Geographic Intelligence Report

THE ROADS OF YUGOSLAVIA

CIA/RR GR 60-3

December 1960

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

~~CONFIDENTIAL~~

Geographic Intelligence Report

THE ROADS OF YUGOSLAVIA

CIA/RR GR 60-3

WARNING

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

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

~~CONFIDENTIAL~~

CONTENTS

Photographs

Maps

Approved For Release 2000/04/17 : CIA-RDP79T01018A000300040001-7

THE ROADS OF YUGOSLAVIA*

I. Introduction

As a potential link between Western Europe on the one hand and Rumania, Bulgaria, Greece, and Turkey on the other, the road system of Yugoslavia could assume a strategic and economic importance not confined to that country alone. At present, however, the roads are inadequate not only for transit traffic but also for national military requirements and the planned development of the Yugoslav economy. Partly because of the diverse historical development of the Yugoslav peoples but even more because of the rugged topography of most of the country, the quality of the roads and the density of the road network vary greatly from place to place. Yugoslavia does have a number of good roads, of which the highway between Ljubljana and Belgrade is the best. In most places, however, the network serves local population centers primarily, and through routes are made up of short hard-surfaced stretches extending only a few miles outside the towns and much longer intervening stretches of no more than poorly maintained macadamized roads. In large sections of the Dinaric Mountains motorable roads are nonexistent.

The opening up and developing of remote or economically backward regions are virtually impossible without better connecting roads than now exist, and the further growth of partially developed farming and industrial areas is hampered. A potentially large tourist trade cannot be realized at present because it, too, is dependent upon the construction of good roads. Furthermore, bad roads are the indirect cause of considerable losses to the country's economy in the form of vehicle damage and freight spoilage and delay. For the past several years the annual average of such losses to the nation because of poor roads is estimated to be nearly $12 million.

Strategic considerations also necessitate a better road network. The greatest military weakness of the existing network is the fact that few good roads cross the rugged belt of uplands that separate the coast of Yugoslavia from the interior. In time of war the necessary movement of personnel and materiel from the coast to the interior or their evacuation from the lowlands into the uplands would be hindered greatly by the lack of good roads. Even in relatively flat areas of

* The information in this report is based on the best sources available to this Office as of 1 August 1960.

the country the roads are generally not suitable for modern military traffic. It should be borne in mind, however, that strategic factors might militate against a good road network in the more inaccessible uplands. During World War II, Yugoslav Partisan forces were able to operate with considerable success because they found refuge in rugged upland areas. In many areas, Axis-led military expeditions failed to wipe out Partisan groups chiefly because there were no roads suitable for the movement of large punitive forces, and the existing roads were easily ambushed or blockaded by the Partisans. In the event of another war, Yugoslav military planners might order the withdrawal of armed units into mountainous terrain, where a poor road network again would be a distinct asset to guerrilla operations.

The rate of progress in road building has been slow and stands in sharp contrast to the high rate of general growth that has characterized the Yugoslav economy in the past few years. The ultimate goal for road construction is a network having 10,000 miles of hard-surfaced roads, but to date no comprehensive program to accomplish this has been activated, and road construction has proceeded on a piecemeal basis. Although Yugoslavia has been the recipient of considerable aid from the United States, assistance received for road projects has been earmarked chiefly for the Adriatic Highway, along the coast.

II. General Characteristics of the Road System

The general pattern of the Yugoslav road system is strongly influenced by the topography of the country (see Map 29067, following p. 18). The uplands, which extend the entire length of Yugoslavia and which, with their associated hills, comprise 75 percent of the area of the country, form the most outstanding feature of the terrain. Except for the high mountains in the extreme northwest, the main mountains of the uplands have a northwest-southeast orientation. On the west the Dinaric Mountains abut directly on the Adriatic coast, and only small isolated lowland areas face the sea. There is no continuous natural route near the coast. Few roads from the coast cross the uplands, and movement from the west to the interior is extremely difficult.

The lowlands along the Danube River and its tributaries provide the principal natural routes of the country. The relatively broad, level valley of the Sava River extends from the mountains along the Italian and Austrian frontiers to its junction with the Danube at Belgrade. North of the Danube, the Vojvodina lowland provides natural routes leading toward Budapest and Vienna. Although the road network east of the Vojvodina lowland is not fully developed, it is possible to move eastward across the Banat into western Rumania. The Carpathian mountain system, however, inhibits movement beyond the Banat. Movement overland along the Danube toward the southeast is blocked at the Iron

Gates, but the valleys of the Morava River* and its tributaries provide natural routes from Belgrade southward to other Balkan cities. The most important tributary valleys are those of the Nišava, which leads toward Sofia, and the Ibar, which, in combination with other smaller valleys, leads to Skopje. Routes utilizing the valleys of the Ibar and Južna Morava Rivers converge at Skopje, and from here on southward the Vardar River valley forms a corridor to Salonika. From Salonika, another natural route extends eastward to Istanbul.

Historically, the valleys of the Sava, Drava, Danube, Velika and Južna Morava, and Nišava Rivers and their associated lowlands have provided the more strategic land routes between Western Europe and the Near East; the valleys of the Zapadna Morava, the Ibar, and the Vardar have been somewhat less important. The principal railroads of Yugoslavia were built along these river valleys. After estrangement from the Soviet Bloc, Yugoslavia wanted to maintain contacts with the West and at the same time maintain a link with its Balkan allies, Greece and Turkey. It was therefore desirable to focus attention on building highways along the Sava-Morava-Vardar route, a policy that has led to the neglect of the Nišava route and other direct connections with the Bloc.

The international Balkan Highway was planned to link Italy, Yugoslavia, Greece, and Turkey. In general the Yugoslav portion of this road, the Bratstvo i Jedinstvo Autoput (Brotherhood and Unity Highway), follows the Sava-Velika and Južna Morava-Vardar route (see Map 28640, following p. 18).** It is the most heavily financed road project in the country and is now about 55 percent complete. When completed the Brotherhood and Unity Highway will extend from the Italian border near Trieste to the Greek border at Gevgelija, about 640 miles. It will connect Ljubljana, Zagreb, Belgrade, and Skopje -- the capitals of the Republics of Slovenia, Croatia, Serbia, and Macedonia, respectively, whose combined populations form 78 percent of the total for the Federal People's Republic of Yugoslavia. Militarily, the Brotherhood and Unity Highway would be both an asset and a liability in time of war. Yugoslav forces could be moved quickly along the highway to roads leading to any part of the country. On the other hand, the highway would be vulnerable to interdiction from the air and to interruption by ground forces advancing from the north across the relatively flat Vojvodina.

---

* The Morava River has three sections: the Zapadna (Western) Morava, the Južna (Southern) Morava, and -- between the confluence of these two rivers and the Danube -- the Velika (Large) Morava.

** Although the Bratstvo i Jedinstvo Autoput is considered to be a first-class route, parts of it are of "superhighway" character, and are so identified in the legend on Map 28640.

At present the Brotherhood and Unity Highway is the closest approach that Yugoslavia has to a through route linking widely separated parts of the country. Current plans, however, envisage completion of several other roads that together with the Brotherhood and Unity Highway will form the basis for a modern national road network. Second only to the Brotherhood and Unity Highway as a major road project is the Jadranski Put (Adriatic Highway). When finished, this road will skirt the Yugoslav coast for almost its entire length, an area where no continuous route of any importance existed previously.

The northern and southern terminal points of this 560-mile coastal highway have not been finally selected, but Pula, Rijeka, or Trieste, Italy, will be the northern terminus and Bar or Ulcinj the southern. An east-west road about 280 miles long between Bar and Skopje, which links the Adriatic Highway and the Brotherhood and Unity Highway, is sometimes considered to be part of the Adriatic Highway. Yugoslavia places great military value on the Adriatic Highway, although publicly stressing to a greater extent its economic and tourist values. The road is important because it is the only alternate route to the Brotherhood and Unity Highway. It also provides a means of facilitating the movement of men and supplies into the interior by providing connections with the few roads that extend inland from the coast. Furthermore, in the event of a war in which Yugoslavia were allied with the West, the proximity of the northern end of this road to the countries of Western Europe would be a distinct military advantage.

Two other roads that will link the Brotherhood and Unity Highway with the Adriatic Highway are planned -- the Bosnian Highway and the Ibar Road. The former will extend for about 230 miles from Metković, near the Adriatic coast, to Županja, where it will join the Brotherhood and Unity Highway. The Bosnian Highway will traverse some of the most rugged terrain of Yugoslavia and will permit communication between the coast and the heart of the country. In time of war this route would be vital to the movement of forces and supplies into the interior, and it would also provide access to many areas suitable as bases for guerrilla operations. The Ibar Road, which will cover a distance of about 190 miles and for a part of its length will follow the Ibar River, will connect Belgrade, Lazarevac, Rankovićevo, and Kosovska Mitrovica, at which point it will join an inland extension of the Adriatic Highway. The Ibar Road will be important to the planned economic development of the Autonomous Region of Kosovo i Metohija (the Kosmet), a region inhabited by an Albanian minority group numbering about 800,000. Albania has often charged Yugoslavia with suppressing this minority, one of the sorer points in the generally poor relations between the two countries. In addition to economic considerations the closer communication between Belgrade and the Kosmet afforded by the Ibar Road will provide the central government with a means for tighter

political control of the Albanian minority. Because it will connect the two longitudinal routes of the country, the road will also have strategic importance.

In general, the major roads of the Yugoslav network form an open and irregular grid-like pattern, which in some areas is integrated with the more numerous local roads and in other areas is entirely unrelated to them. In the lowland region north of Belgrade, roads that extend outward in various directions from towns and villages form radial patterns that connect with the major network in many places. On the other hand the roads of southern Yugoslavia follow the narrow valleys through the block mountains of the region and form a definite although sparse grid pattern, which ties in with the major network at the larger population centers. Throughout most of the rest of the country, the lesser roads that extend only a few miles outward from the settlements have developed chiefly as links with the surrounding countryside. They rarely join the main routes and thus do not form part of the major network.

Aside from long stretches of the Brotherhood and Unity Highway and shorter sections of other roads that are fairly uniformly designed and in good condition, the road system of Yugoslavia at present is characterized by wide variations in widths, gradients, and radii of curves as well as surface conditions. Not only are roads more numerous but their quality also is generally better in the lowlands and large valleys than in the uplands. The roads of the Sava Valley and the lowland north of Belgrade, for instance, are generally straight, have gentle gradients, and are well maintained. Most of the mountain roads, however, have steep gradients, numerous switchbacks, and in places are dangerously narrow (Figure 1). Such roads are especially characteristic of the high crystalline mountains in the northwesternmost part of the country and in the northwest-southeast-trending Dinaric Mountains. Even through the relatively large valleys of the upland areas, roads are likely to be narrow, steep, and twisting. Road maintenance in rugged areas usually is poorer than in the lowlands.

In part, the differences in network density and road maintenance are due to the differences in cultural and technological advancement of the various republics of the Yugoslav Federation. Slovenia and Croatia, on the whole, have more and better roads than do more backward republics such as Montenegro and Macedonia, and some roads in comparatively rugged areas of Slovenia are substantially superior to roads of the Vardar Valley in Macedonia.

According to the latest figures (1958), Yugoslavia has about 51,750 miles of roads of all kinds, or about 1 mile of road for each 1.9 square miles of territory. This compares with about 1 mile of road for every

1.7 square miles of area in Austria (as of 1951), 1 for 2 in Hungary (1948), and 1 for 1.2 in Czechoslovakia (1958). In terms of good roads (hard-surfaced, or "modern"), however, Yugoslavia (at the end of 1959) had only some 3,300 miles of highway, or 1 mile for 30 square miles of area. Similar figures for other countries are: Austria, 1 mile of good road for each 3.8 square miles of territory; Hungary, 1 for 14; and Czechoslovakia, 1 for 5. The original quality and present condition of all these roads vary within each country, and a qualitative comparison at best is only approximate. Nevertheless, it seems clear that the road system of Yugoslavia is inferior in nearly all respects to that of most other European countries.

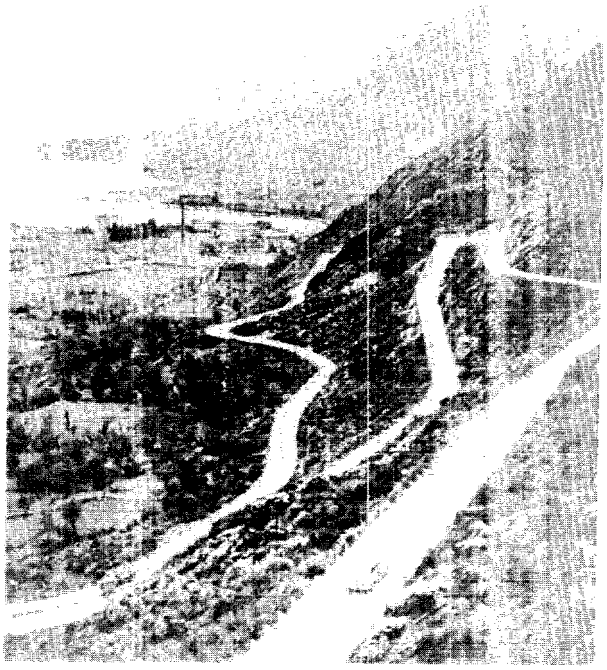


Figure 1. Road crossing the Dinaric Mountains. Numerous switchbacks are necessary as the serpentine roads wind through steep mountains.

III. Problems of Development

The present road network of Yugoslavia reflects, to some degree, the checkered career of the various territories brought together in the Yugoslav state, and the problem of integrating the network arises in part from the wide variation in the stages of development in these territories. Many of the major roads of today -- particularly those in the valleys of the Sava, Drava, Morava, and Vardar Rivers -- follow routes developed by the Romans. After the disintegration of Roman authority the Roman roads remained and in some cases were extended, notwithstanding the turbulent conditions prevailing during the Middle Ages. During the period of Austro-Hungarian control over the northern and northwestern parts of present-day Yugoslavia, the Austrians and Hungarians built roads linking Vienna and Budapest with Trieste and Rijeka, respectively.

The formation of the new state of Yugoslavia after World War I brought together these Austro-Hungarian territories and the less well-developed areas formerly under the control of Turkey, Serbia, and Montenegro. Many of the roads that had served these countries stopped at the borders. Yugoslavia thus inherited a road system that was both primitive and discontinuous. Of some 50,000 miles of roads of all kinds within the country at the beginning of World War II, only 2,050 miles were adequate for modern traffic, and another 4,000 miles were passable only by vehicles with high clearances. The remainder were suitable only for horse-drawn vehicles. During World War II, little if any road building was done, and maintenance was minimal. The condition of the roads at the end of the war, after heavy military traffic and operations, quite likely was worse than before. The task of building an adequate road network was therefore of enormous proportions. Although the country has since prospered and has made significant progress in road construction, the magnitude of work yet to be done constitutes a major problem.

Another category of problems in building and maintaining the network arises from the topographical complexity of the country. Although the need for improved mountain roads is great, the problems of engineering and construction and the cost of building and maintenance have largely discouraged any comprehensive construction program for the uplands. In many gently rolling areas the construction of new roads requires the slow and costly removal of much bedrock (Figure 2). Even in the lowlands and areas of slight relief the problems of road construction are large.

Figure 2. Limestone along road cut. In many parts of Yugoslavia, roads must be cut through such hard bedrock.

The usability of the roads is often adversely affected by natural hazards. In lowland areas, floods are the most serious problem. Some of the better lowland roads are adequately elevated on embankments and are not subject to inundation. Other good roads, however, may be badly damaged by high water (Figure 3) or may be covered with flood-borne debris. Flooding also is common in the uplands, chiefly in the crystalline mountains in the extreme northwestern part of the country. Here heavy rains or spring thaws swell the mountain streams to a level where they may wash away or otherwise damage roads. Although flooding is negligible in the rugged parts of the Dinaric Mountains, where porous limestone tends to absorb rainfall and meltwater, basins within these mountains may be flooded seasonally and roads may be inundated at times. In both rugged and flat areas, flood-control measures are necessary. A stream-control project is planned for the Grdelica Gorge of the Južna Morava, where part of the Brotherhood and Unity Highway is in danger of being flooded. Heavy snows may block roads in all parts of the country, particularly in the mountains; and rockslides, landslides, and snowslides are hazards in all areas of high relief. Various measures, including barrier fences on steep slopes where snow and rock are likely to slip, are adopted in the uplands to protect both new and old roads from damage by slides of all kinds.

Figure 3. The highway between Belgrade and Zagreb after a flood. Although this is the best highway in Yugoslavia, it is subject to serious flood damage.

IV. Road Classifications

Yugoslavia usually classifies its roads in two ways, which are mutually independent. First, roads are designated by numbered classes according to their importance to international, national, or local traffic and, second, according to type of surface, and, in some instances, condition. Either classification may be given on Yugoslav road maps and in tourist guidebooks and other official publications. A road may be shown as a first-class route on one map, whereas on another the same road may appear as a macadamized road in poor condition (see Map 28640, following p. 18, and the Table below).

Table

Roads in Yugoslavia, 1957

Type of Route (by Importance)	Hard Surface a/	Macadam	Dirt	Uncut	Total Mileage
Class I	1,947	3,878	6	68	5,899
Class II	941	7,422	267	458	9,088
Class III	189	12,110	2,364	357	15,020
Class IV	56	6,586	14,637	601	21,880
Total Mileage	3,133	29,996	17,274	1,484	51,887

a. Concrete, asphalt, or stone sett.

The classification of a route according to importance is not governed in any way by the surface or dimensions of the stretches of road that comprise the route. First-class routes are of importance to the nation as a whole. They may lead from Yugoslavia to another country or from one relatively important urban or industrial area within Yugoslavia to another, or they may be of importance as military routes. About 11 percent of all Yugoslav roads are first-class routes. Second-class routes are those of importance to a particular republic (the major civil division; comparable to a state in the United States). Such roads account for about 18 percent of all roads. Third-class routes are of significance to districts (the second-order administrative division in Yugoslavia) and comprise nearly 30 percent of the total road length. Fourth-class routes (not shown on Map 28640), which account for some 42 percent of all roads in Yugoslavia, are merely commune or local roads.

Of the roads that make up first-class routes, including the Autoput, or superhighway, about one-third have hard surfaces, and the rest are macadamized. Some of the macadamized roads of the first-class routes would not meet standards set for many county roads in the United States (Figure 4). For passenger vehicles, maximum safe speeds over first-class routes range from practically unlimited on some sections of the Autoput between Ljubljana and Belgrade to not more than 20 miles per hour on many of the macadamized roads. Not all hard-surfaced roads, however, are classed as first-class routes. Only 60 percent of them are first class and about 30 percent are second class. Most of the rest are third class, but a few are fourth class.

Under the second classification, that based on type of surface, the following four categories are recognized: hard-surfaced roads, including concrete, asphalt, and stone sett; macadamized roads; dirt roads; and uncut roads. Some maps also indicate the condition of the surface. The concrete and asphalt roads in the hard-surface category are self-explanatory. A stone-sett surface consists of stone blocks laid most commonly in a mosaic pattern of concentric arcs. The individual blocks are hand hewn from granite or other hard stone, and are manually placed in fine sand that has been spread over a suitably prepared bed. This surface is common in cities and also is used on some sections of major highways. Roads paved in this manner require relatively little upkeep, but they often develop a rough surface.

Hard-surfaced roads generally are at least 18 feet wide and may be as wide as 50 feet, with firm shoulders extending another 3 feet or so on both sides. Grades are relatively gentle and curves are wide. Two traffic lanes are standard, but in some places there are three lanes. Although 80 percent of all hard-surfaced roads meet modern construction requirements, many of these roads have fallen into disrepair to the

point where they are no better than, or not so good as, many macadamized roads.

Macadamized surfaces are of crushed and rolled rock, usually underlain by one or more layers of coarse rock that has been graded and compacted. This surface is by far the most common in Yugoslavia, comprising nearly 60 percent of the total road mileage. Macadamized roads deteriorate under all but very light motorized traffic; a washboard surface that is also full of potholes develops rapidly (Figure 5). Constant maintenance is required to keep these roads in even minimal condition, and most of them are steadily worsening because of inadequate methods of upkeep, together with increasing vehicular traffic. Although generally in poor condition, macadamized roads can be used in all seasons. They are not affected by heavy rains or inundations, except when floods cause washouts or cover the roads with debris. Macadamized roads are rarely more than 30 feet wide and may be no more than 10 to 12 feet wide, and shoulders may be wholly lacking. Grades are steeper and curves tighter than those of hard-surfaced roads.

Dirt roads generally have some kind of subgrade and are surfaced with a local-earth fill that is then compacted. These roads deteriorate even under horse-and-wagon traffic and in wet weather may be completely impassable to all vehicles. The same dimensions of width, shoulders, grades, and curves that apply to macadamized roads are also true of dirt roads.

Uncut roads are usually nothing more than tracks worn by years of wagon use. No attempt is made to improve them except locally, where needed, and generally they are suitable for horse-drawn and jeep-type vehicles only.

V. Construction Programs

Shortly after World War II Yugoslavia formulated plans to construct some 8,000 miles of hard-surfaced highway to augment the 2,000 miles of good road already in existence. Relatively little money has been allocated for road construction and improvement,* however, and the construction of new roads has proceeded slowly. To date about 6,700 miles of planned roads remain to be built.

According to Yugoslav officials, total reconstruction -- which includes the building of new roads and the rebuilding of old ones -- is

* For each year from 1954 through 1958, funds for roads averaged 1.7 percent of the total national income.

Figure 4. Part of the first-class route between Split and Sarajevo. Most of the road is narrow and has developed a washboard surface.

Figure 5. Poorly maintained macadamized road in the uplands. Broken rock piled along the roadway is used to fill in holes and ruts. In spite of its surface condition, such a road may be a first-class route in Yugoslavia.

too vast and costly an undertaking to be contemplated at the present time except on a relatively limited scale. Therefore, temporary repair (maintenance and limited rebuilding) constitutes the most important element of Yugoslavia's road program, although temporary repair is also costly and not efficient enough to prevent a gradual deterioration of most roads. In the past, considerably less money has been set aside for the construction of new roads than for the improvement and rebuilding of old ones. By 1958, however, the allotment for the construction of new roads had increased to $54 million, an amount that for the first time approached the $59 million allotted for the reconstruction of old roads. In 1959, the allotment for new roads had reached $77 million, and the estimate for 1960 is $107 million.

Road construction usually proceeds on a town-to-town rather than a mileage basis. Projects are commonly scheduled for completion 3 years or 5 years after inception, but target dates are frequently extended. A "new" road is usually one built along an entirely new alignment, but an existing road that has been extensively rebuilt may also be considered new. The materials and techniques of construction of new roads vary according to the terrain and the quality of construction required. A new road in the Morava Valley is described as being nothing more than gravel laid on a subgrade and then rolled. This type of construction, which is common in fairly level areas, in all likelihood will be suitable for relatively heavy traffic during the intended period of service, after which the road will be rebuilt. In some places, "modernization" may result in almost complete rebuilding. Normally, however, improving or modernizing roads chiefly entails merely widening, straightening, or resurfacing, singly or in combination.

Even with slow construction and generally inefficient maintenance the road network is being improved, particularly through work on the Brotherhood and Unity Highway and the Adriatic Highway; and the rate of road construction is increasing each year. About 375 miles of new hard-surfaced roads are planned for 1960. Although the United States has aided Yugoslavia in its road program, the money made available for this purpose has been small in comparison to total US assistance to the country. Nearly all of the US aid for roads, which has included both financial and technical assistance, has been devoted to the construction of the Adriatic Highway.

Among the individual highways planned or under construction the Brotherhood and Unity Highway, which was incorporated as part of the Balkan Highway in 1957, is being built according to international standards and specifications agreed upon by representatives of the four participating countries. Existing roads in Yugoslavia already provided transportation over nearly the same route as the projected Brotherhood and Unity Highway, but the varying dimensions and conditions of these

roads necessitated almost total reconstruction in order to meet specifications for the Balkan Highway. Original plans called for the completion of the Brotherhood and Unity Highway by 1962, but by early 1960 only some 55 percent had been finished. Some sections that are now completed follow new alignments, chiefly in areas of level terrain where construction was relatively easy. Most of the sections yet to be built, however, are in areas of difficult terrain; and here existing roads will be improved and put into use. The specified width of the highway, including the shoulders, is to be 10 meters; and the hard-surfaced roadway is to be 7-1/2 meters across. Normally, the specified minimum radius of horizontal curves is 250 meters, but in some exceptional places it will be reduced to 100 meters. Gradients are to be slight, and junctions with small local roads will be avoided by the construction of overpasses or underpasses. Hard surfaces of concrete, stone sett, or asphalt are called for.

Most of the construction of the Adriatic Highway has been or will be over minor local roads already existing (Figure 6). In many places

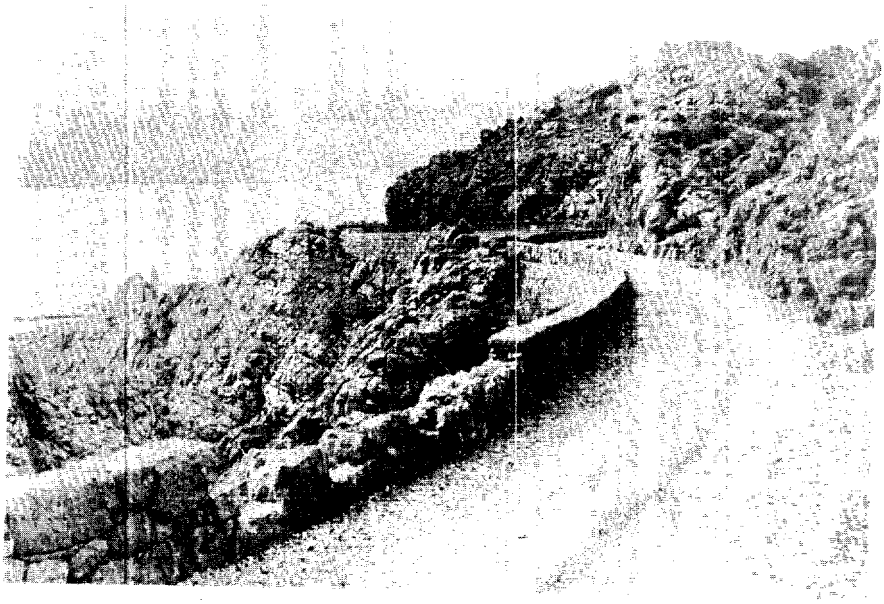


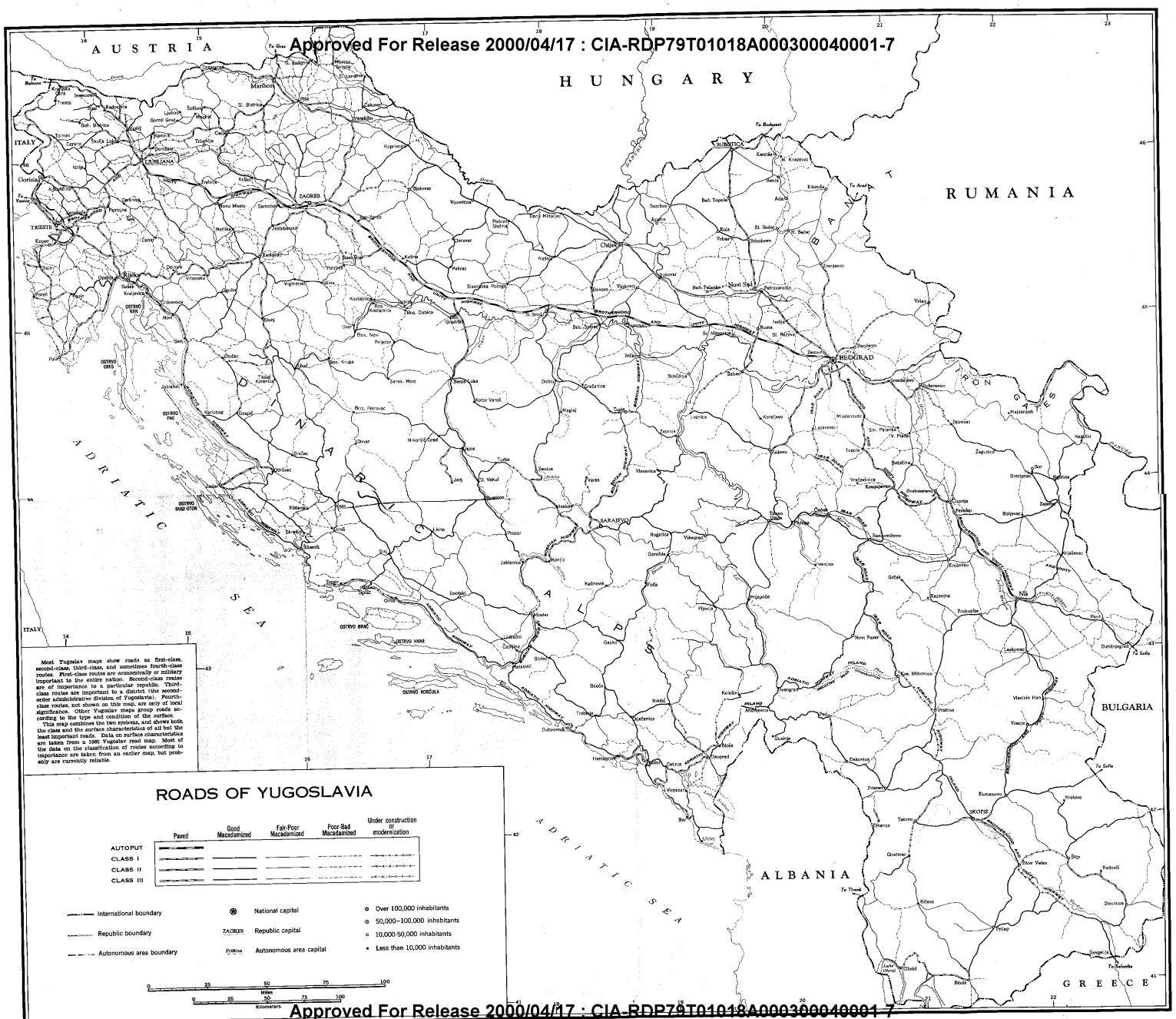
Figure 6. Part of the Adriatic Highway. Most of this highway has been or will be built over existing roads. Along the narrow, rugged coast of Yugoslavia, widening the roadbed, straightening the curves, and making other necessary changes are very costly.

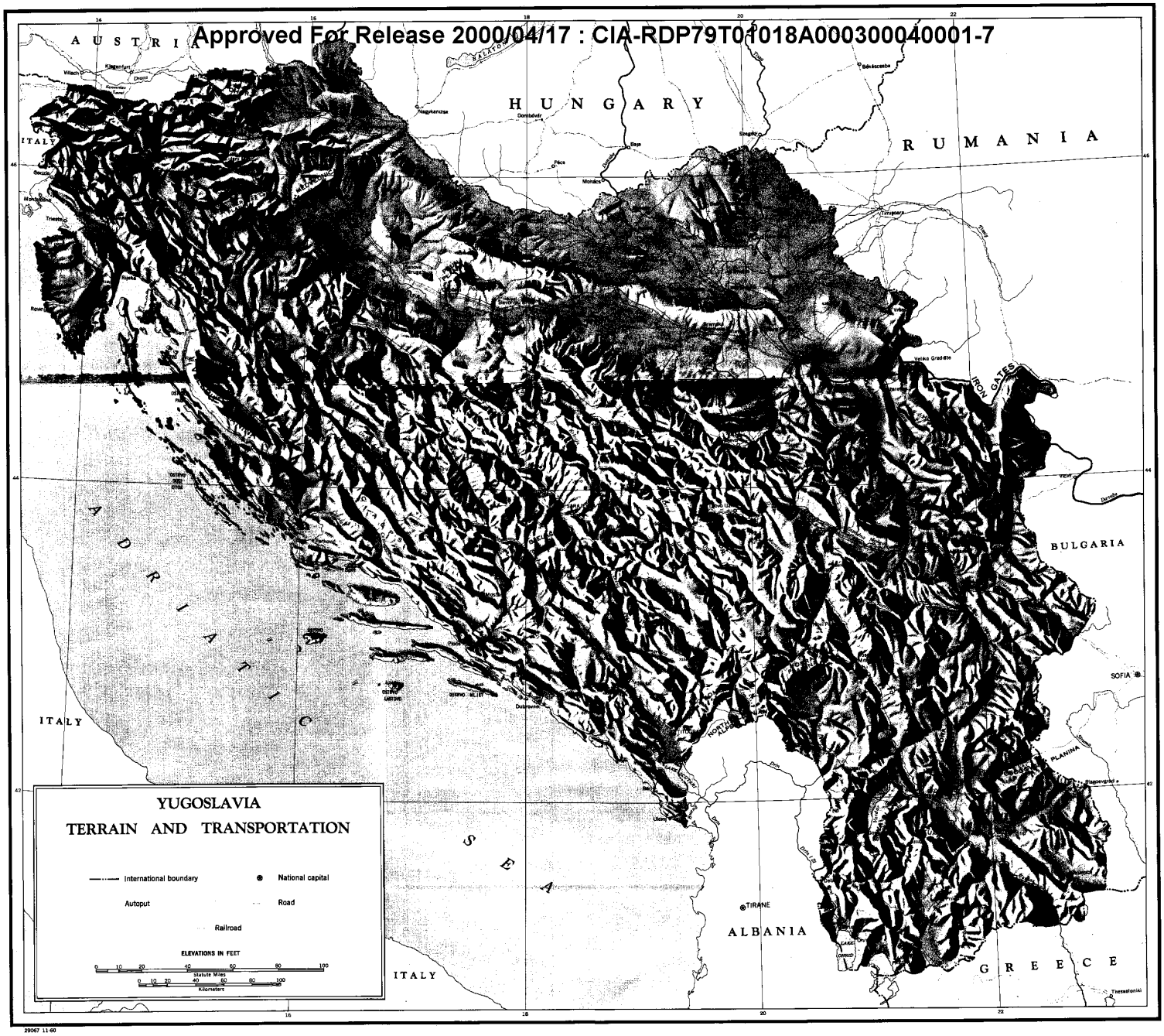
along the coast the steep slopes and lack of shore area make it impossible to build new roads. Much of the inland extension from Bar to Skopje, however, will consist of new roads whose alignments have not yet been surveyed. The total cost of the Adriatic Highway was estimated at about $193 million. The entire project was scheduled for completion in 1966, but latest maps (1960) indicate that no more than 50 percent of the highway has been finished. American officials have stressed adherence to minimum military highway standards in constructing the Adriatic Highway, but in many places the cost of straightening curves or widening the roadbed is prohibitively high, and military specifications are waived. In general the roadway is to be 7 meters wide (room for 2 lanes), with an additional meter for the shoulders. Grades normally are to be 5 to 6 percent, but as much as 7 percent is allowed. The specified minimum radius of curves is to be 100 meters. The road will be paved with asphalt except on steeper parts of the curves where stone sett will be used.

The Bosnian Highway was originally scheduled for completion in 1961 but by late 1959 only about 70 miles of the 230-mile total had been completed. Existing roads cover most of the route but many of them require extensive reconstruction, particularly north of Sarajevo. Like the Bosnian Highway, the Ibar Road route consists chiefly of existing local roads, many of which are in process of being improved. Most of the road work is needed between Lazarevac and Rankovićevo. This route is scheduled for completion in late 1960.

In addition to the four major roads that form the basic network of Yugoslavia a number of shorter roads recently completed or under construction have strategic value. A road being built around Belgrade, which is finished except for a segment approximately 6 miles long northeast of the city, will permit traffic moving along the Brotherhood and Unity Highway to bypass the city. Branches from this 16-mile ring road will facilitate access to the city from several directions. Two new roads in the high mountains along the northwestern frontier will provide communication links between the Soča and upper Sava Valleys -- links that were previously lacking. One of them, crossing the rugged terrain between Kranjska Gora and Trento, has been finished recently. The other, under construction or possibly completed, connects Bled and Cerkno. The roads are about 25 feet wide and are surfaced with gravel. They are reported to be so constructed that they can be mined at strategic places.

Planning and coordination of all road construction and maintenance in Yugoslavia is the responsibility of the Secretariat of Transport and Communication. The actual job of road construction is divided among the Secretariat -- which builds and maintains the major roads -- and the various republics, districts, counties, and cities -- which are





29067 11-60

Figure 7. Youth Brigade at work on the Ljubljana-Zagreb superhighway. Much of the cutting and filling on this road project was done by manual laborers of such brigades.

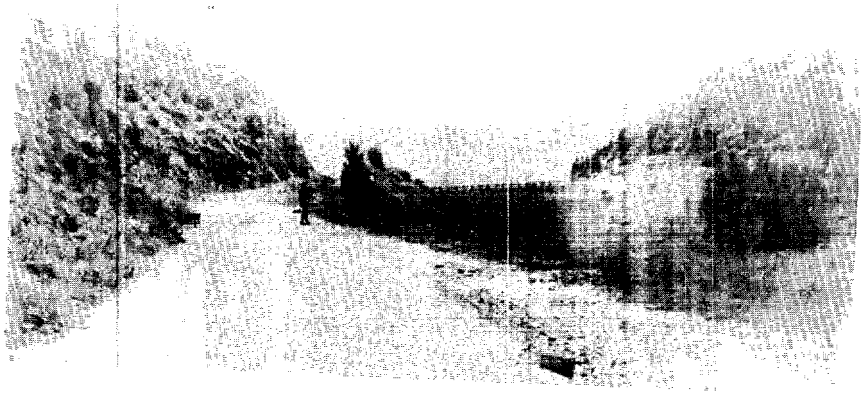


Figure 8. Road through the uplands. Manual labor is used extensively in maintaining most roads in Yugoslavia.

Figure 9. Local workmen using mobile rock crusher. Small crushers of this sort are moved from village to village and are used to prepare material for both the improvement and the maintenance of roads.

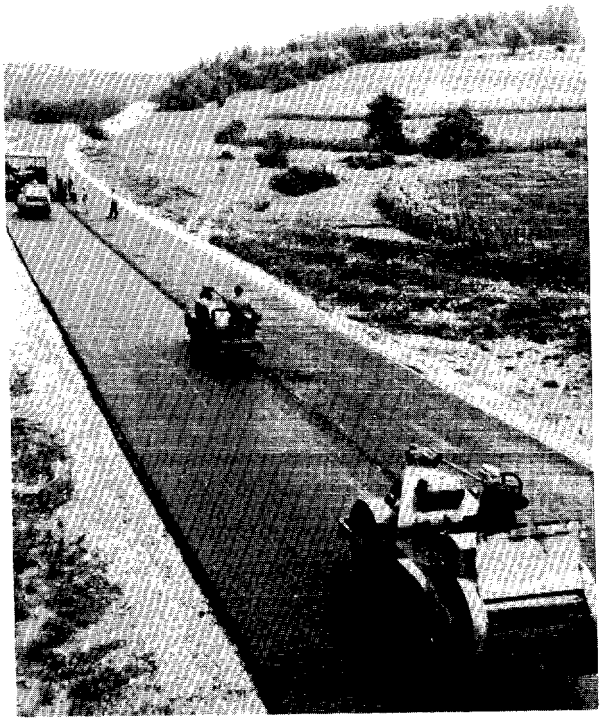


Figure 10. Construction on Ljubljana-Zagreb super-highway, showing part of the up-to-date equipment used in constructing the road.

responsible for lesser roads and streets. Most of the funds for construction and maintenance are supplied by the Secretariat, although the republics, districts, counties, and cities contribute. The Yugoslav Army also does work at the direction of the Secretariat. The Army also may be called upon to repair major damage caused by slides or washouts.

Although Yugoslavia is a Communist state, some private enterprise is allowed. Most of the road construction is done by semiprivate firms that are granted contracts by federal, republic, or other authorities on the basis of competitive bidding. Engineer units of the Yugoslav Army, however, usually build roads in areas of rugged terrain, where their special equipment and techniques are particularly valuable. The Youth Brigades -- units consisting of young people, chiefly from Yugoslavia but including some foreign volunteers -- also work on road construction and related projects. Upwards of 60,000 young people may be thus occupied in the summer (Figure 7).

The routine method of maintaining roads in many areas of Yugoslavia probably has not changed since the advent of motor traffic. Individual villagers, who are responsible for specified stretches of road, are each equipped with a wooden wheelbarrow and a shovel or a rake. Each individual patrols his assigned segment of road, and fills in ruts and holes with earth fill or gravel (Figure 8). In some areas, movable rock crushers provide material for this manual operation (Figure 9). As vehicles pass over newly repaired places, the road soon deteriorates to its previous state.

Although most roads in Yugoslavia are not well built, Yugoslav engineers are capable of constructing highways that compare favorably with Western roads. The Ljubljana-Zagreb superhighway, perhaps Yugoslavia's best first-class route, is particularly well built. Up-to-date equipment was used on this superhighway (a part of the Brotherhood and Unity Highway); and the construction techniques, although primitive in some respects, were sound (Figure 10). The portion of the Brotherhood and Unity Highway between Belgrade and Zagreb is excellent by European standards, although lacking many features required by American standards. Even this part of the highway is deteriorating in places as a result of inadequate maintenance. Road markings are often inadequate. Thus, driving at night is particularly hazardous because lines marking the center and shoulders of the road are lacking, and posts marking the outward edges of the shoulders are widely spaced. Even with increased and sustained emphasis on road construction, the rugged terrain, the low technical standards in many areas, and a general lack of "know-how" will continue to plague efforts to establish an adequate road network throughout Yugoslavia.