

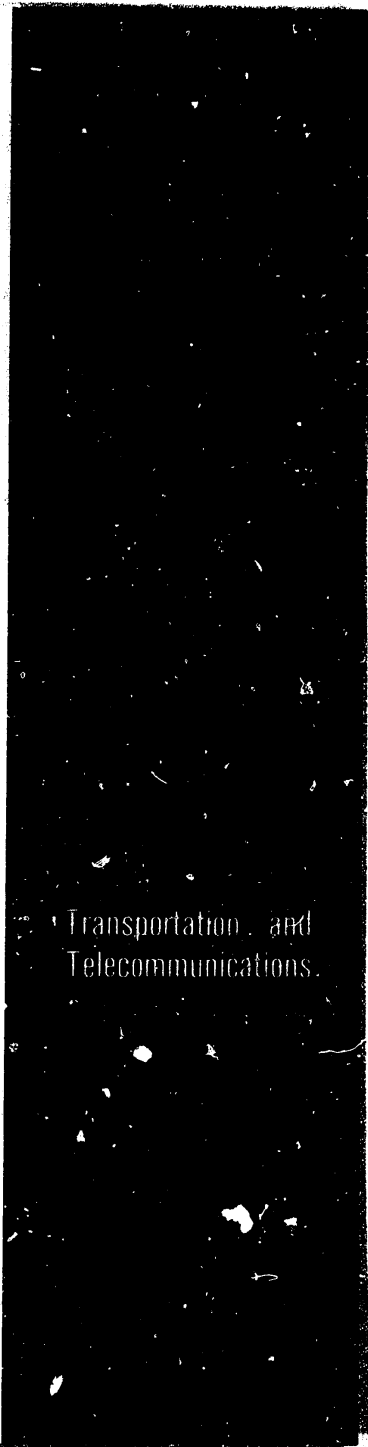
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# Zaire

April 1973

NATIONAL INTELLIGENCE SURVEY

CONFIDENTIAL



Transportation and  
Telecommunications

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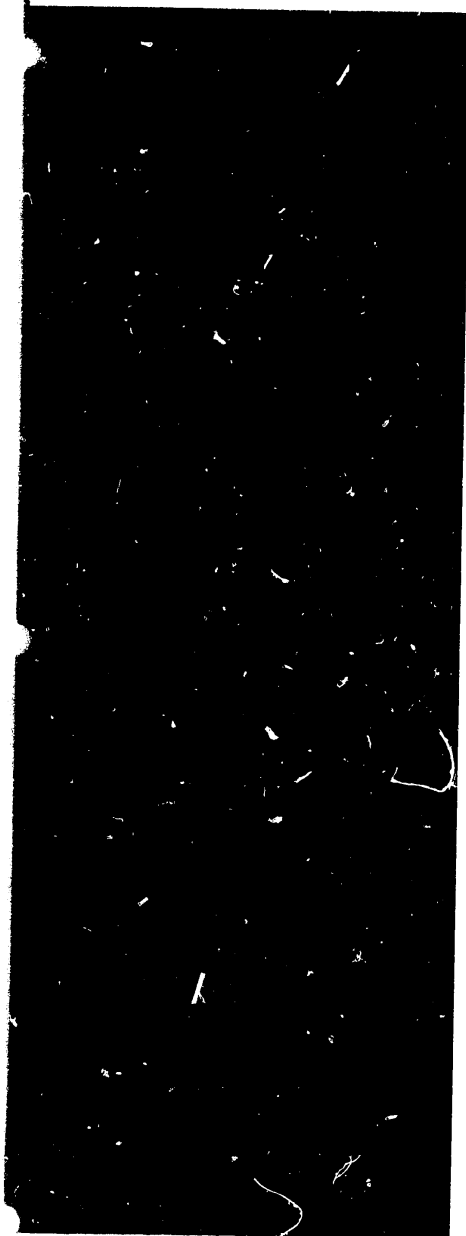
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*This chapter was prepared for the NIS by the Defense Intelligence Agency and includes contributions on merchant marine from the Department of the Navy and on airfields from the Defense Mapping Agency, Aerospace Center. Research was substantially completed by January 1973.*



# Zaire

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# Transportation and Telecommunications

## A. Summary (C)

### 1. Systems

The transportation system of Zaire is based on closely integrated rail and waterway systems, with highways serving as feeders (Figure 15). The rail and waterway networks are barely able to meet the economic needs of the country, and the highway network is inadequate. Nevertheless, the transportation system compares favorably with those of neighboring countries.

The railroads, which are concentrated primarily in the southern half of the country, serve the important mining and urban centers. Most of the route mileage is government owned, and all railroad operations are government controlled. The main railroad network is integrated with the waterways, which consist basically of the Congo River, its tributaries, and Lake Tanganyika. Inland waterway transport is monopolized by government-owned companies.

The highway network is sparse and is concentrated around the more important urban areas. Ownership of highway transport is shared by the government and private interests.

There are two major ports—Matadi and Boma—and one minor, Banana. All are located on the lower Congo and have access to the Atlantic Ocean. Most of the petroleum products enter at the Ango Ango section of Matadi and move inland to Kinshasa via two pipelines. One of these is a 4-inch line, 243 miles in length, which roughly parallels the rail line. It has a capacity of 1,800 barrels a day, is entirely above ground, and has pumping stations at Matadi (Ango Ango), Songololo, Lukala, and at Mile 133. The other pipeline is 6 inches in diameter and 218 miles in length. Except for a small section in Kinshasa, this line is above ground, generally paralleling the Matadi-Kinshasa highway. The capacity of the line is 14,000 barrels a day; pumping stations are at Matadi (Ango Ango) and Lukala. Zaire has a small oceangoing merchant fleet of four ships—three dry cargo and one passenger.

The transportation system is of international importance chiefly because Zaire provides a part of the only rail link across the continent north of South Africa. International connections are made by railroad with Angola and Zambia and by highways and waterways with other neighboring countries.

Scheduled domestic and international civil aviation operations are conducted by the government-owned Air Zaire. The country has 320 usable airfields, 59 of them with runways 4,000 feet or longer. Except in the northern border area, where the system is sparse, airfields are fairly well distributed. Ndjili, near Kinshasa, and Lubumbashi are important international airfields and handle large jets.

The telecommunications (telecom) system is fragmentary and inadequate. Radiocommunication is the principal network, and open-wire lines are next in importance. A few short multiconductor cables and a radio-relay link provide a larger number of channels on a few trunk routes but are very limited. Kinshasa and Lubumbashi have TV stations.

An extensive highway improvement program financed by several international organizations is underway, but no other significant development of the transportation and telecom systems is taking place.

### 2. Strategic mobility

The transportation and telecommunications systems of Zaire would be unable to support large-scale military operations. The rail network consists of three gauges and five unconnected systems, and all lines are single track and have no alternate routes. The rail system serves only a limited portion of the country and must rely heavily on integration with other modes of transportation. Transshipment points are extremely vulnerable to interdiction. Movement of military forces and supplies would be hindered by the lack of a through north-south line and occasional traffic interruptions caused by flooding, landslides, and bridge washouts after heavy rainfall.

The highway network is sparse and lacks good through and alternative routes. Most roads are of poor construction, designed for only light traffic. The roads are concentrated around the more important urban

areas and are normally used for short haul feeder services to the railroads and inland waterways. Additionally, numerous bottlenecks and the adverse effects of climate would restrict operations. During heavy rains, the low capacity roads become slippery or inundated and are often impassable. The poor condition of many bridges and the existence of ferry crossings would also impede movement.

The Congo River and its tributaries provide a considerable transportation potential in support of military operations, especially for bulk products and heavy equipment. The waterway system has no locks, although it is interrupted at several points by falls and rapids that require transshipping to other transportation modes. Most of the inland waterway ports and all the maritime ports are adaptable to military use. The three dry cargo ships of the merchant fleet would have a moderate capability for short-haul (up to 48 hours steaming) troop-lift and logistic support in near-seas operations. The self-loading and unloading capability of these ships is enhanced by booms of 40 tons or more lift, and at least two units have hatches more than 50 feet long. The estimated total capacity of Zaire's cargo ships is 30,560 cargo deadweight tons. The passenger ship could expand its normal 200-passenger capacity and provide longer haul support (more than 48 hours steaming).

Zaire has 19 airfields with paved runways capable of supporting C-54 to C-141 type aircraft. About 300 other fields could support C-47 or utility-type craft. Air Zaire's fleet of aircraft and those of Congo-Frigo would be immediately available for military use, but the availability of flight personnel from Air Zaire would be uncertain because many are foreign nationals.

The telecommunications system is highly vulnerable because of its dependence upon radiocommunication stations. Entire regions could be isolated by jamming or by the destruction of a few stations. The wire lines also extend through isolated areas and are equally vulnerable to sabotage or other disruption.

**B. Railroads (C)**

Railroads total 3,218 route miles and are the most important means of transport in Zaire. The rail network is concentrated mainly in the southern half of the country and consists of five unconnected systems, which rely heavily on integration with other modes of transportation. Rail lines are single track, comprising four different gages. The 2 1/4"-gage Mayumbe Railroad (CFM) extends north from the Congo River at Boma to Tshela. The 3'6"-gage Matadi-Kinshasa

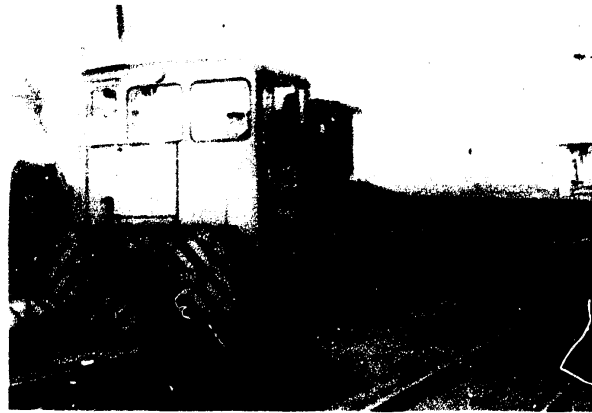
Railroad (CFMK) connects the seaport of Matadi to the river system at Kinshasa, bypassing intervening rapids. The 3'6"-gage Kinshasa-Dilolo-Lubumbashi Railroad Company (KDL) links the interior and southern Zaire to the Kasai River, an important tributary of the Congo. The main KDL line extends from Ilebo (Figure 1) southeast to an international connection with the Zambian system near Sakania. Another important KDL line extends westward from Tenke to Dilolo, where an international connection with the Benguela Railroad provides a direct rail link to the Atlantic Ocean at Lobito, Angola. Another line originates at Kamina and connects with the Congo Great Lakes Railroad Company (CFL) at Kabongo. The CFL line runs northeastward from Kabongo to Kabalo, and then on north to Port de Kindu; another extends east to Kalemie. Water transshipment at Kalemie on Lake Tanganyika provides a connection with the rail net of Tanzania. CFL lines are 3'6"-gage except for an isolated meter-gage (3'3 3/4") line between Kisangani and Ubundi that provides transit around the Lualaba River rapids. The 1'11 5/8"-gage Local Zaire Railroad Company (VICIZAIRE) originates at Bumba on the Congo River, extends east to Mungbere, and has a branch line to Bondo and another to Titule. Mileages operated by the various companies are as follows:

COMPANY	GAGE	MILEAGE
CFMK	3'6"	227
KDL	3'6"	1,595
CFL	3'6"	597
CFL	3'3 3/4"	78
CFM	2 1/4"	85
VICIZAIRE	1'11 5/8"	636

Important international rail connections are made with the railroads of Angola at Dilolo and with the Zambia Railway near Sakania; indirect connections via water transshipments link the CFL at Kalemie with the railroads in Tanzania and the CFMK at Kinshasa with the Congo-Ocean Railroad in Congo. The Zaire railroad network compares favorably with those of neighboring countries and is more efficient than the Zambian network.

The railroads are regulated and controlled by the Department of Transportation and Telecommunications. The Zaire Government wholly owns and operates the National Transportation Office (ONATRA)—formerly known as OTRACO—which has operational control of the CFMK and CFM, as well as both CFL systems. The government has controlling interest in two private companies, the KDL and VICIZAIRE. The KDL assumed operation from the New Lower Congo-Katanga Railroad Company in November 1970.





**FIGURE 1. Railroad operations at Ilebo, a railroad - inland waterway transshipment point (U/OU)**

The skill level achieved by Zairian railroad personnel is high by African standards. Training facilities are adequate both in quality and quantity. KDL schools are located in Likasi and Lubumbashi; ONATRA has schools in Mbanza-Ngungu and Kinshasa, and some students are sent to an advanced training center in Douala, Cameroon; VICIZAIRE has training centers in Aketi and Isiro. Railroad employees total 27,930, including 712 expatriates. KDL personnel consist of 16,092 Zairians and 544 expatriates; CFL, 4,465 Zairians and 73 expatriates; ONATRA, 3,939 Zairians and 61 expatriates; and VICIZAIRE, 2,722 Zairians and 34 expatriates. The number of unskilled laborers is adequate, but there is a shortage of technical and administrative personnel. The CFL plans to reduce the number of employees to a level more in keeping with current traffic volume. The VICIZAIRE is having difficulty recruiting experienced personnel because of its remoteness in Haut-Zaire Region.

Yards, terminals, and repair facilities are well distributed throughout each system and suffice for current traffic needs. No container terminals exist in Zaire. A limited quantity of privately owned dry freight containers, ranging in size from 65 to 282 cubic feet, are transported by rail and can be off-loaded at stations or private sidings, where cranes or forklift trucks are available. Conversions from steam to diesel

repair and maintenance facilities are in progress at Lubumbashi, Likasi, Ilebo, and Kamina on the KDL, and at Kabalo on the CFL. New depots are being constructed at Kananga (KDL) and Kalemie (CFL) and a new transshipping facility is under construction at Bumba (VICIZAIRE).

Zaire has 332 railroad bridges 12 feet and over in length, mostly of steel-deck-girder construction; the CFL 2,442-foot combination rail-highway bridge over the Lualaba river, 7½ miles south of Kabalo is the longest. The two rail tunnels in Zaire are on the CFMK and total 740 feet in length; the longest is 510 feet and is located 4.6 miles southeast of Matadi.

Train control is by the absolute manual block system using semaphore signals, except for 55 miles of centralized traffic control (CTC) equipped with color-light signals between Kinshasa and Sona-Bata on the CFMK. KDL and CFL lines use a key and token dispatch system, but 65 miles of centralized traffic control are planned between Likasi and Tenke on the KDL. Telephone orders are used on the CFM and VICIZAIRE. Telephone facilities, supplemented by telegraph and radio connections, serve all stations. A teletype communications system is planned for the entire KDL network.

Steam locomotives are being replaced by diesels on most systems. Generally, equipment is good, but much of the tractive stock on CFL lines is in poor condition.

Maintenance continues to be hampered by a scarcity of spare parts. The most common types of KDL locomotives in service are 2-8-2 and 4-8-2 steam units, B-B electrics having a continuous tractive effort of 36,740 pounds at 19.5 miles per hour, and B-B diesel hydraulics having a continuous tractive effort of 42,800 pounds at 33% adhesion. Other common types are ONATRA 2,400-horsepower C-C diesel electrics, CFL 1,500-horsepower B-B diesel hydraulics, and VICIZAIRE 550 horsepower B-B diesel hydraulic units. Freight cars are generally 4-axle gondolas or boxcars having capacities ranging from 27.5 to 44.0 short tons.

Center coupler-buffers are standard on all stock. Couplers are located 34 3/8" above top of rail on 3'6"- and 3'3 3/8"-gauge stock, and 12 3/8" and 19 1/2" above rail on 2' 1/4"- and 1'11 3/8"-gauge stock respectively. Vacuum or air brakes are installed on KDL and CFL equipment; ONATRA, CFM and CFMK equipment uses vacuum brakes, and air brakes are used on VICIZAIRE equipment. The 1971 equipment inventories were as follows:

GAGE	KDL	CFMK	CFL	CFL	CFM	VICIZAIRE
	3'6"	3'6"	3'6"	3'3 3/8"	2' 1/4"	1'11 3/8"
<b>Locomotives:</b>						
<b>Mainline:</b>						
Steam	76	0	3	6	0	10
Diesel	52	33	15	0	8	16
Electric	46	0	0	0	0	0
Switchers	51	43	15	10	6	5
Railcars	3	3	0	0	0	0
Passenger cars	151	89	52	20	0	7
Freight cars	4,976	2,940	457	83	370	342

Railroad equipment has been imported from the United Kingdom, Belgium, France, the United States, West Germany, and Japan. Rolling stock is assembled at Isiro on the VICIZAIRE line.

Wood, coal, diesel oil, fuel oil, and electricity are used by locomotives operating in Zaire. Diesel oil is imported from the Netherlands Antilles, Italy, and Venezuela and is also supplied by the refinery at Banana. Wood is available locally. Poor grade coal from the Luena coalfields is utilized, but most coal is imported from Rhodesia. Strained relations between Rhodesia and Zambia, however, result in periodic reductions in coal supply to Zaire. Ample hydroelectric power is available to operate the 532 miles of electrified KDL lines which use 50-cycle, single phase, 25,000 volt alternating current. Water supplies are adequate for steam operations.

Lines are well maintained except for CFM and CFL lines, which are in poor to fair condition. Maintenance is performed manually as directed by the individual

railroad companies, except for KDL and CFMK lines, where modern techniques and equipment are utilized. Heavy construction is generally contracted to private industry. Construction and maintenance equipment, rails, steel ties, track hardware, and structural materials for bridges and culverts are obtained from foreign sources.

Renewal of equipment, especially the replacement of steam with diesel locomotives, remains foremost in development planning. Relaying and realignment of track, improvement of the permanent way and modernization of the signaling systems are planned for the near future. The KDL has completed electrification from Luena to Kamina. The alignment of the planned link between the KDL and CFMK lines remains undetermined. A 115-mile rail extension from Aketi to Bumba has been completed on the VICIZAIRE. Construction is in progress on terminal facilities at Bumba. The Zaire Government has recently granted a contract to the Japanese to construct an 81-mile extension from Matadi to Banana.

Available traffic statistics for 1970 (in thousands) are as follows:

	SHORT TONS	SHORT-TON-MILES	PASSENGERS	PASSENGER-MILES
CFM	81	4,900	0	0
CFMK	1,789	310,200	1,552	79,680
KDL	5,588	1,361,680	3,908	400,137
CFL	345	101,700	537	60,805
(3'6")				
CFL	17	na	na	3,000
(3'3 3/8")				
VICIZAIRE	335	27,400	93	6,300

na Data not available.

Passenger and freight traffic has increased on most lines since the end of civil strife. The trend on KDL lines has been to increase long haul freight traffic and reduce local traffic. Exhaustion of forest resources has accounted for a reduction in tonnage on the CFM. Major exports are copper, tin, coffee, palm oil, and forest products; major imports are machinery,

FIGURE 2. Line characteristics of the railroads (C)

TERMINALS AND ROUTE MILES	GAGE	MAXIMUM GRADE		MINIMUM RADIUS OF CURVATURE	MAXIMUM AXLELOAD	PASSING TRACK		REMARKS
		Going	Coming			Maximum interval	Minimum length	
		--- Percent ---				Miles	Feet	
Boma-Tshela..... 85 miles	2'1/4"	3.2	2.5	164	8.8	15	*700	CFM line.
Matadi-Kinshasa..... 227 miles	3'6"	1.7	1.0	820	19.8	8	984	CFMK line. International connection with Brazza- ville at Kinshasa via Congo River transshipment.
Ilebo-Sakania..... 1,138 miles	3'6"	1.5	2.3	492	16.5	17	1,050	KDL line. Electrified: 358 route miles from Kamina MP 582 to Lubumbashi MP 940. International connection with Zambia railroads 7 miles south of Sakania.
Tenke-Dilolo..... 324 miles	3'6"	1.3	1.3	656	16.5	21	1,050	KDL line. Electrified: 157 route miles from Tenke to Mutshatsha MP 157. International connection with Angola railroads at Dilolo.
Kamina-Kabongo..... 126 miles	3'6"	1.3	1.3	1,640	16.5	33	1,050	KDL line. Connection with CFL at Kabongo.
Kabongo-Kabalo..... 152 miles	3'6"	1.3	1.3	1,640	12.5	33	*1,050	CFL line.
Kabalo-Kalemi..... 170 miles	3'6"	2.0	1.0	492	12.5	27	*1,050	CFL line. International connection with Tanzania railroads at Kalemi via Lake Tanganyika trans- shipment to Kigoma, Tanzania.
Kabalo-Port de Kindu..... 275 miles	3'6"	1.0	2.0	328	12.5	27	*1,050	CFL line. Connects Port de Kindu with Ubundi via Lualaba river transshipment.
Kisangani-Ubundi..... 78 miles	3'33/8"	1.0	1.0	328	12.5	19	*1,050	CFL line. Bypass for Lualaba river rapids.
Bumba-Mungbere..... 540 miles	1'11 3/8"	1.5	1.5	656	8.5	32	689	VICIZAIRE line. Branch lines with the same general characteristics extend from Komba to Bondo (75 route miles), Lienart to Titule (19 route miles), and MP 186 south to Buta (2 route miles).

<sup>a</sup>Estimated.

Abbreviations:

- KDL..... Kinshasa-Dilolo-Lubumbashi Railroad.
- CFM..... Mayumbe Railroad.
- CFMK..... Matadi-Kinshasa Railroad.
- CFL..... Great Lakes Railroad.
- VICIZAIRE..... Local Zaire Railroad.

transportation equipment, iron, steel, petroleum products, and coal. Local traffic consists primarily of ores and agricultural products.

The Portuguese Government periodically has closed the Benguela Railroad in Angola to Zairian traffic in retaliation for attacks on lines of communication in Angola by terrorists based in Zaire. Major operational problems include the scarcity of spare parts, inadequate maintenance of equipment and permanent way on CFM and CFL lines, antiquated rolling stock, and excessive freight car turn-around-time at major yards and terminals. Traffic interruptions are caused by occasional flooding, landslides, and bridge washouts after heavy rainfall. KDL international traffic has suffered periodic interruptions after terrorists have severed the line in Angola just west of the border. Low river levels during the dry season reduce by two-thirds the normal transshipment capacity at Ilebo (April-October) and Aketi (November-March).

The KDL is the only system operating at a profit, but the financial conditions for most lines have improved, with CFL showing the greatest results.

Rails are T-section types weighing 59 and 81 pounds per yard on the KDL, 49 and 59 pounds on the CFL, 50 pounds on the CFM, 67 and 80 on the CFMK, and 36 to 66 pounds on the VICIZAIRE. Rails 23 and 33 feet in length are being welded into 115-foot and longer lengths. KDL lines use steel and concrete ties spaced 2,100 and 2,400 per mile; CFL lines use steel and treated wooden ties spaced 2,100 to 2,400 per mile; CFM uses steel ties spaced 2,250 per mile; CFMK uses steel and concrete ties spaced 2,400 to 2,800 per mile; and the VICIZAIRE uses steel ties spaced 2,400 per mile. Steel ties must be imported, but concrete ties are manufactured locally. Crushed and broken stone ballast utilized throughout the network is available locally.

Figure 2 lists the major characteristics of Zaire's single-track railroads.

### C. Highways (C)

The highway system plays a subordinate role in the overall economy, mainly providing short-haul feeder services to railheads and river ports and to local markets. The road system, inadequate for the country's economic requirements, is sparse, unevenly distributed, and lacking in alternative routes. Highway density is greatest in the lower Congo River area around the river ports of Boma, Matadi, and Kinshasa; in the vicinity of Luluabourg, an important rail, highway, and inland waterway junction; in the

southern mining region around Likasi and Lubumbashi; the eastern lake region around Bukavu; and in the northeastern agricultural and gold-mining region. Highway connections are established with the Central African Republic, Congo, Angola, Zambia, Burundi, Rwanda, Uganda, and Sudan.

The road network totals 86,930 miles, of which 1,095 miles are bituminous (mostly surface treatment as in Figure 3), 10,427 miles are laterite, gravel, or crushed stone, and the remaining 75,408 miles are improved or unimproved earth; there are also stretches of concrete surfacing near Kinshasa. Surface widths range from 10 to 20 feet, and the overall condition of the roads is fair to poor. Shoulders, found on only a few of the better roads, are 2 to 3 feet wide. Roads in the hilly and mountainous regions in the eastern part of the country are narrow and winding and have steep grades.

There are approximately 1,600 bridges in the country. The majority are short-span single-lane structures, limited to a maximum gross load capacity of 3 tons. Some of the longer structures are prefabricated steel bridges, usually of Bailey-type construction (Figure 4). These bridges have a narrow roadway but are capable of supporting 20-ton vehicles. The newer bridges are of reinforced concrete and have load capacities of about 35 tons. Vertical clearances on most bridges are unlimited, but many are only one lane in width. About 600 permanent structures and 130 Bailey bridges require extensive maintenance and repair. Timber bridges are generally in poor condition. There are about 50 ferries (Figure 5) and numerous fords but no tunnels. Most ferries are cable operated and have low capacities. A few larger, more modern ferries are employed at important crossings. Many ferries are in poor condition.

Planning, construction, rehabilitation, and maintenance of the highway network are under the Bureau of Roads of the Department of Public Works. The World Bank and the United Nations Development Program are financing technical studies and providing technical help in road construction and maintenance. Provincial and district authorities probably maintain some local roads, but most maintenance work is performed on a contract basis. The Bureau of Roads contracts with plantation owners, private commercial firms, and other users that have vehicles, equipment, and labor to provide maintenance on roads, exercising supervision to insure that contracts are honored.

The rugged terrain and adverse climate present numerous problems in road construction and maintenance. Annual precipitation is considerable

everywhere, and heavy local rains cause flooding and damage roadbeds; flash floods often wash out temporary structures and sometimes undermine the abutments of reinforced concrete and steel bridges. Along the many tributaries of the Congo River, where it is generally swampy, road construction requires the addition of fill for a more stable subbase foundation. Roads in the dry southwestern part of the country require constant scraping to remove excess sand. In the jungle areas, heavy growth is difficult to clear for road surveying and construction. Timber bridges require continual maintenance or renewal, since they are subject to destruction by fungi and brush fires. Most materials for road construction are not readily available; however, sand and gravel are available in some localities, and cement is produced in sufficient quantities to satisfy demands. Most bituminous materials are imported, although asphalt deposits near Boma may supply all needs when this source is developed. Steel for bridge construction must be imported.

Only minimal maintenance activity was performed on the network between the time of independence in 1960 until 1967 because of civil disturbances, lack of funds and trained personnel, and the destruction of equipment. Emergency repairs to roads and structures and some limited construction were performed between 1967 and 1969; activities were limited to important roads near the larger southern urban areas. Other emergency repairs were undertaken in 1969-70 to improve roads in three southern provinces of Bas-Zaïre, Kasai-Occidental, and Kasai-Oriental to facilitate the distribution of agricultural products raised in these areas for domestic consumption.

The International Development Association (IDA) in conjunction with other international organizations is financing a \$46.4 million highway program in Zaïre. IDA has approved a \$19 million credit. The U.S. Agency for International Development (AID) is providing \$9.8 million, while the balance is expected to come from the Canadian International Development Agency, the United Nations Development Program, and the French Aid and Cooperation Fund. The Government of Zaïre will finance local costs, such as those for supplies and local labor. Funds for this highway program will be used to pay for technical assistance and personnel for the Bureau of Roads, improvement of 1,180 miles of roads, road maintenance equipment, training of equipment operators and maintenance workers, technical aid for the National Highway Laboratory, and for feasibility studies on 370 miles of roads, with detailed

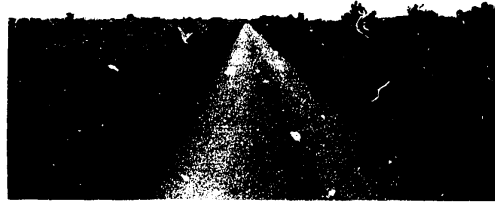


FIGURE 3. Bituminous road between Kinshasa and Kenge (C)

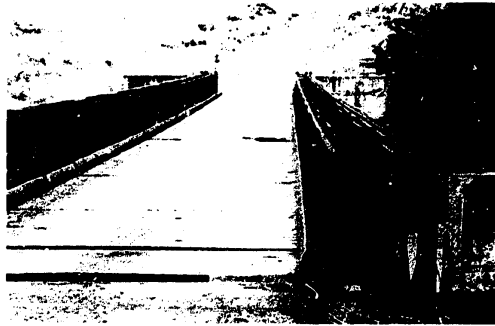


FIGURE 4. Bailey bridge over Black River near Kinshasa; condition is typical of many bridges in country (C)

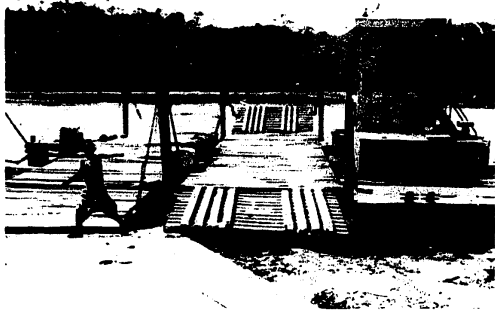


FIGURE 5. Ferry crossing over Kwango River near Mayamba (C)

FIGURE 6. Characteristics of selected highways (C)

ORIGIN AND DESTINATION	DISTANCE	SURFACE TYPE	SURFACE WIDTH	SHOULDER WIDTH	SURFACE CONDITION	CAPACITY*	REMARKS
	<i>Miles</i>		<i>Feet</i>			<i>Short tons/day</i>	
Matadi to Kinshasa.....	241	Bituminous; bituminous surface treatment.	20	0-6	Good.....	4,500; 1,950, wet subsoil...	Some sharp curves and steep grades; undulating to hilly alignment; ferry connection between Kinshasa and Brazzaville.
Kinshasa to Kenge.....	204	....do.....	20	0-3	....do.....	....do.....	Flat to hilly alignment. Ferry over Kwango river.
Kenge to Idiofa.....	338	Improved earth.....	16-20	0-3	Poor to good...	600; negligible with wet subsoil.	Hilly alignment. Many steep grades and sharp curves. Numerous ferries.
Idiofa to Kamina via Kananga.	715	....do.....	8-20	0-3	Poor to fair....	550; negligible with wet subsoil.	Flat to undulating alignment; winding road probably impassable during rainy season, dusty in dry weather.
Kamina to Guba.....	263	Laterite.....	16	0-3	Fair to poor...	900; 100, wet subsoil.....	Undulating to hilly alignment; often impassable during rainy season. Steep grades and sharp curves.
Guba to Lubumbashi via Likasi.	119	Bituminous.....	10-20	0-5	Good.....	5,000; 4,500, wet subsoil.	Flat alignment.
Rte. jct. 10 miles NW of Likasi to Manono.	300	Improved earth; laterite...	13-20	0-3	Poor.....	550; negligible with wet subsoil.	Undulating to hilly alignment; some sections may be impassable during rainy season.
Manono to Uvira via Kalemie.	472	Gravel.....	16-26	0-3	Poor to fair....	650; 100, wet subsoil.....	Undulating to mountainous alignment. Numerous timber bridges; one ferry. Deteriorates during rainy season.
Uvira to Bukavu.....	83	Bituminous.....	22	0-3	Good.....	5,400; 4,850, wet subsoil...	Undulating to mountainous alignment.
Bukavu to Sake.....	112	Bituminous; gravel.....	16-20	0-3	Fair to good...	850; 150, wet subsoil.....	Hilly to mountainous alignment. Steep grades, sharp curves. Timber bridges.
Sake to Goma.....	16	Bituminous.....	20	0-3	Good.....	4,800; 4,350, wet subsoil...	Hilly to mountainous alignment.
Goma to Beni.....	243	Gravel.....	10-25	0-3	Poor to good...	500; 50, wet subsoil.....	Hilly to mountainous alignment; grades up to 7%, very slippery when wet, some low-capacity bridges.

Kisangani to Madula.....	13	Bituminous surface treatment.	20	0-3	Good.....	5,050; 2,200, wet subsoil...	Undulating alignment.
Madula to Rafwasende.....	159	Laterite; gravel; bituminous.	10-20	0-3	Poor to good...	650; 100, wet subsoil.....	Flat to hilly alignment. Some sections become inundated during rainy season.
Bafwasende to Mambasa....	170	Crushed stone.....	18-20	0-3	Good.....	1,500; 500, wet subsoil....	Hilly alignment.
Mambasa to Uganda border via Beni.	127	Gravel; some improved earth.	14-18	0-3	Fair to good...	700; 150, wet subsoil.....	Hilly to mountainous alignment.

\*Higher figures based on optimum moisture condition of the subsoil. Lower figures based on saturated condition of subsoil. Capacities are based on 3.5-short-ton loads with movements carried out over a sustained period (90 days or more).

engineering for 250 miles. AID has also provided \$428,000 for studies of a possible bridge to cross the Congo River at Matadi.

Highway traffic is impeded or interrupted by the numerous poorly constructed roads; sharp curves and steep grades in the mountainous areas; narrow, low-capacity and destroyed bridges; and numerous ferries. During the rainy season (April through October, north of the Equator; November through March, south of the Equator), many of the roads are impassable because of the slippery conditions, and some roads become flooded because of inadequate drainage. Landslides often block roads completely in the mountainous areas. In some regions roads are difficult to traverse during the dry seasons because of drifting sand, and visibility is reduced by dust on the many earth roads.

The highway system is an indispensable element in the regional economic development of Zaire. Since independence and the subsequent civil strife, highway use has been limited because of 1) the destruction of vehicles, roads, and bridges; 2) the deterioration of roads through lack of maintenance; and 3) the rising cost of transportation, particularly in areas where risk factors are high and where competition has diminished. Although transportation companies continue to operate integrated rail, inland waterway, and highway services, operations are limited and irregular. The principal carrier is VICIZAIRE, which operates over 9,300 miles of routes in northeastern Zaire. Freight consists of agricultural products, cement, and industrial products. The second largest highway transportation firm is the Automotive Transport Service of Sankuru (MAS). This company operates over 6,800 miles of routes in the Kananga area. A third firm, known as TRANSCO, operates mostly in the Bukavu-Port de Kindu area. In addition there is one smaller company, known as SOTRANSCONGO, which plays an important though localized role in the transportation of cotton in the Gemena area. Other than these firms, highway transportation is dependent on individual transporters, who for the most part own and operate only one truck. Most highway transportation operations in the country are confined to the areas around Kinshasa, Matadi, Boma, Kananga, Lubumbashi, Bukavu, and Kisangani.

In January 1972 there were about 120,900 motor vehicles registered, including 90,900 passenger cars and 30,000 trucks and buses. All vehicles are imported, the principal suppliers being the United States, EC countries, and Japan. The local affiliate of British Leyland Company is reportedly constructing an

assembly plant for Landrovers, buses, and trucks. Figure 6 lists characteristics of Zaire's most significant highways.

#### D. Inland waterways (C)

Inland waterway transportation has a key role in the economy, combining with connecting railroads to provide most of the major arteries of domestic and international traffic. The inland waterways provide over 5,320 miles of navigable routes, of which 8,390 miles are in the Congo River system and 930 miles are routes on navigable lakes.

About 40% of all surface traffic moves over the inland waterways. The 1,314,180 tons of cargo moved on the waterways in 1970 constitute the greatest amount of tonnage since 1960. The figure, however, is still far short of the normal pre-1960 activity. Upstream cargoes usually consist of machinery, manufactured goods, and petroleum products which account for about 26% of all traffic. Goods moving downstream include copper ore from Shaba Region, palm oil and nuts, coffee, cotton, and timber. Downstream tonnages usually exceed upstream tonnages by as much as 50%. Most of the tonnages are domestic, except for goods moving between Kinshasa and Bangui in the Central African Republic and between Kalemie on Lake Tanganyika and Kigoma in Tanzania. The latter is mostly copper from Shaba Region en route to east African ports. Some 95 million passenger-miles were logged on the waterways in 1970.

The distribution of inland waterways is excellent, and most permit year-round navigation. The Congo River and its tributaries provide one of the best natural networks of navigable waterways in the world. The Congo and the Lualaba flow through the country in a colossal inverted U, looping northward, westward, and southwestward in its semicircular route to the sea. Between the sea and Bukama—the upstream limit of navigation—waterway traffic is interrupted at several points by falls and rapids which divide the route into six separate navigable reaches. Rail lines bypass the unnavigable stretches, making through transport possible. From its mouth to Matadi the Congo is maritime, but also accommodates limited inland waterway traffic. The middle Congo and its chief tributary, the Kasai (called the Kwa along its lower extent), are the two most heavily trafficked routes in the interior. The principal waterway routes emanating from Kinshasa are via the Congo to Kisangani and via the Kasai eastward to Ilebo; the Kasai has become the most important and profitable route in the river network. On the Lualaba, water and rail transporta-



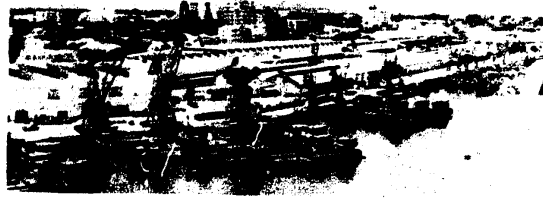


FIGURE 7. ONATRA facilities at the inland waterway port of Kinshasa (U/OU)

tion combine to provide through movement between Kisangani and the important centers of Likasi and Lubumbashi in Shaba as well as with Kalemie on Lake Tanganyika. The higher country of the northeast and the south are the only sections not accessible to water transportation.

Zairian waterways afford numerous international connections. The middle Congo and the Ubangi provide waterway routes to Congo and the Central African Republic. Lake Albert, Lake Edward, Lac Kivu, and Lake Tanganyika afford connections with Uganda, Rwanda, Burundi, Tanzania, and Zambia. The maritime Congo is essentially a deepwater route and can accommodate the largest waterway vessels; the middle Congo is navigable by large vessels, but they must have relatively shallow drafts and ample power to cope with strong currents. Most of the tributaries of the Congo require shallow-draft vessels; and on the eastern lakes, where depths are no, a problem, there are both ocean and river craft.

Because the Congo system is unencumbered by locks and is used mainly in its natural state, craft dimensions are not restricted by structures; only channel depths limit the size of craft. Dumb barges, which far outnumber self-propelled units, are normally towed in-line astern of a diesel-powered tug. Push-towing has been increasing in popularity, and 15-barge tows are now common. Night navigation is increasing on the major waterways because of improved navigational aids, including a system of lighted buoys and channel markers and the more widespread use of radar.

Low water is the most critical factor affecting inland waterway transportation. Seasonal changes in water levels can vary as much as 16 feet between the wet and dry seasons. Silting is a major interruption factor, particularly on the maritime Congo below

Matadi. Other hazards peculiar to this stretch are unusually swift currents of up to about 11 miles per hour and occasional turbulent whirlpools. Very little dredging has been done on the waterways and is usually limited to the port areas. An increasing problem has been the clogging of channels by water hyacinths and papyrus. Lack of maintenance and navigational aids, such as buoys and reflectors, is a continuing problem on some waterways. Violent storms, tornados, and waterspouts are not uncommon during the rainy season on Lake Tanganyika and are a serious threat to small craft. Changing water levels are also hazards on the lake.

The waterway network has virtually no structures restricting navigation. The single dam, immediately above Ilebo on the Kwa/Kasai, is easily bypassed. This dam blocks the left-bank channel in order to provide greater depth in the right-bank channel and also at the wharves. Neither of the two bridges over the waterways interferes with the passage of vessels, including the one over the principal waterway, the upper Lualaba.

There are some 70 ports and landings of varying sizes and importance on the waterways. Thirteen are major ports, the most significant being those where rail-water transshipment occurs. Kinshasa (Figure 7) is by far the best equipped and most important, serving as a storage area and distribution center for goods bound to Matadi for export and for incoming goods destined for Kisangani, Ilebo, Mbandaka, and other interior ports. Cargo handled through the port of Kinshasa in 1970 totaled 660,255 tons. Most of the important river ports are equipped with wharfage, handling equipment, storage facilities, rail or road clearance, and, in some instances, shipyards. Other major inland waterway ports are Matadi and Boma, both of which serve primarily as seaports on the

FIGURE 8. Characteristics of principal inland waterways (C)

NAME, TYPE, AND NAVIGABLE LENGTH	CHANNEL CHARACTERISTICS		CAPACITY	REMARKS
	Width	Safe draft		
	Feet		Short tons/day	
<b>Maritime Congo:</b> Mouth on Atlantic to Matadi; partially dredged stream; 82 miles.	285	25 LW 38 HW	...	Current at times reaches 11 mph. Regular dredging required. Navigable by oceangoing vessels and inland waterway craft. LW period June to Sept., HW Nov. through Jan. Route serves primarily as maritime approach to Matadi.
<b>Middle Congo:</b> Kinshasa to Kisangani; natural stream; 1,080 miles.		4 LW 6.4 HW	Fleet: *3,700 Ports: Kinshasa: 5,300 Kisangani: 2,250	Widths normally range between 1.2 and 6.8 miles, but Pool Malebo (Stanley Pool) is 13.6 miles wide. Navigable by craft up to 1,000 tons at HW, Nov. to April. LW period is July through Aug. Current at times reaches 8 mph.
<b>Lower Luabala:</b> Ubundi to Port de Kindu; natural stream; 191 miles.	2,625	4 LW 6.4 HW	Fleet: *650 Ports: Ubundi: 700 Kindu: 900	Navigable by 300-ton craft at LW, July and Aug., and by 1,000-ton craft at HW, Nov. through April.
<b>Upper Luabala:</b> Kongola to Bukama; partially dredged stream; 404 miles.	66	2.5 LW 3.5 HW	Fleet: *390 Ports: Kongolo: 700 Bukama: 950	Extreme drought can prevent navigation. Bridge 7.4 miles south of Kabalo has least clearances of 111.5 ft. horizontal, 40 ft. vertical; LW occurs July to Aug., with HW Nov. to April.
<b>Kwa/Kasai:</b> Junction of Congo to Ilebo; partially dredged stream; 376 miles.	656	4 LW 6.4 HW	Fleet: **7,500 Ports: Kinshasa: 5,300 Ilebo: 2,250	Known as the Kwa from the middle Congo to Mile 61.5 and Fimi river. Navigable by 1,000-ton craft yearround. LW occurs June through Sept., with HW being Oct. to May.
<b>Kwango/Kwilu:</b> Bandundu to Kikwit; natural stream; 227 miles.	na	3.2 LW 5.0 LW	Fleet: *600 Ports: Bandundu: 1,500 Kikwit: 600	Port capacities include both wharf and over-the-bank operations. LW occurs June to Sept., with HW being Oct. to May.
<b>Ubangi:</b> Junction with Congo to Zongo; partially dredged stream; 370 miles.	na	4 LW 6.5 HW	Fleet: ** Remarks Ports: Kinshasa: 5,300 Zongo: 200	Navigable by barges of 200 tons at LW, March through April, when fleet capability is 250 ST/day. At HW, July through Dec., fleet capacity becomes 3,600 ST/day. Principal inland terminus for this route is Bangui, Central African Republic.

<b>Mongala:</b> Junction with Congo to Businga; natural stream; 204 miles.	na	3.2 LW 5.0 HW	Fleet:** Remarks: . . . . . Ports: Kinshasa: 5,300 Businga: 400	Fleet capability is 200 ST/day at LW, Feb. and March, and increases to 3,700 ST/day at HW, May to Sept.
<b>Itimbiri:</b> Junction with Congo to Aketi; natural stream; 158 miles.	na	3.2 LW 5.0 HW	Fleet:** Remarks: . . . . . Ports: Kinshasa: 5,300 Aketi: 1,200	Junction with VICIZAIRE rail line. At HW period, Apr. to Sept., fleet capacity totals 3,100 ST/day. Waterway often impassable during LW periods, Feb. to March.

na Data not available.  
 . . . Not pertinent.  
 \*Capacity in short tons/day of vessels normally operating on waterway.  
 \*\*Fleet capacities based on route originating at Kinshasa.

**FIGURE 9. Significant inland waterway ports (C)**

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	BERTHAGE	HANDLING AND STORAGE FACILITIES	REMARKS
Kinshasa . . . . . 4°18'S., 15°18'E.; 5,300 ST day.	4,420 ft. of quayage (includes 328-foot stone revetment); alongside depths, 4 ft. (LW) to 6 ft. (HW). 3 piers in SOCCPETROL oil terminal.	Cranes: 57 cargo cranes, capacities 1.5 to 60 tons. Nu- merous cranes in 3 shipyards. Stevedore gear: 30 forklifts, 20 tractors, 250 freight cars. Covered stor- age: 722,250 sq. ft. Open: 218,800 sq. ft. POL: 594,000 bbls., of which 338 bbls. in Masina storage facilities. Refrigerated: 3 cold storage plants in vicini- ty of port; capacity of largest 1,370 cu. yd. Palm oil storage: 47,175 bbl. Grain: 2 granaries in port area; capacity of largest 5,430 cu. yd.	On middle Congo; hub of surface transportation in Zaire; transshipment port for RR. movement to Matadi, waterway shipping to the interior. ONATRA operates port and scheduled ship- ping on the middle Congo. 3 shipyards build and repair barges, tugs, river steamers, and repair dredges and buoy tenders; facilities are 5 marine railways, 1 combination building/marine railway, 2 floating drydocks. Rail and road clearance.
Kisangani . . . . . 0°30'N., 25°12'E.; 2,250 ST day.	ONATRA port area (right bank): 1,150 ft. of wharfage; minimum depth alongside, 6.5 ft.  CFL port area (left bank): 738 ft. of wharfage; minimum alongside depth 6.5 ft.	Cranes: 6, capacities 1 to 6 tons: one 30-ton electric derrick. Covered storage: 4 warehouses, total area 203,000 sq. ft. POL: 38,000 bbl.  Cranes: 4 electric portal jib cranes, capacities 3 to 5 tons; one 30-ton electric derrick; two 5-ton auto- motive cranes. Covered storage: 2 warehouses; total floor area about 69,800 sq. ft.	At upstream limit of navigation on middle Congo; port facilities on both sides of river. ONATRA operates scheduled shipping on this section. Port has road clearance.  CFL operates rail line between Kisangani and Ubundi. Port has road and rail clearance.
Ilebo . . . . . 4°19'S., 20°35'E.; 2,250 ST day.	1,870 ft. of wharfage for general-cargo transfer; alongside depths, 6.5 ft. (LW) to 19.6 ft. (HW). 246 ft. of wharfage for POL transfer.	Cranes: 7 wharf cranes, capacities 2.5 to 6 tons. Special equipment: POL pipeline, 30 forklift trucks. Covered storage: 2 warehouses; total floor area 4,280 sq. ft. One quonset-type shed; floor area na. Refrigerated: limited. POL: 68,000 bbl.	On Kasai; terminus of large barge traffic and rail head for strategic KDL RR. to Shaba region. Port and port area operated by KDL. Road and rail clearance.

na Data not available.  
 \*For definition of port capacity see footnote on Figure 12.

maritime Congo River; Kisangani, Bumba, and Mbandaka on the middle Congo; Ilebo and Bandundu on the Kasai; Ubundi, Port de Kindu, Kabalo, Kongolo, and Bukama on the Lualaba; Aketi on the Iumbiri; Kikwit on the Kwilu; Businga and Akula on the Mongala; and Kalemie, the only port of significance on Lake Tanganyika. Cargoes handled at these ports are predominantly bulk in nature, such as palm oil, ores, petroleum products, palm fruit, and cotton.

The varied character of the waterway system has required numerous types of craft: 1) self-propelled craft such as steamers, rapid passenger/cargo transports, and self-propelled barges; 2) dumb craft, including cargo and tanker barges ranging from 40- to 1,200-ton capacities; and 3) tugs and the more modern towboat. The bulk of the fleet is owned and operated by ONATRA under the general supervision of the Department of Transportation and Telecommunications. The 1970 ONATRA fleet consisted of 180 self-propelled tugs and launches (55,000 hp) and 838 barges and lighters, with a total cargo capacity of 307,000 tons. In January 1970 the CFL fleet had 10 tugs and 33 barges with a combined capacity of 3,750 tons. The condition of the fleets of ONATRA and CFL is generally poor, with about one-third of ONATRA's motive power and total barge capacity in repair. Efforts are being made by ONATRA, however, to upgrade the quality and efficiency of its fleet.

In the past, responsibility for river transportation was shared by ONATRA and the Navigable Waterways and Marine Transportation Service (SVN). Two new semiautonomous administrations have been created to replace the SVN: the Marine Waterways Administration (RVM), responsible for waterways comprising the Congo River estuary, and the River Waterways Administration (RVF), responsible for inland waterways and lakes. Of the two principal carriers operating on the waterways, ONATRA and CFL, ONATRA is by far the most important, handling 95% of all waterway commerce. In addition to operating its rail network, the company operates extensive waterway facilities along the Congo from its mouth to Kisangani, on the Kasai and numerous other tributaries, and on Lac Kivu. The CFL waterway network is concentrated in the eastern part of the country on the Lualaba and on Lake Tanganyika. A privately owned company, *Express*, also operates on the Congo out of Kinshasa. Chronic shortage of funds and a scarcity of competent personnel are major operating problems encountered by the waterway services, and river transportation is in critical condition. It is unable to handle the current traffic

offered, and it is unduly slow, of poor quality, and subject to frequent delays. Maintenance of the waterways has been seriously neglected since 1960, but the national government is well aware of the importance of water transportation to the economy of the country. A \$13 million modernization of the river transportation system is currently underway. The project includes provisions for rehabilitation of navigational aids and dredging facilities in the Congo River estuary; improvement of navigation on the Kinshasa-Ilebo waterway; rehabilitation of OTRACO's fleet; provision of experts for ONATRA, RVM, and RVF; and a study of the most effective rail and river link between Shaba Region and the sea. The improved navigability of the main inland waterways and rehabilitation of OTRACO's river fleet will result in a faster ship turnaround and thereby help Zaire meet the increased river traffic expected over the next 3 years. Figure 8 lists characteristics of the principal inland waterways, and Figure 9 gives details of the most significant waterway ports.

**E. Ports (C)**

The maritime port system consists of two major and one minor ports located on a 80-mile stretch of the lower Congo River. Matadi (Figure 10), the leading port, is located at the interior end of the navigable river channel and handles about two-thirds of the country's maritime requirements. The port of Boma (Figure 11), on the north bank of the Congo 45 miles from its mouth, has two medium-size shipyards that build and repair barges and river boats. The port's largest ship repair facilities are two steel floating drydocks with 1,800 tons lifting capacity each. The minor port of Banana lies on a narrow spit of land near the mouth of the Congo River estuary. This small lighterage port has no commercial significance but serves as the pilot and quarantine station for Congo River maritime traffic. The marine terminal of the Congolese-Italian Refining Company (SOCIR) refinery is located on Crique de Banana about 1 1/2 miles from the port of Banana. Petroleum products are transferred by barge to tankers anchored in the Congo River estuary.

Berthing, stevedoring, and warehousing operations are carried out by ONATRA on behalf of the Marine Service, an office of the Department of Transportation and Telecommunications. The ports of Matadi and Boma adequately meet normal shipping requirements of the country, but facilities at Banana can support only a small lighterage operation.

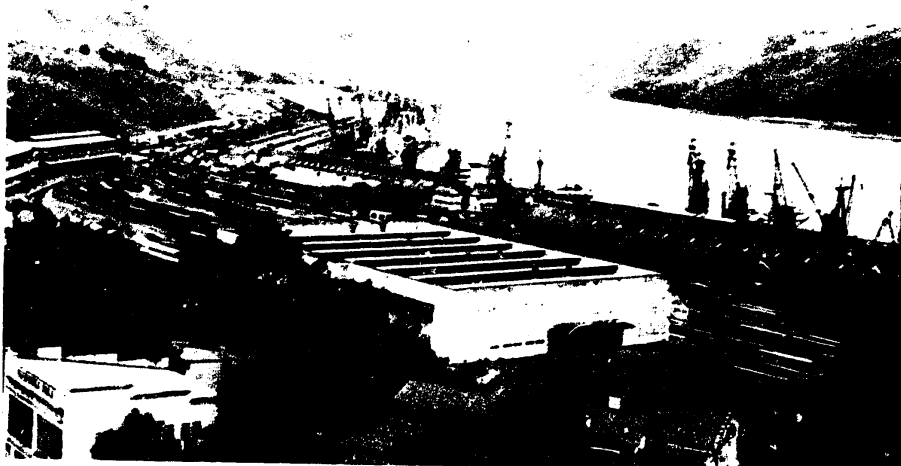


FIGURE 10. Port of Matadi (C)

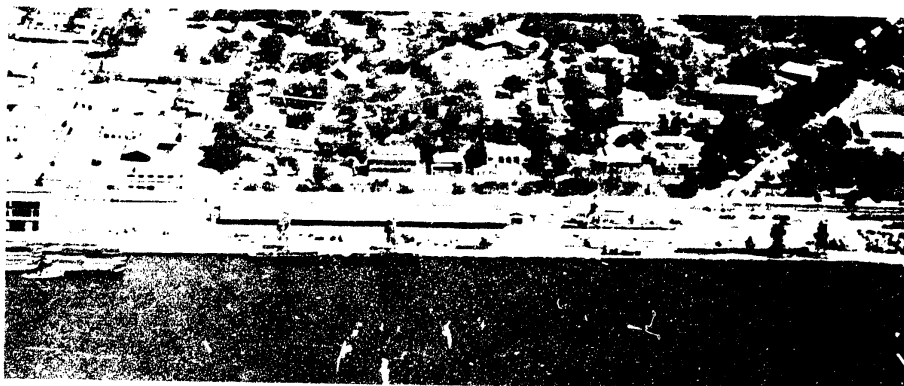


FIGURE 11. Storage buildings and open storage area at Boma (C)

FIGURE 12. Major ports (C)

NAME; LOCATION; MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Matadi (incl. Ango Ango) . . . . . 5°49'S., 13°27'E.; on S. (left) bank of Congo River, 80 miles upstream from the Atlantic Ocean. 8,300	Largest port; has modern quays with storage and mechanical handling facilities; road and rail clearance northeast to Kinshasa; handles 1,167,274 tons of cargo annually, including receipts of foodstuffs, refined petroleum products, building materials, and other general cargoes; and shipments of copper ore, lumber, and palm oil; petroleum and explosives are handled at Ango Ango, 2 miles downstream.	Improved natural river harbor consisting of two 1½-mile stretches of river at Ango Ango and Matadi; good natural protection; controlling depth in river channel 25 ft. at extreme low water; controlling width of channel 285 ft.; vessels for Matadi limited to 575 ft. in length and require speed of more than 10 knots in order to negotiate Mbengo-Mbengo, a 90° bend with currents between 7 and 10 knots.	Alongside—For 11 standard ocean-type cargo vessels, 3 coaster-type cargo vessels, 4 lighters, and 1 small ocean-type tanker. Depths alongside 30 to 18 ft. Fixed mooring—None. Anchorage—For 25 standard ocean-type cargo vessels in nonswinging berths.
Boma . . . . . 5°51'S., 13°03'E.; on N. (right) bank of Congo River, 45 miles upstream from Atlantic Ocean. 2,060	Second largest maritime port; has ship-repair and cargo-handling facilities; connected with Matadi by surfaced road and ferry; handles 110,000 tons annually, 90% as shipments of bananas, logs, sawn timber, and palm oil, and 10% as receipts of general cargo; has two floating drydocks with lifting capacities of 1,800 tons each; capable of most floating repairs to ocean-type vessels.	Improved natural river harbor along 3½-mile stretch of river with least width of ½ mile and central depths of 60 ft.; good natural protection; controlling depth of river channel 25 ft. at extreme low water; least channel width 285 ft.	Alongside—For 3 standard ocean-type cargo vessels, 12 lighters, and 1 standard coaster-type tanker. Fixed mooring—None. Anchorage—For 3 standard ocean-type cargo vessels in the river opposite the town.

\*The estimated military port capacity is the maximum amount of general cargo—expressed in long tons—that can be unloaded onto the wharves and cleared from the wharf aprons during a period of one 24-hour day (20 effective cargo-working hours). The estimate is based on the static cargo-transfer facilities of the port existing at the time the estimate is prepared and is designed for comparison rather than for operational purposes; it cannot be projected beyond a single day by straight multiplication.

Because of silting, constant dredging is required to maintain depths in the Congo River channel. Chronic maintenance problems with dredging equipment present difficulties for maritime navigation.

Figure 12 gives details of the major ports.

#### F. Merchant marine (C)

Zaire's merchant fleet consists of one passenger and three dry-cargo ships totaling 35,901 gross register tons (g.r.t.), or 45,881 deadweight tons (d.w.t.). Two dry-cargo units, totaling 24,865 d.w.t., are 10 and 13 years old; the remaining 11,516-d.w.t. dry-cargo ship is 24 years old; and the 9,500-d.w.t. passenger ship is 24 years old. The dry-cargo units have operating speeds of 13 through 18 knots and the passenger ship has a speed of 16 knots. All ships are diesel powered.

All merchant ships are beneficially owned by the Belgian Maritime Company (Lloyd Royal), S.A., Antwerp (which takes the profit or loss from operations) and are operated by the Zaire Maritime Company (CMZ), in which the government holds the majority of capital shares.

The fleet is employed primarily in the carriage of trade between Zairian ports and ports of the west coast of Africa, Western Europe and the Far East (Japan). CMZ has recently become a member of the Japan/West Africa (from Angola to Cameroon) Shipping Conference and is utilizing two dry-cargo ships for the transport of steel, automobiles, and other cargo from Japanese ports.

CMZ has presently on order a new 15,800-d.w.t. dry-cargo ship being built in a Belgian shipyard and scheduled for delivery in early 1973; this unit is to replace the fleet's oldest ship.

The Department of Transportation and Telecommunications is responsible for the administration of merchant marine laws and regulations. Zaire is a member of the Inter-Governmental Maritime Consultative Organization (IMCO) and a party to the following IMCO Conventions: Safety of Life at Sea, 1960, and Load Lines, 1966.

Zairian seafaring officers and men are being trained in Belgian merchant marine schools and at sea to eventually fill all positions aboard Zairian merchant ships.

#### G. Civil air (C)

Air transportation plays a significant role in linking Zaire with its neighbors, many major cities of Western Europe, and with the United States. Also, because of the limited surface transportation facilities, domestic air transportation is particularly important.

Air Zaire, the national flag carrier, was established as Air Congo in June 1961. The government-controlled airline provides scheduled domestic and international services and is utilized for troop and supply movements when necessary. Technical and managerial assistance is furnished by Pan American World Airways under a long-term contract. Air Zaire operates a route network of approximately 56,000 miles to 29 domestic points and to 20 countries in Europe and Africa. The carrier is a member of the International Air Transport Association (IATA) and the Association of African Airlines (AAFRA), a regional organization whose activities complement those of IATA.

The Zairian Air Transportation Agency (AMAZ), formerly COGEAIR, is Zaire's largest air charter and air taxi organization. Under a new charter issued in 1971, the privately owned carrier obtained the exclusive franchise for air parcel delivery service throughout Zaire. Based at Ndolo, a small airfield in the Kinshasa urban area, AMAZ operates scheduled feeder flights to 19 other domestic points, 15 of which have no other scheduled air service. The company also performs crop dusting and spraying, air surveying, and maintenance and repair services.

There is little general flying or other aviation activity in the country despite the great distances and the limited surface transportation. A number of business concerns and religious missions own and operate light aircraft. To stimulate interest in civil aviation, the formation and development of aeroclubs have been encouraged.

Approximately 200 civil aircraft are registered in Zaire. Of these, 26 have a gross weight of over 20,000 pounds. Air Zaire owns 21 major transport aircraft: two Acropatiale SE210 Series 11R Caravelles, two Douglas DC-8-30's, two Douglas DC-8-63F's, seven DC-4's, and eight Fokker F-27-600's. Congo-Frigo, a commercial food distributing company, owns two Curtiss C-46's and one Douglas DC-4; TRAMACO Service has one Hawker-Siddeley HS-748; and the government's Geographic Institute owns one C-47. The light aircraft are owned by Air Zaire, AMAZ, missionary groups, aeroclubs, and private companies and individuals.

More than 4,000 persons are engaged in civil aviation activities in the country. Of a total of 3,700 employees, Air Zaire has 90 pilots, 30 other flight personnel, and 950 maintenance personnel. AMAZ has 180 employees including 16 pilots and an estimated 50 maintenance personnel. Most flight crew and skilled technical personnel are recruited from Europe. Africanization of Air Zaire's staff is continuing; however, progress is slow. The Zaire

Maintenance Company (SODEMAZ), a civilian maintenance service organization under contract to the Department of Defense, employs approximately 160 expatriates, including 25 to 30 pilots. This quasi-military organization serves as the air force's maintenance wing.

The principal aviation training activities are conducted by the Civil Aviation Training Institute, which was established in Kinshasa by the United Nations in 1964. The institute provides instruction in air traffic control, radio operation and techniques, airport management, and other services. In 1962, Air Zaire adopted an employee training program to raise the academic and professional standards of its employees. The program provides for the training of ground and flight personnel; promising students are sent abroad for additional training. Air Zaire's pilots and other technical personnel receive transitional and specialized training provided by the aircraft manufacturers. Pan American personnel assist in the training of DC-8 flightcrews and maintenance technicians. Basic commercial pilot training can be obtained from the aeroclubs.

The principal aircraft maintenance facilities are those of Air Zaire. The carrier's main facility at Ndjili airport (Kinshasa) can service aircraft up to the DC-8. Air Zaire also has facilities with a limited maintenance capability at Lubumbashi and Kisangani airfields. Major maintenance and overhaul of Air Zaire's jet aircraft are performed in Belgium and France. AMAZ facility at Ndolo airfield can accomplish all light aircraft maintenance except engine overhaul. A minor AMAZ facility is located at Kananga.

Zaire's Directorate of Civil Aviation in the Department of Transportation and Telecommunications was reorganized as the Airways Administration in 1971. The semiautonomous agency is responsible for management, training, airport facilities, and operation and maintenance of the airways system. Management and supervision of the new organization are provided by a team of eight U.S. Federal Aviation Administration technicians. The team is working under a 5-year technical assistance agreement designed to reorganize civil aviation in Zaire. The basic law governing civil aviation was promulgated in October 1955.

Zaire is a member of the International Civil Aviation Organization and has civil aviation agreements or provisional arrangements with 26 countries. Twelve foreign air carriers conduct scheduled services which link Zaire with 23 countries in Africa, Europe, and North America.

## H. Airfields<sup>1</sup> (C)

The air facilities system consists of 320 usable airfields, of which 229 are civil, two are military, one joint military/civil, and 88 privately operated. In addition, there are 166 sites and five seaplane stations. All major air facilities are located at population centers throughout the country. The secondary airfields are generally along water, rail, and road transportation lines. A large concentration is found within 200 miles of Kananga in the south-central area. An additional large group stretches across the country between the Equator and 4° north; a smaller complex is situated in the western section. Few are situated along the northern border, although topography is favorable for airfield construction.

The most important international airfields are Ndjili and Lubumbashi. Only Ndjili has depot aircraft maintenance; a few airfields have limited organizational maintenance capability. There are 19 airfields with hard-surfaced runways able to support C-54 to C-141 type aircraft. The remaining airfields have a capacity for C-47 or utility-type aircraft. The five seaplane stations are for emergency use. Some of the airfield sites could be made usable with a minimum amount of rehabilitation.

The general condition of the major airfields is fair to good, with adequate maintenance being performed to sustain operational capability. However, airfield maintenance support and service facilities are negligible at most of the other airfields. New construction has been limited to private airfields with a capacity to accommodate utility-type aircraft. The two military airfields, Kitona Base and Kamina Base, are being rehabilitated for the use of the air force. All pilot training has been transferred to Kamina Base.

Figure 13 lists characteristics of Zaire's most important airfields.

## I. Telecommunications (C)

The telecommunications (telecom) system is fairly well developed by African standards. It is composed of widely separated segments of wire lines, scattered radiocommunication stations, a few short multiconductor cables and radio-relay links, and scattered AM, FM, and TV broadcast stations (Figure 14). The principal telecom center is Kinshasa; secondary centers are Bukavu, Kisangani, Lubumbashi,

<sup>1</sup>For detailed information on individual airfields in Zaire see Volume 20, *Airfields and Seaplane Stations of the World*, published by the Defense Mapping Agency, Aerospace Center, for the Defense Intelligence Agency.



FIGURE 13. Selected airfields (C)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE, DIMENSIONS: ELEVATION ABOVE SEA LEVEL		ESWL*	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	Feet	Pounds			
Bunia..... 1°34'N., 30°13'E.	Asphalt..... 6,069 x 98 4,045	28,160	DC-4.....	Civil. Air Zaire and the air force both use this airfield. Aviation fuel in drum storage.	
Goma..... 1°40'S., 29°04'E.	Asphalt..... 7,546 x 98 5,069	33,000	DC-4.....	Civil. Air Zaire uses daily and air force uses occasionally for C-130 operations. Aviation fuel in drum storage.	
Ghale..... 4°09'N., 21°40'E.	Laterite..... 4,921 x 164 1,900	14,200	C-47.....	Military. Paracommando training center for the army. Fuel supply estimated in drum storage.	
Kalemie, North..... 1°53'S., 29°15'E.	Asphalt..... 5,741 x 98 2,569	28,160	DC-4.....	Civil. Air Zaire and air force both use this field. Fuel supply unknown.	
Kamina Base..... 8°38'S., 25°15'E.	Asphalt..... 8,858 x 147 3,622	99,000	C-130.....	Military. Pilot training center for the air force. Aviation and jet fuel available in underground tanks.	
Kisangani..... 5°31'N., 25°09'E.	Asphalt..... 6,430 x 148 1,289	33,000	DC-4.....	Civil. Air Zaire and air force use this airfield. Aviation fuel in drum storage.	
Kitona Base..... 5°55'S., 12°27'E.	Asphalt..... 7,874 x 147 394	99,000	C-130.....	Military. Used by the air force to support a large army training center adjacent to airfield. Aviation and jet fuel available by tank trucks.	
Lubumbashi..... 11°35'S., 27°32'E.	Asphalt..... 9,022 x 164 4,288	59,000	DC-8.....	Civil. International airfield. Aviation and jet fuel in aboveground storage.	
Mbandaka..... 0°01'N., 18°18'E.	Asphalt..... 6,726 x 98 1,040	35,500	DC-4.....	Civil. Used by Air Zaire and the air force. Fuel storage in drums.	
Ndjili..... 4°23'S., 15°27'E.	Concrete (reinforced)... 15,420 x 197 1,014	99,000	C-441.....	Joint. International airfield used by both international and domestic airlines. Air force's Operations Wing and Logistics Wing based here. Aviation and jet fuel in underground storage.	

\*Equivalent Single-Wheel Loading: Capacity of an airfield runway to sustain the weight of any multiple-wheel landing gear aircraft in terms of the single-wheel equivalent.

Kananga, and Mbandaka. Services provided include telephone and telegraph over most of the country and telex in principal towns. The quality of service is generally poor—a result of deteriorating equipment, poor maintenance, and a continuing shortage of skilled personnel. Despite these handicaps the system is about average compared with surrounding countries. Zaire ranks 14th in number of telephones in sub-Saharan Africa. An estimated 22,500 telephones serve less than one inhabitant per 1,000. The number of radio receivers is in excess of 800,000, and the number of TV receivers is over 20,000, with domestic and international services improving. About 70 community listening centers are provided by the government.

The Department of Posts and Telecommunications directs activities of the National Post and Telecom-

munications Office of Zaire (ONFTZ) a government organization. CNPTZ is advised by Bell Congo, a subsidiary of Belgium's Bell Telephone Manufacturing Company, an I.T.T. affiliate. The programs of the radio and TV broadcasting stations are controlled by the Department of Information. Private networks are operated by a number of commercial enterprises and missionary organizations.

The principal domestic network is the radiocommunication system. The chief control station is at Kinshasa and connects with six regional stations, which in turn connect with 24 intermediate stations serving as control centers for a large number of smaller stations. There is a radio-relay link between Kinshasa and Matadi. Of secondary importance to the domestic network are widely separated open-wire segments, which are located primarily around Kinshasa and in

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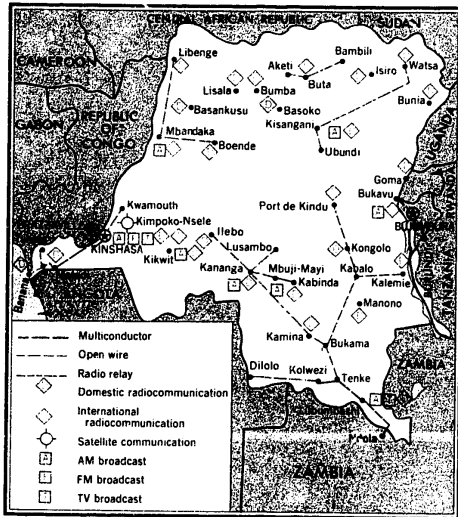


FIGURE 14. General telecommunications pattern (C)

the southeast; there are only a few minor lines in the entire northern half of the nation. Multiconductor cables connect Lubumbashi and Kolwezi.

Most international service is provided by a high-frequency station and a recently completed earth satellite station. The high-frequency radio-communication station, with transmitting and receiving sites, is located at Kinshasa. Direct radiocommunication circuits to several African and other capitals provide two-way telephone, telegraph, and telex service. There is a radio-relay link from Lubumbashi into Zambia. A subfluvial cable crosses the Congo River between Kinshasa and Brazzaville. A minor landline connects Bukavu to Bujumbura, Burundi. The earth satellite communication station is at Kimpoko-Nsele, about 30 miles east of Kinshasa. In addition to improving Zaire's international telephone and telegraph communications, the station is equipped to receive international TV programs. International communications are integrated with the domestic telephone and telegraph nets in Kinshasa; a radio-relay link connects Kinshasa and Kimpoko-

Nsele. Satellite circuits are in operation between Zaire and Italy, the United States, Belgium, and France.

Special-purpose networks are operated by a number of governmental and private organizations. Governmental facilities include those of the civil air authorities, the army, and police. Air radio facilities are operated for the government by the Zairian Aircraft Maintenance Company (SODEMAZ). Army and police facilities have been improved with assistance from the United States. The railroads and the General Quarries and Mines Company of Zaire (GECAMINES) operate their own networks. Other private companies and missionary organizations also maintain special radio nets.

The radiobroadcast system includes a principal AM station at Kinshasa, with medium-frequency transmitters for local coverage and high-frequency transmitters for national and international broadcasts. Other medium- and high-frequency AM stations for regional coverage are located at several towns. A small FM station is in Kinshasa, and TV stations are in the capital and Lubumbashi.

Vast expanses of tropical rain forest have forced reliance on radio rather than landlines to a much greater extent than in most countries. The humid tropical climate causes rapid deterioration of equipment, requiring special protective measures.

In the past, small quantities of radiobroadcast receivers were assembled under a licensing agreement with Philips Company of the Netherlands at a plant in Kinshasa, but it is not known if this facility is still in operation. All other equipment is imported, primarily from Belgium, France, the Netherlands, the United Kingdom, the United States, and West Germany. The automatic telephone exchange equipment for the enlargement of the Kinshasa exchange came from Belgium, and the agreement with the Bell Telephone Manufacturing Company of Belgium includes an arrangement for supplying equipment.

Future projects envision the completion of a radio-relay route, which will connect Kinshasa and Sakania, extending to the ocean, and including automatic telephone exchanges and urban cable systems. The two routes will total more than 2,500 km. and will have an ultimate capacity of 600 channels. In addition, Bell Telephone Company of Belgium is reportedly setting up a facility to assemble telephone instruments and equipment in Kinshasa.

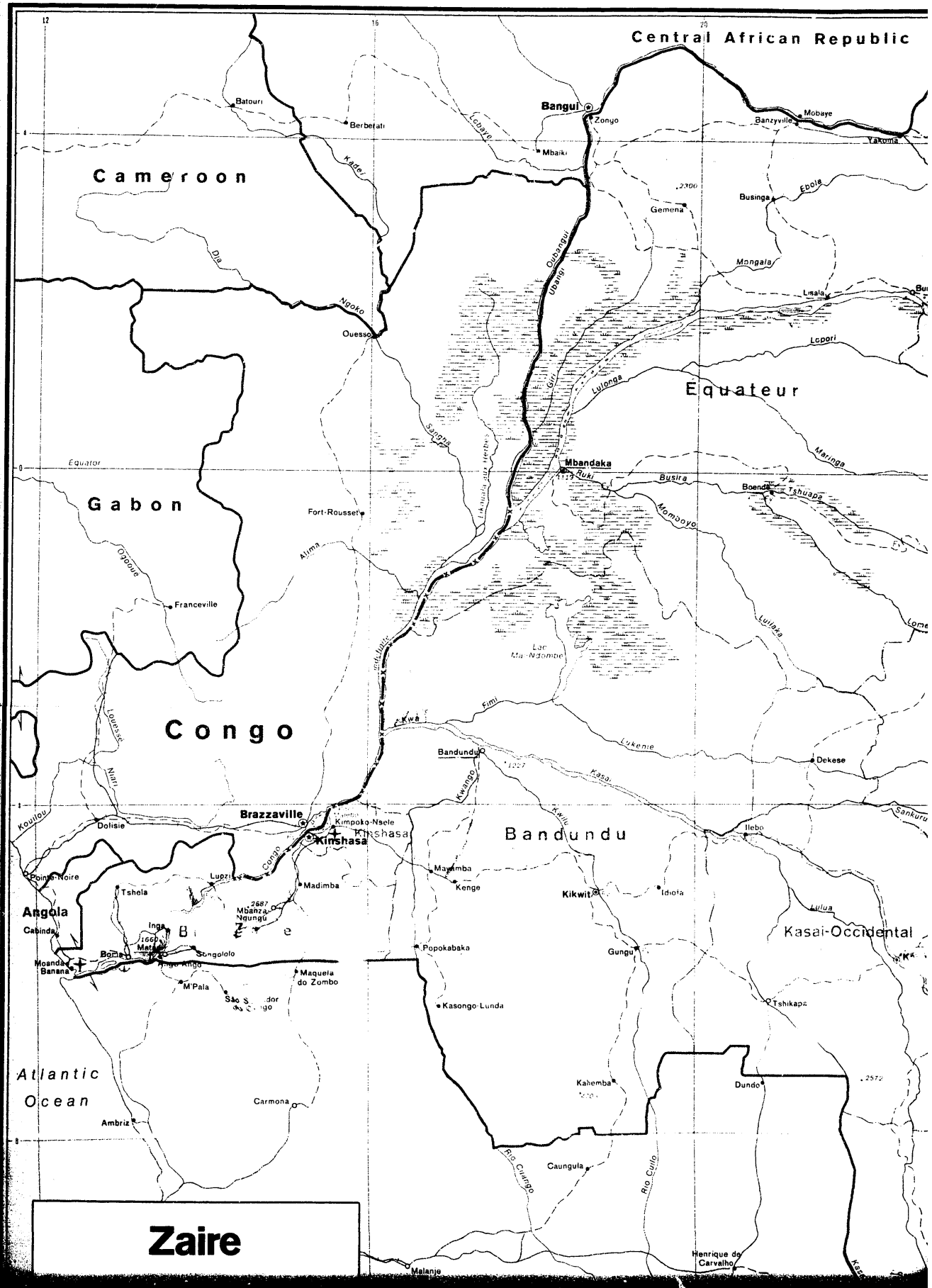
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Places and features referred to in this General Survey (U/OU)

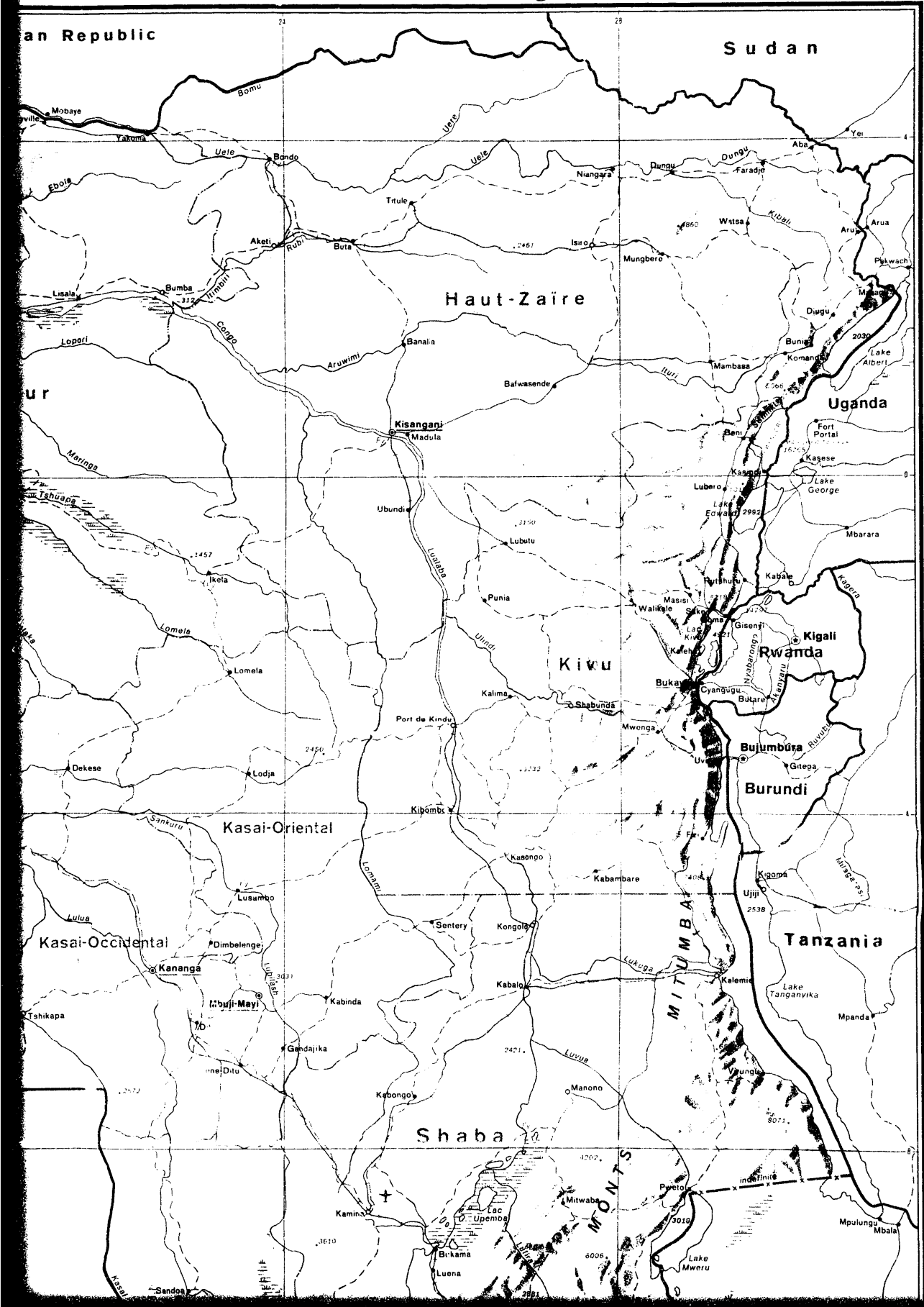
		COORDINATES				COORDINATES		
		° ' S.	° ' E.	° ' S.	° ' E.			
Aketi.....	2 44N.	23 46	Lake Albert (lake).....	1 40N.	31 00			
Akula.....	2 22N.	20 11	Lake Edward (lake).....	1 21	29 35			
Ango Ango.....	5 51	13 26	Lake Mweru (lake).....	9 00	28 45			
Bafwasende.....	1 05N.	27 16	Lake Tanganyika (lake).....	6 00	29 30			
Banana.....	6 01	12 24	Libenge.....	3 39N.	18 38			
Bandundu.....	3 19	17 22	Lienart.....	3 04N.	25 31			
Bangui, Central African Republic.....	4 22N.	18 35	Likasi.....	10 59	26 44			
Beni.....	0 30N.	29 28	Lisala.....	2 09N.	21 31			
Binza.....	1 03	28 54	Lobito, Angola.....	12 20	13 34			
Black River (strm).....	3 57	15 54	Lomami (strm).....	0 46N.	24 16			
Boende.....	0 13	20 52	Luabala (strm).....	0 26N.	25 20			
Boma.....	5 51	13 03	Luapula (strm).....	9 26	28 33			
Bomu (strm).....	4 08N.	22 27	Lubudi.....	9 57	25 58			
Bondo.....	3 49N.	23 40	Lubudi (rr sta).....	9 57	25 57			
Brazzaville, Congo.....	4 16	15 17	Lubumbashi.....	11 40	27 28			
Budjala.....	2 39N.	19 42	Luenta.....	9 27	25 47			
Bujumbura, Burundi.....	3 23	29 22	Lukala.....	5 31	14 32			
Bukama.....	9 12	25 51	Lulu (mine).....	10 38	25 21			
Bukavu.....	2 30	28 52	Lulimba.....	4 42	28 38			
Bumba.....	2 11N.	22 28	Madula.....	0 28N.	25 23			
Bunia.....	1 34N.	30 15	Mambasa.....	1 21N.	29 03			
Busanga.....	10 12	25 23	Maniema.....	1 11	28 37			
Businga.....	3 20N.	20 53	Manono.....	7 18	27 25			
Buta.....	2 48N.	24 44	Masina.....	5 52	17 03			
Chilabombwe, Zambia.....	12 22	27 50	Matadi.....	5 49	13 27			
Congo River (strm).....	6 04	12 24	Mayamba.....	4 46	16 46			
Crique de Banana (tidal creek).....	6 01	12 25	Mayumbe (massif).....	4 30	12 30			
Dilolo.....	10 42	22 20	Mbandaka.....	0 04N.	18 16			
Djelo-Binza.....	4 23	15 15	Mbanza-Ngungu.....	5 15	14 52			
Douala, Cameroon.....	4 03N.	9 42	Mbengo-Mbengo (whirlpool).....	5 50	13 26			
Fimi (strm).....	3 01	16 58	Mbuji-Mayi.....	6 09	23 36			
Fungurume.....	10 37	26 18	Mongala (strm).....	1 53N.	19 46			
Gemena.....	3 15N.	19 46	M'Pala, Angola.....	6 08	13 44			
Goma.....	1 41	29 14	Muanda.....	5 56	12 21			
Guba.....	10 40	26 26	Mulungwishi.....	10 47	26 37			
Idiofa.....	5 02	19 36	Mungbere.....	2 38N.	28 30			
Ilebo.....	4 19	20 35	Mushenge.....	4 32	21 21			
Inga.....	5 39	13 39	Musoshi.....	12 15	27 38			
Isiro.....	2 46N.	27 37	Mutshatsha.....	10 39	24 27			
Itimbiri (strm).....	2 02N.	22 44	Mwenga.....	3 02	28 26			
Ituri (strm).....	1 40N.	27 01	Ndjili.....	4 28	15 21			
Kabalo.....	6 03	26 55	Ndolo.....	3 36	23 03			
Kabongo.....	7 24	25 38	Ndolo (sec papl).....	4 19	15 19			
Kalemie.....	5 56	29 12	Pool Malebo (pool).....	4 15	15 25			
Kamina.....	8 44	25 00	Port de Kindu.....	2 57	25 57			
Kananga.....	5 54	22 25	Punia.....	1 28	26 27			
Kasai (strm).....	3 02	16 57	Ruzizi (strm).....	3 16	29 14			
Kasese, Uganda.....	0 10N.	30 05	Sakania.....	12 45	28 34			
Kasongo.....	4 27	26 40	Sake.....	1 34	29 03			
Katanti (mission).....	2 18	27 08	Sankuru (strm).....	4 17	20 25			
Katonto (hill).....	10 38	25 21	Shituru (mine).....	11 01	26 46			
Kenge.....	4 52	16 59	Sona-Bata.....	4 54	15 09			
Kiambi.....	7 20	28 01	Songololo.....	5 42	14 02			
Kigali, Rwanda.....	1 57	30 04	Tenke.....	10 35	28 07			
Kigoma, Tanzania.....	4 52	29 38	Titule.....	3 17N.	25 32			
Kikwit.....	5 02	18 49	Tshela.....	4 59	12 56			
Kimpoko-Nsele.....	4 14	15 33	Tshikapa.....	6 25	20 48			
Kinkuzu.....	4 58	14 28	Tshinsenda.....	12 18	27 58			
Kinshasa.....	4 18	15 18	Ubangi (strm).....	3 30	17 42			
Kipushi.....	11 46	27 14	Ubundi.....	0 21	25 29			
Kisangani.....	0 30N.	25 12	Uvira.....	3 24	29 08			
Kisenge.....	10 41	23 10	Vila Teixeira de Sousa, Angola.....	10 42	22 12			
Kitona.....	5 28	17 42	Yei, Sudan.....	4 05N.	30 40			
Kolwezi.....	10 43	25 28	Zonzo.....	5 44	14 39			
Komba.....	2 53N.	23 59						
Kongolo.....	5 23	27 00						
Kota Koli.....	11 40	27 28						
Kwa (strm).....	3 10	16 11						
Kwango (strm).....	3 14	17 22						
Kwilu (strm).....	5 40	12 52						
Lac Kivu (lake).....	2 00	29 10						
<b>Selected Airfields</b>								
			Kamina Base.....	8 38	25 15			
			Kitona Base.....	5 55	12 27			
			Lubumbashi.....	11 35	27 32			
			Ndjili.....	4 23	15 27			

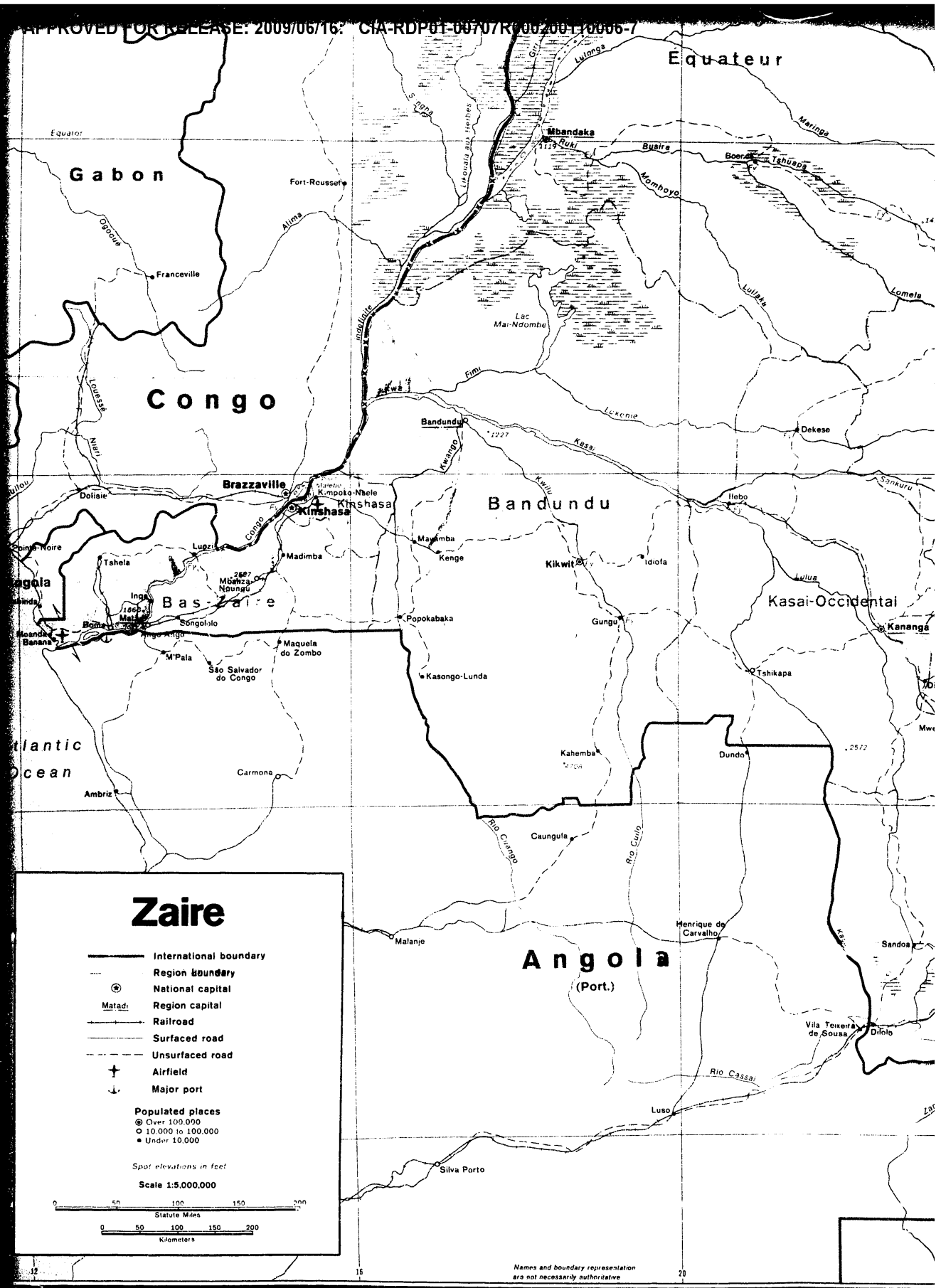
NOTE—All latitudes are south unless otherwise indicated.

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