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NATIONAL INTELLIGENCE SURVEY

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Transportation and
Telecommunications

NATIONAL INTELLIGENCE SURVEY PUBLICATIONS

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YUGOSLAVIA

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Transportation and Telecommunications

A. Appraisal (C)

The location of Yugoslavia between central Europe and the Middle East has resulted in a transportation and telecommunication (telecom) pattern greatly influenced by international traffic considerations. Yugoslavia has important highway connections with each of the seven bordering countries and rail connections with all but Albania. The Danube, with its tributaries and connecting canals, provides an inexpensive mode of transport connecting the country with neighbors to the north and east. About half of the Yugoslav working population is employed in agriculture, but few nations in Europe have made such a dramatic transition to industrial production since World War II. In general, the transportation and telecom systems are adequately supporting current needs of the national economy. However, transportation facilities are not as well developed as those of Western Europe; most of the rail mileage is single track, and only 26.2% of the highway network is hard surfaced.

Distribution of the transportation networks is uneven. Railroad lines, highways, and inland waterways are concentrated mainly in the lowland plains of the north. The rail and highway networks are rather sparse in the mountainous regions covering most of the country.

Although the railroads continue to be the primary carriers of freight in terms of tonnage and ton-miles, they have been declining steadily in total traffic—largely in favor of highway trucking. In 1970 the railroads accounted for 55% of the ton-miles, a decrease of about 9% from 1967. On the other hand, highway transport, and to a lesser extent the inland-waterway carriers, have been showing considerable traffic gains. The impact of the tremendous increase in passenger vehicles—1967 to 1970—is reflected in the 33½% increase in passenger-miles in 1970. Highways act mainly as feeders for the railroads and inland waterways and carry much of the short-haul traffic. In many areas roads are the only means of transportation. Although surpassed by the railroads and highways in amounts of freight and passengers carried, inland waterway transport is also a significant contributor to

the country's transportation effort, domestic and international. Pipeline transportation is relatively insignificant.

Yugoslav ports are increasing in size and importance—from two major and seven minor in 1967 to nine major and 24 minor in 1971—as major railroad lines and highways, linking the ports with the major population centers to the north and east, are being improved and constructed. In addition to substantial utilization in international shipping, these ports are used extensively in coastal shipping, much of which is accomplished by the nationalized Yugoslav merchant fleet. The fleet has gained in ranking since 1966 and is now 17th among the maritime nations of the world; however, the total amount of the nation's seaborne cargoes handled by the fleet declined from over 55% in 1964 to about 45% in 1970—largely because of the closure of the Suez Canal and inefficient management. Yugoslavia has its own air carriers, which provide adequate domestic and international services. A number of good airfields capable of handling modern jetliners and military aircraft are geographically well distributed.

The Yugoslav telecom complex adequately serves the nation's needs. Modern equipment is gradually replacing old equipment. Government emphasis on improved telecom services has resulted in an extensive expansion and modernization program now underway to improve telephone and telegraph facilities.

Government-sponsored programs are providing for extensive improvements to the transportation and telecom systems, but progress is slow mainly because of inadequate finances. Among the more significant projects planned or underway are the following:

Railroads—Construction of a new standard-gage line from the port of Bar to Belgrade.

Highways—Completion of the last segment of the inland Adriatic highway—Ivangrad to Rozaj to Kosovska Mitrovica. Completion of the Belgrade-Kladovo highway, which will considerably shorten the distance between Belgrade and Bucharest by providing a most important international highway border crossing via the top of the Iron Gate dam. Another important aspect of the road development plan is the construction of several sections of divided highway on the principal routes.

Inland Waterways—Completion of work on the Danube - Tisa - Danube canal system and expansion of port facilities at Belgrade.

Pipelines—Completion of the trans-Yugoslav crude oil pipeline from the port of Bakar on the Adriatic to Pancevo near the Danube.

Ports—Completion of port development at Bar and Koper, including container handling facilities at Koper.

Merchant Marine—Current plans for a fleet aggregating 2.5 million g.r.t. by 1975 (1.5 million g.r.t. in 1971).

Civil Air—Purchase of new, larger equipment, expansion of maintenance capability, expansion and modernization of training facilities.

Air Facilities—Expansion and improvement of existing facilities and overhaul of civil airfield management in order to compete favorably with foreign airlines.

Telecommunications—Expansion of coaxial network and radio-relay links and construction of new radio and TV studios.

Administration and control of transportation are vested in the Federal Secretariat for the Economy and its subordinate organizations. The Directorate of Posts, Telegraphs, and Telephones Community is responsible for the control and operation of the telecom system, and the Committee for Radiobroadcasting and Television is responsible for radiobroadcast and TV activities.

B. Strategic mobility (S)

Yugoslavia's defense strategy and logistic mobility are largely determined by fundamental differences in terrain which divide the country into two military geographic regions—the Northern Plains and the Hills and Mountains of the south and west. The combination of environmental characteristics common to each region would have a relatively uniform effect on strategic mobility within the region, but present marked differences between the two regions.

For each mode of surface transport, and telecommunications and air operations, the mountainous two-thirds of the country presents serious restrictions or limitations and would make large-scale logistic support operations extremely difficult. The low Northern Plains are suitable for large-scale conventional operations, but numerous rivers and canals create directional logistic problems and tend to restrict or hamper rapid cross-country movement. Seasonal climatic conditions also are restricting factors, both in the plains and in the mountains.

The rail network is adequate for normal economic needs and could support sustained military operations. However, due to the small number of high-capacity

through routes and lack of adequate bypasses, the civilian economy would feel the impact of any large-scale military movement. The greatest strain would be placed on the low-capacity lines leading from the coastal ports of Rijeka, Split, and Ploce.¹ The main deficiencies which limit the system's capacity are: the predominance of single-track lines, the relatively small number of diesel and electric locomotives, the outmoded mechanical signaling and interlocking operations; and obsolescent and inefficient rail yards at the major traffic centers.

The road network suffers from various deficiencies that would limit military usage of the system on a large scale; these include lack of alternate routes, poor quality construction of many roads, and a variety of traffic bottlenecks such as sharp curves and steep grades. Also, vehicle mobility would be impeded by seasonal climatic conditions—rain, fog, ice, and snow. Rapid cross-country movement of vehicles and troops would be impossible in the mountainous region and difficult in many lowland areas due to swampy terrain and many unbridged sections of waterways and canals. Military movement from the coastal regions into the hinterland would be hampered by the poor alignment and surface conditions, general sparsity of routes, and the rugged terrain. Although modernization of Yugoslavia's highway system eventually will increase its logistic support capabilities, the military value of the network is limited by the uneven spatial distribution of roads.²

Interdiction of both rail and highway movement would be relatively easy in the highland areas where alternate routes or detours are virtually lacking.

As lengthy transport arteries the Danube and the Sava rivers could provide logistic support in the east-west movement of military supplies and equipment across the greater part of northern Yugoslavia. The international Danube provides Warsaw Pact forces high-capacity access northwestward across Austria into southeastern West Germany. Most vulnerable on these waterways is the Iron Gate dam-and-lock installations, destruction of which would halt through-traffic movements on the Danube as well as cause widespread flooding. Serious interdiction could also be accomplished by destruction of large bridges, ports, and repair facilities. In a military supply-resupply

¹For diacritics on place names see the list of names on the apron of the Terrain and Transportation Map, Figure 18, and the map itself.

²The discussion and table on internal routes as well as the map on strategic areas, internal routes, and approaches, in the Military Geography chapter further illustrate the problems of military movement on and off the highways.

operation the waterway route capability of the Danube is 110,500 short tons per day based on the locking facilities at the Iron Gate dam-and-lock installation. Belgrade and the seven significant ports have a combined estimated military port capacity of 64,000 short tons per day.

While Yugoslav ports are generally adequate for normal economic needs, only the major ports are really adaptable for military use. Until the long-range port development plan is completed, port capacities would be inadequate for prolonged military use of logistic resupply.

The merchant marine is capable of supporting military operations involving troop transport and logistic support. A total of 163 cargo ships (131 dry cargo, two refrigerator cargo, 25 bulk cargo, five combination passenger/cargo) have a combined lift capability of 1,501,300 long tons of cargo. The 17 tankers could transport about 348,700 tons (2,971,900 barrels) of petroleum products.

The five passenger ships would be able to transport about 19,000 troops under emergency conditions. There are 17 small passenger ships and one training vessel that could lift another 2,800 troops. This troop-lift capability could be further augmented by two ferries, each over 1,000 g.r.t., and 10 smaller ferries. The 12 ferries could transport about 2,400 troops on a very short-haul basis.

For merchant marine support of military amphibious lift capabilities, there are 16 ships, totaling 151,200 d.w.t., equipped with heavy-lift booms (40 tons or more); 35 ships, totaling 478,555 d.w.t., equipped with large hatches (50 feet or longer); and four ships, totaling 46,818 d.w.t., equipped with heavy-lift booms and large hatches.

This lift capability could be supplemented by units in the coastal fleet. There are 46 dry cargo ships that could transport about 29,900 long tons of cargo and seven tankers that could transport about 3,500 tons (29,900 barrels) of petroleum products.

Use of the merchant fleet in an emergency has been incorporated into contingency planning for the territorial defense of Yugoslavia, with activities to be coordinated by the navy.

The airfields of Yugoslavia are adaptable to meet adequately all internal requirements for military operations. Both military and civil airfields would be placed under military jurisdiction and used for military operations as necessary. The newest military airfields have been constructed with maximum potential for rapid expansion, i.e., addition of parallel runways. Construction of adequate parking aprons and hangers is either underway or planned and could

readily be expedited if necessary. Material shortages and inadequate fuel reserves are still major deficiencies at military air installations. The completion of the planned pipelines should resolve some of these problems.

In the event of a national emergency or mobilization the government would integrate the equipment and personnel of Yugoslav civil aviation into the armed forces. Most Yugoslav Airlines (JAT) personnel have had some previous military training. The major transports could provide considerable airlift assistance and the light aircraft could provide support in such areas as reconnaissance, training, and maintenance of domestic air services.

The local and long-distance telecom transmission networks in Yugoslavia use coaxial cables and microwave radio links which satisfy civil needs and meet most of the military requirements. Separate facilities, however, are maintained by the military services.

The six army district headquarters of the Yugoslav Armed Forces are located in Belgrade, Ljubljana, Nis, Sarajevo, Skopje, and Zagreb. All of these cities are important telecom switching centers and are linked by high-capacity underground cables and radio-relay links. In addition to a large volume of public traffic, these circuits handle special-purpose communications of a military nature. Radiobroadcast stations of 100 kw and above are also located in each of these cities.

Telephone and telegraph services for the army use wire circuits leased from the Directorate of Posts, Telegraphs, and Telephones Community (PTTC) as well as army-owned wire and radiocommunications facilities. The army also has access to the PTTC network through switchboards at each district headquarters. The main center in Belgrade provides telephone and telegraph services to units throughout the country.

In time of national emergency, either the Administration for State Security or the armed forces would control all essential telecom facilities.

C. Railroads (C)

On 1 January 1971 the government-owned Association of Yugoslav Railways (JZ) consisted of 6,393 route miles of line, of which 683 miles were narrow gage (chiefly 2'6") and 5,710 miles were standard gage (4'8 1/2 "). The network is single track except for 463 miles of double track (all standard gage); electrification totaling 1,180 miles is confined to the standard-gage lines.

Yugoslavia's main railroad line runs northwest to southeast through valleys from Jesenice at the Austria border to Gevgelija at the Greece border via Ljubljana, Zagreb, Belgrade, Nis, and Skopje. North of the main line, in the Northern Plains, the rail system is well developed. The major northern connecting routes to the main line include the Maribor-Zidani Most, Botovo-Dugo Selo, and the Subotica-Stara Pazova lines. To the south, rail development has been limited by the predominantly mountainous terrain. The only major connecting lines are found in the central and western parts of the country and include the Sezana-Ljubljana, Rijeka-Zagreb, Zadar-Novska, and Sarajevo to Vrpolje lines.

The only sizable area lacking an adequate rail link with the interior of the country is the section south of Belgrade to the Adriatic coast. In order to integrate this area into the country's rail network, the JZ has been constructing, since 1952, a single-track standard-gage line that will run from Belgrade through the rugged mountain regions of central Yugoslavia (Figure 1) to the port of Bar. When completed, the Belgrade-Bar line will not only open up large areas of underdeveloped land in southern Yugoslavia, but will also provide a shorter, less expensive international route from northern and central Europe to Mediterranean seaports. The port of Bar is being expanded and modernized and is expected to be completed by the time the first trains begin operating early in 1974.

The JZ makes direct connections with the rail systems of all adjacent countries, with the exception of Albania. All international lines are standard gage, and all are single track except for the double-track lines from Sezana into Italy and from Sentilj into Austria.

The more important rail centers are Belgrade, Knin, Koprivnica, Ljubljana, Nis, Novi Sad, Rijeka, Sarajevo, Skopje, Split, Vinkovci, and Zagreb.

Despite the gradual introduction of some mechanization in JZ maintenance work, most of this work is still being done manually. Maintenance procedures are poor by Western European standards. Among the several factors that make construction and maintenance costly is the predominantly mountainous terrain, which requires the construction of numerous bridges and tunnels, particularly on steep grades and sharp curves. Construction along the steep sides of gorges and in river valleys subject to flooding has required many protecting and supporting structures; generally, construction costs are higher than in neighboring countries. Protection of lines from destructive effects of ice, frost, landslides, floods, and other natural hazards is a constant problem.

Since 1961 the JZ has been engaged in an extensive improvement program aimed at increasing capacity, modernizing operations and equipment, and constructing additional lines in less developed parts of the country. Some success was achieved between 1961 and 1963, but since 1963 numerous financial difficulties have forced a curtailment of many projects. The 1971-75 program calls for a reduction in the number of steam locomotives by 15%; improving signaling and telecommunications between Belgrade, Zagreb, Skopje, and other large cities; modernization of facilities at the Belgrade, Ljubljana, Zagreb, Nis, and Skopje yards; increased axleload limits on major routes; standardization of some existing narrow-gage lines; and construction of a few new standard-gage lines.

The most recently completed projects include a new standard-gage section of the Belgrade-Bar line from Vreoci to Valjevo and electrification of the Zidani Most-Zagreb, Belgrade-Lapovo, and Vrpolje-Ploce rail lines. If funds are available, it is hoped that the new standard-gage lines from Bor to Majdanpek and Valjevo to Tuzla will be finished by 1974. The largest project still underway is the 295 mile standard-gage line from Belgrade to Bar. Because of the economic benefits anticipated from this line, the JZ will be directing their major effort toward completing the project by 1974.

It is estimated that there are 25,500 railroad bridges (minimum length 6 feet) in Yugoslavia; they total 554,000 feet in length. In general, most bridges 16 feet and over in length are of steel, and most under 16 feet are of masonry or concrete. The proportion of masonry bridges is highest on the oldest lines in the northern and northwestern parts of the country; in the eastern and southern parts of the country about 30% of the bridges are of concrete and 70% are conventional beam or plate-girder steel structures. Older bridges, especially those of masonry, are gradually being replaced with new steel structures.

Of the approximately 650 rail tunnels, less than 3% are double track, but some of the newer single-track tunnels have been built to double-track width and have sufficient clearance for future electrification. Most tunnels are bored through solid rock and are masonry or concrete lined. The more exposed sections of line through mountainous terrain are protected by galleries and snowsheds.

Rail used on JZ standard-gage lines ranges from 70 to 100 pounds per yard in weight and is from 50 to 80 feet in length. The lines have axleload limits ranging from 16 to 24 short tons. Rail on narrow-gage lines

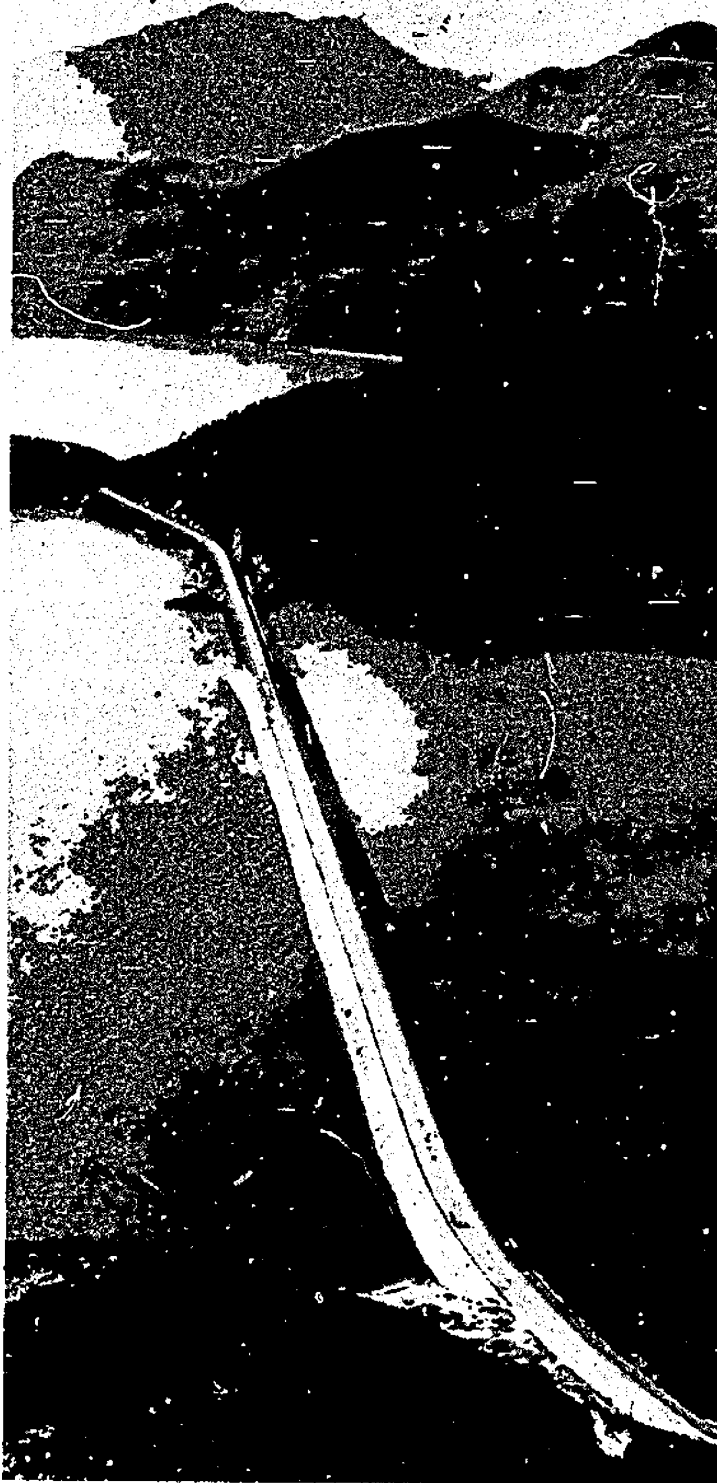


FIGURE 1. The Belgrade - Bar rail line and the Adriatic Highway crossing Lake Scutari. Note railroad tunnel at north end. (U/OU)

weighs 44.5 pounds per yard and is 50 feet long. The lines have axleload limits of 7 to 12 short tons. Most ties are of wood; a small percentage of steel ties is also being used. Ballast is crushed rock, stone, or gravel. On most lines ballast ranges from 14 to 19 inches in depth; the average is 16 inches. Rail is produced domestically, but some is imported, mainly from France. Ties and ballast are available locally.

JZ train control is chiefly by the manual-block system, but automatic block is used on parts of the line between Belgrade and Zagreb, and Centralized Traffic Control (CTC) is in operation on the sections between Doboj and Zenica and between Zagreb and Novska. CTC is being installed between Novska and Belgrade. Color-light and semaphore signals are used but are insufficient in number and are inadequately maintained. The number and condition of signals are satisfactory on only a few major lines, primarily on those carrying international traffic. Communications are via telephone and telegraph.

Coal, diesel oil, and electricity power Yugoslav locomotives. Substantial indigenous supplies of coal are available, but the quality is poor, and the railroads import better coal from East Germany and West Germany to mix with the domestic supplies. Petroleum is produced in Yugoslavia, but diesel oil must be imported. Electricity is supplied by hydroelectric and thermal powerplants. Water is abundant in most areas throughout the year. Although the mineral content is high, water for locomotive use is treated at only a few of the larger yards and rail centers.

JZ freight and passenger traffic has declined steadily since 1965. This downward trend is the result of a leveling off in the growth rate of industrial production, a change in transport preference, and failure of the government to adequately expand and modernize the railroad system. In 1971 the railroads transported 88.0 million short tons of freight and nearly 145 million passengers, accomplishing 12.7 billion short-ton-miles and 6.5 billion passenger-miles. Principal commodities carried were coal, cement, ores, wood, and metallurgical products. The main artery for both domestic and international traffic is the standard-gauge line extending from Austria to Greece. A large percentage of the international freight comprises imports from Italy and those received through the port of Rijeka and destined for adjacent Soviet-oriented countries and Austria. Included in this international traffic are agricultural products, ores and metals, and fuels. In domestic traffic the most heavily traveled lines are in the industrialized north and northwest, but

traffic is increasing in the south-central part of the country, reflecting emphasis on industrial development in that area.

Rail container transport is developing at a rapid rate, despite the small quantities presently handled. In 1970 the JZ transported over 300 units, and the figure has been continually rising. Investment in container transport is being directed toward acquiring special freight cars and construction of special handling facilities at selected terminals. The JZ has fully developed container terminals in Ljubljana and the port of Koper; temporary facilities exist in other important traffic centers. Yugoslavia is a member of the 19-nation European Community INTERCONTAINER (International Company for Transport by Transcontainers) whose functions include organization of container traffic between the transportation networks of the various countries.

In 1971 the JZ equipment inventory comprised 1,882 locomotives, most of which were steam, and 61,869 freight cars, most of which were two-axle units. Replacement of the steam locomotives by diesel (Figure 2) or electric units has been slow. There is a great need for branch-line and switching locomotives of 1,500 horsepower or less. Locomotives and freight cars are built in Yugoslav plants, but much of this production is for export to build up Yugoslav foreign-exchange credits. The JZ normally imports diesel engines from Hungary, Austria, France, and the United States; special-purpose freight cars are purchased from Poland.

Because of equipment shortages, overloading is common and results in equipment failures. Deferred maintenance contributes to the deterioration and frequent breakdowns of equipment. Repairs are subject to long delays because of improper scheduling, and even new equipment rapidly deteriorates under conditions imposed by its heavy use. Superior operating efficiency, however, has enabled the railroads to handle most of the traffic in spite of these shortcomings.

The railroads of Yugoslavia, with the exception of a few minor industrial and port lines, are operated by the JZ under the Federal Secretariat for the Economy. Organization of the JZ is based on a concept of worker management in which the workers participate in administration and usually receive a share of the profits. The JZ is administered by Railroad Transport Enterprises, of which there are three in the republic of Slovenia (Slovenija) and one each in the remaining republics. Activities of these enterprises are coordinated by the Association of Railroads—also

FIGURE 2. Co-Co 1,850-horsepower standard-gage diesel-electric locomotive (U/OU)



known as Union of Railroad Enterprises—acting for the Federal Secretariat for the Economy. The transport enterprises are divided into some 200 working units, each of which has an elected workers council.

On 1 January 1970, JZ personnel numbered about 133,000. There are several railroad training schools located throughout the country. Among the notable schools are the Railroad Electronic School at Ljubljana, the Advanced Communications School at Zemun, and the Railroad Institute at Belgrade.

D. Highways (C)

Highway transport provides feeder and distribution services to other modes of transport and is used chiefly for short-haul movement of freight and passengers. In many areas highways are the only means of transportation. Highway transport, the second dominant mode of transport, is growing rapidly and assuming an increasing importance for the national economy. This trend is expected to continue, mainly because of the marked increase in the number of motor vehicles and related services. In recent years highway transportation has grown at a faster rate than the other transportation modes and has handled a steadily increasing share of freight and passenger transport. Since 1968, road transport has been replacing the railroads as the prime mode of passenger travel. Railroads are still the principal freight carriers, but the trend is toward a fuller utilization of the economic and technical advantages of highway transport.

The magnitude of the increase in highway transport is indicated by the following statistics:

	MILLION FREIGHT SHORT TONS	BILLION TON-MILES
1960	13.6	0.7
1967	44.7	2.7
1969	62.2	3.8
1970	94.7	4.5
1971	78.7	5.0

	MILLION PASSENGERS CARRIED	BILLION PASSENGER-MILES
1960	103	1.8
1967	373	6.4
1969	478	8.5
1970	543	9.6
1971	608	11.3

Despite the recent upswing in road modernization, improvement and new construction has not kept pace with this considerable motor traffic expansion. For the most part, the highway network is inadequate to meet the requirements of accelerated industrial development and the growth of tourism, foreign trade, and agriculture. The general sparsity, poor alignment and surface condition, and uneven spatial distribution are the major hindrances to the increasing traffic. Modern hard-surfaced roads constitute only about 26.2% of the total network. Even the primary roads are inadequate for current requirements and need improvement over many stretches. The network's shortcomings can be attributed to various other factors as well. Most roads were constructed decades ago on poor foundations and for light traffic, requiring expensive maintenance and repairs, especially in areas subject to deep frost. Technical road construction

standards frequently are not adjusted to the ever increasing congestion and heavier vehicle loads, resulting in rapid deterioration and increased maintenance costs. Another drawback is the considerable irregularity in the network's development, varying greatly in each of the republics.

The predominantly hilly and mountainous terrain of Yugoslavia has largely determined both the orientation and the overall pattern of the network. The highways are unevenly distributed, and the main concentration is in the lowland plains of the north. The main routes form a network of arterial highways providing border-to-border movement and international connections. In general, they duplicate the pattern of rail-line concentrations. The Brotherhood and Unity (Figure 3) and the Adriatic Highways form the backbone of the highway network and are part of the European highway system. The Brotherhood and Unity Highway extends across most of the northern part and southward through the eastern part of the country, linking Belgrade with Italy, Austria, and Greece. The Adriatic Highway consists of two portions. The coastal section parallels the Adriatic coast from the Italian border near Trieste to the Albanian border near Shkoder (Figure 1), and the inland section extends from Petrovac via Titograd, Kolasin, Kosovska Mitrovica, and Pristina to Skopje, where a junction is to be made with the Brotherhood and Unity Highway. Several north-south transverse roads—the most important known as the Bosnian Highway—connect the main routes and link the interior of the country with the coast.

Although Yugoslavia's road modernization program has made good progress during recent years, the network is generally below par by Western standards. On the other hand, among Eastern European countries—according to a recent comparison of their highway mileage totals—Yugoslavia's network, because of accelerated upgrading, now ranks second, and it has taken third place in total mileage of hard-surface pavements.

Yugoslavia has about 56,565 miles of public highways classified as Class I, II, III, and IV according to their economic importance, and as hard-surfaced, macadamized, earth, and unimproved according to surface construction. It is not uncommon to have a Class I highway with an inferior surface. The approximate breakdown by highway surface types and percent of total mileage is as follows:

	MILEAGE	PERCENT OF TOTAL
Hard-surfaced (concrete, bituminous, bituminous surface treatment, stone block, cobblestone)	14,850	26.2
Macadamized (gravel, crushed stone)	25,715	45.5
Earth (graded and drained)	15,600	27.6
Unimproved (track)	400	0.7

According to category the breakdown is as follows:

CLASS	MILES
I	6,231
II	8,761
III	12,715
IV	28,858

In addition, about 12,000 miles of forest roads are used by the forestry industries.

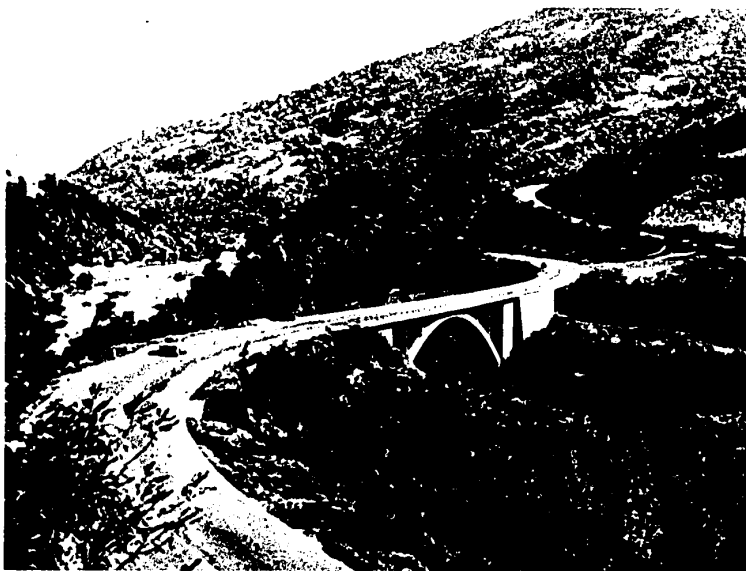


FIGURE 3. Section of Brotherhood and Unity Highway between Belgrade and Skopje (U/CU)

Highway surface widths for the most part range from 8 to 30 feet. Shoulder widths range up to 10 feet but are generally not more than 3 feet. Many stretches of highway, particularly the crushed-stone and gravel roads in mountainous regions, have no shoulders. Many stretches of concrete and bituminous highways, especially in cuts, have concrete curbs about 6 inches high. Base construction on highways having bituminous-treated or better surfaces is generally 3 to 8 inches of crushed stone. Some of the paved highways have telford-macadam bases consisting of hand-set large stones and crushed-stone fragments wedged tightly in the interstices. Stone-block pavements have a layer of fine sand as a cushion between the base and surface courses. Many mountain roads wind along cuts supported by stonemasonry retaining walls; some follow rocky precipices or extend along winding mountaintops and have sharp curves (many hairpin or reverse curves) and steep grades ranging up to 20% (Figure 4).

There are about 3,300 bridges 20 feet or longer on Class I and II roads. Little information is available on bridges on Class III and IV highways, but their number is probably small. Most of the principal highway bridges are of reinforced concrete or masonry; others are steel (including Bailey truss) or timber. Bridges have not been constructed to standard specifications. Little information is available on



FIGURE 4. Military convoy negotiating hairpin curve on steep mountain road (U/OU)

bridge capacities, but it is known that newly constructed bridges on Class I highways have a capacity of 44 short tons and that similar structures on Class II highways have a capacity of 26 tons. In December 1970, a vital bridge and highway construction project was completed. The six-lane Belgrade portion of the Brotherhood and Unity Highway and the 5,280-foot six-lane "Gazelle" bridge, which carries that highway section across the Sava river, were opened to traffic. This new bridge provides an important through route for rapid cross-country traffic and is capable of supporting heavy loads of all kinds.

Tunnels are numerous. Information on the total is not available, but there are an estimated 120 tunnels on Class I and Class II highways. Most are not illuminated or lined and have roadway widths and vertical clearances of 12 feet or slightly over. Only tunnels on main traffic arteries have roadway widths of at least two lanes; these generally have stonemasonry portals and are lined with concrete or ceramic tile.

Information does not indicate that there are any fords; however, there are probably some unpaved short fords along lesser roads. The several ferries on various routes have generally limited capacities that range from two to 10 vehicles and 30 to 40 passengers; most are wooden vessels.

The federal government plays a minimal role in highway administration and is largely occupied with international cooperation through road agreements. The Federal Basic Law on Public Roads (newly amended in 1967) made the Road Funds and Road Councils of Yugoslavia's six republics and two autonomous provinces entirely responsible for the overall coordination, planning, design, construction, maintenance, and repair of the highway network in their respective areas. They generally confine themselves to administration and supervision. The republics and provinces are responsible for Class I, II, and III roads and the municipalities for Class IV roads. Most road construction work is assigned by the responsible authorities to semiprivate and private firms on a competitive bid contract basis. In accordance with negotiated contracts, various road maintenance enterprises perform maintenance and repair assignments. After 1967, maintenance—badly neglected previously—improved considerably. It varies, however, in quality and extent among the republics and provinces due to lack of uniform standards and differences in maintenance methods and availability of funds. Because they have special heavy equipment and the necessary skills, engineer



FIGURE 5. Yugoslav army engineers engaged in road construction (U/OU)

units of the army are used to best advantage in building roads in areas having rugged terrain (Figure 5). In addition, volunteer youth brigades constitute an important part of the construction work force. In some parts of the country, villagers make voluntary contributions in the construction and maintenance of roads that will link them with the main highway network.

Road construction and maintenance in mountainous areas present serious problems, resulting in slow and costly work. In lowland areas many roads have to be elevated to prevent seasonal inundation. In addition, seasonal climatic changes create considerable maintenance problems that necessitate expensive repairs.

With the exception of bitumen, most of which is imported from Trinidad, Yugoslavia is self-sufficient in road construction materials. Supplies of crushed rock and timber are plentiful, and sand and gravel are available in adequate amounts. The Adriatic coastal region provides unlimited quantities of limestone for base and surface-course aggregates and for producing portland cement. Although domestic cement production is steadily expanding, rising requirements still necessitate imports. Supplies of locally produced steel are sufficient for construction purposes.

Road construction equipment ranges from primitive to modern. In many rural areas local volunteers work with wheelbarrows, shovels, and rakes. Equipment used for major construction projects, such as the Adriatic Highway, include concrete mixers, bull-

dozers, and power shovels. Domestic production of road graders, bulldozers, excavators, mobile cranes, scrapers, and road-surfacing machines is making satisfactory progress.

The current third phase (1971-75) of Yugoslavia's 20-year highway development program places primary emphasis on reconstructing and improving the existing network; it also incorporates some new construction, including areas no longer served by railroad lines. Operations on nationally and internationally important routes are scheduled to proceed at a fairly rapid pace during the next few years. The last segment of the inland portion of the Adriatic Highway—one of the major projects that will link southeast Yugoslavia with the Adriatic ports—is nearing completion on the Ivangrad-Rozaj-Kosovska Mitrovica stretch. Construction includes about 35 bridges and 14 tunnels, the longest of which is the new "Lokve" tunnel through the Turjak mountain ridge, scheduled to be about 3,600 feet long. Other construction includes the Bar-Ulcinj road, which will extend the Adriatic Highway close to the Albanian border; the Nis-Pristina-Pec route, designed to shorten connections to the Adriatic coast; and the Bela Palanka-Pirot segment of international highway E-95, being modernized jointly by Yugoslavia and Bulgaria. Construction of the Golubac-Tekija portion (which parallels the Iron Gate section of the Danube) of the Belgrade-Kladovo highway is continuing steadily. Upon its completion Yugoslavia will have a new international border crossing. A road connecting

Kladovo, Yugoslavia, with Turnu Severin, Romania, will cross the dam at the Iron Gate, considerably reducing the distance between Belgrade and Bucharest. Several transverse roads connecting the Brotherhood and Unity and Adriatic Highways are being modernized, and some sections are being entirely rebuilt.

The construction of divided highways is an important aspect of the road development program. The Belgrade-Zagreb section of the Brotherhood and Unity Highway is to be so reconstructed. Preliminary surveys or approved plans for divided highways involve routes from Zagreb to Split via Karlovac; from Varazdin, near the Hungary border, to the Italy border at Trieste, extending via Zagreb, Karlovac, and Rijeka; from Nova Gorica, at the Italy border, via Postojna and Ljubljana to Sentilj at the Austria border. The Belgrade to Novi Sad road construction is the first stage of a four-lane north-south road project from Subotica at the Hungary border to Gevgelija at the Greece border; as part of international route E-5 connecting central Europe with Greece, it is the shortest route to the Mediterranean. Special priority is being given to the Zagreb-Rijeka-Trieste super-highway project. Construction of the Ucka mountain tunnel, a part of this route, is one of the country's most ambitious undertakings. Its planned length is more than 17,000 feet, and it will shorten the distance between the Istrian Peninsula and the strategic port of Rijeka, and the Yugoslav hinterland as well. Completion of most divided highway sections is expected sometime during the 1970's.

Highway operations are hampered by various bottlenecks and by adverse climatic conditions. Major obstructions include numerous winding roads that have sharp, frequently hairpin, curves, steep grades, many narrow or low-capacity bridges, sharp turns at some bridge approaches, and numerous tunnels and underpasses that have clearance limitations. Traffic is also obstructed by narrow tortuous streets in many towns and villages. Adverse weather conditions render many roads impassable or difficult to traverse for varying periods of time. In rural areas, traffic is frequently interrupted by flocks of farm animals or is slowed by animal-drawn carts. Heavy snows and rains, landslides, rockfalls, visibility-restricting fog and dust, and spring floods accompanied by inundation or washouts in low-lying areas are common traffic interruption factors. Offroad movement is virtually impossible along many highways because of rugged terrain, heavy vegetation, and unstable soils.

Motor-carrier operations are controlled by the Federal Secretariat for the Economy. Administration

of economic organizations on the local level is based on the "self-management" principle, and transport enterprises—including highways—function as autonomous entities managed by workers councils. During the last few years, privately owned motor-carrier operations and facilities have been increasing steadily. It is estimated that there are more than 300 motor-vehicle-transportation enterprises specializing in passenger and freight transport; they are rapidly expanding their capacity and services. The number of buslines has increased on all Class I, II, and III roads; regular bus routes connect all regional centers and many villages. New buslines are continually opening between important tourist centers—for example, along the Adriatic Highway. Several bus services link Yugoslavia with some of the adjacent countries.

International highway transportation is rapidly increasing. In many cases international freight is collected in Yugoslav storage centers and is then transported to various major cities and industrial centers abroad. The increase in this transportation parallels the trend of growing industrialization of the economy. It is also attributable to the fact that Yugoslav foreign trade has been growing in terms of the volume of exports and imports and in the number of countries involved; the number of international trade agreements is steadily increasing. In addition, modernization of the road network and motor transport equipment has played an important part.

Transport of domestic freight utilizing trucks has been increasing steadily on most public highways. This is due largely to accelerated highway renovation, increased imports of heavy trucks, and a slowly growing trend to shut down unprofitable railroad lines and replace them with road transport facilities. The principal types of cargo hauled by truck include timber, iron ore, metals, minerals, chemicals, cement, machines and transport equipment, petroleum and petroleum derivatives, and agricultural products. Highway traffic is rapidly expanding, but the overall volume is still lighter than that of Western countries. Heaviest traffic is encountered in the agricultural and industrial areas of the north and around the major coastal ports; however, traffic volumes are subject to seasonal fluctuations and variations in agricultural and tourism transportation requirements.

As of January 1971, vehicle registration totaled an estimated 843,000: 720,875 passenger cars, 107,265 trucks, and 14,680 buses. In addition, there was an approximate total of more than 300,000 motorcycles. The number of passenger cars registered in 1971 was double the number in 1968, and truck and bus registration increased 12.5% over 1968—a remarkable rate of growth for a 3-year period.

In the main, truck capacities range from 1.5 to 10.5 short tons; tractor-trailer combinations range from 12 to 40 tons. Most bus capacities range from 20 to 44 seats; some of the modern buses, produced in association with Hungary, have seating/standing capacities ranging from 80 to 160. Most vehicles are generally in good condition and represent a large variety of manufacturers and models.

The steadily progressing motor vehicle industry is state owned. Production—in part performed under assembly license agreements with Italy, West Germany, France, the United Kingdom, Austria, and Hungary—includes passenger cars, trucks, buses, motorcycles, and various spare parts and engines.

Despite the expanding automotive industry, Yugoslavia must import vehicles to satisfy domestic requirements. Motor vehicles are imported from Czechoslovakia, the U.S.S.R., East Germany, Hungary, West Germany, France, Italy, and the United Kingdom. As a matter of expedience, major vehicle manufacturers also export some vehicles—chiefly passenger cars—to various countries; to achieve a higher level of technology and competition in foreign markets, they have concluded copartnership agreements in the domain of industrial and technical cooperation with various foreign firms. These contracts include exports of spare parts and car bodies, as well as complete vehicles. Yugoslavia, in turn, is provided with imports of these items and technical know-how as well. Countries receiving motor vehicles on this reciprocal basis include the U.S.S.R., Poland, Hungary, East Germany, Greece, India, and Spain.

E. Inland waterways (S)

The major navigable waterways of Yugoslavia are the Danube, two main tributaries—the Sava and Tisa—and a canal network known as the Danube-Tisa-Danube canal system. Although outranked by the railroads and highways, the waterways comprise an important supplement to the other modes, also affording industry and agriculture in the well-developed north a low-cost means of bulk-commodity transport. Several lakes and short coastal rivers support local navigation in the sparsely populated and less-developed south and west. The international Danube provides Yugoslavia a high-capacity, dependable transport connection northward to countries of central and western Europe and indirect access eastward to the Black Sea. The volume of Yugoslav shipping consistently exceeds the amounts annually carried on the Danube by other riparians.

The waterways and waterway facilities are adequate for the current demands of Yugoslav shipping. The Danube, which supports by far the greatest traffic, is the best maintained and developed waterway in the country. Although comparatively little use is made of the secondary waterways, many of the waterways are being improved, several new routes and facilities are being constructed, and long-range plans advocate the development of others.

In 1971 a total of 25.4 million short tons of freight was shipped on the inland waterways. Of this, 15.2 million tons was in domestic traffic, 5.1 million in Yugoslav import-export traffic, and the remaining 5.1 million in international transit traffic. Almost 40% of the 4.8 billion total ton-miles was generated by transit traffic. Yugoslav carriers normally move about 70% of the import-export and all of the domestic traffic. Passenger traffic in 1971 amounted to 33,000 passengers and 3.8 million passenger-miles. The principal items of Yugoslav traffic are sand, gravel and other mineral building materials, crude oil and derivatives, fertilizers, ores and scrap, and coal. Important commodities shipped in lesser quantity include foodstuffs, wood, and cement. Most Yugoslav and all transit traffic moves on the Danube; about 85% of the transit traffic moves upstream.

Excluding coastal rivers and southern lakes, the waterways basically serve only the northern and northeastern lowlands. The 1,278 route miles in and bordering Yugoslavia consist of 963 miles on the Danube and five feedwaters, 48 miles on five coastal rivers, and 267 miles on completed routes of the Danube-Tisa-Danube canal system. The completion of canals under construction or planned east of the Tisa will increase the overall navigable length of the system to 425 miles. The Danube-Tisa-Danube canal system is predominantly land cut and incorporates several newly built canals and a number of older routes. Stabilization is insured by a system of regulatory dams and weirs, pumping stations, flood and safety gates, and locks. The Danube and its tributaries, flowing generally south and southeastward in wide floodplains, are mostly characterized by multichanneled and shoaled courses, low current velocities, unstable regimes, and slight gradients. Gradual stabilization is being achieved by the July 1970 implementation of a dam and two opposite-shore twin locks (Figure 6) on the gorged Iron Gate section of the Danube, which had been characterized by excessive currents, dangerous rapids, whirlpools, and numerous shallows. With the impounding of water behind the dam, a deep and stabilized reservoir is being created upstream as far as Belgrade. Stream

FIGURE 6. Upper gate of Yugoslav lock at Iron Gate installation on Danube (U/OU)

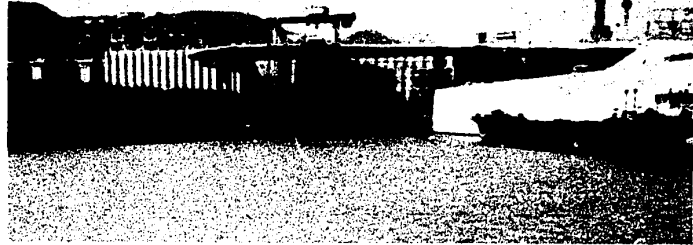


FIGURE 7. Tug pulling 650-ton barge on the Danube-Tisa-Danube canal system (U/OU)



FIGURE 8. A 9,500-ton tow pushed by pusher-tug "Podgora" traveling downstream on Danube toward Iron Gate installation (U/OU)



regulation measures include the extensive levee and dike systems, groinworks, fascine mattresses, and revetments. Direct waterway connections north into Hungary are provided by the Danube, the Baja-Bezdan canal, and the Tisa. To the east, direct connections to Romania are available via the Danube and the Begejski Kanal.

Yugoslav waterway operations are performed mostly by 650- to 1,000-ton dumb barges generally towed by diesel tugs (Figure 7) and by self-propelled barges of 600 horsepower or more. On the Danube, large convoys of up to three rows of four barges abreast (Figure 8) are permitted. On the other rivers and on the canals, barge trains are usually limited to two or three units towed in line-ahead formation. Operations are assisted by a system of visual and audible navigational aids, both floating and ashore, and by traffic-control signals at locks. The installation of a radar network is planned for the Danube, Sava, Drava, and Tisa rivers. Two-way day-and-night navigation is permitted on all portions of the Danube. On other routes operations are limited to daylight hours.

The principal traffic interruption factor is ice, which during January and February halts Danube shipping for an average of 35 days and Tisa shipping for about 45 days; ice is usually in evidence on the Sava for 80 days between early December and late February. Danube shipping may be halted for shorter or longer periods, depending on the incidence of ice floes that precede and follow the freeze. Additional hindrances include floods, which impede or may halt navigation for short periods between April and June; low water levels in late summer and fall, which may require the partial loading of barges on the Danube and Sava; and hurricane-force southeasterly winds, which occasionally disrupt shipping for short periods on the lower Sava, the Tisa, and on the Danube below Belgrade.

Structures include locks, bridges, and regulatory dams and weirs. The 14 old and four new locks are located on the Danube-Tisa-Danube canal system. Upon completing six additional new locks and deactivating four of the older, the canal system will be serviced by 20 single-chamber installations. All new locks are being built to standard chamber dimensions of 279 feet in length, 39 feet in width, and 10 feet in depth over sill and will accommodate vessels up to 1,000-ton capacity. The older locks vary considerably in size. Most locks have electrically operated miter gates, estimated lifts of 4 to 23 feet, and cycles of 40 minutes or less. The locking facilities on both the Romanian and Yugoslav sides of the Danube Iron

Gate installation consist of two single chambers in tandem separated by an intermediate gate. Each chamber is 1,017 feet long and 112 feet wide and has a depth over sill of 15 feet. Upper and lower gates are double-leaf miter, and the intermediate gates are either vertical-lift or rolling-caisson type. The locking cycle for each two-step lock ranges from 60 to 75 minutes. The maximum lift at each lock is an estimated 110 feet. Tows having an average barge capacity of 10,000 tons can be handled simultaneously in both directions through the twin locks. All currently operating barges, including the 2,000-ton classes, can operate through the locks as can tows comprising nine 1,000-ton class barges. About 115 bridges cross the navigable rivers and the eight completed canals of the Danube-Tisa-Danube canal system; except for a ponton swing-span bridge on the Sava, all are fixed structures having adequate horizontal and vertical underbridge clearances. Many of the small concrete dams and weirs throughout the canal system are or will be bypassed via navigation locks.

Most of the inland ports are small, lack mechanical handling equipment, and have low yearly cargo turnovers. Belgrade, the largest and one of the few major Danubian ports, is undergoing extensive enlargement and modernization—including a new container terminal. Other significant ports are Prahovo, Smederevo, Pancevo, Novi Sad (Figure 9), and Vukovar on the Danube and Breko and Sisak on the Sava. Most of these have been recently improved and expanded. At most larger ports the alongside berthage is provided at riverfront masonry embankments and quays, usually serviced by fixed- and portal-jib cranes, ample open- and covered-storage facilities, and direct or nearby clearances by rail or road to the national networks. In addition, several minor ports and landings accommodate limited cargo transfers. Commercial cargo turnover in short tons at major river ports in 1969 was as follows: Belgrade, 5,000,000; Novi Sad, 1,300,000; Pancevo, 1,300,000; Breko, 600,000; Sisak, 600,000; Vukovar, 500,000; and Smederevo, 350,000.

The 1970 dumb cargo fleet included 661 dry-cargo and 178 tank barges; these units had a total capacity of 676,370 short tons. The 21 self-propelled dry-cargo and tanker barges had a total capacity of 7,160 short tons and a total of 10,330 horsepower. The conventional and pusher tug fleet comprised 260 units and had a total of 94,625 horsepower. About 75% of the overall barge capacity is for dry cargo. Most barges are 600- to 1,000-ton units, and most of the tugs are 200- to 800-horsepower diesel units. The 14 river and lake passenger vessels had a total seating capacity of



FIGURE 9. Novi Sad port on Danube - Tisa - Danube canal system (U/OU)

about 1,263. Between 1967 and 1970 the barge fleet was increased by 1.6% in capacity and 9% in the number of units. The power of the tug fleet was increased by 14% during the same 3-year period.

The Federal Secretariat for the Economy exercises control over the inland waterway transport operations and policy. The most important and largest among the 12 river transport enterprises are the Yugoslav River Shipping Organization (JRB) of Belgrade and Danube Lloyd (DL) of Sisak. Both are engaged in domestic and international cargo service, and DL also performs dredging, repair, and improvement work on the

navigable waterways. The JRB owns and operates the greater part of the inland fleet. International Danube regulation is provided by the U.S.S.R.-sponsored Danube Commission, and all riparians except West Germany have membership. The primary commission functions are planning improvement projects, establishing and promulgating operating regulations, coordinating river maintenance, and publishing pilot charts and other navigational data.

The several large-scale development projects underway are designed to modernize and extend the lines of communication in northern Yugoslavia. The partially completed Danube-Tisa-Danube canal system incorporates navigation, irrigation, and land-reclamation features. When completed, the system will provide 425 miles of stable canal navigation for fully loaded 500- to 1,000-ton vessels and will shorten the navigation distance between its termini on the Danube by about 60 miles. Most of the canals and locks are either completed or under construction.

Other significant developments include the Belgrade port expansion project and a substantial increase in the number of pusher tugs and barges for the river fleet.

F. Pipelines (C)

Petroleum and natural gas pipelines are not extensive. About 200 miles of crude oil pipelines and 580 miles of natural gas pipelines are completed or under construction. There are no significant petroleum products pipelines. Crude oil lines are generally short and function mainly to transport crude from oilfields to nearby refineries or terminals on the river transport system. The completion of a planned trans-Yugoslav crude oil pipeline will be of great importance to the

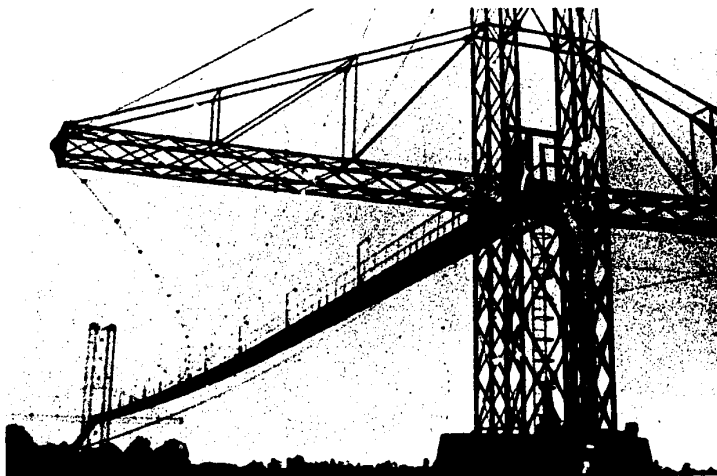


FIGURE 10. Crude oil pipeline from Struzec crossing the Sava river east of Sisak (U/OU)

FIGURE 11. Selected existing and planned pipelines (C)

TERMINALS		LENGTH	DIAMETER	PRODUCTS TRANSPORTED	CAPACITY	REMARKS
From	To					
		<i>Miles</i>	<i>Inches</i>		<i>Bbl./day</i>	
Bakar.....	Sisak.....	109	26	Crude.....	200,000	Planned. Completion expected late 1970's. Route to be via Zlobin, Delnice, Vrbovsko, Karlovac, Glina. Pumping stations planned at Bakar, Zlobin, Karlovac. If needed, additional pumping stations can increase maximum capacity to 340,000 bbl./day. Will serve Sisak refinery.
Sisak.....	Botovo.....	67	*14	....do.....	40,000	Planned branch of preceding line. Eventual increase to 80,000 bbl./day planned. Pumping station planned at Sisak. To serve refineries in Hungary, Czechoslovakia, Poland.
Sisak.....	Bosanski Brod...	87	20	....do.....	94,000	Planned extension of Bakar-Sisak line. Eventual increase to 160,000 bbl./day planned. Pumping stations planned at Sisak, Okucani, Slavonski Brod. Will serve Bosanski Brod refinery.
Bosanski Brod.....	Pancevo.....	*154	16	....do.....	47,000	Extension of preceding line. Eventual capacity of 80,000 bbl./day planned. Pumping stations planned at Slavonski Brod, Novi Sad. 66-mile section, from river terminal and pumping station at Opatovac to Bosanski Brod, completed; transports crude to Bosanski Brod refinery. When completed will also serve refineries at Novi Sad, Pancevo.
Mokrin.....	Elemir.....	23	10.75	....do.....	*40,000	Crude shipped by barge from Tisa river terminal at Elemir to refineries at Pancevo, Novi Sad, Bosanski Brod. Extension of line from Elemir to Pancevo planned. Pumping station at Kikinda.
Velebit.....	Kanjiza.....	6	na	....do.....	na	Crude shipped by barge from Tisa river terminal at Kanjiza to Pancevo.
Sandorovac.....	Struzec.....	*36	*8	....do.....	*4,000	Route via Bjelovar, Ivanicko Graberje, Popovaca. Pumping station at Sandorovac.
Kutina.....	Struzec.....	*12	na	....do.....	na	
Struzec.....	Sisak.....	11	*8	....do.....	15,000	Fig. 10. Serves Sisak refinery. Pumping station at Struzec.
Benicanci.....	Slavonski Brod...	35	*10	....do.....	20,000	Under construction. Completion scheduled for 1972.
Gevgelija.....	Skopje.....	87	*10	....do.....	40,000	Yugoslav section of planned line originating at Thessaloniki, Greece. Will serve new refinery planned at Skopje.

Footnotes at end of table.

FIGURE 11. Selected existing and planned pipelines (C) (Continued)

TERMINALS		LENGTH	DIAMETER	PRODUCTS TRANSPORTED	CAPACITY	REMARKS
From	To					
		<i>Miles</i>	<i>Inches</i>		<i>Bbl./day</i>	
Mokrin.....	Pancevo.....	106	12.75	Natural gas..	**1,356,000	Route via Kikinda, Elemir, Velika Greda. 3-mile branch supplies Zrenjanin with 55,000 cu. m./day. Feeder branches planned from Novo Milosevo and Begejci.
Elemir.....	Beocin.....	47	8.6	...do.....	**510,000	Branch of preceding line. Route via Zabalj, Gospodjinci gasfield, Novi Sad; terminates at Beocin cement plant. Supply branch from Srbobran gasfields to Gospodjinci planned.
Velika Greda.....	Vrsac.....	17	5.5	...do.....	**77,000	Branch of Mokrin-Pancevo line.
Velika Tilva.....	Pancevo.....	22	8.6	...do.....	*510,000	
Pancevo.....	Radinac.....	22	11.8	...do.....	**356,000	Serves steel mill in Radinac.
Velebit.....	Zemun.....	124	20	...do.....	**4,110,000	Reported under construction. Route via Senta, Srbobran, Novi Sad. At Zemun, line will divide to serve both Belgrade and Pancevo.
Janja Lipa.....	Popovaca.....	*25	6.3	...do.....	**165,000	Route via Banova Jaruga, Kutina. Unconfirmed feeder lines from Lipik to Janja Lipa and Gojilo to Kutina.
Popovaca.....	Sisak.....	14	6	...do.....	**82,500	Branch of line from Janja Lipa.
Popovaca.....	Zagreb.....	29	6	...do.....	**82,500	Branch of line from Janja Lipa. Route via Ivanic Grad, Dugo Selo. Feeder line from Klostar Ivanic to Ivanic Grad is 6-in. diameter, 5 miles long.
Kutina.....	Zagreb.....	*45	8.6	...do.....	*250,000	Unconfirmed. Possible feeder lines from Novska and Janja Lipa.
Ivanic Grad.....	Zagreb.....	19	*12	...do.....	**1,440,000	Recently completed. Probable 11-mile branch from Dugo Selo to Vrbovec; diameter and capacity not available.
Ivanic Grad.....	Varazdin.....	88	12.75	...do.....	*1,500,000	Route via Cazma, Bjelovar, Sandorovac, Durdevac, and Koprivnica. Section from Koprivnica to Varazdin completed in 1971. Branches from Varazdin to Maribor and Varazdin to Cakovec reported under construction. 6-mile feeder line from Ferdinandovac to Durdevac.
Lendava.....	Nova Gorica.....	*150	na	...do.....	na	Yugoslav section of planned line from U.S.S.R. to Austria. Yugoslavia will receive 1,370,000 cu. m./day. Completion date not available.
Koper.....	Jesenice.....	*90	*32	...do.....	na	Yugoslav section of planned line to transport imported Algerian gas to Vienna, Austria. Completion date not available.

na Data not available.

*Estimated.

**Natural-gas capacities in cu. m./day.

petroleum industry. The pipeline is scheduled for completion in the mid-1970's, but the present rate of construction makes it seem unlikely that completion will be accomplished until the late 1970's. The pipeline will extend 350 miles from the port of Bakar on the Adriatic coast to refineries at Rijeka, Sisak, Bosanski Brod, Novi Sad, and Pancevo. A 67-mile branch from Sisak to Botovo on the Hungarian border will supply crude oil to refineries in Hungary, Czechoslovakia, and Poland.

Two significant natural gas pipeline systems have been in operation since 1964. The Mokrin-Pancevo system is about 106 miles long and serves the Belgrade area. The other serves the Janja Lipa to Zagreb area and totals about 80 miles. Details of selected existing and planned pipelines are given in Figure 11.

G. Ports (S)

Yugoslavia has nine major and about 24 minor ports. Most are located along the irregular, much indented mainland coast; the remainder lie on offshore islands that flank the mainland and form sheltered inland passages. Rijeka (Figure 12) and Split, the two largest ports, handle most of the foreign trade and passengers and serve as mainland supply and trading ports for the islands; Split is also a naval operating base. Boka Kotorska and Pula are important naval bases, and Dubrovnik, Sibenik, and Ploce are commercial ports used primarily for handling bulk cargoes; Sibenik and Ploce also serve as naval bases. The newest major ports, Koper and Bar, are commercial ports that are partially in operation but still under construction; they are located at opposite ends of the Yugoslav coast.

Poor rail and road access over mountainous terrain to the densely populated inland areas of the Danube and its tributaries has resulted in a limited and scattered development of ports in Yugoslavia. However, a development program that started several years ago has been steadily improving facilities at Koper, Bakar, Zadar, Ploce, and Bar; major emphasis is on expanding deep-draft berths, increasing cargo-handling and storage facilities, including container handling at Koper, and providing adequate inland clearance. When complete, this program will not only meet the expected increase in maritime trade of Yugoslavia but will also help attract more southeastern European transit trade.

Advantageous physical characteristics of the Yugoslav coast—numerous natural harbors, deep



FIGURE 12. Main port facilities at Rijeka, the largest commercial port in Yugoslavia (U/OU)

water, and sheltered passages—are to some extent offset by unfavorable weather conditions, particularly in the winter. Occasional strong winds from the northeast and from the southeast are hazardous, especially for small craft. Fog, however, is infrequent, and the tidal range is small.

The Maritime Affairs and River Transportation Administration, one of three main bureaus under the Secretariat for Transportation and Communication, administers and operates Yugoslav ports through regional offices at Rijeka, Split, and Kotor in Boka Kotorska. The most significant ports have port authority offices, the others have branch offices, or, in some cases, port agents. Commercial activities in the ports are handled by local companies called Port and Warehouse Enterprises. These organizations control the wharves, port maintenance facilities, warehouses, mechanical handling equipment, and stevedores.

Yugoslav ports are adequate to meet normal needs; the long-range port development program is designed to fulfill anticipated requirements. The major ports are generally adaptable for military use. Significant details of the major ports are summarized in Figure 13.

FIGURE 13. Major ports (S)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Bar..... 42°05'N., 19°06'E. 5,300	New port, partially in operation; Shipments—bauxite, metallic ores, iron, timber, olive oil, wool, foodstuffs. Receipts—machinery, coal, petroleum products, coffee, rice, cotton, wool, hides, iron ore, pig iron, grain. Facilities to be completed after rail connection made with Belgrade.	Improved natural harbor formed by 2 converging breakwaters extending from shores of semi-circular cove; harbor roughly rectangular; water area, about 200 acres; central depths, 32 to 42 ft.	Alongside—4 ocean-type cargo ships, 6 coasters, 1 lighter, 3 coaster-type tankers. Anchorage—9 ocean-type cargo ships, 8 coasters.
Boka Kotorska..... 42°25'N., 18°40'E. 11,100	Naval operating base for large and small fleet units; berthing, shipyard, ordnance, storage, communications, medical facilities; of minor commercial importance. Comprised of 8 installations and number of minor landing places. 1 large, 1 medium, 1 small shipyard. Large naval repair yard has 2 floating drydocks, the larger has lifting capacity of 7,000 long tons. Largest commercial drydocking facility is 604-ft. floating drydock having lifting capacity of 12,500-tons; capable of accommodating ships to 25,000 d.w.t.	Natural, consisting of large, almost landlocked irregular body of water divided into 4 spacious deep bays.	Alongside—31 small naval vessels, 4 ocean-type cargo ships, 9 coasters, 18 lighters, 2 sound-and-river-type tank barges. Anchorage—Provides extensive berths for all types of vessels.
Dubrovnik..... 42°39'N., 18°07'E. 9,500	Principal port facilities at Gruz about 1½ miles NW. of old port at Dubrovnik. Shipment—timber, bauxite. Receipts—cement, construction materials, coal, petroleum products; considerable passenger traffic. Small patrol craft base and training center for amphibious troops; naval facilities for berthing, storage, housing, communications, training. Two small shipyards; 200-long-ton-capacity marine railway is largest drydocking facility. New wharf under construction just SW. of Cement Wharf.	Improved natural harbor consisting of 2 divisions. Old small, shallow harbor protected by detached breakwater and mole; large, new deep-water harbor with 2 arms. Old harbor depths, less than 16 ft.; new harbor depths, 20 to 100 ft.	Alongside—8 ocean-type cargo ships, 7 coasters, 29 lighters, 1 ocean-type tanker, 4 small naval ships. Anchorage—1 coaster. Mooring—1 standard ocean-type cargo vessel.

Footnotes at end of table.

FIGURE 13. Major ports (S) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Koper..... 45°33'N., 13°44'E. 4,800	New port, still expanding; mainly handles general cargo, import and transit cargoes have accounted for about 90% of tonnage in recent years; principal products shipped—timber, lumber, meat, industrial products, sulphuric acid, corn. Principal receipts—foodstuffs including vegetables, tropical fruits, edible oils, meats, grain, petroleum products, fertilizers, cotton, metals. Port recently connected to national rail network. Port being expanded rapidly. Dredging operations and mole construction underway in New Harbor area. Port has container-handling availability.	Improved natural harbor at head of bay about 2½ miles long, 2 to 3 miles wide; central depths, 42 to 60 ft. Small breakwater-protected basin on W. side of town for coasters; depths, 13 to 16 ft. New deepwater harbor for oceangoing vessels fronts on N. side.	Alongside—5 ocean-type cargo ships, 4 coasters, 5 lighters, 1 ocean-type tanker, 1 sound-and-river type barge. Anchorage—25 large ocean-type cargo ships.
Ploce..... 43°03'N., 17°26'E. 9,300	Modern deepwater terminal serving inland areas of provinces of Bosnia and Hercegovina; transit port for some Central European countries. Shipments out-weigh receipts. Shipments—ores, ore concentrates, general cargo, minerals, metallurgical products, processed and un-processed wood, building materials, agricultural products. Receipts—coal, coke, ores and ore concentrates, agricultural products, general cargo. Port development program underway to provide 31,000-sq.-ft. cold-storage building (capacity 1,000 tons), 30,000-ton silo, several covered-storage buildings; 2 bridge transporters will be added; road connections to Sarajevo recently completed; motor-torpedo-boat workshop; largest drydocking facility is 197-ft. marine railway; rotational naval reserve and logistical support base for small units of fleet; naval facilities consist of berthing, shipyard, storage, communications facilities.	Improved natural landlocked harbor; length, 1½ miles; greatest width, ½ mile; general depths, 30 to 42½ ft.	Alongside—12 ocean-type cargo ships, 4 lighters, 1 sound-and-river type tank barge, 6 small naval ships. Anchorage—3 coasters. Mooring—21 small naval ships.

Footnotes at end of table.

FIGURE 13. Major ports (S) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Pula..... 44°52'N., 13°50'E. 21,700	Largest naval harbor and training base and important shipbuilding center; of minor importance for commercial cargoes. Shipments—cement, canned fish, minerals. Receipts—petroleum products, ores, machinery, grain, building materials. Operating base for large and small units of fleet; berthing, ordnance, storage communications, medical facilities, meteorological station. 1 large, 2 small shipyards; large Uljanik Shipyard capable of building all types of merchant ships to 325,000 d.w.t. and drydocking vessels to 12,000 d.w.t., 2 graving docks, lengths 453 ft. and 390 ft., and 3 end-launch building ways up to 635 ft. Pula Shipyard and Naval Base (small) effects naval repairs and has three 130-ft.-long marine railways. Red Star Shipyard (small) handles wooden and steel craft to 200 tons on three 100-ft.-long marine railways.	Improved natural breakwater-protected harbor, almost landlocked. Consists of Outer Harbor (water area, nearly 1 sq. mile; central depths, 80-115 ft.) and Inner Harbor (water area, 3/4 sq. mile; central depths, 50-80 ft.).	Alongside—2 ocean-type cargo ships; 23 coasters; 41 lighters; 2 coaster-type tankers; 6 medium, 55 small naval ships. Anchorage—8 ocean-type cargo ships, 6 coasters. Fixed-Mooring—2 ocean-type cargo ships. Free-Swinging-Mooring—7 ocean-type cargo ships. Mediterranean-Mooring—5 submarines.

Footnotes at end of table.

FIGURE 13. Major ports (S) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Rijeka 45°21'N., 14°24'E. 30,000	Largest commercial port; includes newly constructed port area of Bakar; handles 45% of country's maritime traffic, including considerable transit tonnage to Hungary, Czechoslovakia, Austria. Receipts—coal crude oil, wheat, machinery, cotton, hides, sugar, phosphates, wool, textiles, iron ore, manufactured products. Shipments—lumber, fertilizers, ships, wine, cement, fruit, fish, grain, and copper, chrome, barium, lead, zinc ores. Facilities for handling dry bulk cargoes have been constructed at Bakar, a short distance SE. of port, freeing Rijeka to handle primarily general and bulk liquid cargoes. Port also site of principal design facility for naval ships and has facilities for producing torpedoes and diesel engines. Naval communications facilities; limited naval berthing. Two large shipyards, capable of building a variety of ships to 75,000 d.w.t. and performing major floating and underwater repairs. 1 floating drydock, 660 ft. and accommodating ships to 60,000 long tons. Port improvements planned include expansion of shipyard facilities, addition of wharf cranes, rail clearance and support buildings, lengthening berthing facilities, and construction of cross-country petroleum pipeline to Pancevo.	Artificial harbor consisting of series of breakwater-protected basins along 4-mile stretch of N. shore of Rijecki Zaliv; general depths, 5 to 108 ft.	Alongside—39 ocean-type cargo ships, 23 coasters, 17 lighters, 5 coastal-type tankers, 2 sound-and-river type tank barges, 9 small naval ships. Anchorage—12 ocean-type cargo ships, 4 coasters.

Footnotes at end of table.

FIGURE 13. Major ports (S) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Sibenik..... 43°44'N., 15°53'E. 16,900	Important import center and naval operation and support base. Receipts—coal, coke, manganese, grain, building materials. Shipments—aluminum and ferrous alloys, lead, copper, zinc, pyrite, chromite, carbide, bauxite, magnesite, lumber. Supply and operating base for small naval units; berthing, shipyard, ordnance, storage, communications, housing, medical facilities; underground PT boat base. Naval shipyard can perform minor repairs to most Yugoslav naval vessels; 300-ft. floating drydock has lifting capacity of 3,000 long tons; 4 end-haul marine railways for ships to 175 ft. long.	Natural deepwater harbor formed by river estuary, almost landlocked; length, 2½ miles; average width, ½ mile; general depths, 40 to 138 ft. Narrow channel renders navigation unsafe for ships over 650 ft. long unless tugs used.	Alongside—8 ocean-type cargo ships, 4 coasters, 45 lighters, 32 small naval vessels. Anchorage—4 ocean-type cargo ships, 6 coasters. Mooring—9 small naval vessels.
Split..... 43°29'N., 16°26'E. 29,350	Second largest commercial port. Receipts—coal, grain, fertilizers, POL. Shipments—grain, lumber, paper, wine, olive oil, medicinal herbs, lead, copper, paper, plastics, cement. Cargo turnover has decreased in recent years because of relatively poor hinterland connections and because cargo turnover at other ports has expanded; bulk cargoes account for 70% of tonnage handled. Headquarters of Yugoslav Navy and operating base for largest ships of fleet; base provides berthing, storage, and communications facilities and has oceanographic office; most facilities constructed in recent years. Port also shipyard center. 1 large and 3 small yards; the largest and the most important in the country, is capable of building merchant ships up to 150,000 d.w.t. with lengths up to 850 ft. and of performing major floating repairs. Largest drydocking facility in port has 4 marine railways. New quay under construction on S. side of Kastelanski Zaliv.	Improved natural harbor with two divisions separated by peninsula. South or Old Harbor: ½ mile in diameter; depths, 40 to 130 ft. North Harbor: length, 10 miles; width, ½ to 3½ miles; general depths, 60 to 150 ft.	Alongside—19 ocean-type cargo ships, 29 coasters, 43 lighters, 1 small ocean-type and 1 coaster-type tanker; 5 medium and 18 small naval ships, 3 sound-and-river type tank barges. Anchorage—10 ocean-type cargo ships, 3 coasters.

*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.

H. Merchant marine (C)

The Yugoslav merchant marine plays a highly significant role in the economic development and welfare of the nation. Government economists long have recognized that it is mandatory to maintain a sufficiently large merchant marine to transport at least half of the country's seaborne trade. However, the necessary credits have not been forthcoming to enable the shipping enterprises to meet the programed expansion by purchases of ships either from domestic or foreign shipyards.

Although action was initiated early in 1970 to obtain financial cooperation between the shipping companies, domestic shipyards, industries affiliated with the shipyards, Yugoslav banks, and the federal government, there are still unsettled questions about possible changes in the foreign trade system, the inability of producers to retain a sufficient percentage of their products, lack of built-in stabilizers for wages and expenditures, and inadequate economic policy.

The Yugoslav merchant marine ranks 17th among the maritime nations of the world and second to the U.S.S.R. among Communist merchant fleets. As of 31 October 1971, the fleet consisted of 187 ships of 1,000 gross register tons (g.r.t.) and over. Composition of the fleet was as follows:

TYPE	NUMBER	G.R.T.	D.W.T.
Dry cargo	131	814,164	1,152,766
Refrigerator cargo	2	6,017	6,180
Bulk cargo	25	362,341	587,077
Combination passenger/cargo	5	33,952	41,291
Tanker	17	232,691	396,247
Passenger	5	19,050	5,500
Ferry	2	4,675	670
Total	187	1,472,890	2,189,731

Of the ships in the merchant marine, 90 were built in foreign shipyards: Spain, 17; United Kingdom, 14; Netherlands, 12; Japan, 11; Belgium, 10; West Germany, nine; Italy, nine; Sweden, five; and France, Norway, and the United States, one each. The remaining 97 ships were built in Yugoslav shipyards. As a point of interest, none of the ships in the Yugoslav merchant marine were built in shipyards of other Communist countries.

About 62% of the fleet's gross register tonnage is made up of 157 ships of less than 10,000 g.r.t. each. There are six ships (one tanker, five bulk cargo) of over 20,000 g.r.t. each, and four tankers of over 36,000 g.r.t. each.

The average age of the fleet is 10.6 years. There are 89 ships (48%) that are 10 years of age or less, and 51

of these have been in service 5 years or less. There are 98 ships over 10 years of age; one of these is 41 years old, and one is 45 years old.

Diesel engines propel 184 of the ships, and three are steam propelled, two burning oil and the other, coal.

The average speed of the fleet is almost 15 knots. There are five ships (3%) in the 19- to 19.9-knot range; 28 ships (15%) in the 17- to 18.9-knot range; 111 ships (59%) in the 14- to 16.9-knot range; 37 ships (20%) in the 11- to 13.9-knot range; and six ships are in the 8- to 10.9-knot range.

A coastal fleet of 81 ships (215 to 998 g.r.t.) totaling 40,723 g.r.t. and 42,072 d.w.t. augments the larger units of the merchant fleet. Composition of the fleet is as follows:

TYPE	NUMBER	G.R.T.	D.W.T.
Dry cargo	46	26,642	35,608
Tanker	7	2,874	3,983
Passenger	17	6,868	1,008
Ferry	10	3,917	1,353
Training Ship	1	422	120
Total	81	40,723	42,072

Of these ships, 49 (60%) were built in Yugoslav shipyards. The remaining units were purchased from non-Communist countries, principally West Germany, Sweden, and the United Kingdom. The ships range in age from 2 to 61 years and have speeds ranging from 6 to 14.9 knots. Four ships have large hatches: *Duba* (296 g.r.t./430 d.w.t.), built in West Germany in 1952, has a 59-foot hatch; *Hvar* (500 g.r.t./1,064 d.w.t.), built in West Germany in 1957, has a 51-foot hatch; *Lastovo* (965 g.r.t./1,654 d.w.t.), built in Italy in 1959, has a 51-foot hatch; and *Vela Luka* (599 g.r.t./984 d.w.t.), built in West Germany in 1955, has an 87-foot hatch. In regard to propulsion, the training ship and one dry-cargo ship are oil-fired steamships; the remaining 79 vessels have diesel engines.

Although the ships of the Yugoslav merchant fleet are operated by 11 semiautonomous shipping companies, frequently called shipping enterprises, they are all owned by the Yugoslav Government. Details on these shipping companies, together with the number and tonnage of ships owned as of 31 October 1971, are given in Figure 14.

Yugoslavia also owns four dry cargo ships, totaling 37,648 g.r.t. and 60,000 d.w.t., which are operated by the Cross Seas Shipping Corporation under the Panamanian flag, with the Yugoslav Shipping Line acting as agent. These vessels were built in Yugoslavia, one in 1962 and three in 1969. All have speeds of 15.5 knots and are equipped with diesel engines.

FIGURE 14. Merchant shipping enterprises and routes (C)

NAME AND HEADQUARTERS	NUMBER OF SHIPS	FLEET		SHIPPING ROUTES SERVED
		G.R.T.	D.W.T.	
Adriatic Shipping Line, Rijeka.	6	22,088	5,770	Scheduled service to Venice, southern Adriatic ports of Italy, southern ports of Greece.
Adriatic Tramp Shipping Line, Split.	18	127,014	187,848	Scheduled service to Great Lakes; tramp and scheduled service to Red Sea, East African, and Persian Gulf ports.
Atlantic Shipping Line, Dubrovnik.	18	178,450	274,667	Tramp service to Black Sea, Red Sea, Persian Gulf, Indian, U.S., and northern European ports; scheduled service to Japanese ports and Hong Kong.
General Shipping Line, Piran.	19	161,772	223,071	Scheduled service to U.S., South American, and West African ports.
Losinj Shipping Line, Mali Losinj.	8	19,018	23,970	Scheduled service to Adriatic and Mediterranean ports.
Mediterranean Shipping Line, Koreula.	5	12,804	15,798	Scheduled and tramp service to and between Adriatic, Mediterranean, and northern European ports.
Tramp Shipping Line, Sibenik.	10	54,430	89,829	International tramp service.
Transocean Shipping Line, Bar.	10	84,310	130,255	<i>Do.</i>
Yugoslav Ocean Shipping Line, Kotor.	19	229,929	367,438	Scheduled service to Adriatic, Mediterranean, U.K., northern European, North American, and north and west African ports.
Yugoslav Shipping Line, Rijeka.	51	293,760	385,910	Scheduled service to western Mediterranean, U.K., northern European, Levantine (Beirut, Latakia, and Alexandria), South American, North American, and Asian (Iran, Iraq, India, Pakistan, Burma, Hong Kong, Japan, and People's Republic of China) ports.
Yugoslav Tanker-Tourist Hotel, Zadar.	23	289,315	485,175	Scheduled service to the Persian Gulf; international tramp service.
Total	187	1,472,890	2,189,731	

Yugoslavia is an active member of the Inter-governmental Maritime Consultative Organization (IMCO), a specialized agency of the United Nations located in London.

Yugoslavia is an associate member of the Council of Mutual Economic Assistance (CEMA), an organization established in 1949 to promote economic integration of Eastern Europe.

In June 1970, Yugoslavia, Bulgaria, Czechoslovakia, East Germany, Poland, Romania, Hungary, and the U.S.S.R. founded the International Shipowners Association (INSA), with the secretariat located in Gdynia, Poland. The charter stipulates, among other things, that the aim of the association is to "cooperate in developing collaboration of members and to safeguard their interests in international maritime navigation with regard to technical, operational, legal, documentary, and general economic problems."

The Yugoslav merchant marine is employed in regularly scheduled international service, international tramp service, and coastal shipping service. The shipping routes served are detailed in Figure 14.

In 1964 the fleet carried about 55% of the total seaborne foreign trade, thereby surpassing the government's goal of at least 50%. However, participation of Yugoslav ships in transporting seaborne foreign trade has steadily declined since 1966, and in 1970 they carried only 45% (9 million tons) of the total.

Prior to the break with the Cominform in 1948, about 50% of Yugoslavia's trade was with the Communist countries. After the break, this trade virtually ceased and was only gradually resumed in 1955, reaching a level of about 30% in the 1960-68 period. While Yugoslavia's foreign trade has continued to increase steadily, trade with Communist countries has decreased, reaching a new annual low of 27% in 1969. Of the remainder, 58% was accounted for by non-Communist countries and 15% by the less developed countries. Trade in 1970 and 1971 appears to have continued at this same ratio. Yugoslavia's main trading partners are West Germany, Italy, the U.S.S.R., and the U.S.

The principal export items are ferrous and nonferrous metals, pharmaceuticals, woodpulp,

wooden furniture, chemical products, and capital goods—mainly merchant ships. In good crop years, Yugoslavia produces enough agricultural produce for its own needs and makes sizable exports of wheat and corn. Imported items include coke and coking coal, crude oil, petroleum products, cobalt, nickel, textiles, toys, sportswear, and other clothing.

The merchant marine plays a significant role in the Yugoslav economy, particularly in earning and saving foreign exchange. Encouraged by overseas earnings in recent years, Yugoslavia has decided upon a policy of significant expansion of the merchant marine. Current plans call for a fleet aggregating 2.5 million g.r.t. by 1975 and more than 3.5 million g.r.t. before 1990. However, financial problems have given rise to considerable concern on the part of the shipping companies as to the possibility of achieving such goals. Very unfavorable import conditions and the impossibility of payment of foreign credits with foreign exchange amortization funds make the purchase of new ships from foreign shipyards almost impossible. On the other hand, there has been a minimum of funds allocated for building ships in domestic shipyards. The following are the only ships now on order:

TYPE	NUMBER	D.W.T. (EACH)	SOURCE	SCHEDULED DELIVERY
Bulk cargo	1	30,240	Yugoslavia	1973
Do	1	14,940	do.	1973
Dry cargo	6	15,950	Argentina	1974
Do	2	15,750	Spain	1973
Do	4	25,000	Italy	na
Tanker	2	21,500	Japan	1974

na Data not available.

About 14,000 persons are employed in the merchant marine. The oceangoing and coastal fleets employ about 9,800; the extensive river fleet, about 3,000. The remainder are employed in shipping installations ashore. Most merchant marine officers are members of the naval reserve. A large percentage of the seamen and ratings are in the naval reserve, and practically all have served 3 years of obligated duty. All Yugoslav merchant marine personnel belong to the Transportation and Communications Workers Union. Shipboard billets can be obtained only by registering and competing through the union.

Merchant marine personnel are selected carefully inasmuch as they come into direct and frequent contact with non-Communists on a regular basis. Officers are recruited only from intermediate maritime school graduates who have completed the 4-year course in nautical or engineering sections. Young men

15 to 25 years of age who have completed 8 years of elementary school may apply for apprentice seaman papers at designated harbor master offices. However, the number of such papers that can be issued is limited because some 3,000 to 4,000 persons holding seaman papers are unable to find billets on Yugoslav ships.

The merchant marine school system consists of higher maritime schools, intermediate maritime schools, and marine instruction centers. These schools offer courses to officers and seamen and are supported by federal and local governments, the Transportation and Communication Workers Union, and interested shipping and shipbuilding companies.

I. Civil air (C)

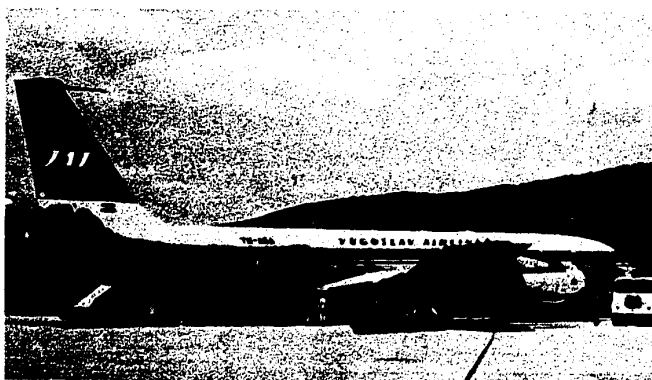
The Government of Yugoslavia, unlike most Eastern European governments, has allowed the development of more than one aviation company to service the air traffic demands generated within that country. This tolerant policy has led to establishment of the state-owned flag carrier Yugoslav Airlines (JAT); its subsidiary, Air Yugoslavia; as well as Inex-Adria, Aviogenex, and Pan Adria. Despite this seeming variety of airlines, JAT remains the dominant Yugoslavian air carrier, providing passenger and cargo service to all seven of the European Communist states (Albania excepted) and to 19 cities located in Western Europe, North Africa, and the Middle East. JAT largely dominates the domestic air routes as well, providing service to 16 cities on a year-round basis. In addition, JAT performs most of the agricultural airwork in the country and engages in charter operations through its subsidiary, Air Yugoslavia. In 1970 Air Yugoslavia carried about 130,000 passengers on vacation flights to Spain, outings to London, and safari flights to Lusaka and Nairobi in Africa. This year the carrier has been given another boost by the addition of Boeing 707 aircraft (Figure 15), which will fly between Yugoslavia, Canada, the United States, Australia, Africa, and Japan.

The Inex-Adria enterprise has succeeded Adria Airways of Yugoslavia as a charter and inclusive-tour airline. Its primary base of operations centers on the city of Ljubljana, but it remains a small charter operator in comparison with JAT.

The third enterprise, Aviogenex, was formed in 1968 as Genex Airlines to operate charter tourist flights. The company is an air transport associate of General Export, the state import-export agency whose activities include the promotion of tourism.

The fourth enterprise, Pan Adria (JPTT), is owned by a Croatian company based in Zagreb and has the

FIGURE 15. The Boeing 707 has been used by JAT to extend its range of scheduled and chartered passenger and cargo operations to Europe, North America, and Africa (U/OU)



primary mission of providing night mail services between Zagreb, Belgrade, Skopje, Titograd, Dubrovnik, Split, and Mostar. Passenger and cargo charter flights to domestic and foreign cities are also undertaken, together with crop spraying and other agricultural operations.

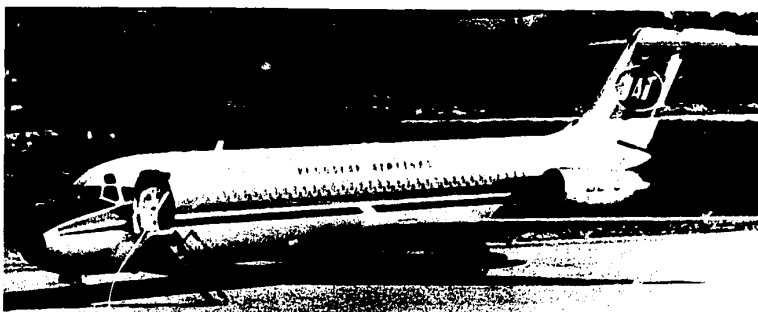
The size of the respective air fleets also reflects the relative dominance of JAT in Yugoslav civil aviation. JAT leads all other domestic air lines in the number of large, modern aircraft with a fleet consisting of three Boeing 707's, seven Convair 440's, six Sud-Aviation Caravelles, eight Douglas DC-9's (Figure 16), and a single Il-18 transport aircraft. Air Yugoslavia, the JAT charter subsidiary, operates one of the Boeing 707 aircraft, two of the Caravelles, and the Il-18 on its charter flights. By 1975, JAT will need increased capacity on its medium-haul routes and is considering such types as the DC-10, the L-1011, the A-300B Airbus, and the stretched M-version of the Tu-154. JAT is also moving toward the procurement of a new 70/60-seater jet—the Fokker F-28 or VFW 614, for example—to replace the Convair 440 on short-haul routes. It is possible that a turboprop type, such as the NAMC YS-11 or Fokker F-27, might be purchased for the purpose. The chosen type would be required to enter service around 1973.

The inventory for Inex-Adria lists two Douglas DC-9 and two Douglas DC-6B transport aircraft, with two more DC-9 aircraft on order. Aviogenex utilizes three Tu-134 aircraft for its various missions and has an option to acquire two Tu-154 aircraft from the Soviet Union. Pan Adria accomplishes its various tasks with two Convair CV-440 aircraft.

The approximately 200 small civil aircraft registered in Yugoslavia are owned by JAT, Pan Adria, and various aeroclubs and schools and are used for flight training and airwork. This airfleet is primarily composed of the Aero Commander 500, the L-200 Morava, and the Piper Pawnee PA-25.

The overall increase in the number of aircraft and aviation enterprises has been rapid and signifies the growing economic strength of Yugoslavia, but it has not occurred without difficulty. The composition of the airfleet shows a wide variety of French, U.S., and Soviet aircraft. This random acquisition has led to problems in maintenance and safety as well as obstacles in pilot and aircraft utilization. The total effect of these problems has been to reduce the profitability of operations and may help to explain why the Yugoslav companies have not been able to compete successfully with foreign companies. The weakness of Yugoslav civil aviation is best noted by

FIGURE 16. One of the mainstays of the JAT airfleet is the McDonnell Douglas DC-9, which was placed in service in the spring of 1970 (U/OU)



the fact that two-thirds of the foreign tourists arriving in Yugoslavia do so by foreign air carriers, including those in charter traffic.

JAT is the principal employer of civil aviation personnel in Yugoslavia. The carrier has over 3,000 employees on its payroll, and this number is expected to increase steadily as traffic volume rises. JAT has under contract 230 pilots, of whom 40 are qualified Caravelle pilots, 38 are Convair qualified, and 60 are qualified in the DC-3. Many of the latter presumably have been retrained to fly either the DC-9 or the Boeing 707 aircraft. Pan Adria has 130 personnel in its employment, and of this number 35 are pilots. Aviogenex also conducts operations with 130 employees.

The JAT maintenance center, at Belgrade's Surcin Airport, received FAA recognition in 1969 and carries out a complete range of maintenance and overhaul services, with the exception of the overhaul of jet engines—this being at present handled for the airline by Sabena in Brussels. Outside help has also come from the McDonnell-Douglas Corporation in the form of instructors sent to update pilot ground training and crew maintenance training of JAT's DC-9 aircraft at Ljubljana Airport.

A new general aviation maintenance and overhaul center was recently inaugurated at the Belgrade Airport. This installation is not outstanding in size but it has a proportionally greater importance. Over the years, Yugoslav general aviation has suffered an accident rate in excess of the average for Western Europe, and part of the reason for this has been unsatisfactory maintenance standards. In an effort to correct this poor safety record, JAT has assigned four engineers and 15 technicians to man the new maintenance center. JAT plans to expand its maintenance capability to aircraft based at other airports, and there are long-range plans to canvass for maintenance contracts in neighboring countries and to extend the center's work to include business jet aircraft. JAT's maintenance shops also handle some work for Inex-Adria, Aviogenex, and the Yugoslav air force. As part of its agreement to purchase Soviet aircraft, Aviogenex has received a complete stockpile of spare parts and engines in Yugoslavia at Soviet expense. It can draw from this stockpile at will and make payment or exchange old parts later. Major overhaul on the Tu-134, however, is performed by Aeroflot under contract.

Basic aviation training is provided by the many national aeroclubs and the Yugoslav Air Force, which together are the main source of pilots for the various

air carriers. JAT is able to perform most of its own training at its large training school at Belgrade's Surcin Airport. This school handles 50 pilots a year, and training techniques are based on U.S. methods. By 1975 it is hoped that about 65 pilots will be trained annually at the center. In addition to its own personnel, JAT is also training cockpit crews of Inex-Adria Airways and, to a certain extent, those of Aviogenex. Because all of its aircraft are of Soviet manufacture, Aviogenex sends its pilots to the Soviet Union for training with the national carrier, Aeroflot. Many of its aircrew members do, however, receive instruction at JAT's Belgrade school, and it is likely that in the future more and more of the training for Aviogenex personnel will be conducted in Yugoslavia. JAT is planning to expand its training school curriculum to include instrument flight courses for both Yugoslav and foreign aviation students. JAT plans to modernize its training facilities with a DC-9 digital simulator recently ordered from Canadian Aviation Electronics Industries (CAE). A simulator which cost US\$1.5 million was put into operation in May 1972. The carrier has been using DC-9 simulator facilities belonging to the Spanish airline, Iberia. Ground training equipment at JAT's Belgrade center includes a Link 60 trainer and a Redifon simulator for the Convair 440.

Governmental responsibility for the control of civil aviation resides in the Directorate of Civil Aeronautics under the Secretariat for Communications. The government has regulatory control over airline operations, but company officials are free to establish budgets and determine route structures, schedules, and fares. Air transport services along unprofitable domestic routes are subsidized by the Yugoslav republics and communities served by these routes.

Yugoslavia has been a member of the International Civil Aviation Organization (ICAO) since 1960. It is a signatory to the 1929 Warsaw Convention and the 1955 Hague Protocol governing the liability of property while engaged in international flights. JAT is a member of the International Air Transport Association. The country has entered into bilateral air transport agreements sanctioning the exchange of scheduled air services with all the European Communist countries and 21 non-Communist countries. Because Yugoslavia's coastal and mountain resorts have gained popularity among European tourists, as many as 20 foreign carriers operate to these tourist centers in the summer. Although this number varies seasonally, it is not reduced by more than two or three in the winter.

J. Airfields³ (C)

Yugoslavia has 78 airfields, 106 sites, and two seaplane stations; 23 of the airfields are military, 10 are joint military/civil, 44 are civil, and one is private.

The airfields are distributed fairly evenly throughout the country. A concentration of airfields, both military and civil, is centered about the industrial cities of Zagreb in the north, Belgrade in the east, and Skopje in the south.

The airfield system is adapted to meet adequately all internal requirements for civil and military operations. Belgrade International is considered the most important civil airfield and is capable of supporting B-52 operations. Dubrovnik and Split international airfields can support C-141 type aircraft. Other international airfields include Ljubljana International, Zagreb, and Titograd, which can accommodate C-135 aircraft. The civil airfields of Rijeka/Krk and Tivat normally support DC-9 aircraft, and Skopje and Ohrid will take up to C-130 type aircraft. Major military airfields include Batajnica, a Yugoslav Air Force (YAF) fighter/transport base, with the primary mission of air defense of metropolitan Belgrade. Bihac, Cerklje, Obrva, and Tuzla are YAF prime fighter bases.

There are 25 airfields with hard-surfaced runways, 15 of which are 8,000 feet or over in length and readily accommodate large transport aircraft. Except for the YAF reserve airfield, Novi Sad, all of these airfields have adequate taxiways and paved parking areas. All of the civil airfields with hard-surfaced runways are

³Detailed information on individual Yugoslav airfields is contained in Volume 15A, *Airfields and Seaplane Stations of the World*, published by the Aeronautical Chart and Information Center for the Defense Intelligence Agency.

equipped to handle freight and passengers. The remaining 53 usable airfields include 29 temporary- and 24 natural-surfaced landing areas in fair to good condition.

The two seaplane stations are capable of use in an emergency.

Most of the airfield sites would require complete rehabilitation of the landing areas and construction of new support facilities in order to become operational.

As a member of ICAO, Yugoslavia operates over 20 of its airfields in accordance with ICAO standards for runway lighting and tower control functions. Runway maintenance and groundskeeping at the international airfields are provided at an acceptable level. Improved airfield services and ground support are the results of the projected overhaul of civil airfield management.

Aviation facilities in Yugoslavia are expanding rapidly to meet the requirements of a growing tourist industry within the country and to satisfy the increasing number of Yugoslav travelers abroad. Civil airlines have added new jet aircraft and increased the number of domestic and international flights, both scheduled and charter.

Belgrade International, Dubrovnik, Split International, and Zagreb are to be expanded and modernized to accommodate jumbo jets by 1975.

The newer military airfields were built in areas that provide maximum potential for expansion. In most cases a parallel second runway can be added if necessary. Parking areas and permanent-type aircraft shelters are being added or improved. However, material shortages and inadequate fuel reserves are still the major deficiencies at the military air installations.

Details of the most important airfields are itemized in Figure 17.

FIGURE 17. Selected airfields (C)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA		ESWL*	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	LEVEL				
	<i>Feet</i>		<i>Pounds</i>		
Batajnica..... 44°57'N., 20°15'E.	Concrete..... 8,200 x 150 265		56,607	C-118.....	Military. Capable of supporting C-135's. YAF fighter base. Division headquarters. Transport squadron.
Belgrade International.... 44°49'N., 20°19'E.	Concrete..... 9,843 x 148 331		105,590	Boeing 707....	Civil. Capable of supporting B-52's. International airport. Headquarters Yugoslav Air Transport Airlines.
Bihac..... 44°51'N., 15°47'E.	Concrete..... 7,200 x 200 1,132		65,100	F-86.....	Military. Runway capable of supporting C-141's. Armed forces underground command center. YAF fighter base.
Cerklje..... 45°54'N., 15°32'E.	Concrete..... 8,200 x 160 510		56,607	.....do.....	Military. Runway capable of supporting C-135's. YAF fighter base and pilot training school.

Footnotes at end of table.

FIGURE 17. Selected airfields (C) (Continued)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA	ESWL*	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	LEVEL			
	<i>Feet</i>	<i>Pounds</i>		
Dubrovnik 42°34'N., 18°16'E.	Asphalt 8,530 x 148 528	65,100	Boeing 707	Civil. Runway capable of supporting C-141's. International airport.
Ljubljana International 46°13'N., 14°28'E.	Concrete 9,843 x 148 1,274	60,160	...do	Civil. International airport. Headquarters of main charter airline. Runway capable of supporting C-135's.
Mostar 43°17'N., 17°51'E.	Concrete 7,874 x 161 175	58,000	C-9A	Joint. Runway capable of supporting C-97's. Soko Aircraft Factory adjoins airfield.
Obrova 43°49'N., 20°35'E.	Concrete 7,300 x 148 686	66,000	F-84	Military. Runway capable of supporting C-97's. YAF fighter base.
Pristina 42°34'N., 21°02'E.	Concrete 7,218 x 102 1,785	45,500	DC-6	Civil. Runway capable of supporting C-133's. Army POL depot adjacent.
Pula 44°54'N., 13°55'E.	Asphalt 9,678 x 148 276	69,884	C-118	Joint. Runway capable of supporting C-135's. YAF advanced pilot training school.
Rijeka/Krk 45°13'N., 14°34'E.	Asphalt 8,202 x 148 279	60,160	DC-9	Civil. Runway capable of supporting Boeing 707's. International airport.
Sarajevo 43°49'N., 18°20'E.	Concrete 7,708 x 148 1,703	60,160	Convair 446	Civil. Runway capable of supporting C-121's.
Skopje 41°58'N., 21°37'E.	Concrete 8,038 x 148 780	35,500	C-131	Joint. YAF fighter base. YAF transport squadron. Domestic airlines. Runway capable of supporting C-130's.
Split International 43°32'N., 16°18'E.	Concrete 8,366 x 148 79	65,100	Boeing 707	Civil. Runway capable of supporting C-141's. International airport.
Titograd International 42°22'N., 19°15'E.	Concrete 8,202 x 150 121	58,000	C-118	Joint. Runway capable of supporting C-135's. International airport. YAF aerial gunnery school.
Tivat 42°24'N., 18°43'E.	Asphalt 8,202 x 148 16	37,610	DC-9	Civil. Domestic and international airlines.
Tuzla 44°28'N., 18°44'E.	Concrete 8,200 x 160 985	56,607	F-86	Military. Runway capable of supporting C-135's. YAF reconnaissance regiment. Reserve pilot training school.
Zadar 44°06'N., 15°21'E.	Concrete 8,202 x 148 289	35,500	C-130	Joint. Yugoslav air force academy. Civil runway is asphalt, 6,562 x 148 ft., and can support C-121's.
Zagreb 45°45'N., 16°04'E.	Concrete 9,383 x 148 351	56,607	C-9A	Joint. Runway capable of supporting C-135's. International airport. YAF fighter base.

*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.

K. Telecommunications (S)

The telecommunication (telecom) system in Yugoslavia provides telephone, telegraph, and broadcast services over open-wire lines, coaxial and multiconductor cables, and radio-relay facilities. These services satisfy most governmental requirements; the needs of the general public are given secondary consideration. All telecom facilities are owned and operated by the government. The Directory of Posts, Telegraphs, and Telephones Community (PTTC) is responsible for broad general policies, and the 41 Post, Telegraph, and Telephone Operating Enterprises (PTTE) operate and maintain facilities. The Committee for Radiobroadcasting and Television is responsible for radiobroadcast and TV activities.

Long-distance switching facilities interconnect about 3,000 telephone exchanges; centers of this system are in Belgrade and Zagreb. There are over 820,000 telephones or nearly four instruments per 100 population. Most of the local telephone facilities are automatic. About 3,000 telegraph offices are located throughout the country, and automatic telegraph exchanges in 29 towns provide telex service.

Open-wire networks consist of carrier-equipped lines that have as many as 60 wires on main routes serving large cities and as few as 10 wires on routes serving mountainous areas. One of a number of radio-relay networks provides 60 telephone channels between Belgrade and Zagreb, using carrier equipment purchased from the L. M. Ericsson Company of Sweden. The relay stations for this network are at sites on Jagodnja, Ozren, Sljeme, and Kozara mountains. The domestic radiocommunication network provides a backup for wire and radio-relay facilities.

The major AM radiobroadcast stations are in Belgrade, Ljubljana, Novi Sad, Pristina, Sarajevo, Skopje, Titograd, and Zagreb. The principal FM stations are at Novi Sad, on Crveni Cot hill, and on Avala, Crni Vrh, Sljeme, and Veliki Jastrebac mountains. FM and AM stations transmit the same programs. TV stations provide coverage to areas around several large cities whose combined population is about 90% of the country's total. In addition to the national programs, Eurovision programs are available for broadcast over the domestic TV network through a relay facility in the Nanos mountains. This facility also relays Yugoslav programs to the Eurovision network. Radiobroadcast and TV facilities have replaced most of the wired-broadcast facilities. Yugoslavia has 3,500,000 radio receivers and 2,050,000 TV receivers.

International telecom services are provided as an extension of the domestic network through transit centers in Belgrade and Zagreb. Traffic is routed to and from these centers over the main network and through circuits in a 300-channel coaxial cable with Austria and in microwave links with Bulgaria and Romania. International landline circuits are available to all neighboring countries. The principal open-wire lines extend to Thessaloniki, Greece; Sofia, Bulgaria; Timisoara, Romania; Szeged, Hungary; and Trieste, Italy. International radiotelephone and radiotelegraph services are available only from Belgrade.

Special-purpose facilities provide aeronautical, maritime, meteorological, military, and railroad telecom services. The Railroad Automatic Telephone Network, the largest network, interconnects the main railroad telephone exchange in Belgrade with district exchanges in Ljubljana, Novi Sad, Sarajevo, Skopje, and Zagreb, and with other automatic and manual exchanges. Wire lines parallel the railroad tracks and provide interconnections between rail terminals. The army uses telephone and telegraph wire circuits leased from the PTTC and also uses army-owned wire and radiocommunication facilities.

Most buildings housing communication equipment are of conventional design. Some facilities are protected by sturdy concrete structures, but service could be disrupted with little effort.

Technical education facilities have improved in recent years, but there is still a shortage of engineers and skilled technicians. Technical training facilities are available for young people not entering colleges or universities, and the armed forces train a significant number of technicians. An electronics organization that has three large manufacturing plants maintains a technical university in Nis.

Most telecommunications are affected by the mountainous terrain and harsh winters. Mountains extending across the country from northwest to southeast provide good sites for radio-relay installations but hinder the development of wire networks.

The telecom industry is capable of producing almost all items required for domestic use. The industry as a whole is concentrated in two major combines, the Electronics Industry (*Elektronska Industrija*) centered in Belgrade and the *Iskra* complex centered in Kranj. The nationwide expansion of communication facilities, however, has made it necessary to import radio and TV broadcast equipment and telephone equipment of advanced types. Simple devices including parts and components must also be imported, chiefly because of the volume required. The principal sources of imports are the

SECRET

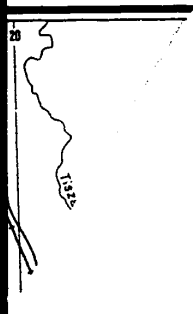
United Kingdom, Italy, West Germany, and the Netherlands.

Current telecom expansion plans include the installation of the following coaxial cables: from Ljubljana to Trieste, Italy; Belgrade to Budapest, Hungary; and Zagreb to Split, Rijeka, and several Adriatic islands. In addition, an earth satellite station

for the PTTE is under construction near Ivanjica, and more radio-relay links are planned between coastal towns and a number of Adriatic islands. Plans also exist to expand broadcast services by constructing new radio and TV studios, to enlarge present studios, and to complete radio-relay links to form an integrated TV network.

Glossary (u/ou)

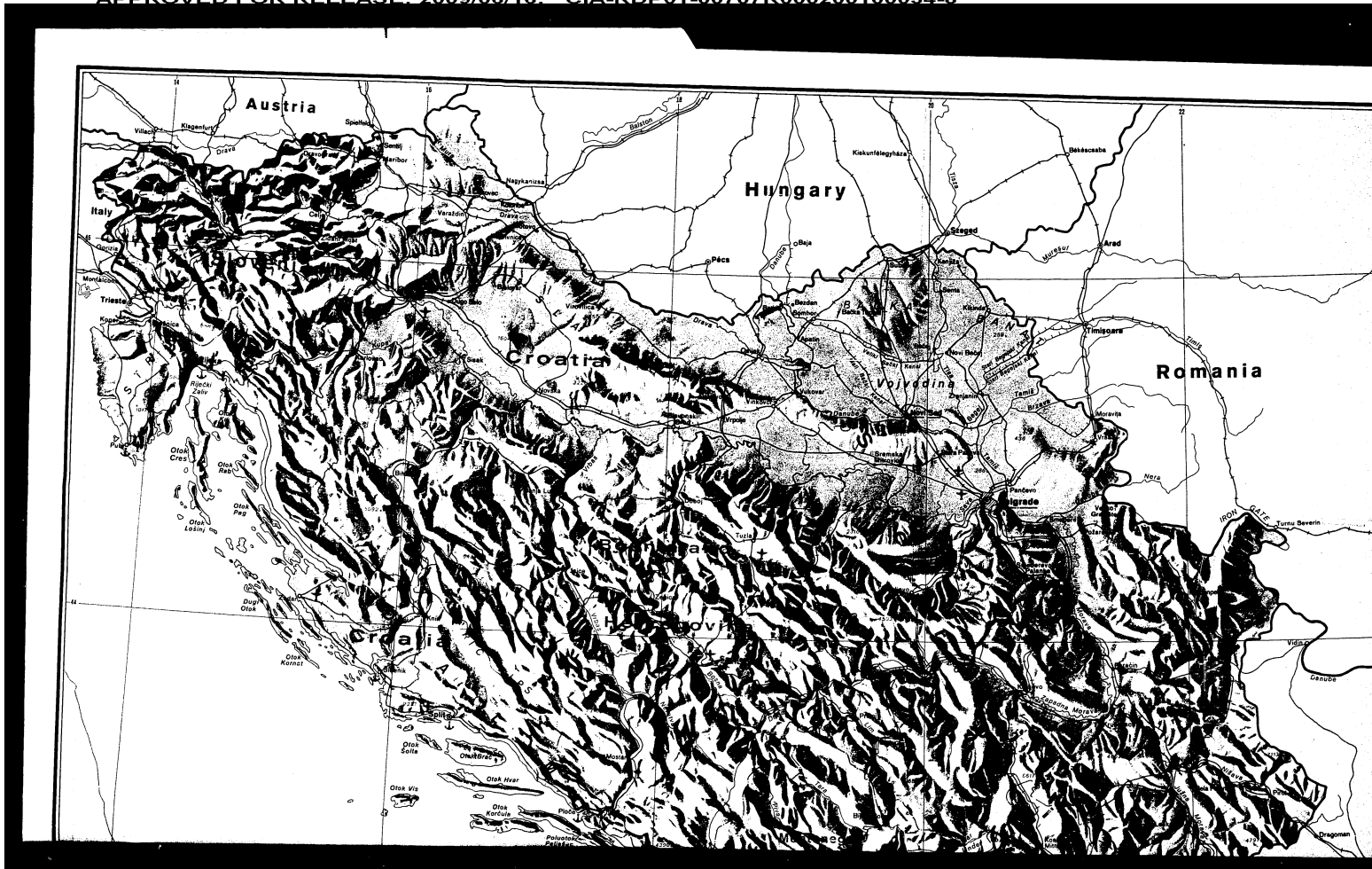
ABBREVIATION	SERBO-CROATIAN	ENGLISH
DL	<i>Dunavski Lojd</i>	Danube Lloyd
JAT	<i>Jugoslovenski Aerotransport</i>	Yugoslav Airlines
JPTT	<i>Pan Adria Aerotransportino Poduzece</i> ..	Pan Adria
JRB	<i>Jugoslovensko Recno Brodarstvo</i>	Yugoslav River Shipping Association
JZ	<i>Zajednica Jugoslovenski Zeleznica</i>	Association of Yugoslav Railways

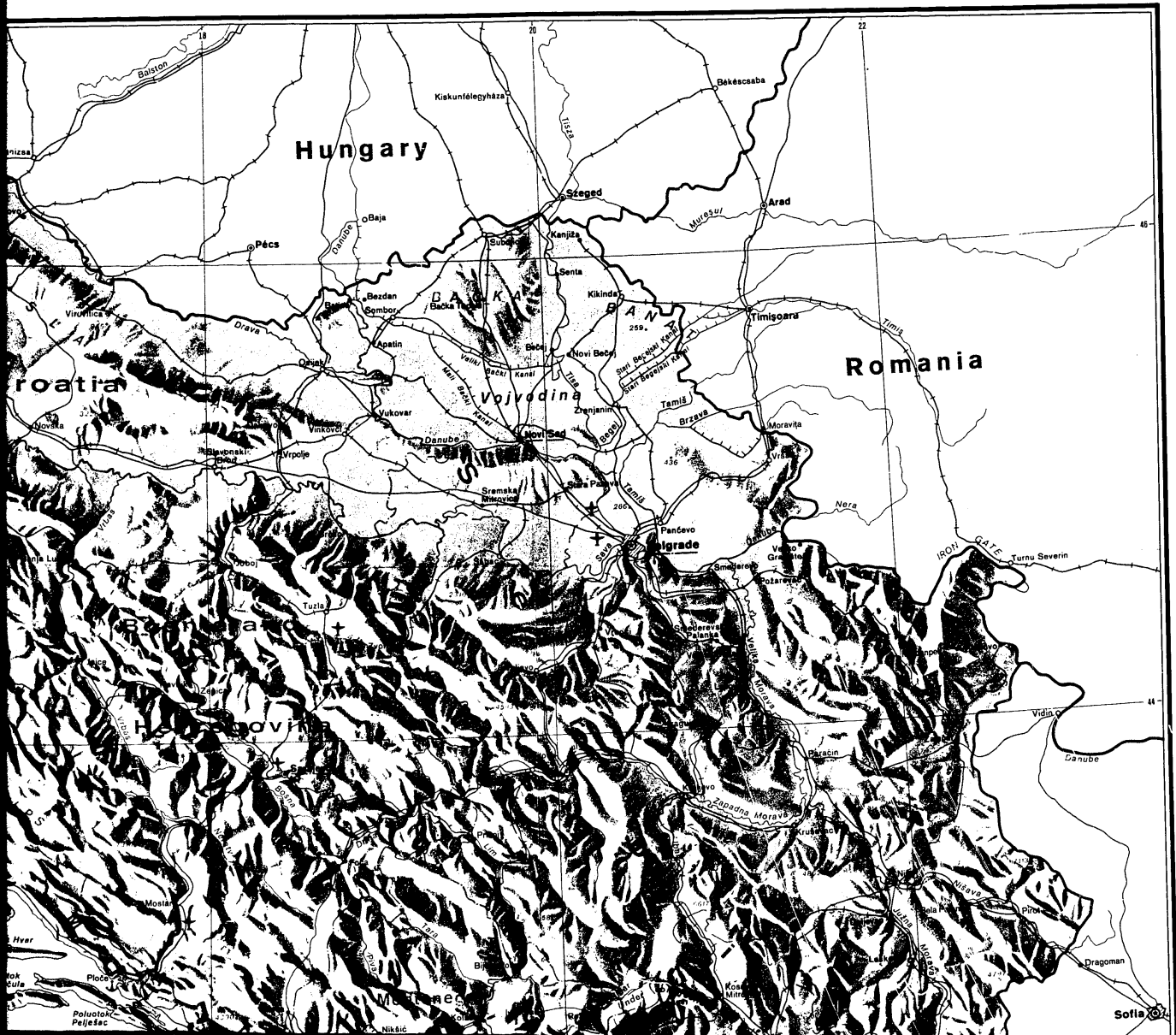


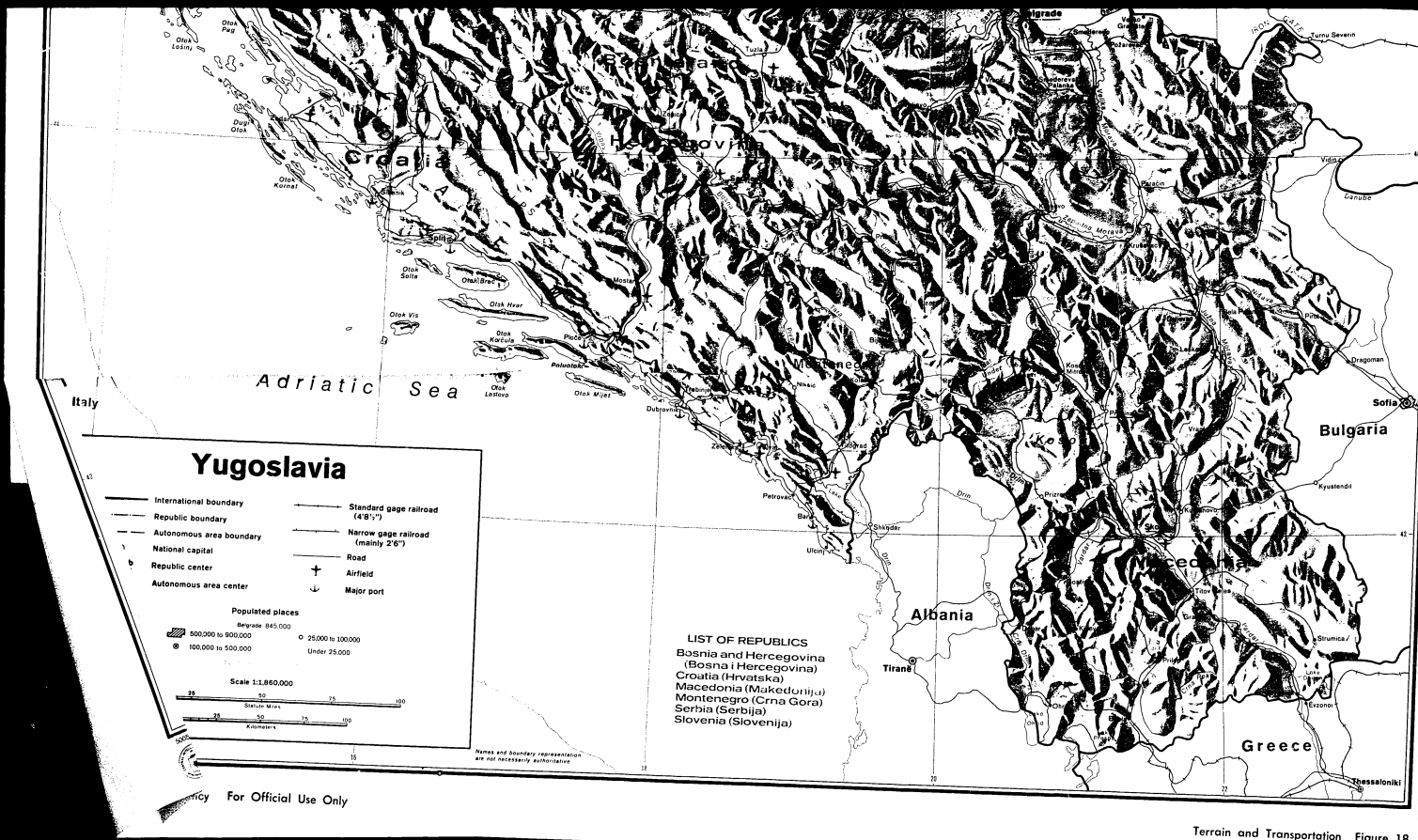
Places and features referred to in this General Survey (U/OU)

	COORDINATES				COORDINATES				COORDINATES					
	°	'N.	° 'E.		°	'N.	° 'E.		°	'N.	° 'E.			
a (sea).....	43	00	16	00	Kakinda.....	45	50	20	29	Sljeme (mt).....	45	54	15	5
.....	44	42	20	31	Kladovo.....	44	37	22	37	Smederevo.....	44	39	20	5
.....	39	00	25	00	Kloštar Ivanić.....	45	44	16	25	Sofia, Bulgaria.....	42	41	23	1
Egypt.....	31	12	29	54	Knin.....	44	02	16	12	Sombor.....	45	46	19	0
ola.....	45	49	19	39	Kolašin.....	42	49	19	32	Spielfeld, Austria.....	46	42	15	3
Palanka.....	44	51	21	20	Koper.....	45	33	13	44	Split.....	43	31	16	2
.....	45	18	14	32	Koprivnica.....	46	10	16	50	Srbobran.....	45	33	19	4
on).....	45	30	21	00	Korčula.....	42	58	17	08	Stara Pazova.....	44	59	20	1
uga.....	45	26	16	54	Kosovska Mitrovica.....	42	53	20	52	Stara Planina.....	43	15	25	0
.....	42	05	19	06	Kotor.....	42	25	18	46	Stružec.....	45	32	16	3
.....	44	54	20	17	Kozara (mts).....	45	00	16	55	Subotica.....	46	06	19	4
.....	45	30	20	36	Kozare.....	42	56	22	06	Šumadija (region).....	44	20	20	4
anal.....	45	27	20	27	Kragujevac.....	44	01	20	55	Svetozarevo.....	43	59	21	1
ka.....	43	13	22	19	Kranj.....	46	14	14	22	Szeged, Hungary.....	46	15	20	1
.....	44	50	20	30	Kraljevo.....	43	34	21	42	Tekija.....	44	41	22	2
.....	45	38	18	11	Kratovo.....	42	05	22	12	Tetovo.....	42	01	20	5
.....	45	12	19	44	Krk.....	45	02	14	35	Thessaloniki, Greece.....	40	38	22	5
.....	44	49	15	52	Kupari.....	42	37	18	12	Timisoara, Romania.....	45	45	21	1
.....	45	54	16	51	Kutina.....	45	29	16	47	Tisa (strm).....	45	15	20	1
rska (inlet).....	42	25	18	40	Lapovo.....	44	11	21	06	Tiranë, Albania.....	41	20	19	5
.....	44	06	22	06	Latakia, Syria.....	35	31	35	47	Titograd.....	42	26	19	1
rod.....	45	08	18	01	Lendava.....	46	34	16	27	Titov Veles.....	41	42	21	1
ion).....	44	00	18	00	Lipik.....	45	25	17	10	Titovo Užice.....	43	52	19	5
.....	46	13	16	55	Ljubljana.....	46	03	14	31	Tivat.....	42	26	18	4
.....	44	52	18	49	Majdanpek.....	44	25	21	56	Trebinje.....	42	43	18	2
otoci (isls).....	44	55	13	46	Mali Lošinj.....	44	32	14	28	Trepča.....	42	47	19	4
Romania.....	44	26	26	06	Maribor.....	46	33	15	39	Trieste, Italy.....	45	40	13	4
Hungary.....	47	30	19	05	Mežica.....	46	31	14	52	Turjak (mt).....	42	51	20	0
.....	45	24	13	59	Miljevina.....	43	32	18	39	Turnu Severin, Romania.....	44	38	22	4
.....	46	23	16	26	Mokrin.....	45	56	20	25	Tuzla.....	44	33	18	4
.....	45	45	16	37	Monfalcone, Italy.....	45	49	13	32	Učka (mt).....	45	17	14	1
.....	46	14	15	16	Moravița, Romania.....	45	16	21	16	Ulcinj.....	41	56	19	1
.....	45	53	15	31	Mostar.....	43	21	17	49	Valjevo.....	44	16	19	3
mt).....	41	51	21	44	Mur, Austria (strm).....	46	18	16	55	Varaždin.....	46	18	16	2
(hill).....	45	09	19	43	Nagykanizsa, Hungary.....	46	27	16	59	Vardar (strm).....	40	35	22	3
region).....	43	00	17	00	Nanos (mts).....	45	48	14	00	Velebit.....	46	01	19	2
rm).....	45	20	29	40	Niš.....	43	19	21	54	Velika Greda.....	45	15	21	0
.....	41	32	20	32	Nišava (strm).....	43	22	21	46	Velika Morava (strm).....	44	43	21	0
.....	45	24	14	48	Nova Gorica.....	45	57	13	39	Velika Plana.....	44	20	21	0
.....	43	32	16	18	Novi Sad.....	45	15	19	50	Velika Tiba (hill).....	44	59	21	0
.....	44	44	18	05	Novo Miloševo.....	45	43	20	18	Veliki Bučki Kanal (canal).....	45	52	18	0
Bulgaria.....	42	56	22	56	Novska.....	45	20	16	59	Veliki Jastrebae (mts).....	43	24	21	1
m).....	45	33	18	55	Obrva.....	43	48	20	36	Venice, Italy.....	45	27	12	1
.....	44	53	19	21	Ohrid, Lake (lake).....	41	00	20	45	Videm-Krško.....	45	58	15	1
.....	42	39	18	07	Okučani.....	45	16	17	12	Vinca.....	44	46	20	3
.....	45	48	16	15	Opatovac.....	45	16	19	10	Vinkovci.....	45	17	18	1
.....	46	02	17	04	Osijek.....	45	33	18	42	Vrbovec.....	45	53	16	1

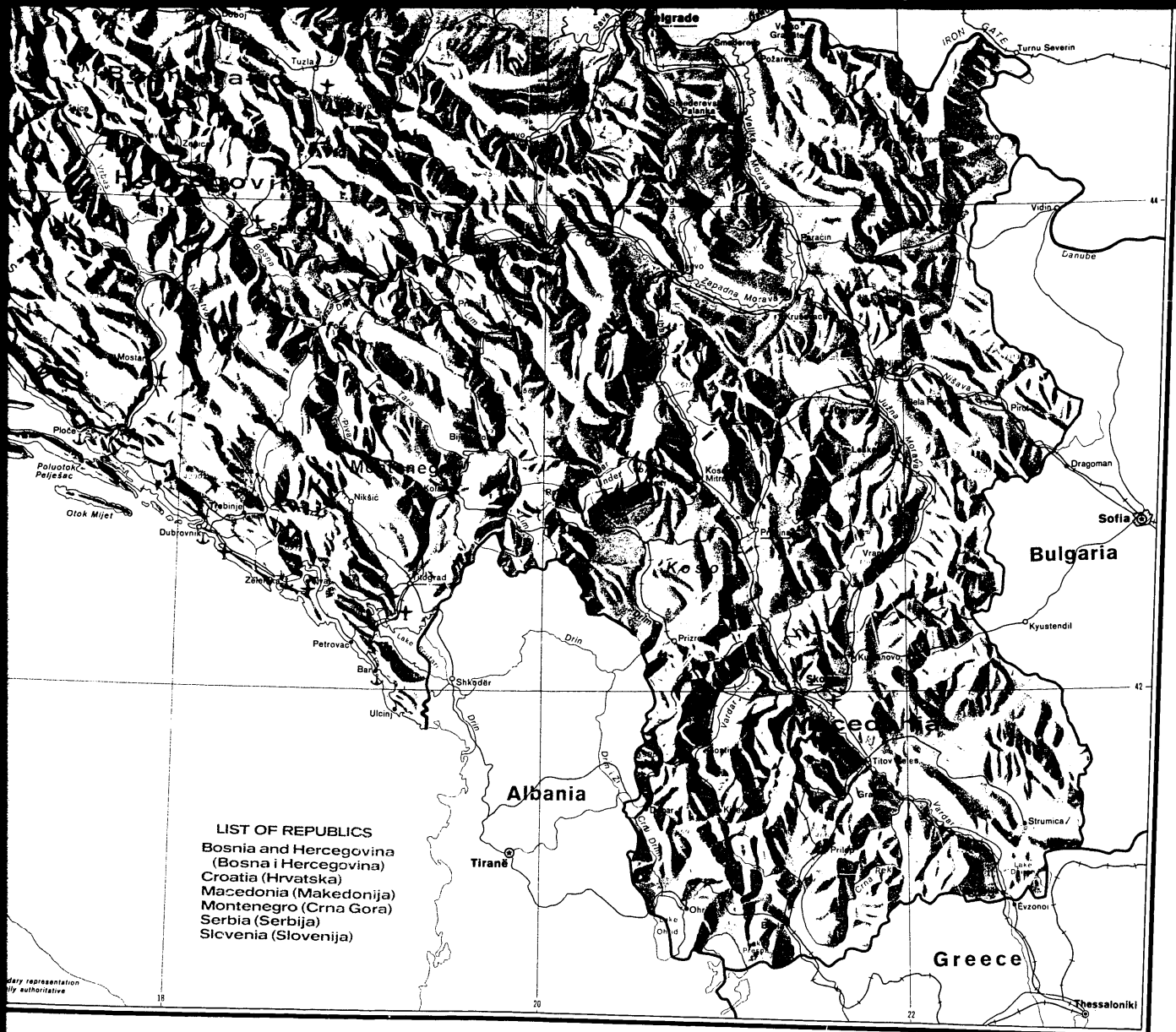
Beslanec	45 12 19 44	Krasovo	45 02 22 12	Tetovo	42 51 24 59
Beotin	45 12 19 44	Krk	45 02 14 35	Thessaloniki, Greece	40 38 22 56
Bihac	44 49 15 52	Kupari	42 37 48 12	Timisoara, Romania	45 45 21 13
Bjelovar	45 54 18 51	Kutina	45 29 16 47	Tasa (strm)	45 15 20 17
Boka Kotorska (inlet)	42 25 18 40	Lapovo	44 11 21 06	Tirane, Albania	41 20 19 50
Bor	44 06 22 06	Latakia, Syria	35 31 35 47	Titograd	42 26 19 16
Bosanski Brod	45 08 18 01	Lendava	46 34 16 27	Titov Veles	41 42 21 48
Bosnia (region)	44 00 18 00	Lipik	45 25 17 10	Titovo Ulice	43 52 19 51
Botovo	46 13 16 55	Ljubljana	46 03 14 31	Tivat	42 26 18 42
Brčko	44 52 18 49	Majdanpek	44 25 21 56	Trebinje	42 43 18 21
Brijunski Otoki (isls)	44 55 13 46	Mali Lošinj	44 32 14 28	Trepča	42 47 19 49
Bucharest, Romania	44 26 26 06	Maribor	46 33 15 39	Trieste, Italy	45 40 13 46
Budapest, Hungary	47 30 19 05	Međica	46 31 14 52	Turjak (strm)	42 51 20 02
Buzet	45 24 13 59	Miljevina	43 32 18 39	Turnu Severin, Romania	44 38 22 40
Čakovec	46 23 16 26	Mokrin	45 56 20 25	Tuzla	44 33 18 41
Cazma	45 45 16 37	Monfalcone, Italy	45 49 13 32	Uška (mt)	45 17 14 12
Celje	46 14 15 16	Moravitsa, Romania	45 16 21 16	Uleinj	41 56 19 13
Cerklje	45 53 15 31	Mostar	43 21 17 49	Valjevo	44 16 19 53
Crni Vrh (mt)	41 51 21 44	Mur, Austria (strm)	46 18 16 55	Vasraždin	46 18 16 20
Crveni Čot (hill)	45 09 19 43	Nagykanizsa, Hungary	46 27 16 59	Vardar (strm)	40 35 22 50
Dalmatia (region)	43 00 17 00	Nanos (mts)	45 48 14 00	Velebit	46 01 19 57
Danube (strm)	45 20 29 40	Niš	43 19 21 54	Velika Greda	45 15 21 02
Debar	41 32 20 32	Nišava (strm)	43 22 21 46	Velika Morava (strm)	44 43 21 03
Delnice	45 24 14 48	Nova Gorica	45 57 13 39	Velika Plana	44 20 21 05
Divulje	43 32 16 18	Novi Sad	45 15 19 50	Velika Tinja (hill)	44 59 21 00
Doboj	44 44 18 05	Novo Miloševo	45 43 20 18	Veliki Bački Kanal (canal)	45 52 18 52
Dragoman, Bulgaria	42 56 22 56	Novska	45 20 16 59	Veliki Jastrebac (mts)	43 24 21 26
Drava (strm)	45 33 18 55	Obrva	43 48 20 36	Venice, Italy	45 27 12 21
Drina (strm)	44 53 19 21	Ohrid, Lake (lake)	41 00 20 45	Videm-Krško	45 58 15 29
Dubrovnik	42 39 18 07	Okučani	45 16 17 12	Vince	44 46 20 36
Dugo Selo	45 48 16 15	Opatovac	45 16 19 10	Vinkovci	45 17 18 49
Durdevac	46 02 17 04	Osijek	45 33 18 42	Vrbovec	45 53 16 25
Elemir	45 26 20 18	Otranto, Strait of (strait)	40 00 19 00	Vrbovsko	45 22 15 05
Évzonoi, Greece	41 06 22 33	Ozren (mt)	43 18 17 36	Vreoci	44 26 20 17
Ferdinandovac	46 03 17 12	Pančevo	44 52 20 39	Vrpolje	45 13 18 24
Gevgelija	41 08 22 31	Paracin	43 52 21 25	Vrška	45 07 21 18
Gdynia, Poland	54 30 18 33	Peč	42 39 20 18	Vukovar	45 21 19 00
Glin	45 20 16 06	Petrovac	42 12 18 57	Zabalj	45 23 20 04
Gl. li, Otok (isls)	44 51 14 50	Piran	45 32 13 34	Zadar	44 07 15 15
Guljilo	45 29 11 53	Pirot	43 09 22 36	Zagreb	45 48 16 00
Golubac	44 39 21 38	Ploče	43 04 17 26	Zastava	45 35 15 14
Gorenja Vas	46 07 14 10	Podgorica pri Črnučah	46 06 14 35	Zemun	44 50 20 24
Gospodinci	45 24 20 00	Popovača	44 34 16 37	Zenica	44 13 17 55
Gostivar	41 48 20 54	Portorož	45 31 13 36	Zidani Most	46 08 15 10
Gradsko	41 34 21 57	Postojna	45 47 14 14	Zirovski Vrh (ridge)	46 05 14 10
Grocka	44 41 20 43	Prahovo	44 18 22 35	Zletovo	41 59 22 15
Gruž	42 39 18 05	Prepa, Lake (lake)	40 55 21 00	Zlobin	45 18 14 40
Hercegovina (region)	43 00 17 50	Priština	42 40 21 10	Zrenjanin	45 23 20 23
Hercegnovi	42 27 18 32	Pula	44 52 13 50	Zvornik	44 23 19 07
Hlebine	46 09 16 58	Radinac	44 37 20 59		
Hvar, Otok (isls)	43 07 16 45	Raša	45 05 14 06		
Idrija	46 00 14 02	Rižka	45 21 14 24		
Ionian Sea (sea)	39 00 19 00	Rijeka Zaliv (gulf)	45 15 14 25		
Iron Gate (gorge)	44 41 22 31	Rovinj	45 05 13 38		
Istria (peninsula)	45 00 14 00	Rožaj	42 51 20 10		
Ivangrad	42 51 19 52	Šabac	44 45 19 43		
Ivančić Grad	45 42 16 24	Šandorovac	45 54 17 02		
Ivaničko Graberje	45 43 16 29	Sarajevo	43 50 18 25		
Ivanjica	43 35 20 14	Sava (strm)	44 50 20 28		
Jagodnja (mt)	44 20 19 18	Scutari, Lake (lake)	42 10 19 20		
Jagjedovac	46 06 16 49	Senta	45 56 20 05		
Janja Lipa	45 27 17 00	Šentilj	46 41 15 40		
Jesenice	46 27 14 04	Sermenli (strm)	41 10 22 32		
Julian Alps (mts)	46 20 13 45	Sežana	45 42 13 52		
Južna Morava (strm)	43 41 21 24	Shkodër, Albania	42 05 19 30		
Kalna	42 52 22 26	Šibenik	43 44 15 53		
Kanjiza	46 04 20 03	Sisak	45 29 16 22		
Karlovac	45 29 15 33	Skofja Loka	46 10 14 18		
Kaštelanski Zaliv (bay)	43 32 16 22	Skopje	42 00 21 29		
Kidričevo	46 26 15 47	Slavonski Brod	45 09 18 02		
				Selected Airfields	
				Batajnica	44 57 20 15
				Belgrade International	44 49 20 19
				Bihac International	44 51 15 47
				Cerklje	45 54 15 32
				Dubrovnik	42 34 18 16
				Ljubljana International	46 13 14 28
				Mostar	43 17 17 51
				Obrva	43 49 20 35
				Priština	42 34 21 02
				Pula	44 54 13 55
				Rijeka/Krk	45 13 14 34
				Sarajevo	43 49 18 20
				Skopje	41 58 21 37
				Split International	43 32 16 18
				Titograd International	42 22 19 15
				Tivat	42 24 18 43
				Tuzla	44 28 18 41
				Zadar	44 06 15 21
				Zagreb	45 45 16 04







Terrain and Transportation Figure 18



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