transit traffic represented almost 94 percent and presumably about the same percentage of the revenue earned. The route ^{uses} centralized traffic control (CTC) signaling. The estimated capacity for military traffic is 19 trains each way per day with 550 tons each.

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c. Lourenco Marques - Malvernia.

This route is commonly referred to as the Limpopo route. It extends north from Lourenco Marques through Vila Luiza and thence northwest to Malvernia on the border of Southern Rhodesia, a distance of 332 miles. At that point it connects with the Rhodesian railroad system and thence through Rhodesia to South Africa or to the Republic of the Congo. It is one of the two Indian Ocean links in the trans-Africa network serving Angola, the Republic of the Congo, Mozambique, Rhodesia and South Africa. During 1960 the route handled 1.4 million tons. About 82 percent of the tonnage handled by this route was international traffic interchanged with the Rhodesian railroads, the major portion of which is transit traffic. The estimated military capacity of the route is 6 trains each way per day with 550 tons each.

d. Moamba - Xinavane.

This is a minor route connecting routes b and c mentioned above.

2. The Beira Railroad

The headquarters of the Beira Railroad are at Beira. The route extends from the port of Beira to Machipanda on the border of Southern Rhodesia, a distance of 196 miles, where it connects with the railroad system of Rhodesia. It is the second of the two Indian Ocean links in the trans-Africa network serving Angola, the Republic of the Congo, Mozambique, the Rhodesias and South Africa. During 1960, the Beira Railroad carried 3.2 million tons, of which 2.3 million tons (71 percent) was interchanged with the Rhodesian railroads. It is believed that a major portion of the traffic interchanged with the Rhodesian system was transit traffic to and from the

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port of Beira. The estimated military capacity of the route is 10 trains each way per day with 320 tons each.

3. The Trans-Zambesia Railroad.

The Trans-Zambesia Railroad is a British-owned company with headquarters at Inhaminga. The route extends from Dondo, a junction on the Beira Railroad, to Border, on the Nyasaland border where it connects with the Nyasaland railroads. The route distance is 205 miles. From Dondo to Beira, the Trans-Zambesia runs over the lines of the Beira Railroad. This route provides the only rail access to the sea or to other countries in Africa for Nyasaland. During 1960 the route carried slightly more than 1 million tons of freight. It is estimated that the military capacity is 5 trains each way per day with 340 tons per train.

4. The Mocambique Railroad.

The route extends from the minor port of Nacala, via Monapo, to Nova Freixo, a distance of 334 miles. Trackage has been laid on an additional 68 miles extending the route to Congerenga, but it is believed that operations have not yet commenced on the newly constructed section. The route does not connect with any other system. A 26-mile spur runs from the minor port of Lumbo and joins the main route at Monapo. Traffic over the route in 1960 was 184 thousand tons. The estimated military capacity of the route is 4 trains each way per day with 375 tons each.

5. The Tete Railroad.

This route connects with the Trans-Zambesia Railroad at Donana and runs to Benga on the Zambezi River, a distance of 146 miles. At Benga, a ferry service crosses the Zambezi River to Tete. During 1960 the route carried about 329 thousand tons of freight. Its estimated military capacity is 5 trains each way per day with 340 tons each.

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6. Gaza Railroad - 88 miles.*
7. Inhambane Railroad - 61 miles.*
8. Quelimane Railroad - 90 miles.*

The railroads appear to be adequately maintained and quite efficiently operated. This condition is particularly true of the three international railroads. These railroads consistently operate at a profit and have excellent operating ratios and even though some of the small government-owned railroads have operating deficits, the system as a whole earns a healthy net profit. Freight traffic density on the railroad system as a whole is not high and in 1960 was only 810 thousand net ton miles per mile of route. This average traffic/^{density} is about half the density found on the railroads of the Federation of Rhodesia and Nyasaland although the systems in both territories are single track and are predominantly steam operated. The traffic density of the international railroad lines in Mozambique which interchange traffic with neighboring territories is 1.631 million ton miles per mile of route, still slightly less than the over-all density of the railroads of the Federation of Rhodesia and Nyasaland and considerably less than the density of traffic on the Rhodesian railways. This comparison suggests that the railroads of Mozambique are relatively under-utilized and that considerable additional freight could be carried if the demand existed even though the supply of motive power and rolling stock is not as favorable as in the Federation.

* These three railroads are short, unconnected, and isolated routes serving minor ports on the Indian Ocean and are not considered in detail in this report. Traffic data are shown in Table 2, page 23⁴ below.

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C. Highways

Highway transport is the only form of transport available to many parts of Mozambique, but the highway system is seriously inadequate. There are no adequate north-south routes in the country and motor transport service in this direction must often take routes through neighboring countries of South Africa and Southern Rhodesia. During the long, rainy season, wooden bridges are often washed away by flood waters and the roads with earth surfaces which predominate become impassable. A program is underway to improve the highway network but a lack of funds has delayed its implementation. Recent political unrest, however, with its internal security problems, has emphasized the need for a more adequate road system, and the government has accelerated the highway construction program and incorporated it in the Second Development Plan for the period 1959 - 1964.

The highway network consists of about 22,840 miles of roads. Only 720 miles have a waterproof surface, mostly bitumen; 620 miles are of rolled stone surface; while the remaining 21,500 miles are natural earth surface roads. Highways are classified according to their relative importance and not according to the type of construction. First class or national routes link the capitals of the nine administrative districts with each other and with the seaports and neighboring countries. Second class roads link the outlying towns and cities in each district with the district capitals. Other classified roads are designated as regional or third class roads. Unclassified roads are generally nothing more than tracks which are practically impassable for motor vehicles.

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Rainfall in Mozambique varies from 39 inches per year in the north to 60 inches in Beira and 30 inches in Lourenco Marques. During the long rainy season, October to March, transport by road is virtually impossible. Traffic is disrupted for long periods at a time through heavy rains washing away road surfaces, destroying wooden bridges and closing ferries. During the dry season, unsurfaced roads corrugate badly and are subject to wind erosion while sand surfaces in coastal regions are unstable.

Almost all commercial highway transport services are owned and operated by the State Roadways, a Department of the Mozambique Administration of Harbors, Railways and Transport Services. This government-owned service does not compete directly with the railroads and is, in fact, prohibited from doing so. The service operates primarily as feeder service to the railroads or between producing and consuming areas which are remote from the railroads. During 1961, the most recent year for which statistics are available, State Roadways carried about 308 thousand tons of freight. In 1960, the State Roadways owned about 280 trucks and buses, 9 tractors, and 60 trailers. The average carrying capacity of the trucks was about 3 tons each and trailers 5 tons each. There are an estimated 18 to 19 thousand trucks of all sizes registered in Mozambique but most of these are believed to be small units not suitable for long distance transport of heavy cargo.

It is improbable that Mozambique could provide a significant amount of international highway transport service as a substitute or an alternate for railroad service. There are some highways, however, which could be used during fair weather and over which a significant amount of freight could be transported. These highways and their estimated capacity for military traffic are as follows:

1. Lourenco Marques to the Swaziland border, 51 miles, 315 vehicles each way per day with 3 tons each.
2. Lourenco Marques to Ressano Garcia on the South African border, 53 miles, 1,115 vehicles each way per day with 3 tons each.
3. Beira to Machipanda on the South Rhodesia border, 173 miles, 2,555 vehicles each way per day with 3 tons each. This route becomes virtually impassable during the rainy season for extended periods of time.
4. Quelimane (minor seaport) to the Nyasaland border via Milange, 215 miles, 150 vehicles each way per day with 3 tons each. This route is virtually impassable during the rainy season. It passes through Nyasaland and re-enters Mozambique at Zobue.
5. Zobue on the Nyasaland border to Cochemane on the South Rhodesia border via Tete, 174 miles, 230 vehicles each way per day. Closed during rainy season for weeks at a time.

D. Inland Waterways.

Although some of the inland waterways are navigable for shallow draft river craft, none of them are developed and only insignificant amounts of freight and passenger traffic is carried on them. The most recent estimate of traffic indicates that about 100 thousand tons of freight are carried annually on the waterway system, of which 70 percent is carried on the Zambezi River. None of the waterways provides connections with adjacent countries and there are no regularly scheduled services on any of the waterways. The only river ports of any significance are those at or near the river mouths and which are also seaports. Elsewhere, cargo handling facilities for river traffic are primitive.

E. Ports.

There are two principal ports and five minor ports in Mozambique. In 1960 and 1961, the two principal ports of Lourenco Marques and Beira handled 95.3 percent of all freight traffic handled by all ports in Mozambique. See Table 3.* For the purposes of this report, Lourenco Marques and Beira are the only ports studied in detail.

1. Lourenco Marques.

Lourenco Marques, in the extreme southern part of Mozambique, is the largest and the busiest port in the country. It is the eastern terminus of the Lourenco Marques railroad system which serves the northern portion of South Africa and Southern Rhodesia and, in 1960, handled 6.3 million tons of freight or 63.2 percent of the country's seaborne commerce. More than 67 percent of the tonnage handled in 1960 was transit traffic (51% for South Africa and 16.3% for Rhodesia). Mineral and coal traffic from South Africa represented nearly 2 million tons or 60 percent of the total outbound tonnage through the port in 1960, and mineral traffic from Rhodesia was 687 ^{thousand} / tons or 27.8 percent.

Lourenco Marques is one of the best equipped ports in southern Africa. The main wharf is 7,300 feet long with accomodation for 12 vessels. There are 54 cranes on the wharf, including 16 of 3 tons, 34 of 5 tons, 3 of 10 tons, and one of 80 tons capacity. Ample storage is available including space for 50,000 tons of coal and 160,000 tons of mineral ore. The estimated capacity of the port for military traffic is 9,450 tons per day.

* Page ²³⁶ below.

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2. Beira.

Beira, the second port in Mozambique, in 1960 handled 3.2 million tons of freight or 32.1 percent of the seaborne traffic. About 56 percent of the total tonnage handled through the port is transit traffic from and to North and South Rhodesia. Total transit traffic for the Rhodesias in 1960 amounted to about 983 thousand tons outbound from the Rhodesias and 835 thousand tons inbound to the Rhodesias.

The port of Beira has five main deep water berths with 2,670 feet of wharfage. The wharf has 26 electric cranes of from 3 to 6 tons capacity. An additional berth separated from the main wharf, handles chrome ore by conveyor belt at the rate of 350 tons per hour. Two new wharves were completed late in 1962 and are awaiting the installation of cranes and other equipment before they will be placed in regular use. In addition to the main wharves and berthing facilities, there are 1,464 feet of lighterage wharf equipped with a number of steam and diesel cranes. Open storage is available for 16,000 tons of chrome ore and 21,000 tons of copper ore, and ore dumps at the main ore loading wharf have storage space for 250,000 tons of chrome ore. The estimated capacity of the port for military traffic is 5,600 tons per day.

There is no evidence of port congestion at Lourenco Marques, and port capacity appears to be adequate for present needs. Moreover the port is being expanded to accommodate an increase in traffic of at least 1 million tons by 1964. There has been some congestion at the port of Beira in the past. However, the two new wharves completed late in 1962 have probably relieved that congestion, and it is probable that the current capacity of the port is adequate for the traffic anticipated during the next few years.

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F. Civil Air Transport.

Civil air transportation in Mozambique is operated by the Civil Air Transport Division (DETA) under the Director of Civil Aeronautical Service. DETA is engaged in both domestic and international operations linking Mozambique with South Africa and Southern Rhodesia on international routes, and the most important towns in Mozambique on domestic routes. There is no scheduled air freight service in Mozambique. The aircraft of DETA consist of 6 DC-3s, 1 Dove, 3 Friendship 200s and 1 Beaver. During 1961, DETA carried 36,500 passengers.

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Table 1.

Railroads of Mozambique

Miscellaneous Data, 1962

| | Lourenco Marques | Gaza | Inhambane | Beira | Trans-Zambesia | Tete | Quelemene | Mocambique | Totals |
|---|------------------|------|-----------|---------|------------------|------|-----------|------------|--------|
| Total Track Miles | 625 | 92 | 67 | 264 | 221 | 161 | 99 | 428 | 1,957 |
| Route Miles ^{a/} | 497 | 88 | 61 | 196 | 205 | 146 | 90 | 428 | 1,711 |
| Gauge: | | | | | | | | | |
| 3' 6" (standard) | 497 | 0 | 61 | 196 | 205 | 146 | 90 | 428 | 1,623 |
| Other | None | 88 | None | None | None | None | None | None | 88 |
| Maximum Grade (percent) | 2 | 2 | 2 | 2.61 | 1.25 | 1.8 | 1.2 | 1.6 | |
| Signaling: | | | | | | | | | |
| Manual Bloc | None | 88 | 61 | 196 | 205 | 146 | 90 | 428 | 1,214 |
| Automatic Bloc | 432 | None | None | None | None | None | None | None | 432 |
| CTC | 65 | None | None | None | None | None | None | None | 65 |
| Weight of Rail (pounds per yard) | 60 - 90 | 30 | 60 | 60 - 80 | 60 - 75 | 60 | NA | 60 | |
| Maximum Axle Load (short tons) | 16 | 7 | 8.4 | 15 - 22 | 15 | 20 | 14 | 15 | |
| Maximum Distance between passing tracks (miles) | 19 ^{b/} | 30 | 23 | 11 | 30 | 20 | 31 | 25 | 220 |
| Locomotives (units) | 70 ^{b/} | 7 | 5 | 51 | 35 ^{c/} | 25 | 6 | 21 | |
| Freight Cars: | | | | | | | | | |
| Box | 350 | 29 | 19 | 136 | | 182 | 62 | 158 | |
| Open | 1,904 | 38 | 38 | 936 | 410 | 698 | 98 | 137 | |
| Tank | 143 | 2 | 2 | 84 | | 7 | 3 | 9 | |
| Other | NA | NA | NA | 105 | 18 | None | None | None | |
| Total freight cars | 2,397 | 69 | 59 | 1,261 | 428 | 887 | 163 | 304 | 5,568 |
| Passenger cars | 81 | 7 | 7 | 39 | 21 | 13 | 10 | 16 | 194 |
| Passenger motor cars | 12 | None | None | None | None | None | None | None | None |

a/ All railroads in Mozambique are single track and steam operated.

b/ Includes 5 diesel mainline and 3 diesel switchers.

c/ Includes 8 diesel mainline and 2 diesel switchers.

Table 2
Railroads of Mozambique
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|--|-------------|-------------|-------------|------------|
| TOTAL ALL RAILROADS | | | | |
| Passengers Carried (number) | 2,254,844 | 2,293,911 | 2,584,831 | NA |
| Passenger Miles | 120,587,508 | 119,906,359 | 127,158,051 | NA |
| Tons Carried (short tons) | 10,396,493 | 10,076,962 | 11,195,999 | NA |
| Ton Miles (000 short ton miles) | 1,315,922 | 1,273,148 | 1,386,382 | NA |
| Total Revenues (\$US) ^a | 35,113,503 | 33,729,285 | 38,446,147 | NA |
| Expenses (\$US) | 15,405,463 | 17,556,154 | 17,881,724 | NA |
| Operating Ratio (percent) | 43.87 | 52.05 | 46.51 | NA |
| A. Lourenco Marques System (4 routes) | | | | |
| Passengers Carried (number) | 1,423,951 | 1,450,072 | 1,663,946 | 1,708,722 |
| Passenger Miles | 35,614,480 | 37,624,664 | 46,535,348 | 47,844,216 |
| Tons Carried (short tons) | 5,843,303 | 5,597,612 | 6,199,934 | 6,424,672 |
| Ton Miles (000 short ton miles) | 619,308 | 588,128 | 661,153 | NA |
| Revenues (\$US) ^a | 535,158 | 619,701 | 632,077 | 685,915 |
| Expenses (\$US) | 14,845,048 | 14,235,502 | 15,984,306 | 16,140,543 |
| Operating Ratio (percent) | 5,631,389 | 14,855,203 | 16,616,383 | 16,826,458 |
| Personnel | 36.61 | 6,488,191 | 6,444,421 | NA |
| | NA | 43.68 | 38.78 | NA |
| | | NA | 7.813 | NA |

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Table 2 (continued)

Railroads of Mozambique
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|-----------------------------------|------------|------------|------------|------|
| A. Lourenco Marques System | | | | |
| 1. <u>Ressano - Garcia line</u> | | | | |
| Passengers Carried (number) | 672,802 | 510,899 | 716,744 | NA |
| Passenger Miles | 16,425,504 | 13,261,645 | 20,331,283 | NA |
| Tons Carried (short tons) | 4,236,156 | 3,742,817 | 4,160,273 | NA |
| Ton Miles (000 short ton miles) | 228,571 | 195,010 | 220,164 | NA |
| Revenues (\$US) ^{a/} | 224,064. | 203,664. | 257,690. | NA |
| Passenger | 6,404,964. | 5,928,757. | 6,660,450. | NA |
| Freight | 6,629,028. | 6,132,421. | 6,918,140. | NA |
| Total Revenues | 2,161,144. | 2,348,072. | 2,539,679. | NA |
| Expenses (\$US) | 32.6 | 38.3 | 36.7 | NA |
| Operating Ratio (percent) | NA | NA | NA | NA |
| Personnel | | | | |
| 2. <u>Goba line</u> | | | | |
| Passengers Carried (number) | 61,546 | 117,026 | 111,050 | NA |
| Passenger Miles | 1,283,396 | 1,780,915 | 1,687,436 | NA |
| Tons Carried (short tons) | 172,228 | 236,646 | 311,714 | NA |
| Ton Miles (000 short ton miles) | 4,049 | 5,706 | 6,040 | NA |
| Revenues (\$US) ^{a/} | 17,328. | 26,007. | 26,369. | NA |
| Passenger | 101,607. | 156,967. | 149,413. | NA |
| Freight | 118,935. | 182,974. | 175,782. | NA |
| Total Revenues | 94,073. | 142,485. | 116,171. | NA |
| Operating Expenses (\$US) | 79.1 | 77.9 | 66.1 | NA |
| Operating Ratio (percent) | | | | |

Table 2 (continued)

Railroads of Mozambique
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|---|------------|------------|------------|------|
| A. Lourenco Marques System (con't) | | | | |
| <u>3. Limpopo Line</u> | | | | |
| Passengers Carried (number) | 163,253 | 206,245 | 731,658 | MA |
| Passenger Miles | 11,325,309 | 14,236,027 | 18,619,506 | MA |
| Tons Carried (short tons) | 1,377,390 | 1,486,065 | 1,407,163 | MA |
| Ton Miles (000 short ton miles) | 385,367 | 382,752 | 423,414 | MA |
| Receipts (\$US) ^{a/} | 155,181. | 207,137. | 228,002. | MA |
| Passenger Freight | 8,252,997. | 8,059,482. | 8,943,851. | MA |
| Total Revenues | 8,408,178. | 8,266,619. | 9,171,853. | MA |
| Expenses (\$US) | 3,195,545. | 3,682,444. | 3,554,237. | MA |
| Operating Ratio (percent) | 35.3 | 44.5 | 38.8 | MA |
| Personnel | MA | MA | MA | MA |
| <u>4. Xinyavane Line</u> | | | | |
| Passengers Carried (number) | 526,350 | 615,902 | 104,494 | MA |
| Passenger Miles | 10,223,853 | 12,195,314 | 10,657,978 | MA |
| Tons Carried (short tons) | 57,529 | 132,085 | 320,785 | MA |
| Ton Miles (000 short ton miles) | 1,321 | 4,660 | 11,535 | MA |
| Revenues (\$US) ^{a/} | 201,514. | 182,883. | 231,188. | MA |
| Passenger Freight | 85,480. | 90,298. | 230,603. | MA |
| Total Revenues | 286,994. | 173,181. | 461,791. | MA |
| Expenses (\$US) | 180,627. | 315,192. | 134,346. | MA |
| Operating Ratio (percent) | 62.9 | 182. | 29.1 | MA |
| Personnel | MA | MA | MA | MA |

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Table 2 (continued)

Railroads of Mozambique
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|---|-------------|-------------|-------------|------------|
| B. Beira Railroad | | | | |
| Passengers Carried (number) | 294,685 | 271,648 | 276,524 | NA |
| Passenger Miles | 30,077,870 | 27,690,111 | 25,439,509 | NA |
| Tons Carried (short tons) | 3,069,192 | 3,056,180 | 3,239,919 | NA |
| Ton Miles (000 short ton miles) | 482,477 | 480,339 | 495,680 | NA |
| Revenues (\$US) ^a / _b | NA | 292,755. | 280,554. | NA |
| Passenger Freight | Na | 11,160,770. | 12,198,033. | NA |
| Total Revenues | 12,124,858. | 11,453,525. | 12,478,587. | NA |
| Expenses (\$US) | 5,530,563. | 6,257,456. | 6,366,636. | NA |
| Operating Ratio (percent) | 45.61 | 54.63 | 51.02 | NA |
| Personnel | NA | 4,733 | 5,050 | NA |
| C. Trans-Zambesia Railroad | | | | |
| Passengers Carried (number) | 202,333 | 190,811 | 186,975 | 193,170 |
| Passenger Miles | 38,018,371 | 35,850,444 | 34,960,707 | 30,298,000 |
| Tons Carried (short tons) | 805,058 | 789,194 | 1,075,664 | 938,244 |
| Ton Miles (000 short ton miles) | 136,296 | 133,648 | 151,106 | 145,004 |
| Revenues (\$US) ^a / _b | 3,259,144. | 3,029,824. | 3,750,868. | NA |
| Passenger Freight | 2,775,284. | 2,799,389. | 3,879,124. | 3,821,353. |
| Total Revenues | 6,034,428. | 5,829,213. | 7,629,992. | NA |
| Expenses (\$US) | 2,321,836. | 2,308,071. | 2,485,831. | NA |
| Operating Ratio (percent) | 38.5 | 39.6 | 32.6 | NA |
| Personnel | NA | NA | NA | NA |

Table 2 (continued)

Railroads of Mozambique
Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|-----------------------------------|-----------|-----------|-----------|----------|
| D. Gaza Railroad | | | | |
| Passengers Carried (number) | 27,212 | 27,452 | 60,880 | NA |
| Passenger Miles | 749,248 | 732,595 | 1,469,540 | NA |
| Freight Tons Carried (short tons) | 26,756 | 18,394 | 23,939 | NA |
| Ton Miles (000 short ton miles) | 887 | 1,993 | 1,106 | NA |
| Revenues (\$US) ^a | | | | |
| Passenger | 18,673. | 19,368. | 24,507. | NA |
| Freight | 28,243. | 28,282. | 26,674. | NA |
| Total Revenues | 46,916. | 47,650. | 51,181. | NA |
| Expenses (\$US) | 105,397. | 123,514. | 120,157. | NA |
| Operating Ratio (percent) | 224.6 | 259.2 | 234.8 | NA |
| Personnel | NA | NA | NA | NA |
| E. Inhambane Railroad | | | | |
| Passengers Carried (number) | 24,895 | 25,537 | 47,904 | 189,395 |
| Passenger Miles | 821,150 | 787,897 | 1,146,428 | NA |
| Tons Carried (short tons) | 28,586 | 25,610 | 27,270 | 45,726 |
| Ton Miles (000 short ton miles) | 996 | 784 | 1,066 | NA |
| Revenues (\$US) ^a | | | | |
| Passenger | 16,416. | 16,851. | 18,039. | 54,608. |
| Freight | 25,465. | 29,716. | 30,975. | 48,035. |
| Total Revenues | 41,881. | 46,567. | 49,014. | 102,643. |
| Expenses (\$US) | 111,659. | 132,288. | 148,405 | NA |
| Operating Ratio (percentage) | 266.6 | 284. | 302.8 | NA |
| Personnel | NA | NA | NA | NA |
| F. Quelemane Railroad | | | | |
| Passengers Carried (number) | 102,320 | 122,243 | 123,660 | 137,256 |
| Passenger Miles | 5,428,743 | 6,265,895 | 6,136,650 | NA |
| Tons Carried (short tons) | 158,324 | 118,762 | 115,959 | 119,740 |
| Short Ton Miles (000) | 7,666 | 6,280 | 5,668 | NA |
| Revenues (\$US) ^a | | | | |
| Passenger | 85,385. | 85,163. | 85,372. | 82,836. |
| Freight | 174,191. | 148,650. | 135,540. | 113,026. |
| Total Revenues | 259,576. | 233,813. | 220,912. | 195,862. |
| Expenses (\$US) | 372,863. | 517,792. | 523,001. | NA |
| Operating Ratio (percent) | 143.6 | 221.4 | 236.7 | NA |
| Personnel | NA | NA | 1,907 | NA |

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Table 2 (continued)
 Railroads of Mozambique
 Selected Statistical Data, 1958 - 1961

| | 1958 | 1959 | 1960 | 1961 |
|---------------------------------|-----------|------------|------------|----------|
| G. Mocambique Railroad | | | | |
| Passengers Carried (number) | 154,878 | 172,492 | 189,656 | 216,836 |
| Passenger Miles | 7,929,412 | 8,643,878 | 9,040,934 | NA |
| Freight Carried (short tons) | 157,629 | 158,285 | 184,465 | 159,983 |
| Ton Miles (000 short ton miles) | 22,203 | 19,045 | 22,859 | NA |
| Revenues (\$US) ^{a/} | | | | |
| Passenger | 116,096. | 128,198. | 134,351. | 143,161. |
| Freight | 587,153. | 582,014. | 671,232. | 592,922. |
| Total Revenues | 703,249. | 710,212. | 805,583. | 736,083. |
| Expenses (\$US) | 825,665. | 1,094,178. | 1,086,137. | NA |
| Operating Ratio (percent) | 117.4 | 154.0 | 134.8 | NA |
| Personnel | NA | NA | 5,488 | NA |
| H. Tete' Railroad | | | | |
| Passengers Carried (number) | 24,570 | 33,656 | 35,286 | 39,040 |
| Passenger Miles | 1,968,234 | 2,310,875 | 2,428,935 | NA |
| Freight Carried (short tons) | 307,645 | 312,925 | 328,849 | 380,412 |
| Ton Miles (000 short ton miles) | 46,089 | 43,931 | 47,744 | NA |
| Revenues (\$US) ^{a/} | | | | |
| Passenger | 29,664. | 29,751. | 31,534. | 32,862. |
| Freight | 492,725. | 523,351. | 562,961. | 579,112. |
| Total Revenues | 522,389. | 553,102. | 594,495. | 611,974. |
| Expenses (\$US) | 506,091. | 634,664. | 707,136. | NA |
| Operating Ratio (percent) | 96.9 | 114.7 | 118.9 | NA |
| Personnel | NA | NA | 6,047 | NA |

^{a/} Revenues and Expenses converted from Escudos at rate of 1,000 Escudos = 1 Conto = \$34.96

Ports of Mozambique

Traffic and Revenues, 1958-1962 ^{a/}

| | 1958 (% of total) | 1959 (% of total) | 1960 (% of total) | 1961 (% of total) | 1962 (% of total) |
|-------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| TOTAL ALL PORTS | | | | | |
| Total Tons Handled (short tons) | 9,376,079 | 9,999,451 | 11,542,112 | MA | MA |
| Total Revenues (\$US) ^{b/} | 12,877,155. | 14,130,487. | MA | MA | MA |
| Total Expenses (\$US) | MA | MA | MA | MA | MA |
| Lourenco Marques | | | | | |
| Tons Inbound (short tons) | 2,898,293 | 3,008,977 | 3,287,059 | 3,220,921 | 3,220,921 |
| Tons Outbound (short tons) | 3,226,332 | 3,313,414 | 4,091,831 | 4,597,693 | 4,597,693 |
| Total Tonnage Handled | 6,124,625 (65.4) | 6,322,391 (63.2) | 7,378,890 (63.9) | 7,818,614 | 7,818,614 |
| Revenues (\$US) ^{b/} | 6,798,926. | 7,692,441. | 8,461,718. | MA | MA |
| Expenses (\$US) | 4,247,956. | 5,444,606. | MA | MA | MA |
| Beira | | | | | |
| Tons Inbound (short tons) | 1,483,291 | 1,519,278 | 1,623,688 | 1,603,847 | 1,603,847 |
| Tons Outbound (short tons) | 1,295,923 | 1,690,039 | 2,002,879 | 2,830,920 | 2,830,920 |
| Total Tonnage Handled | 2,779,214 (29.6) | 3,209,317 (32.1) | 3,626,567 (31.4) | 3,434,767 | 3,434,767 |
| Revenues (\$US) ^{b/} | 6,078,229. | 6,900,335. | MA | MA | MA |
| Expenses (\$US) | MA | MA | MA | MA | MA |
| Other Ports (combined) | | | | | |
| Total Tonnage Handled (short tons) | 572,240 (5.0) | 406,288 (4.3) | 467,743 (4.7) | 536,695 (4.7) | 536,695 (4.7) |
| Revenues (\$US) ^{b/} | 935,071. | 907,761. | 895,710. | MA | MA |
| Expenses (\$US) | MA | MA | MA | MA | MA |

^{a/} Includes revenues from passenger traffic

^{b/} Revenues and Expenses converted from Escudos at rate of 1,000 Escudos = 1 Conto = \$34.96

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Appendix C

Part V. The Transportation System of the Republic of South Africa.*

A. Introduction

Transportation service for the Republic of South Africa and South-West Africa is provided by all forms of modern transportation except inland waterways and pipelines. The "Republic of South Africa Railways and Harbours" owns and operates all railroad facilities and ports, some motor transport, and coastal shipping services as well as the commercial air lines. Private interests own and operate additional motor transport services and the bulk of the merchant marine. The railroads account for 95 percent of the internal freight transportation service measured in ton-miles, although motor transport carries more than twice the number of tons. The latter service, however, is for the most part in short haul local distribution. Coastal shipping accounts for a small amount of the total. The merchant marine carries no more than five percent of South Africa's imports. Over 95 percent of the passengers carried in the country are transported by the railroads. Motor transport and civil aviation share the balance of the inter-city transportation market.

Railroad freight service within the country is characterized by fairly long hauls between centers of major industrial and commercial activity such as between the Rand area and the principal ports, and short hauls of mineral and agricultural products within the Transvaal and Orange Free State and in the areas adjacent

*This appendix includes also a discussion of transportation in South-West Africa and the Protectorates of the UK.

to the ports. The South African Railways provide most of the long-distance motor freight service primarily between areas not served by the railroads, while the private motor carriers concentrate on urban and short distance feeder service to the railroads. Over 90 percent of all passengers carried by the railroad are commuters who travel daily between suburban towns and reserves and the cities and other areas of employment. In spite of strenuous efforts on the part of the railroads, long distance passenger traffic is being lost gradually to motor and air transportation.

B. Railroads

I. Track, Motive Power and Rolling Stock

The South African railroads are composed of some 13,615 route miles of track, of which 13,175 are 3½ foot gauge and 440 miles are 2 foot gauge. Originally commenced in 1860 with European and American standard gauge, (4 feet, 8½ inches), the lines were regauged about fifteen years later to 3½ feet because of the heavy investment in roadbed and clearances necessary to reach the interior. The railway system developed into a pattern of lines leading from the ports to the Orange Free State and Transvaal. With the discovery of gold and later of other mineral deposits in and near ^{the} Witwatersrand, new lines were added, many of them of comparatively short length within the areas of greatest mining and industrial activity. The Mozambique port of Lourenco Marques came to supplement the ports of the Republic of South Africa by affording short rail and road connections between the sea and the Rand district.

During World War I, a connection was made with the 1 foot 11⁵/₈ inch (.6 meter) gauge system of what had been German Southwest Africa. ~~By 1962~~, the Southwest African System ^{has been} converted entirely to the 3½ foot gauge. South Africa

Railways operate a 200 mile stretch of the Rhodesia Railway extending from Ramatlabama to Mahalapye in Bechuanaland. South African equipment is exchanged with Rhodesia but normally does not move beyond Bulawayo. A tabulation of the principal railroad routes is included in Table 1.*

Rail used in the $3\frac{1}{2}$ foot gauge portions of South African Railway System varies from 96 lbs. to 45 lbs. per yard. There are over 4600 miles of 96 lb. track. Ninety-five percent of the railways have rail of 60 lbs. or heavier. New track is being installed using welds, with sections up to one half mile in length and sliding joints to allow for expansion. Ties are mainly of imported wood, but stretches of track have been laid with steel and prestressed concrete ties and are undergoing testing. All main lines are ballasted with crushed hardstone. A Class I roadbed consists of 96 lb. rail, 2376 ties and 2200 cubic yards of ballast per mile. It permits axle loads of 23.5 tons, and passenger speeds of up to 60 miles per hour. Higher speeds for diesel and electric powered passenger trains are being planned, and the stresses involved were investigated in a recent visit to Japan by a South African Railway delegation. (Japan also uses a $3\frac{1}{2}$ foot gauge, and runs a number of trains at speeds somewhat in excess of 60 miles per hour).

As of 31 March, 1962, the South African railways had electrified route mileage of 1,486 miles and electrified track mileage of 3,278 miles. There were about 1,000 miles of double and multiple track in the system, and at least 220 miles of single track with centralized traffic control. Aside from double and multiple trackage in the Rand, the principal stretches of double track extend from Germiston to Bloemfontein and from Durban to Newcastle. Electrification is concentrated on the commuting

* Page 257, below.

lines around Johannesburg, Pretoria, Durban and Capetown. The through line from Johannesburg to Durban has been almost completely electrified. Authorization has been granted for finishing the electrification of this route as well as the line from the Rand to Komatipoort on the Mozambique border, which handles traffic to and from Lourenco Marques. The main line from the Rand to Capetown via Kimberley has been electrified for a considerable portion of the distance. All electrification consists of an overhead catenary system of 3,000 volts direct current.

In 1961-62, along with completion of regauging, the Southwest Africa railway was completely dieselized. This line runs through arid country where water is a problem, and locomotive coal has had to be transported to the area. Electrification and dieselization elsewhere have resulted in a saving in coal movement for railway purposes, but South African coal is cheap (\$1.85 per ton in 1961 at the mine head) and most tonnage in 1961-62 was still moved by steam. A further conversion to diesel and electric power for many lines is, however, contemplated.

Motive power as of 31 March 1962, consisted of 560 electric, 168 diesel and 2,572 steam locomotives for 3½ foot gauge, as well as 439 electric powered, multiple unit, suburban passenger cars. The last steam locomotives were purchased in 1958-59.

Passenger equipment other than the multiple unit cars already counted consisted of 5974 cars of various types, including 1190 suburban trailers and baggage cars. There were over 109,000 freight cars, about a third of which were 2-axle cars.

For the 2 foot gauge, there were 73 steam locomotives, 115 passenger

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cars and 1700 freight cars. Selected track, locomotive and rolling stock data are presented in Table 2.*

2. Traffic

The fiscal or reporting year of the South African Railways and Harbors closes on March 31, the end of the summer. For the years ending on March 31st, 1957 and March 31, 1962, ton miles of freight moved by the railways amounted to 20.6 billion and 25.6 billion respectively. Fiscal year 1962 was the year of highest attainment up to that point, and the increase of 24.2 percent over Fiscal year 1957 is indicative of the general rise in the economy during the five year period. Tonnages carried for the same two years were 75 million and 89.7 million respectively.** Average lengths of haul were 274 and 285 miles respectively.

The pattern of movement of freight tonnage on the railways consists of (1) movement of major commodities from mines or producing areas to industrial centers and port areas partially for export, (2) imports of petroleum and miscellaneous freight from the ports to major inland cities and centers of consumption, (3) movement of industrial freight within the Transvaal and Orange Free State mining and manufacturing areas and (4) movement of railroad coal from mines to coaling points on the lines. (See Figure 2.***) There is generally a movement of sheep and cattle from drought stricken areas to greener range land in Southwest Africa, which although not large in comparison with total freight carried, may create problems in obtaining sufficient numbers of railroad cars because of its urgency.

* Page 258.

** Traffic on the Railroads of South Africa, 1958-62 is shown on Table 3, page 259.

*** Figure 2. Map

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Commodities which represent the largest tonnages moved are coal and coke, ores, petroleum, corn, sugar and other agricultural products. The category of general merchandise also represents a large part of the total. Principal types of goods handled in the fiscal year ended 31 March 1962* are shown below in millions of tons:

| | |
|--------------------------------|------|
| Coal and coke | 30.6 |
| Minerals, excluding coal | 15.3 |
| Agricultural produce | 13.5 |
| General merchandise | 11.7 |
| Manures and fertilizers | 3.4 |
| Building and fencing materials | 3.2 |
| Timber | 3.2 |

Commodities moved to the ports, mostly for export, were iron and manganese ores, corn, sugar, wool and citrus fruits. The largest single import is petroleum. In the 1962 fiscal year 2.3 million tons moved inland from the ports by rail, principally from Durban and the Mozambique port of Lourenco Marques. Under a long-standing agreement with the Government of Mozambique, 47.5 percent of import tonnage destined for the Witwatersrand-Vereeniging-Pretoria industrial area must come in via Lourenco Marques; in practice, this quota is usually exceeded. Other international traffic moved by rail in recent years is shown below.

* Also referred to herein as Fiscal Year 1962.

Traffic Interchanged with Foreign Railroads*

(in thousands of tons)

| <u>Rhodesian Railroads</u> <u>Fiscal Year</u> | <u>Traffic forwarded to</u> | <u>Traffic received from</u> | <u>Total</u> |
|--|-----------------------------|------------------------------|--------------|
| 1959 | 690 | 463 | 1,153 |
| 1960 | 723 | 341 | 1,364 |
| 1961 | 662 | 263 | 925 |
| 1962 | 650 | 285 | 935 |

| <u>Mozambique Railroads</u> <u>Fiscal Year</u> | <u>Traffic forwarded to</u> | <u>Traffic received from</u> | <u>Total</u> |
|---|-----------------------------|------------------------------|--------------|
| 1959 | 1,562 | 1,331 | 2,893 |
| 1960 | 1,789 | 1,292 | 3,081 |
| 1961 | 2,267 | 1,342 | 3,609 |
| 1962 | 2,607 | 1,365 | 3,972 |

* Fiscal year ended 31 March.

Greatest densities of rail movement occurred on the lines in the Rand district around Johannesburg, which support industries, mines, power plants, consuming centers and the railways themselves. The main lines running inland from the ports to the Rand carried tonnages which are estimated at about 16 million tons per annum in both directions combined for Durban, 5 million for Port Elizabeth, 9 million for Capetown and 4 million for Lourenco Marques. The capacities of these lines, on which there was considerable electrification and double trackage, were not approached.

In the 1962 fiscal year 93 percent of all passengers carried on the South African Railways were commuters. Out of nearly 316 million passenger journeys, 294 million trips were commutation movements. The remaining 7 percent were medium and long distance intercity movements. Despite strenuous efforts to hold the longer haul passenger business by increasing speeds and introducing modern equipment, the South African Railways are affected by the world-wide trend away from rail to highway and air travel for these movements. Between 1956-57 and 1961-62, ordinary intercity and long distance passenger journeys decreased by about 6 million, or 21 percent, to 21.7 million. Commutation trips on the other hand increased 24% (i.e. 56 million net gain) to the 294 million total already stated. Over 90% of the gain in commutation took place in the Rand population concentrations of Johannesburg and Pretoria. The remaining centers, chiefly Capetown, either increased very little or fell off.

The phenomena of heavy suburban movements are explained by the South African policy of strict segregation of races. On 1 February 1958, the Rand services were changed by requiring all white commuters to travel first class, and all

non-whites to travel second or third class. In addition, traffic in the area was affected by the movement of both whites and non-whites to homogeneous suburban towns, communities and reserves, and by the general growth in the tempo of the economy. Second class was eliminated entirely in the Capetown area. In consequence, much capital has had to be provided in improving commuter services. Monumental new stations have been built at Johannesburg, Pretoria and Capetown. Nearly all commuter lines out of Johannesburg have been electrified and a considerable amount of new suburban passenger equipment has been procured and put into service. New, faster trains have been added, but also on a few lines, suburban rail services have been discontinued in favor of the use of buses.

3. Finance

The financial account of the railways is included in that of the administration which also embraces harbors, steamships, highways and airways. The administration has no borrowing power independent of its relationship with the government of the South African Republic, and is required by law to fulfill its capital requirements from the Republic governmental treasury which can float internal and external loans. The administration may, however, with parliamentary authority, employ net income to reduce interest-bearing capital held by the government.

The amount of interest-bearing capital owed the government by the administration on 31 March 1962, was almost \$2.1 billion. The government in turn owed the World Bank about \$137 million for the purchase of electric and diesel locomotives in England and the United States. Other governmental

loans were outstanding against a large proportion of the capital, over 90 percent of which were held in South Africa.

Earnings of the Railways fluctuate with business activity. In 1958-59, a deficit of over \$14 million after interest requirements was recorded. This occurred in the midst of an extensive capital improvements program slated to be completed early in 1963 and to cost in all about \$700 million. In 1961-62, a profit of \$14.5 million was earned after \$100 million of interest payments to the government and \$38 million of depreciation.

The property of the South African Railways as of 31 March 1962, represented an accumulated investment less depreciation of \$1.9 billion. In 1962, average revenue per ton of freight was \$5.50 for revenue freight only.* The average revenue per ton mile for revenue freight was 1.78¢. Average revenue per passenger journey, on the other hand, was less than 19 cents. Selected financial statistics for the Railroads of South Africa, 1958-62 are presented in Table 3.**

4. Evaluation of the System

The South African Railway System has an efficient passenger service. Its trains are generally prompt and run at fair speeds. The intensive, cheap commuter traffic is being encouraged by government policy, but it is expensive for the railroad in that more modern, new equipment and improved stations and other facilities are constantly needed. Nevertheless, this additional heavy investment acts as a stimulus to the national economy. The railways by themselves would undoubtedly

* In fiscal year 1962, the South African railways hauled 12.2 million tons of non-revenue freight, mostly for own account.
** Page 259.

show a greater profit if the passenger business were not encouraged in this manner, but heavy industry, machine building, housing and other sectors of the economy could not benefit as they do from the subsidy provided by the low cost commutation service. The net result is large expansion of railway facilities, principally around Johannesburg, and substantial additions of new suburban passenger equipment.

Shippers of freight are reported to complain that there is insufficient rolling stock to support all the needs of industry and commerce at the time and place needed. This condition is not a unique complaint in that it occurs in all industrialized countries, and it should not be regarded as a reflection on the substantial ability of the railroads to support the economic development of the country. The railroads in their present stage of development are also able to support vigorously the social and security policies of the government.

No trunk route has had difficulty in providing sufficient line capacity to handle the traffic offered, but there have been seasonal peaks on the Capetown route which have strained facilities. In May 1962, traffic south from De Aar reached a level of over 23,000 tons per day. Capacity of single track main lines was reported in a South African trade publication of January 1960, to be 25,000 tons per day, and of double lines, 45,000 tons, but these figures were based on steam operation on lines without special signaling. In the cited instance, the strain was relieved by supplementing steam power with diesel locomotives surplus to southwest Africa. The Capetown route is gradually being electrified.

The route from the Rand to Durban, which is the most heavily used,

is being both electrified and double tracked. That from the Rand to Komatipoort on the Mozambique border is scheduled for electrification but not double tracking. In 1961-62, the traffic in the controlling direction amounted to about 2.75 million tons over this line. Owing to a movement of empty cars of different types in opposite directions, it is estimated that 10,000 tons of capacity or about 330 cars average had to move in each direction every day. Thus the capability of the line was not approached. The main need of the whole system on a long term basis is for improved utilization of existing freight cars, additional freight cars and a larger inventory of electric and diesel locomotives. There are no financial obstacles to obtaining the equipment, but governmental policy of supporting the domestic car building industry makes it necessary to defer placement of orders for that portion of the currently needed equipment which is in excess of the home industry's annual productive capacity, even though such equipment could readily be obtained abroad.

5. Labor Policy

It is difficult to forecast the future attitude of the non-white railroad workers who constitute about half of the roughly 200,000 personnel currently employed* by the railroads but steps are being taken to maintain their loyalty to the enterprise. Notwithstanding segregation, conditions for non-white employees are being improved in a number of ways. The railways are building better housing for them and are conducting schools for their training. Mixed-race work teams are being organized and trained to operate as units. Pay levels are being improved. Railroad pay is considerably better than pay in the mining industry, which is the largest employer of Bantu labor in the Republic. Provision is being made for the prompt airing

* Selected statistics on personnel and wages, 1958-62, are presented on Table 3, p 259.

of grievances. Non-whites are being incorporated into the railway police. Good personnel relations are stressed in training and guidance literature. Schools for training of employees are conducted by the Railways and Harbors. 2,620 employees received training at the Railway College at Esselen Park in 1962 and classes for training non-whites were provided at a number of other points.

C. Motor Transport

The roadway system consists of some 200,000 miles of roads and tracks of all types. There are about 12,000 miles of bituminous main roads, 100 miles of concrete highway, 58,000 miles of gravel and 31,000 miles of improved earth roadway. The remainder may be classified as tracks. Because of the relatively dry climate, the earth roadways serve their purposes fairly well. The national roads lead from the ports to the Rand. There is also a coastal road running from Capetown to Durban and a main highway running from Johannesburg and Pretoria to the border of Southern Rhodesia near Messina. South-West Africa has a limited system of inferior roads. A description of the motor road network including mileage of each type may be found in Table 4.*

The national roads in general are surfaced with bitumen with a base of 8 inches of crushed stone. They vary from 18 to 22 feet in width. Vertical clearances are 16 feet. Passing is to the left. There are numerous bridges, practically all of which are substantially built. Aside from the national roads, the road network is considered to be inadequate to handle a large increase in heavy trucking service. The gravel highways will not be rapidly changed to roads of bituminous surface

because of the attitude the government in directing heavy traffic to the railroads.

On 1 January 1963, there were registered in South Africa just over one million private automobiles, 275,000 trucks, 20,000 buses and about 100,000 motorcycles. The largest concentration of motor vehicle registrations is found in the Transvaal. Motor transport services and privately operated vehicles carry about 200 million tons of freight annually or about twice the tonnage carried by the railroads. The bulk of this traffic is moved in short haul delivery service by private carriers. These are strictly regulated by the government in order to prevent competition for the railroads on longer hauls.

The South African Railways operate their own buses and trucks over about 32,000 miles of routes. In 1962, more than three million tons were moved by inter-city trucks and about four million tons were carried in local cartage service. Some 8,000 vehicles were used by the Railways for this purpose. About half of the total freight tonnage was represented by grain, fertilizers, fruit, sugar and livestock. The remaining tonnage consisted of a wide variety of items. Eight million passengers were carried by the Railway bus services, using 460 vehicles. The Road Transport Establishment of the Railways had a capital investment account of almost 41 million dollars at the end of March 1962. Vehicular operation had gross revenues for 1962 of 22 million dollars, exclusive of the revenues from tourist buses, but an operating loss of over one million dollars was sustained.

There are adequate vehicle repair and fueling facilities distributed throughout the country.

D. Ports

The principal seaports of South Africa have been developed to handle two-way general cargo, exports of dry bulk commodities such as coal and ore, and imports of petroleum. Docks and quays are under control of the South African Railways and Harbours administration, and their improvement is included in the current program of expanding transportation facilities. Routes for the movement of individual export commodities are carefully developed, and certain ports are specified for their handling. In view of the importance of foreign trade to the Republic, the ports are a vital link in the economy.

Following is a list of the principal ports, together with trade handled in 1961-62 in thousands of tons.

| | <u>Landed</u> | <u>Shipped</u> | <u>Transhipped</u> | <u>Total</u> |
|-----------------------|---------------|----------------|--------------------|---------------|
| <u>Durban</u> | 4,584 | 5,888 | 139 | 10,611 |
| <u>Capetown</u> | 2,390 | 2,154 | 30 | 4,574 |
| <u>Port Elizabeth</u> | 1,290 | 1,116 | 7 | 2,413 |
| <u>East London</u> | 692 | 656 | 1 | 1,349 |
| <u>Walvis Bay</u> | 316 | 589 | - | 905 |
| <u>Mossel Bay</u> | 149 | 15 | - | 164 |
| <u>Port Nolloth</u> | 68 | 8 | - | 76 |
| <u>Luderitz</u> | 18 | 12 | - | 30 |
| <u>Total</u> | <u>9,507</u> | <u>10,437</u> | <u>177</u> | <u>20,122</u> |

Lourenco Marques in Mozambique also handled for South Africa about 1.4 million tons of imports and 2.6 million tons of outbound shipments in 1961-62, so South

Africa overseas and coastal trade excluding transshipments at ports was about 24 million tons. Principal imports consisted of general cargo, petroleum, timber and grain. Leading exports were ores, coal, general cargo, corn, sugar, fruit and wool. A large portion of the exports originated in the interior of the Republic and had to be shipped by railroad to the ports. Most of the imported cargo moved inland to final destinations.

Total port traffic (exclusive of activity at Lourenco Marques associated with South Africa) consisted of 14,200 vessel arrivals, comprising 61,860,000 GRT of shipping. Of the arrivals, 6,300 were ships in international trade, 2100 were coasters and 5800 were whalers and trawlers. The ports can handle a considerable increase of traffic without much difficulty. There were a few delays during the year 1961-62, but improved performances generally were shown over the previous year. At most ports further expansion of facilities is possible. The major project under construction during the 1962 fiscal year consisted of two ore-handling berths at Port Elizabeth. Progress also was made on new berths and terminals at Durban, and the entrance to Table Bay Harbor at Capetown was widened.

The following are illustrative of the controlling depths and berthing space at the principal ports:

| | <u>L.W.O.S.F.*</u> <u>Depth</u> | <u>Berthing Space</u> |
|----------------|------------------------------------|---------------------------|
| Durban | 40 feet | 858 feet |
| | 36 feet | 1200 feet |
| Capetown | 38 feet | 900 feet |
| Port Elizabeth | 40 feet | 1200 feet (Bulk Handling) |
| | 36 feet | 1700 feet |
| East London | 35 feet | 1660 feet |
| Walvis Bay | 35 feet | 1750 feet |
| Mossel Bay | 18 feet | 700 feet |

* Low water ordinary spring tide.

The South African ports in fiscal year 1962 had revenues of \$25,886,000 and expenses of \$19,723,000, yielding a profit of \$6,163,000 or about 23 percent of gross income. The largest single item of income was from wharfage. Maintenance of facilities represented 21 percent of operating expenses. Total capital investment in harbors was \$122,000,000.

There were 5,184 employees on the staffs of the South African harbors in 1961-62, of which 2,262 were white and 2,922 were non-white.

E. Coastal Shipping and the South African Merchant Marine

There is comparatively little coastal shipping along the shores of South Africa. For many years the movement was confined almost exclusively to the shipment of sugar from Durban to other South African ports. After introduction of new rates in 1954, the traffic increased both in tonnage and diversity. In 1961-62 the total amount of goods transported in coastwise movement was 1,070,000 tons, of which 966,000 tons were conveyed in coasters and 104,000 tons in other ships. Tankers carried 336,000 tons of petroleum products from the refinery at Durban to other South and Southwest African ports. Railroad coal shipped through Lourenco Marques to Capetown on the S.S. Hangklip owned by the Railways and Harbours Administration and on 3 chartered shipsⁱⁿ 15 voyages amounted to 160,000 tons. The balance of tonnage moved consisted of sugar, wool and a variety of different items.

Apart from the ships owned by the South African Railways and Harbours, the small merchant marine of South Africa is privately owned. It consists of about 30

ships of over 1000 gross registered tons each with a total gross registered tonnage of approximately 200,000 and a total deadweight tonnage of about 280,000. It moves no more than five percent of South Africa's seaborne foreign trade. South Africa is therefore heavily dependent on shipping services provided by foreign flag carriers.

F. South African Airways

South African Airways was started in 1934 as a local airline owned by the Government. It is operated by the South African Railways and Harbours Administration.

There are now three types of service, the internal, regional and trunk services. The last two types fly jet and other aircraft to points outside of the country. The regional air route pattern includes flights to Rhodesia and Mozambique 3 times per week, and weekly jet service to Rhodesia, Kenya and the former French Congo in Africa. Trunk service is provided to Athens, Rome, Frankfurt, Amsterdam, Zurich, Paris and London in Europe. A bi-weekly service to Australia via Mauritius and the Cocos Islands is also operated. Internal, regional and trunk lines total over 40,000 miles. Passengers flown during the 1962 fiscal year were: internal services 330,717, regional services, 27,996 and trunk services, 50,838, for a total of 409,551.

Freight ton miles flown totaled over 12 million, of which 87 percent were provided by the trunk service. Encouraged by special commodity rates designed to boost exports, there were important increases in shipments of karakul pelts, fresh vegetables and fruit, (including avocados and mangoes), cut flowers and other perishables, mostly for the London and Amsterdam markets.

South African Airways had revenues of nearly 39 million dollars and expenses of almost 37.5 million dollars, yielding a net profit of about 1.5 million dollars. The investment account stood at about 39 million dollars, including an increase of \$350,000 during the year 1961-62.

The total inventory of aircraft consisted of 28 aircraft, of which 3 were Boeing 707's, 20 were 4-engine piston or turbo-prop aircraft and 5 were DC-3's. There were 3,382 employees, of which 2,914 were white and 486 were non-white. Flying personnel numbered 400 and maintenance and servicing personnel, 1,308.

Following are the principal operating statistics for 1961-62.

South African Airways Operating Statistics, 1961-62

| | <u>Passenger Miles</u> (thousand) | <u>Freight Ton Miles</u> (thousand) | <u>Mail Ton Miles</u> (thousand) |
|----------|--------------------------------------|--|---|
| Internal | 174,297 | 1,437 | 799 |
| Regional | 13,941 | 147 | 83 |
| Trunk | <u>223,237</u> | <u>10,449</u> | <u>2,640</u> |
| Total | 411,475 | 12,033 | 3,532 |

The three major airports in South Africa, i.e., Johannesburg (Jan Smuts,) Durban (Louis Botha), and Capetown (D.F. Malon), are operated and maintained by the Airports Authority under the Department of Transport of the Government. Minor airports are operated by the Railroad and Harbours Administration.

The route to Western Europe formerly embodied a stop at Leopoldville, but this service was shifted to Brazzaville, French Congo, after the Belgian Congo obtained its independence. Recently Portugal and South Africa have agreed that South African

Airways may use Portuguese airfields, beginning in October 1963, when a new jet strip will be completed at Luanda, Angola. Flights to Lisbon via Luanda and Sal (Cape Verde Islands) will alternate with the present service through Brazzaville and Kano, Nigeria. The new route would replace the latter should the African nations implement the Addis Ababa resolution for a diplomatic and economic boycott of South Africa.

G. Pipelines

At present, there are no pipelines for petroleum or gas transport in the South African Republic. On December 20, 1962, the Minister of Transport announced that he had approved in principle the construction of a pipeline for the conveyance of petroleum products from Durban to the Witwatersrand, provided the cost of construction could be economically justified. The pipeline would be built via Kroonstad in the Orange Free State, which would make it about 500 miles long. The rail distance from Durban to Johannesburg is 487 miles.

There is one large refinery at Durban, and construction of a second is planned. One official South African report has concluded that the pipeline would not be economical to operate until 1971. The rate of petroleum movement from both Lourenco Marques and Durban to the Rand in 1961-62 was about 1800 tons (150 cars) per day. A 10-12 inch ^{diameter} pipeline could handle this traffic.

Table 1
South African Railways
Approximate Distances of Principal Railroad Routes

| Route | Miles |
|---|--------------|
| Bloemfontein - Johannesburg | 260 |
| Bloemfontein - Kimberley | 100 |
| Bloemfontein - Ladysmith | 310 |
| Bloemfontein - Port Elizabeth | 450 |
| Capetown - Johannesburg | 970 |
| Durban - Golela (N. Coast) | 250 |
| Durban - Johannesburg | 490 |
| Johannesburg - Komatipoort | 300 |
| Johannesburg - Mafeking | 170 |
| Johannesburg - Pretoria | 45 |
| Komatipoort - Soekmeaar | 255 |
| Noupoort - Walvis Bay | 1200 |
| Pretoria - Beit Bridge (So. Rhodesia) | 360 |
| Ramatlhabana (Bechuanaland) - Warrenton | 200 |
| Springfontein - East London | 310 |
| Total Principal Routes | 5,670 |

Table 2

South African Railways

31 March 1962

| | | |
|---|---------------------|-----------------|
| Total Trackage Operated (miles) | 18,422 | |
| Total Route (miles) | 13,615* | |
| Single Track | 12,624 | |
| Double Track | 923 | |
| Triple Track | 22 | |
| Quadruple Track | 40 | |
| Quintuple Track | 4 | |
| Steam Operation | 10,907 | |
| Diesel Operation | 1,453 | |
| Electric Operation | 1,486 | |
| Operated with Centralized Traffic Control Signaling | 220 | |
| Gauge: 3' 6" | 13,175 | |
| 2' | 440 | |
| Maximum Grade (percent) | 3.3** | |
| Weight of Rail: 3' 6" gauge | 60-95 lbs. per yard | |
| 2' | 46.5 lbs. per yard | |
| Maximum axle load | 23.5 tons | |
| Locomotives (units) | <u>3' 6" gauge</u> | <u>2' gauge</u> |
| Steam | 2,572 | 73 |
| Diesel | 168 | |
| Electric | 560 | |
| Cranes | 169 | |
| Freight Cars (units) | 109,645*** | 1,707 |
| Box | 4,865 | |
| Open | 76,384 | |
| Tank | 3,296 | |
| Refrigerator and insulated cars | 7,751 | |
| Special | 423 | |
| Caboose and guard cars | 3,120 | |
| Passenger Cars (units) | | 115 |
| Motor | 439 | |
| Non-Motor | 5,974 | |
| Multiple unit trailers - coach | 2,387 | |
| Multiple unit trailer-baggage | 7 | |
| Regular baggage | 379 | |
| Regular saloon | 2,593 | |
| Regular Diner | 177 | |
| Regular inspection | 446 | |
| Other | 85 | |

* Includes 200 miles of line operated but not owned by South African Railways, under agreement with the Rhodesian Railways, and 32 miles of privately owned RR also operated by SAR.

** Maximum grade for new construction is 2 percent. Ruling grades are from 1.6 to 1.9 percent.

*** Total capacity of 3' 6" gauge freight car park is 3,300,000 tons.

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Table 3

Railroads of South Africa, Performance and Personnel, 1959 - 1962
(Fiscal Year ended 31 March)

| | 1959 | 1960 | 1961 | 1962 |
|---|---------|---------|---------|---------|
| Traffic: | | | | |
| Tons carried (thousand) | 79,722 | 81,942 | 88,092 | 89,668 |
| Ton miles (million) | 22,285 | 23,112 | 24,623 | 25,558 |
| Passengers carried (thousand) | 274,359 | 294,711 | 309,419 | 315,638 |
| Revenues: (gross) | | | | |
| Freight (thousand \$US) | 339,527 | 362,319 | 383,699 | 395,392 |
| Passenger (thousand \$US) | 53,343 | 59,577 | 58,813 | 59,214 |
| Other (thousand \$US) | 37,763 | 39,415 | 41,041 | 40,778 |
| Total (thousand \$US) | 430,633 | 461,311 | 483,553 | 495,411 |
| Average Revenue per Ton-Mile (US cents) | | | | |
| Including Free Freight | 1.55 | 1.63 | 1.56 | 1.55 |
| Revenue Freight only | 1.83 | 1.86 | 1.82 | 1.78 |
| Average Revenue per Loaded Ton (\$US) | | | | |
| Including Free Freight | 4.26 | 4.42 | 4.36 | 4.41 |
| Revenue Freight only | 5.01 | 5.15 | 5.07 | 5.10 |
| Average Revenue per Passenger Journey (US cents) | 19.44 | 20.22 | 19.00 | 18.77 |
| Operating expenses (thousand \$US) | 381,800 | 373,800 | 379,251 | 401,367 |
| Operating ratio (operating expenses to gross revenue) | 88.66% | 81.03% | 78.43% | 81.02% |
| Average Turnaround Time of Freight Cars (days) | 8.87 | 9.01 | 9.01 | 8.87 |
| Personnel (persons) | 217,010 | 207,548 | 207,548 | 206,339 |
| Wages and Salaries (\$US) (millio: / | 231,982 | 226,734 | 228,237 | 235,073 |
| Average Wage (\$US) | 1,069 | 1,080 | 1,100 | 1,139 |
| Personnel: | | | | |
| Colored | 108,096 | 104,666 | 102,059 | 100,794 |
| White | 108,914 | 105,215 | 105,489 | 105,545 |

Table 4

Net Mileage and Types of Roads (Excluding urban) in the Republic of South Africa as of March 31, 1962

| Class | Type | Cape Province | | | Orange Free State | | | Total |
|------------------------------------|--------------------------------------|---------------|-----------|-------|-------------------|------------|-------|-------|
| | | Transvaal | Transvaal | Natal | Transvaal | Free State | Natal | |
| National Roads (Mileage) | Bituminized Dual Highway Two-lane | 33 | 40 | - | 32 | 105 | | |
| | | 2545 | 950 | 756 | 492 | 4743 | | |
| | Total Bituminized | | | | | | | 4848 |
| | Gravelled or under construction | | | | | | | 628 |
| Total Mileage | | 463 | 27 | 14 | 124 | 628 | | |
| | | 3041 | 1017 | 770 | 648 | 5476 | | |
| Special Roads (Mileage) | Bituminized Two-lane | 255 | - | 273 | - | 528 | | |
| | Gravelled or under construction | 509 | 235 | 236 | 182 | 1162 | | |
| | Total Mileage | 764 | 235 | 509 | 182 | 1690 | | |
| Provincial Main Roads (Mileage) | Bituminized Concrete (Gravel) | 1924 | 2571 | 770 | 510 | 5775 | | |
| | | 159 | - | - | - | 159 | | |
| | Total Bituminized | | | | | | | 24741 |
| | Gravelled or under construction | | | | | | | 30675 |
| | | 15304 | 4313 | 164 | 4960 | 24741 | | |
| | | 17387 | 6884 | 934 | 5470 | 30675 | | |
| District Roads (Mileage) | Bituminized Concrete | 266 | 374 | - | - | 640 | | |
| | | 5 | - | - | - | 5 | | |
| | Total Bituminized | | | | | | | 62208 |
| | Gravelled or under construction | | | | | | | 62853 |
| | | 23460 | 23048 | 13800 | 1900 | 62208 | | |
| | | 23731 | 23422 | 13800 | 1900 | 62853 | | |

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Table 4 (Con't)

Net Mileage and Types of Roads (Excluding Urban) in the Republic of South Africa as of March 31, 1962

| <u>Class</u> | <u>Type</u> | <u>Cape Province</u> | <u>Transvaal</u> | <u>Orange Free State</u> | <u>Natal</u> | <u>Total</u> |
|--|---|----------------------|------------------|--------------------------|--------------|---------------|
| Total Roads Under Road Authorities and Systematically Maintained. | | | | | | |
| | | 44923 | 34558 | 16013 | 8200 | 100694 |
| Estimated Local Roads - Unimproved Earth, approx. | | | | | | |
| | | 45000 | 30506 | 15800 | 8000 | 99306 |
| | Grand Total of Roads in South Africa - approx. | 89923 | 62064 | 31813 | 16200 | 200000 |
| Types of Surface of Roads - Mileage | | | | | | |
| | Bituminous | 5023 | 3935 | 1799 | 1034 | 11791 |
| | Concrete | 164 | - | - | - | 164 |
| | Gravel - Approx. | 28006 | 16099 | 7314 | 6216 | 57635 |
| | Earth - Approx. | 56730 | 42939 | 22700 | 8950 | 130410 |
| | | 89923 | 62064 | 31813 | 16200 | 200000 |

Part VI. Tanganyika

A. The Transportation System

Tanganyika is served by three major railroads extending to the interior from the ports of Tanga, Dar es Salaam and Mtwara. A connection from the Tanga-Arusha railroad serves the port of Mombasa in neighboring Kenya. The first lateral connection, between the Tanga line and the Dar es Salaam line (117 miles) was almost completed by February 1963. There are few roads, particularly in the south-central and western parts of the country. Inland water transport services operate primarily on lakes, and combination rail-water routes provide connections to the Republic of the Congo, Uganda and Kenya. Some twenty cities and towns are served by scheduled air services.

The operations on waterways, railroads, ports and some highway transportation in Tanganyika, Uganda, and Kenya were united in 1948 under the East African Railways and Harbours Administration (EAR&H). The EAR&H is set up to function without being limited by territorial boundaries or by political division of the three territories. As of 1 January 1962, EAR&H employed a total staff of 49,691: 88% Africans, 9% Asians and 3% Europeans.

B. Railroads

There are some 1,750 route miles of railroad in Tanganyika, all 3' 3 3/8" (metre) gauge and virtually all single track. The difference in gauge from the uniform 3'6" gauge of the railroads in the bulk of Southern Africa is not yet an

operational disadvantage, but it would be if the East African system were linked up with the Rhodesian, Congo, Sudan and other neighboring systems. With this in mind, all new track and rolling stock of the East African Railways is designed so as to be convertible to 3'6" gauge. A link between the Tanganyikan and Rhodesian rail systems was proposed as recently as 2 June by the Northern Rhodesian Nationalist leader, Kenneth Kuanda. Nyasaland is also considering the construction of a railroad from Lake Nyasa to Mbeya, just inside the Tanganyika border.

All trains are completely air or vacuum braked (remaining vacuum being converted to air) and are equipped with center hook and buffer type couplers. EAR&H railroads are mostly operated by steam-traction, but are gradually converting to diesel traction with the ultimate possibility of straight electric traction. Oil, coal and some wood are used for fuel. The coal and oil must be imported. Water supply is a serious problem. Seasonal droughts often lead to slowdowns and curtailment of service.

The single track system was said by an official of the EAR&H to have reached near-capacity operation with steam traction by 1958, and conversion to diesel traction was decided to be the lowest cost first step to increased capacity. This conversion is still underway and presumably just keeping up with gradually increasing traffic requirements. (See Table 2 , below). The level of traffic in 1961 remained at about the level of 1960 largely because of uncertainty accompanying the granting of Tanganyikan independence. An increase in traffic resumed and reached a new high in 1962, however. Commodity flows are shown in Figure 2*. The predominant types

* Page 270.

of freight carried are grain, petroleum, cement and coffee.

Traffic on the Dar es Salaam - Kigoma line (779 miles), part of a possible alternate route to the sea via Lake Tanganyika for traffic from Northern Rhodesia and the Congo, increased to 328 million ton-miles in 1961.* Moved into Dar es Salaam were 216,000 tons, of which 45,000 tons were transit traffic from Kigoma on Lake Tanganyika. Traffic from Dar es Salaam to the interior totaled 328,000 tons, of which 106,000 tons was petroleum. Also included in the total were 44,000 tons of import for the Congo moving via Kigoma, Lake Tanganyika and Albertville. Estimated military capacity of this railroad is 1,000 short tons each way per day, or 365,000 tons per year in each direction.

The increase in capacity for the railroads of Tanganyika which would result from the installation of the modern types of signaling has not been undertaken because there is no readily available electric power source and also because of the difficulties of track circuiting for these types of signaling on steel ties which are used extensively in the territory.

EAR&H railroads employ over 48,000 people and the railroads are the largest single employer in Tanganyika. The railroad workshops in Dar es Salaam are the largest industrial establishment in the country.

C. Ports

Tanganyika has one principal, two secondary, and four minor ports, the latter are of no commercial importance. Dar es Salaam is by far the most important

* Includes branch lines.

with an estimated military unloading capacity of 1,350,000 short tons per year.*

Mtwara and Tanga are of secondary importance with an estimated military unloading capacity of 720,000 and 525,000 short tons per year respectively. Commercial tonnage (thousand of tons) moved through these ports in 1960 and 1961 was as follows:

| | <u>Year</u> | <u>Dar es Salaam</u> | <u>Tanga</u> | <u>Mtwara</u> |
|---------------------------------------|-------------|----------------------|--------------|---------------|
| Dry Cargo (Imports and exports) | 1960 | 603 | 182 | 65 |
| | 1961 | 531 | 209 | 71 |
| Bulk Oil (Imports) | 1960 | 235 | 17 | 16 |
| | 1961 | 218 | 17 | 6 |

Dar es Salaam has modern alongside berthing facilities for oceangoing ships.

The port can accommodate three large ocean-type cargo vessels, two small coaster-type cargo vessels and one standard ocean-type tanker alongside the wharves in addition to several lighters at shallow-draft berths. The port has adequate mechanical handling facilities and extensive general-cargo storage facilities. Dar es Salaam handles most of the import-export traffic of Tanganyika and to a much lesser degree those of the eastern provinces of the Republic of the Congo.

Tanga has no alongside berths for ocean-type ships, and all cargo is lightered. The port has berths for 10 lighters alongside and has many anchorage berths for ships of all classes. Covered storage and other facilities are adequate for the current operations of the port.

Mtwara has facilities in excess of current requirements. The port can

* If Dar es Salaam should become congested or unavailable for any reason, it will soon be possible to reroute Kigoma - Dar es Salaam traffic through the port of Mombasa, Kenya via the nearly completed rail connection between the lines serving the two ports.

accommodate two large ocean-type cargo vessels alongside the wharves, which have adequate ancillary facilities. Rail service was discontinued to the port of Mtwara in July 1962 and the construction of an improved road network connecting the port to the nearby agricultural regions is under active consideration.

In recent months labor problems have hampered port operations. Dock workers now receive the highest rate for unskilled workers in the country but productivity has fallen sharply; workers handled 438 tons per ship per day in 1961, but only 368 tons per ship per day by the end of 1962.

D. Highways

Highway transport in Tanganyika is essentially a complementary service to the railroads. While the road system is not well integrated or uniformly distributed, being particularly sparse in the south central and western parts of the country, it does provide connections with Northern Rhodesia, Kenya, Uganda and Ruanda Urundi.

In January 1959 the Tanganyika road network totaled 19,143 miles, of which 541 were bituminous surfaced, 2,401 were gravel surfaced, and the remaining 16,201 miles were improved earth. In January 1961 there were 33,512 vehicles registered in Tanganyika of which 15,994 were passenger cars, 16,037 trucks and 1,481 buses.

Construction and maintenance problems are caused by the nature of the existing terrain and by seasonal rains. Principal bottlenecks which impede traffic include numerous low-capacity ferries, fords, narrow causeways, low-capacity bridges, narrow stretches of road, sharp curves and steep grades. During the rainy season sections of roads in the low-lying areas become impassable because of surface

inundation.

A principal international highway connects the port of Dar es Salaam with the Ndola-Broken Hill area of Northern Rhodesia (about 1,135 miles) and with Elisabethville in the Congo via Northern Rhodesia (about 1,350 miles). This route is generally two lane gravel surfaced with regular maintenance except for about 120 miles of hard surfaced two lane highway from Dar es Salaam to just beyond Morogoro and other short hard surfaced stretches in the vicinity of larger towns. Other short stretches in remote areas deteriorate to dirt roads improved only on difficult sections. The latter sections are considered subject to interruption in bad weather. Military through capacity is estimated at 237,250 short tons per year, limited by low capacity bridges on the Tunduma-Tsoka road (70 miles) in Northern Rhodesia near the Tanganyika border. At Nakonde in Northern Rhodesia a branch road leads to Fort Hill in Nyasaland and thence to Salima, the terminus of the railroad in Nyasaland.

E. Inland Water Connections with Southern Africa

The only water connection with the southeastern part of the Congo is afforded by inland water service on Lake Tanganyika between the railheads of Kigoma, Tanganyika and Albertville, Congo. This service is under the control of the Republic of the Congo and is discussed in that section of this report.

Service between Northern Rhodesia and Tanganyika is furnished by EAR&H vessels on Lake Tanganyika. EAR&H traffic on the lake is mostly passengers (22,000 in 1961); most of the small amount of cargo carried (7,200 tons in 1961) is to or from Mpulungu, Northern Rhodesia.

Total route mileage for the round trip between Kigoma, Tanganyika and Mpulungu, Northern Rhodesia is 674 miles and takes about six days on the SS Liemba. Mpulungu is not served by rail.

F. Civil Air

Local scheduled air services are provided by the East African Airways Corporation (EAAC) which is owned jointly by Tanganyika, Kenya and Uganda. Civil aviation is administered by the Regional Representative (in Tanganyika) of the Directorate of Civil Aviation for the East African Territories (DCA-EA) at Nairobi, Kenya. The EAAC serves some 20 cities and towns and scheduled air services are operated over a network of approximately 5,500 unduplicated air route miles. Most of the internal services are conducted with Douglas DC-3 aircraft. EAAC's regional services between Tanganyika and other African areas are flown with DC-3, Fokker F-27 and Comet IV aircraft. Other than the aircraft of EAAC used in Tanganyika, only about nine civil aircraft were based in the territory in 1961, all privately owned. Selected statistics for EAAC in 1961 are presented in the following tabulation:

| | |
|-------------------------------|---------|
| Passengers carried | 173,811 |
| Passenger miles (thousand) | 151,900 |
| Seat miles (thousand) | 254,000 |
| Seat load factor (percent) | 60.6 |
| Load ton miles (thousand) | 18,087 |
| Capacity ton miles (thousand) | 30,000 |
| Weight load factor (percent) | 60 |
| Aircraft owned (units) | 15 |
| Comet IV | 3 |
| DC-3 | 9 |
| Fokker F-27 | 3 |

Table 1
 Railroads of East Africa, Performance and
 Personnel, 1958-61

| | | <u>1958</u> | <u>1959</u> | <u>1960</u> | <u>1961 a/</u> |
|-----------------------|-----------------------|-------------|-------------|-------------|----------------|
| Traffic: <u>b/</u> | | | | | |
| Tons Carried | (thousand) | 5,645 | 5,591 | 5,377 | 5,418 |
| Ton-Miles | (million) | 1,726 | 1,802 | 1,851 | 1,834 |
| Passengers Carried | (thousand) | 5,221 | 5,086 | 4,648 | 4,310 |
| Gross Revenue: | (thousand US\$) | | | | |
| All Railroad Services | | 53,003 | 54,639 | 55,084 | 54,818 |
| Freight Service | | 41,985 | 43,558 | 44,444 | 44,333 |
| Passenger Service | | 5,615 | 6,058 | 6,018 | 6,012 |
| Other | | 4,870 | 4,582 | 5,063 | 5,006 |
| Operating Expenses | (thousand US\$) | 44,534 | 44,447 | 46,326 | 46,513 |
| Operating Ratio | | 84.0 | 81.3 | 84.1 | 84.8 |
| Personnel <u>c/</u> | (number of employees) | 48,109 | 49,825 | 47,555 | 48,126 |
| Wages and Salaries | (thousand US\$) | 21,035 | 21,552 | 23,591 | 23,756 |

- a. Preliminary reports indicate that 1962 traffic increased about two percent in tons and nearly 2.5 percent in ton-miles over 1961.
- b. Includes cattle at 900 lbs. per head, using the average length of haul for all freight.
- c. Railroads in 1961 employed 97 percent of all EAR&H employees; 88 percent of which were African, nine percent Asian, and only three percent European.

*Includes Kenya, Tanganyika and Uganda.

Table 2
East African Railways, 1961*

| | | |
|---|------------------------|---------------------|
| Total trackage | (miles) | 4,152 |
| Total route | (miles) | 3,490 |
| Single track | | 3,486 |
| Double track | | 4 |
| Gauge | (metre) | 3' 3-3/8" |
| Weight of rail | (pounds per yard) | 40.3 to 95 |
| Maximum axle load | (short tons) | 10 to 22 |
| Dar es Salaam - Kigoma | | 13.2 |
| Maximum distance between passing tracks | (miles) | N.A. |
| Dar es Salaam - Kigoma | | 37 |
| Maximum grade on main line | (percent) | 2.2 |
| Dar es Salaam - Kigoma | | 2.2 |
| Locomotives | (units at end of year) | 470 |
| Steam | | 414 |
| Diesel | | 56 |
| Freight cars | (units at end of year) | 9,401 ^{a/} |
| Box | | 4,293 |
| Open | | 2,650 |
| Tank | | 839 |
| Other | | 1,619 |
| Passenger cars | (units at end of year) | 979 |
| Coaches | | 344 |
| Mail and baggage | | 339 |
| Other | | 296 |

a. About one-third of these are two axle types.

* Includes Kenya, Tanganyika and Uganda.

APPENDIX D

MILITARY AND SECURITY FORCES IN SOUTHERN AFRICA

I. Summary and Conclusions

A. The Situation

The provinces of Angola and Mozambique, The Republic of South Africa, and the Colony of Southern Rhodesia have been described as the "White Redoubt", that is the last stronghold of a white minority's supremacy over non-white an ~~non~~ majority on the continent. In South Africa, whites totaling less than 20 percent of the population dominate the country by military strength, organization, and the policy of "apartheid" and as a result of the indifference of the non-white masses. In the other areas a smaller percentage of whites are similiarly attempting to maintain their privileged position. As a result of normal evolution and outside agitation, the non-whites in these areas are demanding a role in the government in proportion to their importance in the population. The whites are determined to resist this demand with force, and the non-whites are generally willing to respond with force. The purpose of this section is to assess the present and future strength of the opposing sides in this struggle.

B. The African Strength

There are organized groups attempting to unseat their white governors in each area. Unfortunately for the success of the ^{non-white} ~~non~~ nationalist aspirations, there are too many groups and much of their energy is wasted in rivalry, sometimes quite bloody. The most effective opposition thus far has occurred in Angola, where the rebels have been able to sustain a campaign

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which deserves the title of military action. Even with a garrison of more than 40,000 men, the Portuguese have not been able to eliminate their opponents and show no sign of being able to do so. The rebels in Angola claim to have 5,000 men under arms. However, their force is ill-equipped, poorly organized, and poorly led. In Mozambique, Southern Rhodesia, and South Africa, the dissidents are even less well organized and have thus far exhibited a capability for riots, sabotage, and terrorism but not military action even of a guerilla nature.

C. The White Strength

In comparison with the non-white military strength in the area, white forces appear formidable. White ground forces number well over 70,000 fully armed, well-trained troops backed up by more than 17,000* police and an immediately available trained reserve of better than 25,000 men. These ground troops are supported by more than 4,000 Air Force personnel with 450 combat and transport aircraft. Although these forces are in three separate armies, initial moves have been made for the exchange of intelligence, coordination, and mutual support for certain types of activity. It is likely that this coordination will increase in the future.

* Not including non-white

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Regular Military and Police Forces in Southeast Africa a/

| | Police | | | Military | | | Country Total |
|------------------------|--------|---------|-----------|----------|-------|--|---------------|
| | White | African | Ground* | Air | Naval | | |
| Angola | 2,000* | NA | 43,000 | 1,700 | 400 | | 47,100 # |
| Congo | NA | NA | 25,000 | 300 | 0 | | 25,300 |
| U.N. Congo | 0 | 0 | 11,000 b/ | | 0 | | 11,000 |
| Rhodesia and Nyasaland | 2,200 | 8,800 | 5,200 | 600 | 0 | | 16,800 |
| Mozambique | NA | NA | 17,000 | NA | NA | | 17,000 |
| South Africa | 13,500 | 14,500 | 12,000 | 3,900 | 1,700 | | 45,600 |
| Total | 17,700 | 23,300 | 113,200 | 6,500 | 2,100 | | 162,800 |

* Includes non-white troops. In the case of Angola, 12% of the Army is non-white; in other areas the division between white and non-white is unknown.

a. Data rounded to nearest hundred.

b. As of May 1963, includes some Air Force personnel.

D. Military Prospects

In spite of the apparent disparity in the competing forces in the present situation, factors in operation favor the ultimate victory of the non-white rebels. White mobilization is very near its peak, and further increases in white strength can come only with considerable cost and sacrifice, which are not likely to be made. Non-white strength on the other hand is just beginning to emerge. Rebel troops have the support of almost all of the independent African states and are training cadres in many of them. Experience and training will pay a greater return to the dissident troops in terms of increased capability in this situation than they will to the already trained white units. White forces are relatively unified in their present organizations and goals and can gain only a little strength from increased cooperation. The rebels, on the other hand, are weakened by factionalism. If the rebel groups can get together, their strength will greatly increase. World opinion favors the rebels, and as the conflict becomes more open, sanctions against the whites may occur at the same time that aid to the rebels is increased. Because the white forces are dependent on external sources for POL and much of their modern armament, they could be greatly weakened by such sanctions. Finally, numbers alone almost assure the ultimate victory of the non-whites. Of the more than 32 million people in the area, far fewer than 20 percent are white. Although these factors seem to make the eventual non-white victory a certainty, they do not provide a

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time table for the conflict. Although insurgency and dissatisfaction are increasing, ^{and} the insurgent capabilities are increasing, large segments of the non-white population do not support non-white nationalist movements. Nevertheless, both help from other African states and disapproval of white policies are increasing.

II. Angola*

A. Strength of Regular Forces

As of 1 January 1963, the strength of the Portuguese Army was 102,000 men, more than 55 percent being employed in the defense of overseas colonies. The strength of the Portuguese ground forces in Angola is about 43,000 men (about 40 percent of the total Portuguese Army). The largest tactical unit is the battalion, and most of the troops in Angola are organized in battalion or company-size units. Although detailed order of battle and numerical designators of military units in Angola are not available, the organization of the forces in operations units is approximately as follows:

| | |
|------------------|----------------------------|
| Infantry: | 33 Battalions, 5 Companies |
| Armored Cavalry: | 2 Battalions |
| Artillery: | 3 Battalions |
| Engineer: | Possibly 2 Battalions |

There are numerous service, administrative and engineering units of detachments and 2,000 police. Two transport companies have been identified.

*Including Cabinda.

In addition to the units listed above, over 500 paratroopers are under the command of the Air Force.

To support the ground forces, elements of the Portuguese Air Force are also deployed in Angola. A transport squadron is located at Tolo with the following aircraft:

16 Noratlas

6 C-47

4 C-54

An air-ground support squadron is located at Luanda with the following aircraft:

12 F-84G

12 PV-2

18 T-6

16 DO-27

2 Skeeter

The total number of ~~Air Force~~ personnel is about 1,700, and ground support equipment is believed to be adequate for normal operation and maintenance of the aircraft.

The Angolan Naval Command of about 400 men operates a number of patrol craft, including subchasers, along the Angolan coast. Several vessels have been observed operating as troopships and moving contingents of troops numbering 1,500 men into and out of Angola. It is not

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known whether these are naval vessels or merchantmen under charter.

B. Local Forces

Supplementing the regular forces of Angola is a local civilian volunteer corps which provides defenses for individual plantations in the insurgent area. The strength and organization of these forces is unknown. Although they could be counted on in the struggle against the insurgents, they cannot be regarded as completely loyal to Portugal, for they favor more autonomy for Angola. If Portugal appears to be losing ^{to} the insurgents and if the regular military decide to support them, local leaders might attempt to force Portugal to concede some form of local government to the province.

C. Logistics and Transportation

Total Portuguese strength in Angola is about 43,000 officers and men. The main logistical fact of life in the Portuguese campaign in Angola is the necessity for providing complete support from a home base 5,000 miles distant by sea and 2,500 by air. All weapons and equipment, a substantial amount of food, and most of the men must be brought in from abroad. Tactically, within Angola, logistics and transportation have not been a problem thus far. At this time, rebel activity is confined to the northwest corner of the province and has been in the form of squad or platoon-size actions.

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The rebels have not recently shown a capability for extensively interdicting road traffic, which would constitute the main avenues of movement for the Portuguese troops. Although the TO&E of the Portuguese units in Angola are not known, American Military Assistance Programs have provided 1,100 jeeps, more than 1,500 trucks, and 1,700 trailers, which the Portuguese have admitted are employed in Angola. Air transport is available as indicated in II, A, above. All of the railroads lie to the south of the combat area and neither have proved vulnerable to attack thus far nor have contributed tactically to the recent fighting in the north. In summary, Portuguese transport requirements in recent months have been relatively light and easily met.

D. Military Prospects

Portugal's greatest asset thus far in the Angolan campaign has been the weakness and lack of cohesion and coordination among the rebels. Recent reports of training, new arms, and increasing support from other African nations promise a gradual increase in rebel capabilities. Rebels have been recently threatening a "second front" to the south, an operation which appears more feasible since Katanga has been brought under the control of Leopoldville. If this threat materializes, the Portuguese problems will obviously increase, and the strategic Benguela Railroad would be threatened. However, the Congo would probably not be willing to see the Benguela line cut until it has an alternative route open for the movement of Katanga ores to market. The Congo can and probably

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will play a key role in the development of the Angolan situation. When the so-called "national route" opens, the Congo may make a political decision to divert some traffic from the Benguela railroad, as a gesture of support for the rebels.

IV. Federation of Rhodesia and Nyasaland

A. Strength of Conventional Forces

Ground troops under the control of the Federation of Rhodesia and Nyasaland number 5,171 men, organized into one all-white battalion and four battalions with white officers and ~~African~~ non-white troops. This force, the Royal Rhodesian Army, modeled along British lines, is probably the second best-equipped, best-trained force in the area under consideration. In addition to the military units, 10,945 police are under the control of the provinces. These police are distributed as follows:

| | |
|--------------------|---------------------|
| Northern Rhodesia: | 4,609 (730 white) |
| Southern Rhodesia: | 4,090 (1,275 white) |
| Nyasaland: | 2,246 (148 white) |

Two ~~African~~ non-white battalions and a white armored car company of the Army are normally deployed in Northern Rhodesia, one white and one non-white battalion in Southern Rhodesia, and the remaining battalion in Nyasaland. In addition to these active forces, a trained military reserve of at least 6,000 men (whites) is available in Southern Rhodesia. A police reserve of 5,000 men is also located in Southern Rhodesia. The Royal Rhodesian

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Air Force, under the control of the federal government, numbers 600 men and has the following aircraft:

118 Vampire FB-9
15 Canberra B-2
2 Pembroke
4 Canadair C-4
8 Dakota C-47
3 Alouette III
15 Vampire T-11
3 Canberra T-MK-4
4 Provost T-1
10 Provost T-52

This force is organized into seven squadrons and has served at British bases in Aden, Cyprus, and elsewhere.

Local Forces

No local organized paramilitary-type forces exist in the Federation.

C. Logistics and Transportation

Although well-equipped and completely mobile, the Federation force has depended on the UK for military supplies and equipment and undoubtedly will continue to do so in the future. Until now, this dependence on the UK has proved to be an advantage. After the proposed break up of the Federation, however, should radical non-white leaders come to power and sever their relations with the UK, this dependence could prove to be a serious weakness. A fundamental weakness in the military posture of the Rhodesian Federation and each of the component states is the fact that the country

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has no access to the sea. All of its external supplies must move over land routes controlled by nations who may not always be friendly.

D. Military Prospects

The Federation is slated to break up into its component states in the near future. When this break-up occurs, the forces will probably be divided among the states (i.e. 2 battalions each to Northern Rhodesia and Nyasaland, white units to Southern Rhodesia). The future of the Air Force is of special concern to the UK, and its disposition has not yet been decided. The result of this division will be to replace the second most powerful military force on the southern portion of the continent with three smaller and much weaker forces. These smaller forces will easily be able to maintain internal order and put down any dissidence which may occur in the foreseeable future. In Southern Rhodesia, however, efforts of the non-white to supplant the all-white government may eventually result in a conflict which would tax the Army's ability.

V. Mozambique

A. Strength of Regular Forces

Portuguese ground strength in Mozambique consists of a little more than 17,000 men, organized into 14 infantry battalions, 1 armored battalion, 1 artillery battalion, 1 engineer battalion, 1 signal company, and other miscellaneous units. An unidentified Air Force unit provides some air transport capability and air-ground support with the following aircraft:

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4 C-47

3 C-54

6 T-6

Number of Air Force personnel and their ground-support capabilities are unknown. Several naval vessels (all smaller than a destroyer) are assigned to the area.

B. Local Forces

No local militia are known to exist in Mozambique. However, even if such an organization did exist, the Portuguese would probably place little trust in it because of the opposition to Salazar which has long existed among Mozambique whites.

C. Logistics and Transportation

As in the case of Angola, the principal logistical factor affecting operations in Mozambique is the extreme distance which supplies and men must move from Portugal. Resistance to authority by Africans in Mozambique has been more comparable to scattered tribal unrest than organized insurgency, and the Salazar regime thus far has probably been more concerned with police control of white opponents to the regime than it has with non-white African dissidence. Nothing is known of the TO&E of Portuguese troops in the area, but one source reported that they were equipped with the new NATO rifle. They also may be presumed to have some of the equipment that Portugal has received under the American Military Assistance Program, including motor vehicles (see II, C, above).

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D. Military Prospects

It is difficult to comment on Portugal's military prospects in Mozambique. Certainly no difficulty is presented in controlling indigenous dissidence in its present form, for ^{non-white} African nationalists from Mozambique have shown almost no capability for fomenting insurgency in the territory. However, dissidence exists among the whites as well as the ^{non-white} Africans in Mozambique, and neighboring countries are known to be training and aiding various Mozambique nationalists movements. Although the situation at the present appears to be stable, the future seems to contain increasing challenge to Portuguese rule in the province which Portugal may not have the military capability to suppress.

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III. Congo

A. Strength of Regular Forces

1. Indigenous

The Congolese National Army (ANC) consists of about 25,000 troops organized into 24 battalions. The Katangan Gendarmerie, which totaled about 19,000 men in December 1962, has in a large part dispersed as a result of conflicts with UN forces since that date. However, Tshombe has been paying some troops, and part of the Gendarmerie may still be loyal to him. Although units of the ANC and Gendarmerie bear various designators (commando, paracommando, Gendarmes, etc.), they are all essentially infantry battalions, averaging about 600 men each.

The Congolese Air Force has a strength of 300 Congolese and 16 Europeans. The Air Force has a total of 19 aircraft of various types, but a lack of pilots and ground support renders it a very ineffectual force.

2. UN

As of May 1963, UN Forces in the Congo totaled 11,000 men. Current UN plans call for the reduction of this force to less than 7,000 men by 1 July 1963, and complete removal of all UN forces by the end of 1963.

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B. Local Forces

No self-defense or paramilitary forces exist in the Congo in the normal sense of these terms. However, tribal organizations remain strong, and tribal warriors constitute a force whose effectiveness is directly proportional to the quality of their weapons, leaders, and motivation, which vary from time to time and place to place.

C. Logistics and Transportation

The Congo does not have a munitions or an armament industry, and consequently all equipment must be imported. The only effective surface supply routes are through the port of Matadi.

Most operations will be by battalion-size or smaller units. As has been demonstrated in the recent fighting, large units of troops cannot live off the land in the Congo, and it is necessary to carry not only military hardware needed for a campaign but all food and medical supplies as well. Logistical considerations [redacted] for a modern force operating in the Congo are so critical as to be a limiting factor in most campaigns. Little information is available concerning the equipment inventory of the ANC, but, in general, organic transport, both surface

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and air, is at the present time inadequate for any but local operations.

A major weakness of the ANC is a lack of vehicles and communications equipment.

D. Military Prospects

The ANC has very limited capabilities at the present time.

Most observers predict that if all UN forces are withdrawn as scheduled, the ANC will have great difficulty in maintaining internal order and security. Predictions range from the reemergence of secessionist movements to bloody tribal warfare and massacres. The future prospects and capabilities of the ANC are in the hands of six western nations committed to training the ANC and developing it into a modern effective force. These are Belgium, Israel, Italy, Norway, Canada,* and the US. The US has already initiated a modest military assistance program. However, this training will take time, and the prospects for a period of stability in which the ANC would have time to train and reorganize are not good without the UN or some other outside intervention.

VI. Republic of South Africa

A. Strength of Conventional Forces

The South African Army has a strength of 12,000 men, organized into a mobile watch unit, a parachute battalion, and 10 training units

* Norway, Canada, and Italy have been reluctant to proceed with the training of the ANC without UN supervision.

equivalent to composite battalions. The police force consists of 28,000 men, of which 14,500 are non-white and would ^{be} of questionable value in surpressing racial violence. These regular units are supported by a Citizens Force consisting of 14,700 men who have had 9 months of basic training and who receive 2 weeks of active training each year. The South African Air Force has a strength of 3,885 military personnel and 303 civilians. In addition, the Air Force reserve has a strength of 10,000 members, more than 2,500 of whom are qualified pilots. Operational units of the Air Force include 2 fighter squadrons, 1 transport squadron, 1 search and rescue squadron, and 1 maritime reconnaissance squadron. The reserve contains 6 training and 1 transport squadrons. The Air Force has a total inventory of over 400 planes, including 70 jet fighters,* 250 training aircraft configured for air-ground support,** 41 transport aircraft, and 17 helicopters. South African Naval Forces numbered 1,746 men manning 3 destroyers and other smaller craft.

* Sixteen Mirage III C aircraft have been ordered from France, and negotiations are underway for the purchase of an undetermined number of Mirage III B aircraft. Acquisition of these aircraft will significantly increase the fighter strength of the South African Air Force.

** In this report all training type aircraft listed are configured for air-ground support.

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B. Local Forces

More than 50,000 men are enrolled in militia-type units known as Commandos. Each Commando unit consists of 16 officers and 300 men. In addition to the formation of Commando units, the government has embarked on a program of military training of every man and has considered forming women into units.

C. Logistics and Transportation

South Africa has a munitions industry capable of producing small arms, explosives, and aircraft and bazooka-type rockets. For larger more sophisticated equipment, South Africa is dependent on imports. Recently, negotiations have been underway for the purchase of US KC-135 aircraft. Ostensibly for early warning purposes, the aircraft are probably intended to insure rapid communication between South Africa and Europe without the necessity of transiting areas controlled by unfriendly African states. In addition to 800 armored cars, the Army has 5,000 trucks (3/4 ton to 5 ton, of US manufacture), with 3,000 of these being in storage. More than 300 tanks and 150 jeeps, sedans, and other vehicles complete the motor park of the South African Army. The Air Force maintains POL stocks at a level adequate for 30 days of sustained operations. The country is attempting to become self-sufficient for all armaments including aircraft, but it will be unable to achieve

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this goal. The internal transportation system is adequate for support of any action () including large-scale extended combat.

D. Military Prospects

The present regime in South Africa, loudly proclaiming a fear of invasion, has announced intentions of improving its military posture in every way possible. The Army and the police are already capable of dealing with existing dissidence, which is sporadic, poorly organized, and generally ineffective. As South Africa's harsh racial policies generate increasing tensions, however, the Army may eventually prove unable to cope with the situation either because of the scope of the uprising or because of sanctions (such as embargo of POL shipments) imposed as a result of international indignation.

There is reasonable doubt as to the UN's ability to enforce effective sanctions, for countries such as Portugal and the UK probably would not support them. Moreover, the discovery of oil in Angola could provide an alternative source for a limited amount of petroleum, which is the only commodity that could be effectively embargoed to interfere with South African military capabilities for providing internal security.

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VII. Logistics

A. US/UN Forces

The type and kind of forces which might be employed in operations in the ^{White Redoubt} area would vary widely from place to place depending on many factors.

It is probably worthwhile to consider requirements of US forces in various types of situations, first to establish a yardstick against which the requirements of other forces might be measured; second, because UN forces might receive US logistic support similar to that required by US forces. In the case of US/UN forces, deployment as well as resupply must be considered. A 17,500-man US infantry division weighs approximately 27,000 tons. The new type of airborne division has 11,500 men and weighs about 14,500 tons, with its combat elements alone weighing about 5,000 tons. Immediate air deployment of this division from a US base would require 600 to 700 aircraft of 20 to 25 tons capacity.* The following tabulation gives the total requirements (including food, materiel, transport, medical supplies, etc.) for US troops in given situations.

(Pounds per man per day)

| <u>Type of Action</u> | <u>Infantry**</u> | <u>Armor**</u> |
|---------------------------|-------------------|----------------|
| Reserve | 13 | 18 |
| Inactive (ready) | 33 | -- |
| Pursuit | 34 | 45 |
| Security force | 50 | -- |
| Attack on fixed positions | 64 | 88 |

* Based on FM 101-10, Part I, October 1961.

** Assuming operations in division-size units in non-nuclear and non-gas warfare. Based on WW II data modified to reflect the new TO & E.

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NO FOREIGN DISSEM**B. Portuguese Forces**

Literature on the logistic requirements of the Portuguese army is not available. Estimates of logistic requirements therefore are subjective and subject to revision on the receipt of any more definitive material. It would normally be assumed that the Portuguese colonial forces would consume less than US forces. This assumption is reinforced by complaints of Portuguese officers concerning lack of transport capability and other supplies in the field. Little or no artillery is being used in Angola or Mozambique, and the nature of the fighting would indicate no future requirement for artillery larger than mortars. Tactical air support also ^{has played} ~~plays~~ a negligible role in the fighting thus far, but the use of helicopters and air-ground support aircraft will probably increase if the fighting increases. Armor also has played a negligible role in the fighting thus far and will continue to be unimportant. The Portuguese would require substantially less POL, ammunition, and ordinance support than would an American force of comparable size. The average Portuguese soldier also requires less food, medical care, and general support than do average American soldiers. The following tabulation contains estimates of the requirements for the Portuguese forces operating in Angola and Mozambique. The tables presume the same level of combat and essentially the same number of Portuguese troops as those presently deployed.

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(Pounds per man per day)

| <u>Type of Action</u> | <u>Infantry</u> |
|---------------------------|-----------------|
| Reserve | 7 |
| Inactive (ready) | 17 |
| Pursuit | 17 |
| Security force | 25 |
| Attack on fixed positions | 32 |

Portuguese forces in Angola today probably require from 7 to 25 pounds per man per day depending on their location. Because the insurgents are not judged capable of holding or establishing a fixed position at this time or even of requiring the Army to function as a security force throughout the entire country, the average daily level of requirement has not been raised to 32 pounds per man. Even under conditions of maximum mobilization, including maximum use of armor, artillery, and aircraft, however, Portuguese requirements would never greatly exceed 32 pounds per man per day.

C. British-Modeled Forces (South Africa and Southern Rhodesia)

Unlike the Portuguese forces, who are already in a combat situation, the forces of South Africa and Southern Rhodesia are garrison and training troops except for occasional incidents. No logistics problem exists for these forces at this time, and it is impossible to derive a meaningful estimate of their current requirements. Accordingly

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the estimates in the following tabulation are for the forces of these countries in a combat situation.

(Pounds per man per day)

| <u>Type of Action</u> | <u>Infantry</u> |
|---------------------------|-----------------|
| Reserve | 9 |
| Inactive (ready) | 22 |
| Pursuit | 22 |
| Security force | 33 |
| Attack on fixed positions | 42 |

These requirements assume a limited action of the type now in progress in Angola, with little or no use of armor and artillery, but greater use of aircraft. Little or no increased mobilization also is assumed. If South Africa or Southern Rhodesia were forced into a maximum effort and the entire population were involved in a fight to preserve their lives and homes, the total daily requirement would increase, but the requirements per man could be decreased to the level of the Portuguese requirements or below.

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APPENDIX E

Sabotage Targets

I. Vulnerability of the Transportation Systems of Southern Africa

The accompanying material discusses transport vulnerabilities in Southern Africa as one aspect of a broader study of the significance of transportation in the area. A general statement on physical and cultural conditions in which interdiction of transportation might be anticipated is followed by units that comment on the vulnerability of transportation systems in six political entities of Southern Africa. Tables of major railroad bridges have been included with each unit. Bridges appearing in these tables are shown on maps of each country. Railroads, highways, and waterways discussed appear on the country maps and on the general map of Southern Africa.

II. Comments on Vulnerability

Transportation in Southern Africa is highly vulnerable to interdiction. Worthwhile targets in physical settings that favor dissident groups are not limited to a few scattered locations but are found in a number of places in every country. Railroads, key elements in the economy and early targets for interdiction, traverse many miles of unprotected territory and cross many large bridges for which no alternates are available. Aside from urban areas and scattered concentrations of rural population, most of the countryside is underpopulated, undeveloped, and difficult for security forces to control. Numerous wooded landscapes, forested stream

valleys, thickly grown marshes, and broad areas of tall brush or high grass afford many opportunities for concealment and present few obstacles to movement on foot. Where adequate roads exist, they may be patrolled in force but off-road areas are relatively free from scrutiny. There are few target areas that do not provide concealment potential for properly indoctrinated personnel -- even from observation by low flying aircraft.

The rail lines that run west from Kolwezi in the Katanga across Angola to the port at Lobito, south from the Copperbelt to Livingstone, Northern Rhodesia, and east from Salisbury, Southern Rhodesia to the port at Beira, Mozambique are representative of routes that traverse relatively isolated, partially wooded countryside. Several long bridges on a single track railroad, widely separated passing sidings, inadequate highways, good concealment and the proximity of international borders are factors that favor attempts to interdict these lines. Very dry areas, such as parts of South-West Africa or Bechuanaland, offer fewer opportunities for concealment, present better working conditions for repair crews, and are generally less favorable in terms of unassisted survival. Dry areas offer more in terms of conditions suitable for air support -- both for dissidents and security forces -- than do wooded areas.

Grasslands are between forests and deserts in terms of area of potentially undetected dissident operations. Grassland areas are traversed by rail lines in the vicinity of Bulawayo, Southern Rhodesia, between Kamina and Port Francqui and between Leopoldville and Matadi, both in the Congo. In these areas movement during

the day is subject to air observation but wooded stream valleys afford a safe haven.

Cross country travel at night under the open sky is practical and is difficult for security forces to control.

Heavily populated areas are no less vulnerable to the actions of dissident groups if the general population is unsympathetic to the mission of local security forces. The semi-skilled industrial worker by day could very well be the man security forces seek after dark. Industrialized areas of the Republic of South Africa, the Copperbelt of Northern Rhodesia, and the Katanga of the Congo, and most ports are not suitable areas of operation for large bands of dissidents but these areas do offer numerous opportunities for small groups that can mingle undetected with the local population. Electric power transmission lines and substations, centralized traffic control cables, switch control cables, and telegraph and telephone lines are all industrial targets whose systematic interdiction could cause traffic delays of serious proportions.

III. The Vulnerability of Transportation in Specific Countries

A. Angola

Railroads are the most important means of long haul freight transport in Angola. The highways act principally as feeders for the railroads. The roads are in general in poor condition and, because of regulations restricting competition with the government-favored railroads, those paralleling the railroads are given the least attention. The three main rail lines are all single track, 3'6" gauge, and are not interconnected. The only international route is the Benguela Railway

which provides a direct outlet on the Atlantic Ocean for the minerals of the Katanga and the Copperbelt. (See Figure 3, map No. 37823)

The critical points on the Benguela Railway are the principal bridges, especially the 512-foot bridge located about 55 miles east of Silva Porto; the major repair shops at Nova Lisboa; and the terminal facilities at Lobito.

There are eight bridges over 125 feet long on the Benguela Railway. Two of these bridges are combined road and rail bridges and would therefore be excellent targets. One of these is 2 miles north-east of the city of Benguela, and consists of ten spans of 34 feet each for a total length of 340 feet. The other is the extremely critical 512-foot bridge over the Cuanza River 55 miles east of Silva Porto. This is a steel through-truss type with four spans of 128 feet each. Destruction of one or more spans of this bridge would effectively sever both rail and highway service. A third major structure is the two-span 262 foot steel bridge over the Rio Cuiba 25 miles east of the Cuanza River.

The Nova Lisboa workshops provide heavy repairs to all equipment and assemble rolling stock. Power is provided by a 1250-kilowatt hydroelectric station located 12 miles south of Nova Lisboa.

A single track leads from the terminal facilities at Lobito to Benguela. There are two bridges over 250 feet long within eight miles on the track between Lobito and Benguela.

The two shorter main lines also are vulnerable to a well-planned sabotage effort. Critical points on the Luanda - Malanje line are the three principal

bridges and the workshops and classification yards at Luanda. On the Dondo branch of this line there are two bridges over 150 feet long. There are two major bridges on the Mocamedes - Vila Serpa Pinto line, one 1,312 feet long two miles northeast of Mocamedes, and the other 656 feet long ten miles northeast of Mocamedes. No information is available on bridges east of Sa da Bandeira.

The only railroad tunnel in Angola on the Mocamedes - Vila Serpa Pinto line is 230 feet long and is approximately 20 miles north of Sa da Bandeira. Important workshops and terminal facilities at Mocamedes are concentrated in a small area and are reached by a single track.

Principal fuel is locally available wood, but some imported coal, fuel oil and gasoline are used. Disruption of fuel supplies would seriously hamper railroad operations. See Table 1 on railroad bridges of Angola.*

B. Congo (Leopoldville)

The railroads of the Congo carry more freight than any other means of transport and during some seasons of the year are the only reliable means of land movement. However, the chief port, Matadi, is not connected directly by rail with the Katanga, the area producing most of the export tonnage. Direct rail access to ports is possible only through connections with rail systems of other countries: the Benguela Railway to Lobito, Angola on the Atlantic; the Rhodesia Railways to Beira and Lourenço Marques, Mozambique on the Indian Ocean; and South African Railways to ports in South Africa and South-West Africa. (See Figure 4, map No. 37824).

* Page 316, below.

Normally to reach Matadi cargoes are carried by rail from the Katanga to Port Francqui by the Compagnie des Chemins de Fer du Bas-Congo au Katanga (BCK), transferred to barges of the Office d'Exploitation des Transports Coloniaux (OTRACO) on the Congo-Kasai river system to Leopoldville, transferred back to rail for transport to Matadi by the OTRACO rail line. An alternate rail-water route is possible by BCK rail to Kamina, Compagnie des Chemins de Fer du Congo Superieur aux Grand Lacs Africains (CFL) rail to Kindu, OTRACO barge to Ponthierville, CFL rail to Stanleyville, OTRACO barge to Leopoldville, and OTRACO rail to Matadi.

OTRACO also operates a short line from Boma to Tshela. The Societe des Chemins de Fer Vicinaux du Congo (VICICONGO) operates an independent line in northeastern Congo that ties into the head of navigation on the Itimbiri River. The track, totaling 522 miles, runs eastward from Aketi to Mungvere and branches to the north at Komba to reach the Uele River at Bondo.

Locomotives in use in the Congo include steam, diesel and electric. Except for electrified sections the BCK uses steam, the CFL uses steam, and diesel equipment -- backed up by steam -- is used by OTRACO and VICICONGO. Coal and wood are burned on the BCK and CFL lines. Most of the coal is imported from Rhodesia but a low grade of coal is mined near Luena, 115 miles north of Tenke. Main workshops are located at Matadi for OTRACO, at Elisabethville for BCK, at Albertville for CFL, and at Aketi for VICICONGO.

The electric locomotives of the BCK operate on 25,000 volt, single phase, 50 cycle current that is obtained from power stations in the Katanga through 110 kv

high lines supplying substations at Elisabethville, Jadotville, Fungurume, Kisanfu, and Kolwezi. The substation at Fungurume was destroyed in January 1963. Although some power is supplied to the Katanga from the Kariba complex in Rhodesia, four hydroelectric plants produce most of Katanga's power: The Le Marinel and Delcommune plants on the Lualaba River north of Kolwezi and the Bia and Francqui units on the Lufira River northeast of Jadotville.

Rail traffic in the Congo is particularly subject to interruption because all lines are single track, and no alternate routes are available. All of the 38 bridges over 150 feet long on the rail systems are potential bottlenecks. Damage to electric facilities in the Katanga could also cause considerable disruption of rail traffic. The line from the Rhodesian border at Sakania to Elisabethville has no major structures but the electrified line from Elisabethville to Tenke has three major bridges. These are key bridges in the Katanga and all three were partially destroyed in January 1963 but have since been reopened to traffic. Blockage of this line not only cuts off exports of minerals to the south but prevents industrial supplies, including Rhodesian coal, from reaching Jadotville and Kolwezi.

The track from Tenke to Dilolo Gare and the junction with the Benguela Railway on the Angolan border crosses four bridges over 150 feet long and five more between 30 and 150 feet long. Between Tenke and the end of the electrification at Luena there are two large bridges and from Luena to the terminus of the line at Port Francqui the line crosses four more major structures. The bridge over the Lubilash River near Kisamba that has three spans of 138 feet each, was partially

destroyed in the 1962-63 fighting and has not been restored to service.

There are eight major bridges on the line leading north from Kamina to Kindu. The 14-span, 1,628 foot bridge over the Lualaba River at Kongolo has been damaged and is out of service. The CFL line between Kabalo and Albertville on Lake Albert has a major bridge over the Liuzi River with one span of 164 feet and four of 43 feet each.

The OTRACO line between Leopoldville and Matadi crosses nine major bridges. Four of these bridges that vary in length from 150 to 316 feet are situated within three route miles near Matadi. On the eastern end of the line, centralized traffic control train operation has been installed on 43 miles of the line between Leopoldville and Sona Beta. There is one major bridge on the OTRACO line between Boma and Tshela and three on the VICICONGO tracks in the northeastern Congo. The CFL line between Stanleyville and Ponthierville crosses three large bridges. Two of these have multiple spans of 43 feet each and one has a 95 foot span.

Inland waterways are well developed in the Congo but are of primary importance only to internal transportation. The primary waterways, the Congo and Kwa-Kasai systems, do not serve ocean ports nor do they reach the Katanga. Rail lines, designed to supplement waterways, fill in unnavigable sections of rivers and reach areas without navigable waterways. At the present time the Katanga is cut off from river transport because of the damage to the Lubilash River bridge on the rail connection to Port Francqui and to the Lualaba River bridge on the Kinou line.

In the eastern Congo, lake services are provided on Lake Albert, Lake Kivu,

Lake Tanganyika, and Lake Mweru. The most important of these services links the CFL rail line at Albertville with the East African Railways at Kigoma, Tanganyika, thus providing a route to Dar es Salaam on the Indian Ocean. The CFL and the East African Railways operate services on Lake Tanganyika. Damage to boats, tugs, barges, or fuel oil storage areas could disrupt inland water transport.

The highways of the Congo were developed primarily as feeders for the rail lines and inland waterways. The best roads are found in the area between Leopoldville and the sea, in the Katanga, and between Lake Tanganyika and Lake Kivu. The road network has not been maintained systematically since independence and is currently in poor condition. With the possible exception of the routes from Leopoldville to Matadi, and from Kolwezi to the Rhodesian border, there are no cross country roads capable of sustained heavy truck traffic. There are five major bridges and a ferry across the Congo River on the road between Leopoldville and the Port of Matadi. Between Kolwezi and Elisabethville there are a number of large bridges several of which can be bypassed without great difficulty. One that was blown out in January 1963, and for which no bypass was found, is the 180 foot bridge over the Lufira River at Guba. Even with all bridges in service, the highways of the Congo could not transport the tonnage normally carried by rail lines and inland waterways. See Table 2 on railroad bridges of Congo (Leopoldville) over 150 feet long.*

C. The Federation of Rhodesia and Nyasaland

The railroads are the most important cross-country carriers in the Federation.

* Page 38, below.

Almost all imports and exports, including minerals, and agricultural and commercial goods are moved by rail. There are two separate 3'6" gauge systems in the Federation. The two systems, Rhodesia Railways and Nyasaland Railways, are tied together in Mozambique by the Trans-Zambesia and the Beira railroads which also serves the Port of Beira. The Rhodesia Railways tracks also join those of the Lourenco Marques Railway in Mozambique to reach the port of Lourenco Marques, those of the South African Railways to the south, and those of the Katanga Railway to the north. (See Figure 5, map No. 37820).

Centralized traffic control train operation is used on portions of the main-line of Rhodesia Railways. At the end of 1962 there were 83 miles to be completed in Southern Rhodesia and 221 miles to be completed in Northern Rhodesia in the plan to operate the entire line between Umtali and Ndola by CTC. Panels of the CTC system are in operation at Livingstone, Salisbury, and Bulawayo and are planned for Umtali, Gwelo, Monze, Broken Hill, and Ndola.

Locomotive repair shops capable of complete overhaul are situated at Bulawayo, Umtali, Livingstone, and Broken Hill. In Nyasaland locomotive repair shops are located at Limbe. Most of the locomotives in use are coal fired and supplied with coal from the Federation's major source of coal at Wankie. Fuel oil is carried by rail from the port at Lourenco Marques for diesel locomotives operating between Malvernia and Somabula and from Beira for those on the Machipanda to Salisbury line. The line between Salisbury and Gwelo also operates with diesel equipment. All of the locomotives on the Nyasaland Railways are coal fired, but some diesels are on

order. Wankie coal is supplemented by supplies from the Moatize coalfields near Benga on the Zambesi River in Mozambique.

The number of bridges over large rivers, the lack of alternate routes, and the easily isolated repair facilities and source of coal make the rail systems of the Federation susceptible to interdiction. There are more than 260 bridges on the Rhodesia Railways system of which 32 are considered major. On the Nyasaland Railways there are 120 bridges including three of more than 150 feet.

Disruption of railroad activity within the Copperbelt of Northern Rhodesia could be effected by destruction of a series of three bridges within a distance of approximately 40 miles. One of these bridges is over the Kafue River and has 5 spans of 75 feet each, a second over the same river has 5 spans varying from 30 to 75 feet each, and a third over the Mwambashi River has 3 spans of 50 feet each.

The flow of minerals south from the Copperbelt could be disrupted by destruction of one or more of a total of nine bridges between Lusaka and Bulawayo. The longest bridge in this series crosses the Kafue River at Kafue and has 13 spans of 100 feet each. The most difficult bridge to replace, however, is the Victoria Falls rail and road bridge which has spans of 62, 500, and 87 feet and is more than 400 feet above the waters of the Zambezi River.

The major source of coal for the Federation is situated at Wankie, about 67 route miles southeast of Victoria Falls. Destruction of large bridges on either side of Wankie would temporarily prevent coal from reaching the railroads and the industry of both Northern Rhodesia and Southern Rhodesia. The only tunnel on the

Rhodesia Railways is on the Wankie bypass; its destruction would slow traffic but would not block the line.

The line leading to the port of Beira has two major bridges between Salisbury and Umtali. Destruction of either of these structures would also isolate the major repair facility of Umtali. The line to Lourenco Marques has three large bridges in Southern Rhodesia. The line between Salisbury and Bulawayo is one of the most heavily travelled in the Federation and crosses six major bridges, all of which have spans of 90 feet or longer.

In Nyasaland, destruction of either of the bridges over the Shire River at Chiromo, two spans of 161 feet each and one span of 258 feet, and at Shire North Station, two spans of 110 feet each and six spans of 50 feet each, would block the rail traffic. The repair shops are at Limbe which is situated between these major bridges.

Highways in the Federation have been designed as feeders for the rail system and with some exception could not be used successfully to take over heavy traffic in the event of railroad stoppages. Most of the through roads parallel the general routes of rail lines and must cross the same major rivers. A notable exception is the all-weather road that links Lusaka and Salisbury directly rather than by the rail route through Victoria Falls and Bulawayo.

Interruption of highway traffic is best accomplished by destruction of bridges over large rivers. Many streams that generally carry little water but flood seasonally are crossed on "low bridges" that are little more than long culverts. During

high water they may be impassable for four or five days at a time. This type of crossing is found on the major highways and during low water some of these may be bypassed without great difficulty. These bridges are gradually being replaced by "high bridges" that are open to traffic at all times.

Along the major highways there are more than 50 high bridges over 150 feet long. Some of these could be bypassed at low water or adjacent rail bridges might be used for road traffic. In some places, such as at Victoria Falls, highway and rail traffic normally cross on the same structures. Bypasses around bridges on major rivers such as the Limpopo, Zambesi, Kafue, or Sabi are not practical. Some of the key highway bridges in Northern and Southern Rhodesia are: The Beitbridge-Bulawayo bridge over the Limpopo River with 14 spans of 111 feet each, the Victoria Falls rail-highway bridge with a main span of 500 feet, the Kafue River bridge south of Lusaka with three spans of 140 feet each, the Otto Beit bridge over the Zambesi River on the route between Lusaka and Salisbury with a main span of 1,050 feet, and the Matetsi River bridge between Wankie and Victoria Falls with four spans of 106 feet each. In Nyasaland the main highway outlet to the Indian Ocean crosses the Ruo and Tuchila Rivers over bridges that each have spans of 100 feet. The highway network of the Federation, like the railroads, offers little opportunity for alternate routing. Major internal routes as well as those leading to ports serving the Federation could be interdicted by destruction of highway bridges. The following list of railroad bridges in the Federation that are 150 feet or longer are shown in Table 3.*

* Page 324, below.

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D. Mozambique

Transportation routes across Mozambique provide access to the sea for the north-eastern part of the Republic of South Africa, the landlocked Federation of Rhodesia and Nyasaland, and Katanga Province in the Republic of the Congo. Railroads are the most important method of transport because of the nature of traffic hauled, the inadequacy of the highway system, and the little use that is made of the extensive inland waterways. Highways are increasing in importance but except for a few roads in the vicinity of the ports they are unsurfaced and could not handle sustained heavy traffic. (See Figure 6, map No. 37819).

Five railroad companies operate service on widely separated rail systems in Mozambique. In the south the Lourenco Marques Railroad (Caminho de Ferro de Lourenco Marques) systems has two international railroad connections, one with the Republic of South Africa and the other with Southern Rhodesia. In the north the Mozambique Railroad (Caminho de Ferro de Mocambique) operates an isolated line running inland from Lumbo and Macala. The third system serves the port of Beira with three inter-connected lines: the Beira Railroad (Caminho de Ferro de Beira) that has an international connection with Southern Rhodesia; the Tete Railroad (Caminho de Ferro de Tete) leading from the Moatize coalfields; and the only privately owned railroad in Mozambique, the Trans-Zambesia Railway Co., Ltd., which joins the Central African Railway en route to Nyasaland.

The main lines are all 3'6" gauge and are single track except for six miles of double track leading south from Lourenco Marques. There is a total of 280 bridges

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over 12 feet long, of which 26 are over 150 feet long. The longest is the 12,064 foot long Zambezi River Bridge north of Sena, the longest bridge on the African continent.

From Lourenco Marques, capital and main port of Mozambique, rail lines extend in three directions -- southwest through Goba to the Swaziland border, west to Ressano Garcia, and north to Malvernia. Lourenco Marques' facilities include railroad workshops, an enginehouse, classification yard, loading equipment, and oil tanks. There are at least 13 oil tanks in Lourenco Marques proper, and 21 more at Matola Petroleum Pier six miles to the west.

The line leading southwest to Goba has one principal bridge on it, the 1,181-foot long steel structure over the Rio Umbeluzi, 15 miles north of Goba. At Goba the Mozambique highway service connects the line with the South African highway service.

The important line from Lourenco Marques to Ressano Garcia, where there is a connection with the South African Railways, provides Pretoria and Johannesburg with their closest outlet to the sea. There are 14 bridges in the 55 route miles in Mozambique -- one a principal structure of 305 feet situated 15 miles northwest of Moamba. The tie to the Lourenco Marques - Malvernia line extends northeast from the junction at Moamba.

Southern Rhodesia and Lourenco Marques are linked by the line that has its international connection at Malvernia. There are three bridges over 150 feet on this line with the principal target the 1,380-foot long President Carmona Bridge

over the Rio Incomati. This is a combined rail and road bridge and would therefore disrupt truck transport as well as rail. The other two bridges on this important route are 689 feet long and 2,010 feet long. Lourenco Marques and Beira are connected by rail only via the Federation of Rhodesia and Nyasaland.

Beira is the second major port of Mozambique and is served by two rail lines with international connections: one to Southern Rhodesia and one to Nyasaland. It is also the major east coast port for Katanga Province of the Republic of the Congo. In the port complex there are a classification yard, a railroad workshop, an enginehouse, and loading and unloading equipment. A single track rail line leads from the port and in one place there are 34 oil storage tanks within 1,200 feet of this track.

The Beira-Machipanda line leading to Southern Rhodesia has 53 bridges on its 196 route miles -- and average of over one bridge every four route miles. Seventeen of these are principal structures and nine, totaling 8,460 feet in length, are in one 11-mile stretch across the Rio Fungue mud flats. There are four more bridges over 150 feet long within 40 miles of the Rhodesian border. The main repair shops are at Machipanda.

The rail line to the Nyasaland border branches off the Beira-Machipanda line at Dondo 18 miles northwest of Beira. The Zambezi River railroad bridge, north of Sena, is the only reliable manner of crossing the Zambezi River in this region. The bridge also carries motor vehicles across the river on railroad flat cars. This line is important not only for the international traffic from Nyasaland but also

for the coal it carries from the Moatize coalfields. There are three other principal bridges between Moatize and the junction at Donana: the most important is the 263-foot bridge over the Rio Goma 31.7 miles northwest of Donana. Other critical points on this line are the shops at Inhaminga and Sena, and the junction and shop at Donana.

In northern Mozambique a railroad serves the agricultural region with ports at Nacala and Lumbo-Mocambique. The line has now been extended as far west as Congerenga and has three principal bridges: 315-foot over Rio Luria, 20 miles east of Cuamba; 345-foot over Rio Nalume, 45 miles east of Cuamba; and 490-foot over Rio Monapo near Monapo Station. Other important targets would be the railroad shops at Nampula and the terminal yard at Nacala. (See Table 4 of railroad bridges in Mozambique over 150 feet in length*).

E. South Africa

The rail net operated by the South African Railways -- that serves the Republic of South Africa, South-West Africa and Bechuanaland -- is a sophisticated system that presents numerous vulnerable targets. The fairly dense network in the Republic provides alternate routes in the event of damage to individual lines. Because of the heavy traffic carried by these lines, however, service could be disrupted by damage to power sources, transformer stations, or transmission lines that feed energy to electrified sections or by destruction of centralized traffic control (CTC) and other signaling systems that are required to maintain the customary density of traffic. Disruption of fuel supplies for diesel and coal burning

* Page 330, below.

Locomotives could also reduce the capacity of the system but in an emergency both steam and diesel equipment could replace electric locomotives in critical areas. (See Figure 7, map No. 37821).

In South-West Africa the network is largely single track and no alternate routes are available. Locomotives presently in use are all diesel on this line because of the shortage of water and the long distance from sources of coal. The line that crosses Bechuanaland to reach Bulawayo in Southern Rhodesia is also single track in a very dry area.

Damage to coal mines, petroleum storage facilities, port facilities, locomotive repair facilities, and freight yards could possibly curtail rail traffic to some extent, but systematic destruction of bridges and tunnels in addition to damage to supporting facilities could seriously hamper the utility of the rail system. Damage to a series of bridges on a single line creates bottlenecks and materially slows repair work. Destruction of mainline structures such as the 1,430 foot bridge over the Orange River near Norvalspoor or the 1,580 foot bridge over the Vaal River near Vereeniging would seriously congest rail traffic. If properly executed, destruction of a series of bridges could halt through movement of rail traffic for a time.

The ports of South Africa and South-West Africa and Lourenco Marques in Mozambique are relatively isolated from the main network of the South African Railway system. Destruction of spans of seven bridges selected from a total of 40 would effectively cut off these ports from the heart of the rail system.

Durban, the principal port, is served by a single rail line that crosses four major bridges and passes through nine tunnels that cannot be by-passed. Cape Town, another principal port, may be approached by two lines, one of which has two bridges and a tunnel and the second four major bridges and four tunnels. Both Walvis Bay and Luderitz, secondary ports in South-West Africa, could be isolated from the Republic by destruction of portions of a single bridge 3,514 feet long. There is one tunnel on the Walvis Bay line. The port of Port Elizabeth could be isolated by destruction of two of three bridges, and East London by a single bridge near the port, by two or three bridges on approaches to the port or by two of three tunnels. Destruction of two of four bridges or two of five tunnels could cut off the minor port of Mosselbaai.

The secondary port of Simonstown and the minor port at Saldanaha are served by the same approach routes that serve Cape Town. Port Shepstone a minor port, is approached through Durban and could be isolated from Durban by damage to one or more of nine bridges. Traffic from the Republic to Lourenco Marques or to Southern Rhodesia could be cut off in the Republic by destruction of one 750 foot bridge near the border or by two of a possible five bridges some distance from the border. The line linking Southern Rhodesia and the Republic that passes through Bechuanaland crosses four major bridges each of which has at least two spans 100 feet in length.

The highway networks of the Republic, South-West Africa, and Bechuanaland serve an important role in short haul traffic but do not carry a significant

percentage of heavy, long haul traffic. Many of the bridges are narrow or have limited load capacities and some are under water after heavy rainfall. Additional bridges, ferries, or fords are available as alternates for most bridges but some key structures do not have by-passes readily available. Such structures are the 1,369 foot Vaal River Bridge 18 miles south of Vereeniging or the 150 foot Kaffer-rivier Bridge 17 miles north of Reddersbruy. These two bridges are on routes that parallel rail lines. There are an additional 34 major road bridges that parallel rail bridges.

There are an estimated 10,000 rail bridges of significant size in the South African Railways system. Seventy-one of these structures are over 150 feet in length. (See Table 5*).

F. Tanganyika

Railroads operated by the East African Railways are the most important means of long-haul transport in Tanganyika. Highways and waterways provide feeder and transshipment service between rail stations and outlying areas. The two important rail lines are the Central line (Dar es Salaam - Kigoma) and the Tanga line (Tanga - Arusha). The gauge of all the railroads in Tanganyika is 3' 3 3/8" which is different from the standard African gauge of 3'6". (See Figure 8, map No. 37822).

There is not at present a connection between the two main rail lines in Tanganyika. A connection is planned however, from Mnyusi on the Tanga line and

* Page 334, below.

Ruvu on the Central line. The Tanga line in the north is connected with the railroad system in Kenya and thence to the port of Mombasa. There are few good highways in the country, especially in the south-central and western areas. Transport of large quantities of freight via the highways would be restricted by numerous fords, low-capacity ferries, narrow and low-capacity bridges, narrow stretches of road, sharp curves, and steep grades. Weather factors such as floods during the rainy season, dust during the dry season, and the intense heat also afflict highway transport.

Inland waterway transport is important but is confined to lakes which are not connected; however, by utilizing railroad-waterway routes, transshipment can be made to the Republic of the Congo, Uganda, and Kenya.

The Tanga line extends north-westward 272 route miles from the port of Tanga to Arusha. At Kahe, 206 miles northwest of Tanga, a branch extends to the Kenya main line. There are six bridges over 100-feet long on the line, two of them between Kahe and Tanga. These are close to Korogwe, about 45 miles west of Tanga. Because of the alternate route through Kenya leading to the sea at Mombasa it also would be necessary to damage the bridge eight miles northeast of Kahe or one of the four in Kenya in order to block traffic with the port.

The Central line extends east-west for 779 route miles and is part of an international route from Tanganyika to the Congo via Lake Tanganyika. Because of the difference in gauge between the railroads of Tanganyika and the Congo there is no rail ferry between Kigoma, Tanganyika and Albertville, Congo. There are 116

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bridges over 10-feet long on the Central line, 11 of these are 100 feet or longer. Critical points on the line are the two 100-foot long bridges near Kilosa and Morogoro, the terminal facilities and major repair shop at Dar es Salaam, and the transshipment facilities at Kigoma. Destruction of selected bridges could sever transportation of this rail line for a lengthy period.

The import port of Dar es Salaam has the following facilities: two classification yards, a freight yard, major and minor repair shops, 14-stall roundhouse, passenger car sheds, freight sheds, scales, oil, coal, water, and sidings to wharf. There are at least 25 oil tanks at Dar es Salaam and large stocks are usually maintained. At Kigoma there is a minor repair shop, roundhouse, freight sheds, oil, and water besides the transshipment facilities.

A branch line extends from Tabora on the Central line to the lake port of Mwanza on Lake Victoria. There are facilities at Mwanza for transshipment of freight to Uganda and Kenya. Within a distance of 40 miles in the vicinity of Shinyanga there are three bridges over 100 feet long.

Another branch extends south-westward from Kallua servicing the lead mines at Mpanda. There are no bridges of any great length on this branch but there are 16 bridges of 10 feet or longer spread along the 131 route miles.

One other potential target on the Tanganyika railroads is the many oil tank cars that use the lines because of the need for disbursing the imported oil from the ports for use as fuel oil for the locomotives. Similarly water is hauled in tank cars to combat severe seasonal droughts. (See Table 6*, bridges of 99').

* Page 342, below.

SECRETARY OF DEFENSE

Table 1
Railroad Bridges - Angola

| Structure Number (See Fig. 3) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|-----------------------------|------------------|---------------------|--------------------|--------|---------|--|
| | | | Material | Type | Number | | |
| 1 | 45 miles W of Villa Salazar | 198 | reinforced concrete | n.a. | n.a. | 1 | over stream |
| 2 | 30 miles W of Villa Salazar | est. 194 | steel | through truss | 1 | 1 | over Rio Luinha |
| | | | n.a. | deck arch | 1 | est. 30 | |
| 3 | 22 miles E of Villa Salazar | 330 | steel | half-through truss | 3 | 1 | over Rio Lucala |
| 4 | 15 miles N of Dondo | 180 | steel | n.a. | n.a. | 1 | over Rio Lucala |
| 5 | 3 miles N of Dondo | 165 | steel | plate girder | 5 | 1 | over stream. Combined rail and road bridge |
| 6 | 7 miles S of Lobito | 276 | steel | through truss | 1 | 1 | over Rio Catumbela |
| 7 | 2 miles NE of Benguela | 340 | n.a. | deck girder | 10 | 1 | over Rio Cavaco. Combined rail and road bridge |
| 8 | 10 miles SE of Benguela | 380 | steel | deck truss | 5 | 1 | over Rio League. Bridge on curve |

SECRET

Table 1 - (Continued)

Railroad Bridges - Angola

| Structure Number (See Fig. 3) | Location Mileage Approx. | Total Length Ft. | Spans | | Length Ft. | Tracks | Remarks |
|----------------------------------|---------------------------|------------------|---------------------|---------------|------------|--------|--|
| | | | Material | Type | | | |
| 9 | 55 miles E of Silva Porto | 512 | steel | through truss | 4 128 | 1 | over Rio Cuanza. Combined rail and road bridge |
| 10 | 80 miles E of Silva Porto | 262 | steel | through truss | 2 131 | 1 | over Rio Cuiba |
| 11 | 2 miles NE of Mocamedes | 1312 | reinforced concrete | deck girder | 30 43.7 | 1 | over Rio Pero. Combined rail and road bridge |
| 12 | 10 miles NE of Mocamedes | 656 | reinforced concrete | deck girder | 15 43.7 | 1 | over Rio Giraul. Combined rail and road bridge |

SECRET
Table 2

Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mileage Approx. | Total Length Ft. | Spans | | Material | Tracks | Remarks |
|----------------------------------|----------------------------|------------------|------------------------------|--------|----------|--------|------------------------|
| | | | Type | Number | | | |
| 1 | 10 miles W of Jadotville | 169 | through truss | 1 | n.a. | 1 | over Lufira River |
| 2 | 20 miles NW of Jadotville | 156 | through truss deck girder | 1 2 | n.a. | 1 | over Mulungwishi River |
| 3 | 27 miles NW of Jadotville | 172 | through truss | 2 | n.a. | 1 | over Dikuluwe River |
| 4 | 80 miles W of Jadotville | 342 | through truss | 2 | steel | 1 | over Isaalaba River |
| 5 | 160 miles E of Dilolo Gare | 171 | through truss | 1 | steel | 1 | over Labudi River |
| 6 | 140 miles E of Dilolo Gare | 171 | through truss | 1 | steel | 1 | over Mukulweshi River |
| 7 | 35 miles E of Dilolo Gare | 171 | through truss | 1 | steel | 1 | over Lalus River |
| 8 | 60 miles S of Bukema | 169 | through truss | 1 | n.a. | 1 | over Labudi River |
| 9 | 35 miles S of Bukema | 169 | through truss | 1 | n.a. | 1 | over Kalule-Nord River |

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Table 2 - (Continued)

Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mile- age Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|--------------------------------|------------------------|----------|---|-------------|--------|--|
| | | | Material | Type | Number | | |
| 10 | at Bukama | 828 | n.a. | through bow- string deck girder (both on masonry piers and abut- ments) | 4 | 1 | over Luilaba River |
| 11 | 122 miles NW of Kamina | 446 | steel | through truss deck type approach spans (both on masonry piers and abut- ments) | 3 2 | 1 | over Lubilashi River. Restora- tion anticipated by fall of 1963. |
| 12 | 150 miles NW of Kamina | 276 | n.a. | through truss | 2 | 1 | over Luilab River |
| 13 | 100 miles SE of Lulusabourg | 236 | n.a. | through truss | 1 | 1 | over Bushimale River |
| 14 | 7 miles S of Kabalo | 2439 | steel | through truss deck girder deck girder (on masonry piers and abutments) | 2 2 8 | 1 | rail/road bridge over Luilaba River |
| 15 | 43 miles E of Kabalo | 336 | steel | through truss girder deck plate girder (on masonry or concrete piers and abutments) | 1 4 | 1 | over Luizi River |

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Table 2 - (Continued)
Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|----------------------------------|------------------|---------------------|--|--------|------------------|---|
| | | | Material | Type | Number | | |
| 16 | 24.5 miles N of Kabalo | 158 | n.s. | deck plate girder | 4 | 39 | 1 over Lukuga River |
| 17 | 25 miles N of Kabalo | 529 | steel | through truss suspension (on concrete piers and abutments) | 2 1 | 149 230 | 1 over Lukuga River |
| 18 | 33 miles N of Kabalo | 232 | steel | through truss lattice deck girder (on concrete piers and abutments) | 1 1 | 131 96 | 1 over Laufubuta River |
| 19 | 52 miles N of Kabalo at Kongolic | 1628 | reinforced concrete | deck type | 1 8 | 52 112 230 | 1 road/rail bridge over Luulaba River. Restoration not anticipated for at least 2 years. |
| 20 | 20 miles W of Kasongo | 338 | steel | through truss plate deck girder (on masonry abutments and masonry and metal piers) | 1 4 | 164 43 | 1 over Laufubu River |

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Table 2 - (Continued)

Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|----------------------------|------------------|----------|---|-------------|----------------|-------------------------|
| | | | Material | Type | Number | | |
| 21 | 60 miles S of Kindu | 183 | n.a. | plate girder deck lattice girder deck (on masonry abutments and piers) | 2 1 | 43 98 | 1 over Lowe River |
| 22 | 38 miles S of Kindu | 338 | steel | through truss plate deck girder (on masonry abutment and masonry and metal piers) | 1 4 | 164 43 | 1 over Ineki River |
| 23 | 24 miles S of Stanleyville | 190 | n.a. | lattice girder plate girder (on masonry abutment and piers) | 1 1 1 | 43 95 43 | 1 over Biraro River |
| 24 | 12 miles S of Stanleyville | 192 | n.a. | plate girder deck (on masonry abutments and steel pylons piers) | 4 | 43 | 1 over Malinda River |

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Table 2 - (Continued)

Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|---------------------------|------------------|---------------------------|--|--------|----------|--|
| | | | Material | Type | Number | | |
| 25 | 5 miles S of Stanleyville | 241 | n.a. | plate girder deck (on masonry abutments and masonry piers topped by steel pylons) | 5 | 43 | over Mongamba River |
| 26 | 80 miles E of Buta | 250 | steel | through truss girder | 3 | 82 | Zobia Bridge over Zobia River |
| 27 | 26 miles E of Aketi | 250 | steel | through truss girder | 3 | 82 | Gams Bridge over Likati River road/rail bridge |
| 28 | 20 miles S of Bando | 230 | steel | through truss girder | 2 1 | 82 66 | road/rail bridge over Libogo River |
| 29 | 17 miles NE of Tysville | 328 | steel | through truss | 2 | 164 | over Inkisi River |
| 30 | 26 miles W of Tysville | 158 | steel reinforced concrete | deck girder arch | 2 1 | 66 26 | over stream |
| 31 | 38 miles W of Tysville | 164 | steel | half-through truss | 1 | 164 | over water course |

SECRET//NO FOREIGN DISSEM

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Table 2 - (Continued)

Railroad Bridges - Congo (Leopoldville)

| Structure Number (See Fig. 4) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks | |
|----------------------------------|--------------------------|------------------|------------------------------|---|--------|-----------|---------|------------------------------------|
| | | | Material | Type | Number | | | |
| 32 | 42 miles W of Thysville | 262 | steel | half-through truss | 1 | 262 | 1 | over Kivilu River |
| 33 | 7.5 miles E of Matadi | 263 | steel | half-through truss plate girder approach | 1 2 | 131 66 | 1 | over Lufu River |
| 34 | 6.4 miles E of Matadi | 150 | steel reinforced concrete | half-through truss arch | 1 2 | 98 26 | 1 | over stream |
| 35 | 6 miles E of Matadi | 316 | n.a. reinforced concrete | deck girder deck arch | 4 2 | 66 26 | 1 | over Ravine du Diable |
| 36 | 4.5 miles E of Matadi | 262 | steel | through truss (on masonry abutments) | 1 | 262 | 1 | over Pozo River |
| 37 | 3.5 miles E of Matadi | 294 | steel | truss deck | 6 | 49 | 1 | over water course |
| 38 | 38 miles N of Boma | 197 | steel | through truss | 1 | 197 | 1 | road/rail bridge over Lukula River |

Table 3

Railroad Bridges - Federation of Rhodesia and Nyasaland

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|----------|---|--------|--------|-------------------------------|
| | | | Material | Type | Number | | |
| 1 | at Salima | 350 | n.a. | through truss girder | 5 1 | 1 | over Lintipe River. Nyasaland |
| 2 | 45 miles N of Blantyre | 420 | n.a. | through truss girder | 2 4 | 1 | over Shire River. Nyasaland |
| 3 | 50 miles S of Blantyre | 580 | n.a. | through truss girder (on concrete piers and abutments) | 2 1 | 1 | over Shire River. Nyasaland |
| 4 | 20 miles W of Untali | 315 | steel | deck type girder (on concrete piers and abutments) | 1 3 | 1 | over Odzi River |
| 5 | 60 miles NW of Untali | 180 | steel | deck type girder (on concrete piers and abutments) | 3 | 1 | over Lesapi River |
| 6 | 5 miles W of Shamva | 175 | n.a. | through truss girder | 1 1 | 1 | over Poorte River |
| 7 | 40 miles NW of Salisbury | 200 | n.a. | through truss girder (on concrete piers and abutments) | 2 | 1 | over Gwebi River |

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 Table 3 - (Continued)

Railroad Bridges - Federation of Rhodesia and Nyasaland

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|----------|--|--------|-----------|--------------------------|
| | | | Material | Type | Number | | |
| 8 | 8 miles S of Kildonan | 160 | n.a. | deck type girder (on concrete piers and abutments) | 2 1 | 50 60 | 1 over Makwadzi River |
| 9 | 20 miles SE of Zawi | 400 | n.a. | through truss girder (on concrete piers and abutments) | 4 | 100 | 1 over Kuyani River |
| 10 | 20 miles W of Salisbury | 360 | steel | deck type girder | 4 | 90 | 1 over Kuyani River |
| 11 | 60 miles W of Salisbury | 300 | n.a. | semi-through Warren truss girder (on concrete and masonry piers and abutments) | 3 | 100 | 1 over Umvuli River |
| 12 | 8 miles SW of Gatooms | 200 | n.a. | through truss girder (on concrete and masonry piers and abutments) | 2 | 100 | 1 over Umsveswe River |
| 13 | 22 miles N of Que Que | 429 | n.a. | both through-type and deck-type, (on concrete piers and abutments) | 4 1 | 100 29 | 1 over Umwati River |

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Table 3 - (Continued)

Railroad Bridges - Federation of Rhodesia and Nyasaland

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|----------------------------|------------------|----------|--|--------|----------|----------------------------|
| | | | Material | Type | Number | | |
| 14 | 4 miles N of Que Que | 364 | n.a. | through truss girder (on concrete piers and abutments) | 3 | 91 | 1 over Sebakwe River |
| 15 | 10 miles S of Que Que | 300 | n.a. | deck-type truss girder (on concrete piers and abutments) | 3 | 100 | 1 over Que Que River |
| 16 | 5 miles N of Fort Victoria | 180 | n.a. | through truss girder and deck type girder (both on concrete piers and abutments) | 1 | 100 | 1 over Umhagaashe River |
| 17 | 25 miles SE of Shabani | 150 | n.a. | deck-type girder | 3 | 50 | 1 over Singvesi River |
| 18 | 10 miles SE of Shabani | 360 | n.a. | deck-type girder (on concrete piers and abutments) | 4 | 90 | 1 over Ngezi River |
| 19 | 30 miles NW of Shabani | 140 | n.a. | deck-type girder (on concrete piers and abutments) | 2 | 40 60 | 1 over Kashambi River |

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Table 3 - (Continued)

Railroad Bridges - Federation of Rhodesia and Nyasaland

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|----------|---|--------|--------|----------------------------|
| | | | Material | Type | Number | | |
| 20 | 35 miles SE of Bulawayo | 150 | n.a. | semi-through truss girder (on masonry piers and abutments) | 2 | 75 | 1 over Sese River |
| 21 | 30 miles SE of Bulawayo | 210 | n.a. | deck-type girder (on concrete piers and abutments) | 3 | 70 | 1 over Umzingwane River |
| 22 | 20 miles SE of Bulawayo | 150 | n.a. | semi-through truss girder (on masonry piers and abutments) | 2 | 75 | 1 over Knyeme River |
| 23 | 65 miles NW of Bulawayo | 150 | n.a. | through truss girder (both on concrete piers and abutments) | 1 | 100 | 1 over Umguza River |
| 24 | 88 miles NW of Bulawayo | 300 | n.a. | through truss girder (on concrete piers and abutments) | 3 | 100 | 1 over Gwaai River |

Railroad Bridges - Federation of Rhodesia and Nyasaland

Table 3 - (Continued)

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks | |
|----------------------------------|---------------------------|------------------|------------------|---|--------|--------|---------|--|
| | | | Material | Type | Number | | | |
| 25 | 10 miles SE of Wankie | 208 | n.a. | through truss girder | 2 | 75 | 1 | over Lakosi River |
| | | | | deck-type girder (both on concrete piers and abutments) | 2 | 29 | | |
| 26 | 5 miles W of Wankie | 400 | n.a. | through truss girder (on masonry piers and abutments) | 4 | 100 | 1 | over Deha River |
| 27 | 35 miles W of Wankie | 169 | n.a. | deck type girder | 1 | 42 | 1 | Kasiba Bridge over Doomba River |
| | | | | | 1 | 40 | | |
| | | | | | 3 | 29 | | |
| 28 | 25 miles SE of Livingston | 440 | n.a. | through truss girder | 4 | 100 | 1 | over Metetsi River |
| | | | | deck type girder (both on concrete piers and abutments) | 2 | 20 | | |
| 29 | 5 miles S of Livingston | 670 | steel arch, face | deck type truss anchored into gorge | 1 | 62 | 1 | Victoria Falls rail/road bridge over Zambezi River Gorge |
| | | | | | 1 | 500 | | |
| | | | | | 1 | 87 | | |

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Table 3 - (Continued)

Railroad Bridges - Federation of Rhodesia and Nyassaland

| Structure Number (See Fig. 5) | Location Mileage Approx. | Total Length Ft. | Spans | | Material | Length Ft. | Tracks | Remarks |
|----------------------------------|----------------------------|------------------|--|-------------|----------|----------------|--------|----------------------|
| | | | Type | Number | | | | |
| 30 | 80 miles NE of Livingstone | 200 | through truss girder (on masonry abutments) | 2 | n.a. | 100 | 1 | over Kalomo River |
| 31 | at Kafue | 1300 | through truss girder (on concrete piers and abutments) | 13 | n.a. | 100 | 1 | over Kafue River |
| 32 | 20 miles NW of Ndola | 375 | deck type girder (on concrete piers and abutments) | 5 | n.a. | 75 | 1 | over Kafue River |
| 33 | 20 miles SE of Chingola | 150 | deck type girder (on concrete piers and abutments) | 3 | n.a. | 50 | 1 | over Mwaubashi River |
| 34 | 15 miles SE of Chingola | 265 | deck type girder (on concrete piers and abutments) | 3 | n.a. | 75 40 | 1 | over Kafue River |
| 35 | 5 miles N of Chingola | 235 | deck type girder (on concrete piers and abutments) | 1 2 2 | n.a. | 75 50 30 | 1 | over Kafue River |

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Table 4

Railroad Bridges - Mozambique

| Structure Number (See Fig. 6) | Location Mileage Approx. | Total Length Ft. | Spans | | Material | Type | Number | Length Ft. | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|-------|------|------------------------------------|--------------------|--------|------------|--------|--|
| | | | n.s. | n.s. | | | | | | |
| 1 | 15 miles NW of Moamba | 305 | | | steel | n.s. | n.s. | n.s. | 1 | over stream |
| 2 | 50 miles NE of Moamba | 1380 | | | reinforced concrete | deck arch | 14 | 98.5 | 1 | over Rio Incomatic. President Carmona Bridge largest concrete bridge in Africa, serves rail and road |
| 3 | 12 miles S of Canicado | 689 | | | steel | half-through truss | 3 | n.s. | 1 | over Rio Mozimchopes |
| 4 | 15 miles W of Canicado | 2010 | | | steel deck and timber construction | n.s. | 67 | 30 | 1 | over Limpopo River |
| 5 | 15 miles N of Goba | 1181 | | | steel | through truss | 6 | 196 | 1 | over Rio Umbeluz. |
| 6 | 13 miles NW of Dondo | 426 | | | reinforced concrete | deck girder | 23 | 18.5 | 1 | over swampy ground |
| 7 | 13.8 miles NW of Dondo | 1702 | | | reinforced concrete | deck girder | 92 | 18.5 | 1 | over swampy ground |

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Table 4 - (Continued)

Railroad Bridges - Mozambique

| Structure Number (See Fig. 6) | Location Mile- age Approx. | Total Length Ft. | Spans | | | | Tracks | Remarks |
|----------------------------------|-------------------------------|---------------------|---------------------|---|-------------|----------------|-------------|--------------------|
| | | | Material | Type | Number | Length Ft. | | |
| 8 | 15.1 miles NW of Dondo | 426 | reinforced concrete | deck girder | 23 | 18.5 | 1 | over swampy ground |
| 9 | 17.9 miles NW of Dondo | 800 | steel | through truss | 5 | 160 | 1 | over River Fungue |
| 10 | 20.1 miles NW of Dondo | 851 | reinforced concrete | deck girder | 46 | 18.5 | 1 | over swampy ground |
| 11 | 21.3 miles NW of Dondo | 851 | reinforced concrete | deck girder | 46 | 18.5 | 1 | over swampy ground |
| 12 | 24 miles NW of Dondo | 851 | reinforced concrete | deck girder | 46 | 18.5 | 1 | over swampy ground |
| 13 | 25 miles NW of Dondo | 851 | reinforced concrete | deck girder | 46 | 18.5 | 1 | over swampy ground |
| 14 | 26 miles NW of Dondo | 1702 | reinforced concrete | deck girder | 92 | 18.5 | 1 | over swampy ground |
| 15 | 40 miles E of Umtali | 250 | steel | deck girder deck girder continuous deck truss | 1 2 2 | 30 60 50 | 1 1 1 | over stream |

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Table 4 - (Continued)

Railroad Bridges - Mozambique

| Structure Number (See Fig. 6) | Location Mileage Approx. | Total Length Ft. | Material | | Spans | | Number | Length Ft. | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|----------|-------------------------|-------------------------|------------|---------|------------|--------|---|
| | | | Material | Type | Type | Length Ft. | | | | |
| 16 | 34.9 miles NE of Umtali | 265 | steel | deck girder | deck girder | 1 | 30 | 1 | 1 | over stream |
| | | | | deck girder | deck girder | 1 | 60 | 1 | 1 | |
| | | | | deck girder | deck girder | 1 | 75 | 1 | 1 | |
| | | | | deck girder | deck girder | 1 | 60 | 1 | 1 | |
| | | | | deck girder | deck girder | 1 | 40 | 1 | 1 | |
| 17 | 20.1 miles NE of Umtali | 200 | steel | half-through truss | half-through truss | 2 | 100 | 1 | 1 | over stream |
| 18 | 20 miles NE of Umtali | 196 | steel | half-through truss | half-through truss | 2 | 48 | 1 | 1 | over stream |
| | | | | half-through truss | half-through truss | 1 | 100 | 1 | 1 | |
| 19 | 4 miles S of Vila Fontes | 450 | n.a. | n.a. | n.a. | 5 | 90 | 1 | 1 | over Rio Zangue |
| 20 | 0.6 miles NE of Sena | 12,064 | steel | bowstring through truss | bowstring through truss | 33 | 263 | 1 | 1 | over Zambezi River. Longest bridge in Africa. Steel spans of unknown number and length total 1828 ft. |
| | | | | n.a. | n.a. | n.a. | remarks | | | |
| | | | | n.a. | n.a. | 7 | 165 | | | |
| | | | | n.a. | n.a. | 6 | 67 | | | |
| 21 | 31.7 miles NW of Donana | 263 | n.a. | n.a. | n.a. | n.a. | n.a. | 1 | 1 | over Rio Goma |
| 22 | 85 miles NW of Donana | 197 | n.a. | n.a. | n.a. | n.a. | n.a. | 1 | 1 | over Rio Malica |

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Table 4 - (Continued)

Railroad Bridges - Mozambique

| Structure Number (See Fig. 6) | Location Mileage Approx. | Total Length Ft. | Spans | | | Length Ft. | Tracks | Remarks |
|----------------------------------|---|------------------|------------------------|-----------|--------|------------|--------|----------------------|
| | | | Material | Type | Number | | | |
| 23 | 105 miles NW of Donana | 197 | n.a. | n.a. | n.a. | n.a. | 1 | over Necombeze River |
| 24 | 22.5 miles E of Cuamba (Nova Freixo) | 315 | n.a. | n.a. | n.a. | n.a. | 1 | over Rio Iurio |
| 25 | 45 miles E of Cuamba (Nova Freixo) | est. 345 | reinforced concrete | beam | n.a. | n.a. | 1 | over River Nalume |
| 26 | 1 mile NW of Monapo | est. 490 | reinforced concrete | beam arch | 3 | 108 | 1 | over River Monapo |

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Table 5

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mile- age Approx. | Total Length Ft. | Spans | | Length Ft. | Tracks | Remarks |
|----------------------------------|-------------------------------|---------------------|---------------------|----------------------|---------------|--------|--------------------|
| | | | Material | Type | | | |
| 1 | 95 miles E of Worcester | est. 500 | reinforced concrete | deck arch | est. 50 | 1 | Buffelsrivier |
| 2 | 170 miles E of Worcester | est. 840 | steel | through truss | 7 | 1 | Leeu (stream) |
| 3 | 50 miles N of Kimberly | est. 1580 | steel | n.a. | 10 | 1 | Vaal River |
| 4 | 20 miles NW of Kimberly | 900 | steel | through truss | 6 | 2 | Vaal River |
| 5 | 10 miles N of Port Elizabeth | 450 | steel | n.a. | 3 | n.a. | Swartkops (stream) |
| 6 | 25 miles N of Port Elizabeth | 616 | reinforced concrete | n.a. | 11 | n.a. | Sundays River |
| 7 | 75 miles N of Port Elizabeth | 480 | reinforced concrete | open spandrel arches | 8 | 1 | Klein-Vis (stream) |
| 8 | 130 miles N of Port Elizabeth | 360 | reinforced concrete | open spandrel arches | 6 | n.a. | Great Fish River |
| 9 | 130 miles N of Port Elizabeth | 360 | reinforced concrete | open spandrel arches | 6 | n.a. | Great Fish River |

SECRET
 Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | Number | Length Ft. | Tracks | Remarks |
|----------------------------------|-------------------------------|------------------|---------------------------|-------------------------|--------|------------|--------|--|
| | | | Material | Type | | | | |
| 10 | 130 miles N of Port Elizabeth | 280 | reinforced concrete | deck span | 5 | 56 | n.a. | Great Fish River |
| 11 | 130 miles N of Port Elizabeth | 280 | reinforced concrete | deck span | 5 | 56 | n.a. | Great Fish River |
| 12 | 130 miles N of Port Elizabeth | 300 | reinforced concrete | arch | 5 | 60 | n.a. | Great Fish River |
| 13 | 30 miles SW of Springfontein | 1430 | steel | truss | 11 | 130 | 1 | Orange River |
| 14 | 15 miles NE of Bloemfontein | 300 | steel | n.a. | 3 | 100 | 2 | Renosterpruit River |
| 15 | 20 miles NE of Bloemfontein | 400 | steel | n.a. | 4 | 100 | 2 | The Modderrivier |
| 16 | 55 miles NE of Bloemfontein | 525 | reinforced concrete | deck | 7 | 75 | 1 | Vet River |
| 17 | 40 miles SW of Kroonstad | 300 | reinforced concrete | deck girder | 4 | 75 | 2 | sand |
| 18 | 0.5 miles E of Vereeniging | 705 | steel reinforced concrete | deck truss deck arch | 3 6 | 150 30 | 2 | Vaal River, Twin Bridges on common piers and abutments |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|---------------------------------|------------------|---------------------|--------------------|--------|--------|---|
| | | | Material | Type | Number | | |
| 19 | 125 miles N of Fort Elizabeth | 350 | steel | through truss | 1 | 1 | Great Fish River. Combined rail and road bridge |
| 20 | 30 miles W of Potchefstroom | est. 675 | steel | through truss | 5 | 1 | Milner Bridge, Vaal River |
| 21 | 15 miles NW of Durban | est. 252 | reinforced concrete | deck arch | 7 | 2 | Vmlabuzana (stream) |
| 22 | 30 miles NW of Durban | est. 252 | reinforced concrete | deck arch | 7 | 2 | stream |
| 23 | 30 miles NW of Pietermaritzburg | 300 | reinforced concrete | deck arch | 5 | 2 | Moolrivier |
| 24 | 35 miles S of Ladysmith | 300 | reinforced concrete | deck arch | n.a. | 2 | Little Bushmans (stream) |
| 25 | 15 miles S of Ladysmith | 375 | reinforced concrete | deck | 5 | 2 | Tugela River |
| 26 | 100 miles SE of Johannesburg | 360 | reinforced concrete | open spandrel arch | 6 | 2 | |
| 27 | 5 miles SE of Pietermaritzburg | 567 | steel | deck truss | 7 | 1 | Inchange Viaduct, over stream |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks | |
|----------------------------------|----------------------------|------------------|---------------------|---------------|--------|--------|----------------|--------------------|
| | | | Material | Type | Number | | | |
| 28 | 30 miles E of Pretoria | est. 271 | steel | deck girder | 3 | 1 | Welge (stream) | |
| | | | steel | deck girder | 1 | | | est. 60 |
| | | | reinforced concrete | deck arch | 4 | | | est. 35 est. 14 |
| 29 | 90 miles E of Pretoria | est. 273 | steel | deck truss | 3 | 1 | Olifants River | |
| 30 | 145 miles E of Pretoria | est. 250 | reinforced concrete | deck arch | | | | |
| | | | steel | deck girder | 5 | 1 | Elandsrivier | |
| 31 | 100 miles W of Komatipoort | est. 250 | steel | deck girder | 5 | 1 | Elandsrivier | |
| | | | steel | through truss | 5 | 1 | Komati River | |
| 32 | at Komatipoort | est. 750 | steel | through truss | 9 | 1 | Sable (stream) | |
| 33 | 60 miles NW of Komatipoort | est. 1080 | steel | deck arch | | | | |
| | | | steel | through truss | 3 | 1 | stream | |
| 34 | 60 miles E of Pietersburg | est. 390 | steel | through truss | 3 | 1 | stream | |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | | Trucks | Remarks |
|----------------------------------|----------------------------|------------------|---------------------|---------------|--------|--------|--|
| | | | Material | Type | Number | | |
| 35 | 1 mile E of Uptington | 3514 | steel | n.a. | n.a. | 1 | Orange River (longest bridge on SAR) |
| 36 | 20 miles SE of Rehoboth | 600 | n.a. | n.a. | n.a. | 1 | Usib River |
| 37 | 60 miles W of Mosselbaai | est. 300 | steel | n.a. | 5 | 1 | Kafferkuils (stream) |
| 38 | 30 miles W of Mosselbaai | 770 | steel | deck truss | 2 | 1 | Gouritis (stream) |
| 39 | 8 miles NE of Mosselbaai | 550 | reinforced concrete | through truss | 11 | 1 | Klein-Brak (stream) |
| 40 | 8 miles NE of Mosselbaai | 336 | reinforced concrete | through truss | 6 | 1 | Groot-Brak (stream) |
| 41 | 40 miles NW of Port Alfred | 550 | steel | hinged arch | 1 | 1 | Elaukrantz Bridge, over stream |
| 42 | at East London | 975 | steel | through truss | 3 | 1 | Buffelsrivier (only double deck bridge on the SAR) |
| 43 | 55 miles SE of Queenstown | est. 350 | reinforced concrete | deck arch | 10 | 1 | Toise (stream) |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | | Tracks | Remarks |
|----------------------------------|------------------------------|------------------|---------------------|--------------------------|---------|--------|---|
| | | | Material | Type | Number | | |
| 44 | 50 miles SE of Queenstown | est. 350 | reinforced concrete | deck arch | 10 | 1 | Thomes (stream) |
| 45 | 30 miles SE of Springfontein | 1088 | reinforced concrete | deck | 16 | 1 | Orange River |
| 46 | 50 miles N of East London | 1287 | steel | n.a. | 9 | 1 | Kei River |
| 47 | 70 miles SE of Springfontein | est. 360 | steel | through truss | 6 | 1 | Orange River |
| 48 | 70 miles SE of Bloemfontein | est. 900 | steel | through bow-string truss | 6 | 1 | Caledon River |
| 49 | 35 miles SE of Kimberly | est. 300 | steel | through truss | 3 | 1 | Modderrivier |
| 50 | 7 miles S of Durban | 318 | steel | n.a. | 2 | 2 | Canal |
| 51 | 9 miles S of Durban | 450 | steel | n.a. | 3 | n.a. | Umbogintwini River |
| 52 | 14 miles S of Durban | est. 250 | steel | deck girder | 10 | 1 | Amanzimtoti River |
| 53 | 18 miles S of Durban | est. 750 | steel | deck girder | est. 30 | 1 | Illovo River |
| 54 | 25 miles S of Durban | 729 | reinforced concrete | deck girder | 9 | 2 | Umkomaas River. Combined rail and road bridge |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | | Length Ft. | Tracks | Remarks |
|----------------------------------|-------------------------------|------------------|---------------------|---------------|--------------|----------------------------|--------|--|
| | | | Material | Type | Number | | | |
| 55 | 26 miles N of Port Shepstone | est. 300 | reinforced concrete | n.a. | est. 5 | est. 60 | n.a. | Sezela River |
| 56 | 22 miles N of Port Shepstone | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Ifafa River |
| 57 | 10 miles N of Port Shepstone | 660 | reinforced concrete | n.a. | 11 | 60 | n.a. | Umzambe River |
| 58 | 4 miles N of Port Shepstone | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Umhlangskula River |
| 59 | 0.5 miles N of Port Shepstone | est. 1320 | n.a. | n.a. | n.a. | n.a. | n.a. | Umzimkula River. Combined rail and road bridge |
| 60 | 15 miles NE of Durban | est. 1170 | steel | through truss | 9 | est. 120 | 2 | Queen Bridge. Umgeni River |
| 61 | 30 miles NE of Durban | 440 | steel | truss | 11 | 40 | 1 | Great Umhlanga River |
| 62 | 55 miles NE of Durban | est. 875 | steel | deck truss | 15 1 1 | n.a. est. 75 est. 50 | 1 | Tugela River |
| 63 | 65 miles NE of Durban | est. 270 | steel | deck girder | 9 | est. 30 | 1 | Antikula River |

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Table 5 - (Continued)

Railroad Bridges - South Africa

| Structure Number (See Fig. 7) | Location Mileage Approx. | Total Length Ft. | Spans | | Length Ft. | Tracks | Remarks |
|----------------------------------|----------------------------|------------------|---------------------|--------------------|------------|--------|---|
| | | | Material | Type | | | |
| 64 | 100 miles NE of Durban | 840 | reinforced concrete | bowstring arch | 120 | 1 | Mhlatuze River |
| 65 | 135 miles NE of Durban | est. 900 | steel | through | 100 | 1 | Umfolozi (stream). Combined rail and road bridge |
| 66 | 20 miles S of Messina | est. 250 | n.a. | deck girder | est. 50 | 1 | Sandrivier |
| 67 | 2 miles N of Messina | 1554 | steel | deck truss | 111 | 1 | Alfred Beit Memorial Bridge over Limpopo River, combined rail and road bridge |
| 68 | 135 miles S of Francistown | 350 | n.a. | half-through truss | 75 | 1 | over Mhalapshwe River |
| 69 | 30 miles S of Francistown | 200 | n.a. | half-through truss | 100 | 1 | over MacLoutsi River |
| 70 | 18 miles S of Francistown | 500 | n.a. | half-through truss | 100 | 1 | over Shasi River |
| 71 | at Francistown | 400 | n.a. | half-through truss | 100 | 1 | over Tati River |

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Table 6

Railroad Bridges - Tanganyika

| Structure Number (See Fig. 8) | Location Mileage Approx. | Total Length Ft* | Spans | | | Tracks | Remarks |
|----------------------------------|--------------------------|------------------|----------|-------------|--------|--------|--------------------|
| | | | Material | Type | Number | | |
| 1 | 5.4 miles SE of Korogwe | 130 | steel | n.a. | 1 | 1 | over stream |
| 2 | 0.8 miles SW of Korogwe | 100 | steel | n.a. | 1 | 1 | over stream |
| 3 | 8 miles NE of Kabo | 100 | steel | deck girder | 2 | 1 | over Kimo River |
| 4 | 4.9 miles SW of Mushi | 180 | steel | n.a. | 3 | 1 | over Karanga River |
| 5 | 13.7 miles E of Arusha | 100 | steel | n.a. | 1 | 1 | over Useri River |
| 6 | 8.1 miles F of Arusha | 100 | steel | n.a. | 1 | 1 | over stream |
| 7 | 1.4 miles E of Morogoro | 100 | steel | n.a. | 1 | 1 | over stream |
| 8 | 19.9 miles NW of Kilosa | 100 | steel | n.a. | 1 | 1 | over Kidete River |

* May be less than total length of bridge since source did not list spans under 50 feet long.

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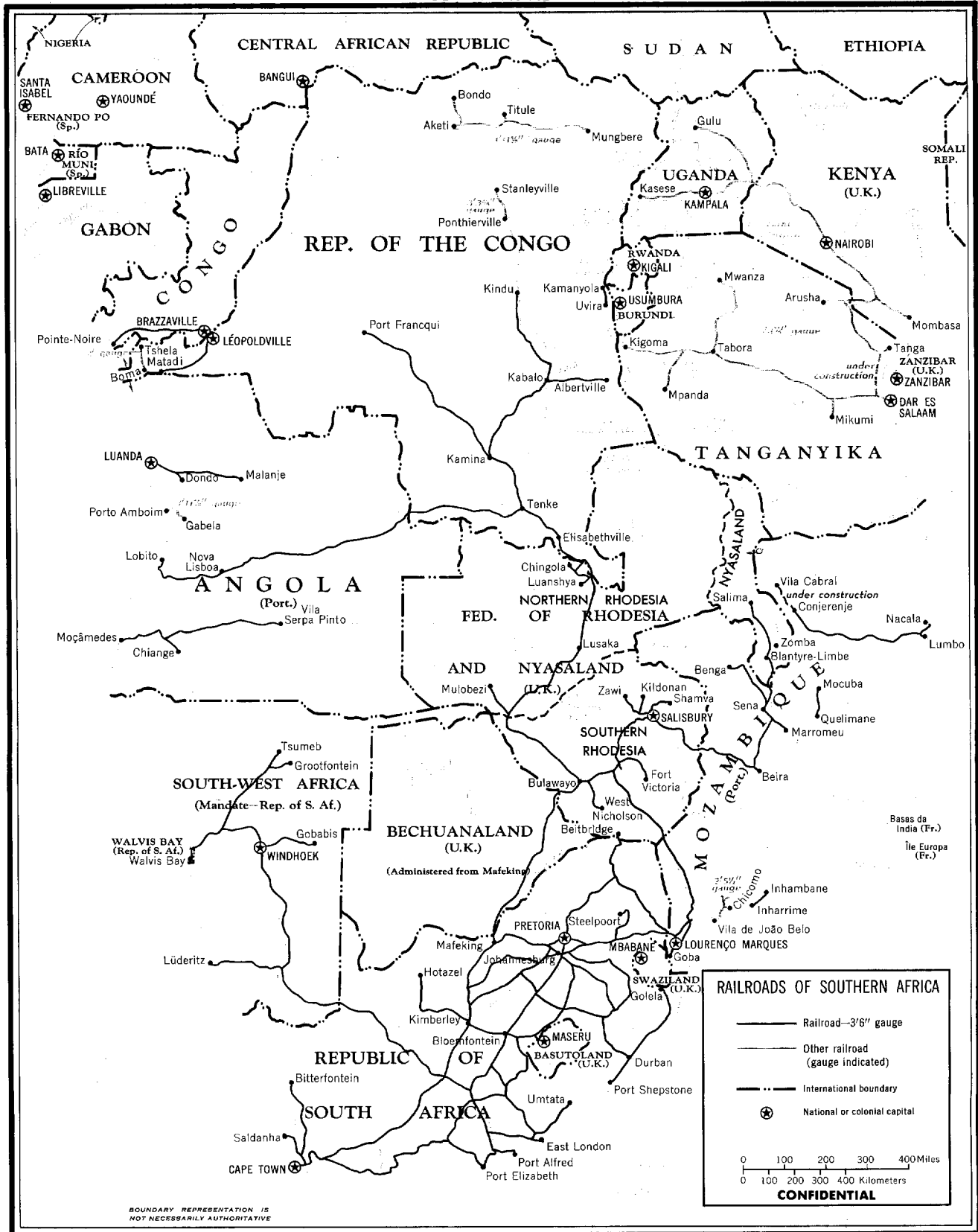
Table 6 - (Continued)

Railroad Bridges - Tanganyika

| Structure Number (See Fig. 8) | Location Mileage Approx. | Total Length Ft | Spans | | | Tracks | Remarks |
|----------------------------------|----------------------------|-----------------|----------|------|--------|--------|-------------|
| | | | Material | Type | Number | | |
| 9 | 22.4 miles SW of Shinyanga | 100 | steel | n.a. | 1 | 1 | over stream |
| 10 | 10 miles NE of Shinyanga | 100 | steel | n.a. | 1 | 1 | over stream |
| 11 | 20.5 miles NE of Shinyanga | 120 | steel | n.a. | 2 | 1 | over stream |

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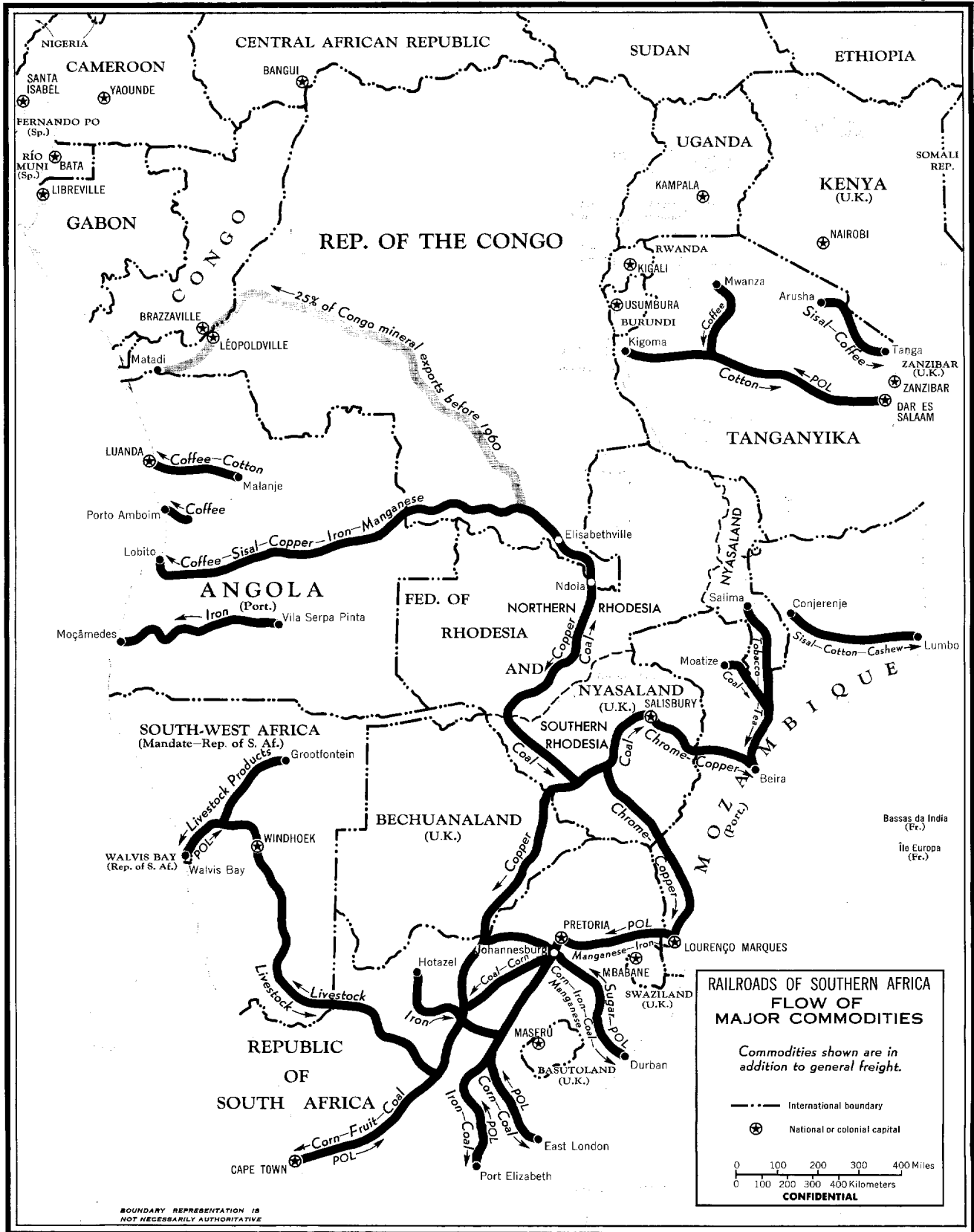
Figure 1



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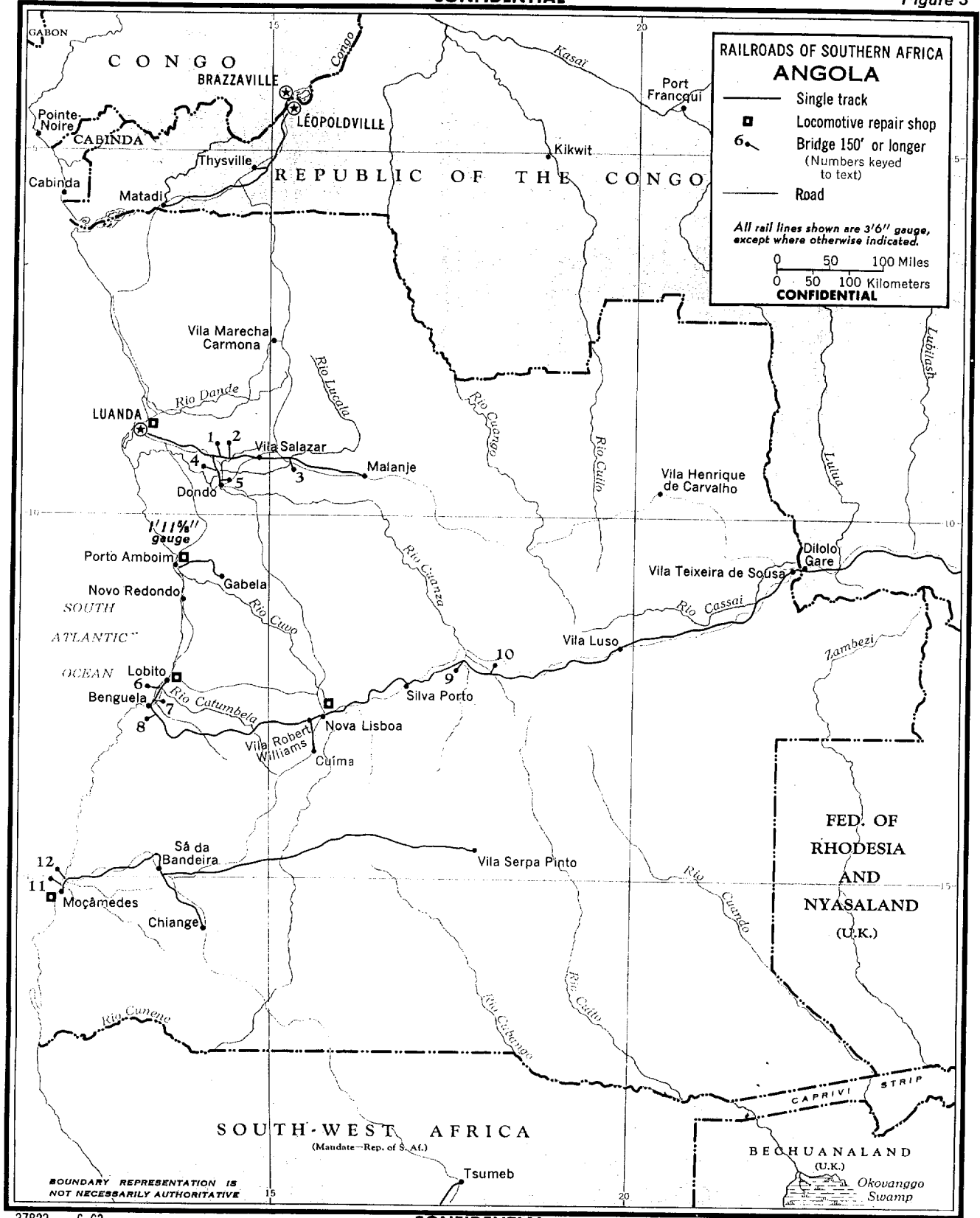
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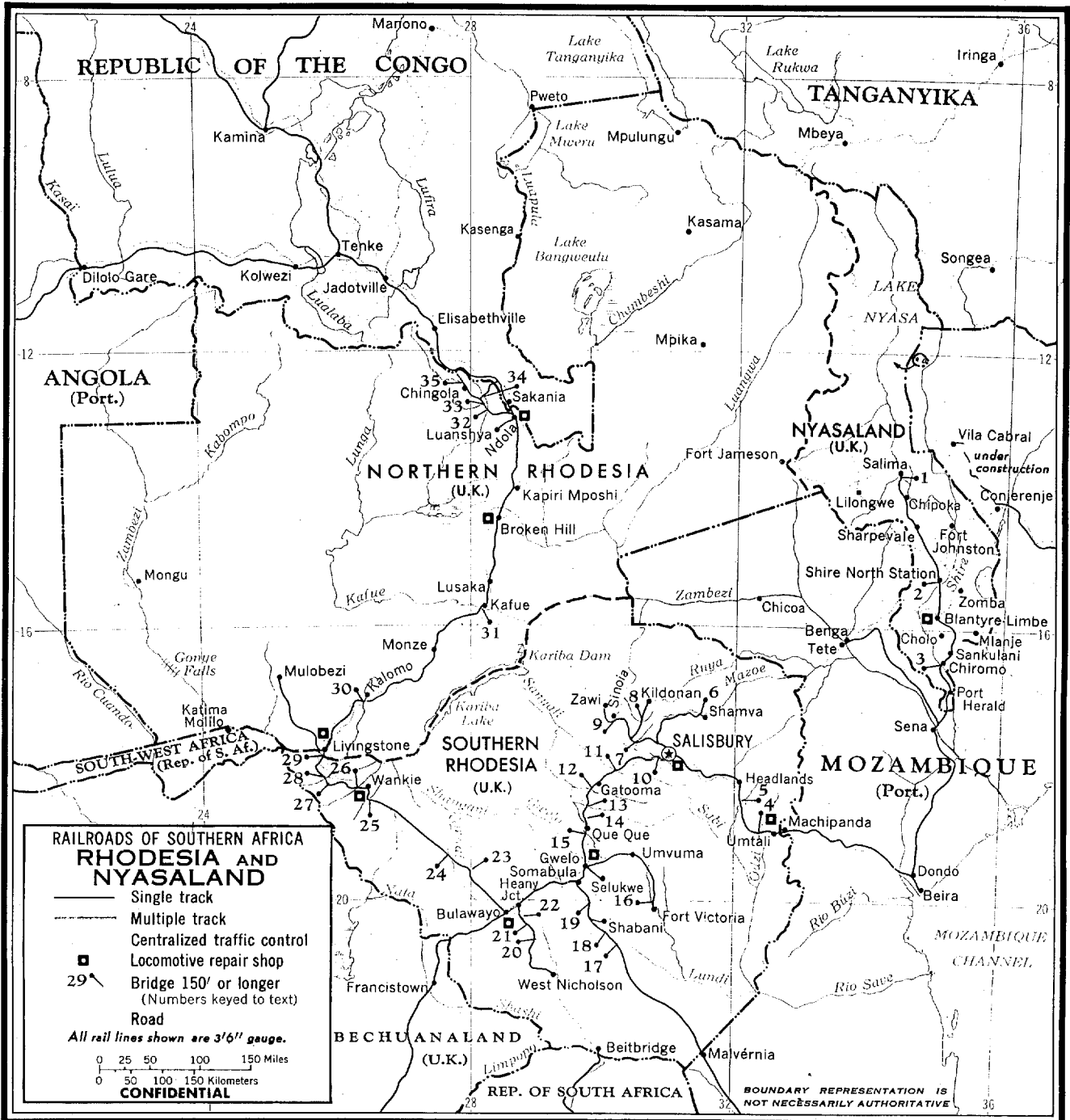
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Figure 3



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Figure 5



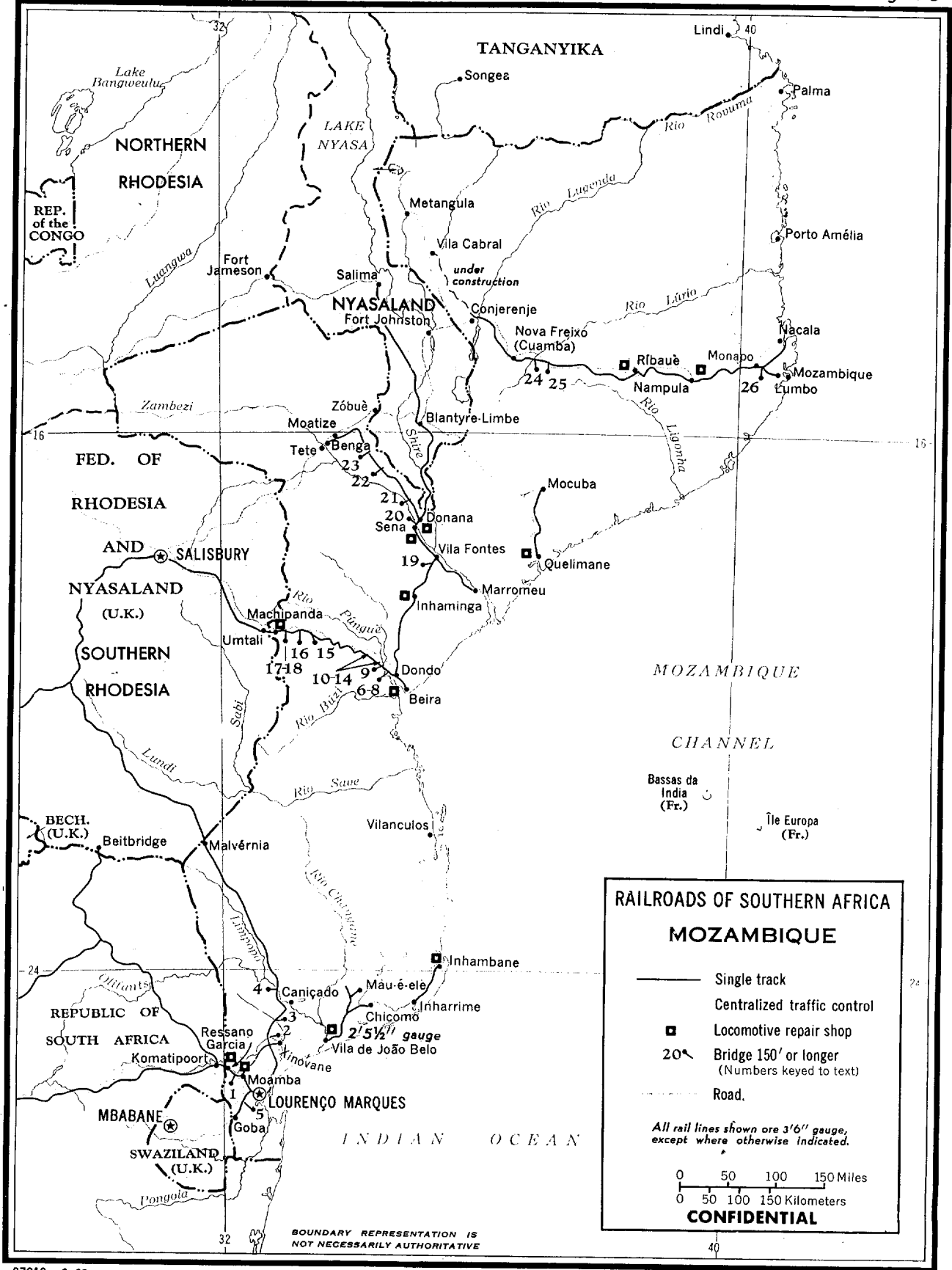
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GROUP 1 EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

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Figure 6



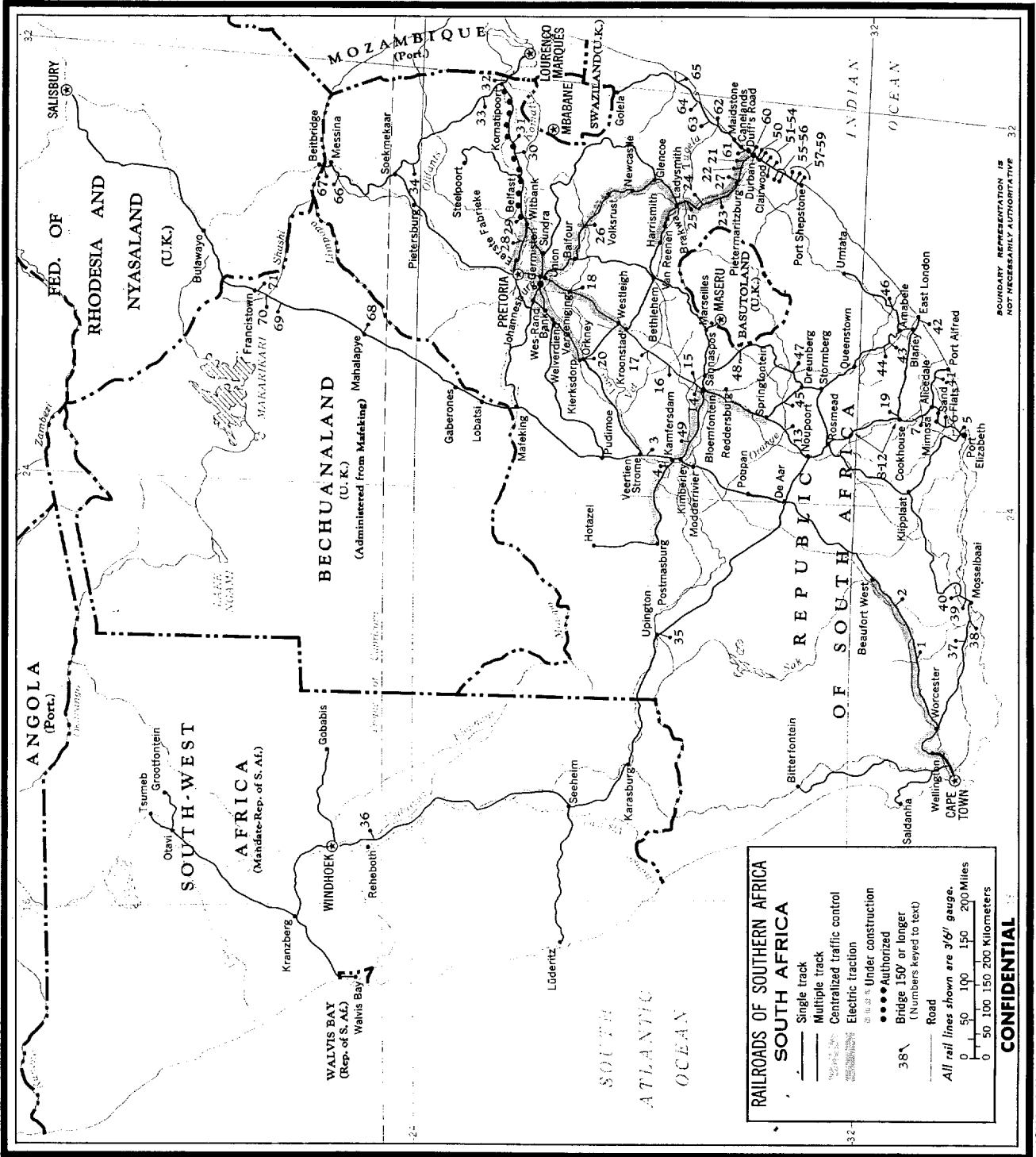
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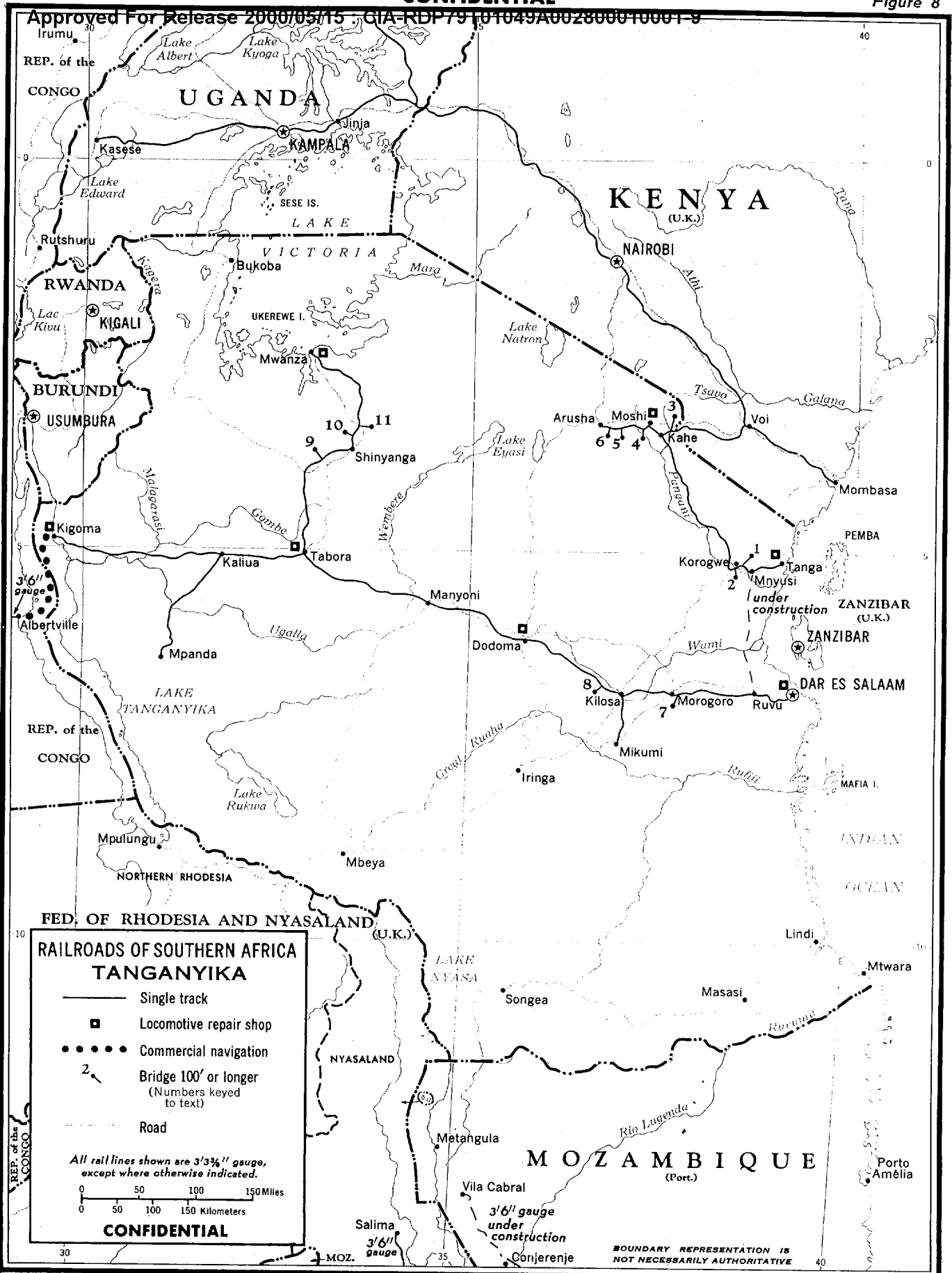
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Figure 7

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