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



Poland

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Transportation and Telecommunications

A. Appraisal (S)

The transportation and telecommunications (telecom) systems of Poland, despite qualitative deficiencies, are generally adequate for the national economy. Poland's geographic position in the northern European plain makes its main transportation lines especially significant for transit military and economic movement between the U.S.S.R. and East Germany; also, the arterial north-south routes provide Czechoslovakia and Hungary access to the Baltic Sea. All of the transportation systems are government owned and operated.

The overall transportation complex is marked by a concentration of facilities in the western part of the country, largely the result of historical events that determined Poland's boundaries. The poorly integrated and unevenly distributed rail network was established after World War I from portions of three distinct railroad systems. The western region, formerly held by Germany, is served by a dense rail system having numerous connections and alternate routings but oriented primarily toward Berlin rather than toward an all-Polish network. The central and eastern areas, formerly held by Austria and Russia, have comparatively sparse and underdeveloped systems comprising a few major lines radiating from Warsaw to principal rail centers in the west and to the frontiers in the east. Highways, like the railroads, are better developed in the ex-German territory in the west, and are of lesser quality and density in the central and eastern areas once occupied by Austria and the U.S.S.R.

The rail, highway, and inland waterway systems provide international connections with all adjacent countries; pipeline connections are made only with the U.S.S.R. and East Germany.

Railroads are the chief long-haul freight carriers. The standard-gage system is compatible with those of East Germany and Czechoslovakia but requires transloading facilities at connections with the broad-gage system of the Soviet railroads except on tow lines where standard-gage and broad-gage trucks for special passenger cars are exchanged. Highway transport is used primarily in short-haul service and has been growing in importance. The inland waterways, although reflecting a relatively small contribution in the overall transportation effort, are nevertheless an important long-haul bulk-carrier supplement to the overworked railroads. Pipelines are a significant complementary facility to the other surface transportation modes; the major pipeline is part of the Council for Economic Mutual Assistance (CEMA) international system which carries most of the country's crude-oil imports in addition to transit shipments destined for the Schwedt refinery in East Germany.

Of the almost 1,529 million short tons hauled by the three major transport modes in 1971, highways accounted for 70.6% of the total as compared with 28.6% for railroads and 0.8% for inland waterways; in terms of ton-mile performance, the railroads produced 83.9% of the total, highways 14.3%, and waterways 1.8%.

The growing merchant fleet of 252 commercial ships of 1,000 gross register tons and over operates on

40 shipping routes worldwide. In 1971 the fleet carried almost 47% of Poland's seaborne foreign trade, the total volume of which is adequately handled by the four major and six minor ports. The Szczecin/Swinoujście¹ port complex comprises the country's largest marine facility and normally handles over 45% of the annual bulk trade.

Despite continuing personnel and facility deficiencies, civil aviation has been improving gradually since its near demise in the mid-1960's. LOT, the Polish flag carrier, operates 39 major aircraft—all of Soviet manufacture—and in 1971 transported over one million passengers, a new high for the airline. The air facilities system is more than adequate for present military and civil requirements. Currently there are 146 known airfields, most of which serve the military. Several airfields support both military and civil aircraft; Warsaw/Okecie, the international airport of entry, is the principal facility for civil aviation.

Development and improvement of the various transportation facilities are progressing under the current Five Year Plan (1971-75). Railroad programs are focusing on converting all main lines to automatic signaling, changing motive power from steam to diesel and electric, and constructing some container terminals. Main emphasis of highway programs is to improve existing routes by adding wider and better surfaces; also, a new arterial highway under construction is to follow the Baltic coastline. Some 770 miles of new pipelines are being installed, including an addition to the CEMA system. Facilities at several inland waterway ports are being modernized and expended, and some new fluvial ports are under construction; fleet development is also continuing. The first stage of construction is underway on what is to be the largest deepwater maritime port in Poland—Polnocny. The target for the expanding merchant fleet is 3.5 million deadweight tons, and the shipbuilding industry is being enlarged. Plans relative to air transport call for modernizing facilities, renovating equipment, and acquiring new aircraft.

Services of the Warsaw-centered telecom system, which adequately supports government needs, include domestic—and some international—telephone, telegraph, radiobroadcast, and TV. Nearly 50% of the villages have telephone service, and radiobroadcasts reach 96% of the population. TV is transmitted to about 78% of the people. Telegraph channels are provided to 27 countries. Direct lines are available from Warsaw to Prague, Budapest, Moscow, and East

¹For diacritics on place names see the list of names on the apron of the Terrain and Transportation map, Figure 12, and the map itself.

Berlin, and indirect access is available to Western Europe via Hamburg. Telecom services are being modernized and increased under the present Five Year Plan; main emphasis is on renovating and improving intercity networks, expanding telephone facilities, and increasing automation.

B. Strategic mobility (S)

Poland's transportation facilities, including the port and airfield installations, could adequately support military logistical operations. There are, however, certain deficiencies in the overall transportation complex that would impose limitations on any large-scale movement and supply of military forces. While main rail and highway routes provide for rapid deployment to all regions of the country, adequate alternative routes are available only in the western parts. Most of the highway net comprises natural-surface roads which limit the capability of the system to handle heavy military traffic. The predominance of single trackage on the rail system is a major deficiency limiting the use of railroads for large-scale movements. Because they are capable of handling large quantities of ammunition, equipment, and supplies and despite being limited in total length and areal distribution, the inland waterways could provide excellent long-distance supply-resupply routes in any military operations. Through connections with East German waterways, the Polish waterway network forms an integrated part of an international waterway route across Eastern Europe, connecting major maritime ports along the Baltic and important strategic areas in the interior with points on or near the West Germany border. Within Poland, the inland waterways could provide logistical support to military units travelling north or south and east or west between major ports on the Baltic and important strategic centers in the interior. Tactically, the waterways are natural barriers to rapid overland movement. Most vulnerable are locks, dams, and weirs on some parts of the system, destruction of which would completely halt through traffic. Damage to dams could cause widespread flooding and flash flooding with subsequent loss of water-level control and shipping channels. Serious interdiction could also be achieved by destroying ports, repair facilities, and large bridges. The large lock and dam at Wloclawek on the Vistula river and the 22 locks on the cross-country Oder-Vistula waterway are the most vulnerable installations on the international through route.

The Polish merchant marine would be able to provide substantial logistic support but very limited

long-haul troop transport to military operations. The 166 dry cargo and four refrigerator cargo ships have a combined lift capability of about 1,094,200 long tons of cargo. The small tanker fleet (four ships) could transport about 70,800 tons (603,800 barrels) of petroleum products. For amphibious lift support, 72 cargo ships totaling 779,700 d.w.t. have a heavy-lift capability of 40 tons or more; nine cargo ships totaling 31,000 d.w.t. have at least one large hatch (over 50 feet in length); and three cargo ships totaling 40,500 d.w.t. have a large-hatch/heavy-lift capability. The 780-passenger capacity of the transoceanic passenger ship could be considerably expanded under emergency conditions. In addition to the oceangoing fleet, three large ferries have about 650 passenger berths, and a small passenger ship has another 120 berths. Very limited logistic support would be provided by the coastal fleet consisting of 29 small cargo ships having a cargo-carrying capacity of about 20,300 long tons, four small tankers having a capability of about 2,600 tons (21,900 barrels) of petroleum products, and a small passenger ship having 25 berths. The 67 major vessels in the fishing fleet have crew quarters for about 7,000 persons; no doubt, these quarters could be used under emergency conditions.

There appears to be no formal mobilization plan for LOT aircrews and aircraft, but it would seem that they would be readily available in time of emergency. LOT is controlled by the Polish Government, and most of the staff either have had prior military experience or are in the military reserves. Aircrew instructions referring to such an emergency direct that those aircraft and crews on duty in Warsaw would remain there, and crews at other airports would report to the military airfield designated in their reserve forces booklet. The air crew and aircraft would immediately fall under jurisdiction of the nearest military airfield commander. LOT did participate in the transportation of militia personnel to Gdansk from Warsaw during the late-1970 uprising in that city. LOT pilots flew two AN-24 aircraft to augment flights made by the Polish Air Force Transport Command. In any future emergency this type of augmentation would probably be repeated to reinforce the airlift capability of the air force. The equipment, facilities, and personnel of the air ambulance groups and aeroclubs are used in the performance of such activities as transporting injured persons, carrying medical supplies, and engaging in air reconnaissance and air/sea patrol and rescue. Under emergency conditions the scope of these services could be widened, and these groups would be of great value in a military supportive role.

The Polish defense forces are the largest single subscribers of the common-carrier landline telecom networks, and they also maintain extensive separate military cables, open-wire lines, and point-to-point radio facilities. Military communications are also transmitted over the Postal Service telex network, which became fully automated in 1971. Cables used for military traffic are under constant surveillance by government security forces, and special alarm devices have been installed to alert switchboard operators if any attempt is made to tap the lines. The cutting of cables around the main exchange in Warsaw would create considerable havoc, and the cutting of ring cables at other important cities would practically destroy wire telecom traffic throughout Poland.

C. Railroads (S)

Railroads provide the most important and efficient means of long-distance transport in Poland. The Polish State Railroads (PKP), a government agency under the Ministry of Transportation, operates a network totaling 16,469 route miles and accounts for over 80% of the total ton-miles.

The rail system is densest in the north, west, and southeast, where industrial development is heaviest, and sparse in the central and eastern areas. Primary lines lead from the heavily industrialized areas around the city of Katowice to the eastern and western borders and to Warsaw, Poznan, Wroclaw, and the major ports. The few major lines in eastern and central Poland radiate from Warsaw to the principal outlying areas. There are also few alternate routes or cross connections between the main lines in these areas. The topography of most of Poland consists of relatively flat to gently rolling terrain over which railroads may be built without difficulty. On routes in the Sudeten and Carpathian Mountains near the Czechoslovakia border, however, sharp curves and steep grades are numerous.

As of December 1970, the Polish railroad network consisted of 16,469 route miles—14,381 route miles of standard gage (4'8 1/2"), of which approximately 4,644 route miles are double track, and 2,088 route miles of various narrow gages. There are 2,400 miles of electrification, all on standard-gage lines and mostly in south-central Poland.

International connections are provided with all neighboring countries. Main lines are standard gage, and direct interchange of equipment is possible with the East German and Czechoslovak standard-gage systems. Direct exchange of equipment with the U.S.S.R. 5'0" broad-gage rail system, however, is

possible only after interchanging standard- and broad-gauge trucks; facilities for this process, used for special passenger cars only, are available at Brest in the U.S.S.R. and at Przemysl, Poland. Well-equipped freight-transloading facilities are available at nearly all border crossing points.

The east-west routes are particularly strategic as they afford direct connections between the U.S.S.R. and East Germany. A significant volume of commercial and military traffic moves on many of the main east-west through routes, the greatest being on the Brest-Poznan-Frankfurt and Medyka-Wroclaw routes. The north-south traffic flow is heaviest in the Silesian industrial areas, on the routes that connect Czechoslovakia, Silesia, and Warsaw with Poland's major ports.

More than two-thirds of the approximately 12,000 bridges in the railroad network span relatively narrow watercourses and are less than 50 feet in length; most bridges 1,000 feet or longer are crossings of the Vistula and Oder rivers. Bridges are generally of steel or concrete and are well structured and in good condition. The few existing timber structures are on minor routes. Many bridges are being reconstructed and reinforced to permit increased tonnages and the addition of a second track. Most of the 25 tunnels on the network are in the mountainous southern region; the longest is a 5,253-foot structure southeast of Walbrzych near the Czechoslovakia border.

Track structure of the Polish railroads is generally poor. Heavy traffic demands and inadequate maintenance and supplies have hampered improvement efforts. Poland produces rails in sufficient quantity for export as well as domestic use. All rail is of the T-section type and ranges in weight from 61 to 122 pounds per yard. As a rule, standard-gauge main lines are laid with 85- and 99-pound rail, but 122-pound rail is being introduced. The standard length of rail is 98.4 feet. Wooden ties are gradually being replaced by steel and reinforced-concrete ties. Ballast is of crushed stone on 70% of the main lines; gravel and some sand are used on lines of less importance. Axleload limits are generally 19.3 to 22 short tons on main lines, 16.5 to 18.1 tons on secondary ones, and as low as 11 tons on a few local lines. Heavy track maintenance equipment is imported from Austria, Switzerland, and the U.S.S.R.; light and medium equipment are produced domestically.

Both manual and automatic block systems are in operation on the Polish railroads. Plans to convert all main lines to automatic signaling have been in effect for several years, and work is progressing toward that goal. Experimental installation of the dispatcher

signal control (*Dyposytorskie Urzadzenie Nastawcze—Dun*) system are also being made. Colorlight signals are being installed to replace the manually operated semaphores and signal control boxes on main lines. Most interlocking is mechanical; however, relay installations and automatic interlocked switches are planned for main-line stations. Telephone and teletype transmissions are used almost exclusively within the communication system.

Coal is the principal railroad fuel, but because of its importance as an export item, its use is being decreased as electrification, dieselization, and use of other fuels expand. The supply and quality of water are satisfactory for locomotive use.

Economic expansion has caused a steady annual increase in long-haul and intercity rail traffic. In 1971, railroads hauled 438 million short tons of freight and carried 1.06 billion passengers, accounting for 71.4 billion short-ton-miles and about 22.7 billion passenger-miles.

Railroad equipment manufacturing is a large industry in Poland and an important part of the economy. Full utilization of domestic production by the PKP has been prevented by a large export program, and much of the existing rolling stock is old and in poor condition.

Although none have been acquired since 1957, steam locomotives are still used in over half the PKP operations; some of the units in operation have been converted to use mazut (a petroleum residue) and will be relegated to use on secondary lines. Dieselization has moved rather slowly. In general, Poland's development of diesel locomotives has been limited to units of 150 to 750 horsepower (hp.), but some 800-hp. units have been produced locally. Almost all heavy-duty diesels have been imported from Romania or the Soviet Union; however, the current Five Year Plan

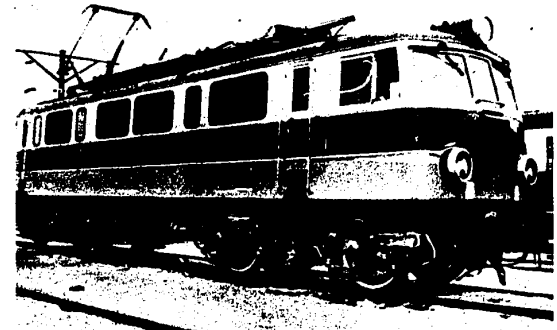


FIGURE 1. Series EU07 electric locomotive built in Poland under English Electric license (U/OU)

calls for the domestic production of some diesels of this type. Electric locomotives have been purchased from the United Kingdom, Sweden, East Germany, Czechoslovakia, and from the domestic industry (Figure 1), which in 1970 introduced a new 4,080-hp. electric locomotive. Two prototypes are being tested and should be in operation sometime in 1973.

The estimated PKP locomotive and rolling-stock inventory in December 1970 was as follows:

Locomotives:	
Steam	5,200
Diesel	1,000
Electric	800
Rolling Stock:	
Freight cars	*280,000
Passenger cars	13,900

*Includes 30,000 units having four or more axles.

The rolling-stock industry has concentrated on building four-axle freight cars having an average capacity of 28.6 sho.+ tons. New types of passenger cars are being developed for long-distance domestic and international traffic. Poland's membership in the CEMA freight-car pool has helped relieve the shortage of rolling stock considerably.

Expansion and modernization of repair shops has continued to be among the top priorities for increasing railroad efficiency. The introduction of electric and diesel locomotives resulted in the reorganization of repair shops; separate maintenance shops were merged into the association for Railroad Rolling Stock Repair Shops (ZNTK), where, in addition to maintenance, several types of freight and some special cars are produced. There are 19 regional ZNTK's, but it is anticipated that this number will decrease as electrification progresses and the use of steam locomotives decreases.

Containerization has been lagging; however, the government recently launched a program which it hopes will be in full-scale operation by 1980. Plans call for building at least 10 rail container terminals throughout the country. A very important installation is to be built at Lodz to serve the textile and other big industries there.

Five Year Plans through 1980 stress a continued effort to increase long-haul rail traffic. Further electrification and dieselization are planned along with the reconstruction of some lines. The present Five Year Plan (1971-75) calls for an increase of more than 1,000 miles of electrification. Emphasis is also placed on modernizing classification yards, extending the use of automatic block signaling, and installing centralized switch controls on main lines and in yards.

Projects now underway and future main-line improvements include constructing and electrifying the Lokow-Pilawa stretch on the Terespol-Poznan line and building a "Central Arterial Route" connecting Silesia and Warsaw via Zawiercie, Radom, and Pilawa.

D. Highways (S)

Highway transport in Poland has expanded considerably in recent years. Although used primarily for short-haul freight and passenger services, its increased usage reflects the significance of highway transport to the nation's economy. In 1971, highways transported 1,080.3 million short tons of freight, more than double the amount hauled in 1965; in 1971 also, 12.2 billion short-ton-miles were achieved, representing a 46% increase over the 1965 figure. Principal goods transported were construction materials, foodstuffs, fuel, and light industrial products.

The existing highway network is capable of meeting the current economic needs. However, the overall condition of the system is assessed as poor because of inferior surfacing of some main roads and the predominance of local roads built to inadequate construction standards. Through military movement would thus be confined to the main north-south and east-west routes.

The network is adequately distributed throughout the country. It is densest in the western regions and in the industrial areas of the southwest. The overall density is 1.5 miles of highway per square mile, compared with 0.92 in Czechoslovakia and 0.70 in East Germany.

The Polish highway system totals approximately 190,095 miles, 39,700 of which are classified as state or national routes. These are the main through routes which connect Warsaw, the capital, with all the large cities, key military and industrial areas, as well as with border crossing points to all adjacent countries. Most national routes are paved (Figure 2) and in good condition. A breakdown of the highway mileage of surface types is as follows:

Concrete, bituminous, cobblestone, stoneblock	40,389
Crushed stone, gravel	39,479
Earth (including unimproved)	110,227

Highway surface widths range from 10 to 48 feet. Most main routes are 18 to 24 feet wide, but approaches to the more important cities have widths up to 36 feet and sections of the ex-German autobahn system are divided highways with two 24-foot-wide surfaces. Local routes generally have gravel, crushed-



FIGURE 2. Szczecin-Warsaw highway, typical of many national routes (C)

stone, or earth surfaces and widths as narrow as 10 feet. Shoulder widths range from 3 to 9 feet but are almost nonexistent on local roads. Except for some sharp curves and steep grades in the south along the Carpathian and Sudeten mountain ranges, alignments are good and gradients moderate.

The highway net has an estimated 17,100 bridges, more than half of which are timber structures less than 250 feet long. Bridges on the more important routes are of steel, concrete (reinforced or prestressed), or masonry construction. With the exception of timber structures, most bridges are in good condition and are of at least 33-ton capacity. Timber bridges are generally restricted to 10 tons; many of these are gradually being replaced by modern steel or concrete bridges. The only known highway tunnel is a 643-foot structure located within the Warsaw city limits. The single major ferry on the network is on the east-west route from Swinoujscie to the East Germany border.

Traffic is impeded by the effects of adverse weather conditions in mountainous and estuary areas, by narrow streets in cities and villages, by numerous sharp curves and steep grades in southern Poland, and by slow-moving horse-drawn vehicles on local roads. Bypasses have been built around several of the larger cities and towns to help reduce urban traffic congestion.

Highway construction and maintenance activities are administered by the Ministry of Transportation through the Central Administration of Public Works. Highway transport is operated by the State Motor Transport (PKS), also under the Ministry of Transportation, and by the socialized industries and farm cooperatives. The PKS is gradually absorbing these latter categories into a centrally controlled organization in an effort to improve efficiency. The major operating problems facing the motor transport industry are a shortage of spare parts and inadequate repair facilities.

Containerization in Poland has been developing at a relatively slow pace. Currently, container usage is limited mostly to small shipments over short distances. This situation is due primarily to the inability of the road surfaces to withstand heavy axleloads, the maximum load-bearing capacity on main routes being 8 tons per single axle. The Jelcz Motor Vehicle Plant has recently produced the 8-ton Jelcz 316 truck (Figure 3), which the government hopes will help stimulate long-haul container shipments.

As of June 1970 registered Polish vehicles totaled an estimated 747,550 (454,900 passenger cars, 259,050 trucks, and 33,600 buses). In addition, there were approximately 1.8 million motorcycles. Although Poland produces passenger cars, the automobile industry has been incapable of meeting the country's demands and must rely on imports to some degree. The government is taking great strides to improve the vehicle industry and is predicting that the yearly rate



FIGURE 3. Jelcz 316 truck and trailer. This new-model vehicle produced by Poland was designed especially for container traffic. (U/OU)

of passenger cars will increase from the 90,000 produced in 1971 to 150,000 by 1975; most of the cars produced are built under license from Fiat of Italy.

Road construction and maintenance are influenced by topography and climate. The terrain is generally favorable for construction except in the mountainous regions of the south, where large cuts and fills are required, and in parts of central and eastern Poland, where flooding necessitates building roads on embankments. Repair and maintenance problems are extensive, particularly during the winter. In many instances, road surfaces are not strong enough to withstand heavy volumes of traffic, having been built mainly to accommodate agricultural needs and light commuter services. The heavy traffic in conjunction with severe weather conditions make frequent repair work necessary. Main through routes are accorded priority in maintenance, however, and are usually in good condition. Construction and maintenance projects are undertaken by public road enterprises, but military units and civilian Social Action volunteer groups provide assistance. There is an adequate supply of construction materials, except for bituminous materials, which are imported from Albania, Bulgaria, Romania, and the U.S.S.R. Road construction equipment is in short supply; most units are of obsolete design.

Long-range plans call for the development of a highway system commensurate with expanding economic and military requirements. Emphasis is placed on improving existing roads toward which about one-half of the 1971-75 highway budget has been allocated. Improvements, such as road widening, resurfacing, realignment, and construction of bypasses around large cities, are continuing under the current Five Year Plan. Although progress has been slow on construction of high-speed expressways, it is predicted that 310 miles of limited-access highways will be completed by 1980. A major project underway is the construction of the new Baltic Arterial Highway, which is to extend along the coastline in the north-central and northwestern regions. A significant project recently completed is a highway bridge over the Vistula at Kiezmark on the Gdansk-Warsaw route; the bridge replaced a ferry and seasonal pontoon bridge.

E. Inland waterways (S)

The navigable waterways of Poland, totalling about 3,700 route miles, comprise two north-south systems, the Oder and Vistula, both interconnected by the east-west Oder-Vistula waterway. Although forming a

sparse network, the navigable inland waterways are fairly well integrated and geographically well distributed between the eastern and western parts of the country. They serve most major centers of population, production, and foreign trade and make strategically important international connections with the inland waterways of East Germany, Czechoslovakia, and the U.S.S.R. The inland waterways primarily supplement the railroads and provide mining and other basic industries with a low-cost means of long-haul transportation for bulk commodities. They are important in affording industries in the Upper Silesia industrial complex, as well as those in East Germany and Czechoslovakia, dependable access to maritime ports on the Baltic Sea. The waterways and waterway facilities are not being utilized to full capacity but generally are adequate for current traffic demands placed on them. In 1971 Polish waterway shipping transported 10.6 million short tons of freight and generated 1.5 billion ton-miles; during the same year 7.8 million passengers were carried and 85.6 million passenger-miles produced. The principal cargoes carried are construction materials, coal, ores, and lumber. The traffic pattern is mainly long-haul north-south shipments to and from the Baltic Sea ports, and about 60% of the total yearly tonnage moves on the Oder system. In recent years, however, multidirectional short-haul transport service has increased, and coastal shipping for the supply of industries located on the Baltic coast has been introduced by the waterway navigation enterprises. Foreign waterway traffic to and from East Germany and Czechoslovakia moves through Szczecin on the Oder.

The Oder provides access west to the East German system via direct connections with major East German routes—the Hohensaaten-Friedrichsthaler Wasserstrasse, the Oder-Havel-Kanal, and the Oder-Spree-Kanal—which extend west and converge on Berlin beyond which other high-capacity routes provide waterway access to the Elbe river and West Germany. To the south the Oder provides direct access to Ostrava, Czechoslovakia, for small barge units; Czech transit cargo, however, is transloaded to and from rail facilities at the ports of Kozle and Gliwice, the upper termini of commercial shipping on the Oder and the Kanal Gliwicki. The lower Vistula distributaries via the joint Polish-Soviet-controlled Frisches Haff afford a direct connection to Kaliningrad, U.S.S.R.

Of the 3,700 route miles of navigable waterways in and bordering Poland, about 40% comprise principal navigation integrated into a national network in support of or under development for large-scale long-

distance commercial operations. The principal waterways are as follows:

	MILES OF NAVIGABILITY
Oder System:	
Szczecin Maritime Fairway	41.6
Oder and branches	496.0
Kanal Gliwicki	24.7
Oder-Vistula System:	
Oder-Vistula Waterway	182.8
Warta	108.0
Vistula System:	
Vistula and branches	646.5
Kanal Zeran-Zegrze	10.9
Frisches Haff	23.0
Elblag	9.2
Total	1,542.7

These principal routes are geographically well distributed and form essentially an H-shaped pattern. Those of the well-developed Oder system serve the major centers of industry, trade, and population in western Poland, and the less-developed routes of the Vistula system serve the major urban and production centers in eastern and central Poland. The Oder-Vistula waterway in west-central Poland affords the only significant navigable east-west through route joining the north-south oriented Oder and Vistula systems.

Poland's generally flat topography results in meandering waterways characterized by slight gradients, low current velocities, and unstable flow regimes. The principal navigable routes have been improved considerably, and about one-half of their length consists of regulated streams. Natural streams and lakes, mostly in the Vistula system, account for about one-fourth, and the remainder are canalized streams and land-cut canals.

Structures on the principal waterways include locks, bridges, and regulatory dams and weirs. Most of the 70 locking installations are of concrete construction, and single-chamber arrangements are most common. Locks vary considerably in size throughout the network but are generally of uniform dimensions on individual waterways. Locking cycles range from about 20 to 45 minutes, and lifts from 4 to 26 feet. Of about 265 known bridge crossings, most are fixed-span structures, and all have adequate horizontal and vertical clearances for craft normally operating. Small regulatory dams and weirs, most of which are of concrete and masonry construction, are generally two-to four-gate sluices. The Vistula dam at Wloclawek is the largest structure on the waterways. The principal routes are adequately equipped with floating and

shore-based navigational aids of standard design and specification including kilometer markers, channel markers, and signals on bridges and locks. Lighting is available at ports, locks, and bridges, but only the Oder as far upstream as Wroclaw is sufficiently marked with lights and audio equipped aids.

Despite their general adequacy in meeting present traffic demands, reconstruction and development of the inland waterway ports continue in an effort to reduce vessel turnaround time and to meet the projected requirements of the national transport plan. Old mechanical-handling equipment is gradually being replaced by modern high-capacity units augmented by smaller automotive cranes. Specialized quays and basins are being constructed or reconstructed at or near developing industries. Most of the inland ports have artificial basins, masonry quays and reinforced embankments for berthing, shoreside jib cranes and specialized bulk-cargo-handling equipment, extensive open but limited covered storage, and direct rail and/or road clearance from quayside. Principal ports in terms of annual cargo turnover and extent of facilities are: Kozle on the Oder and Gliwice on the Kanal Gliwicki, vital transshipment centers for upper Silesian industry and Czechoslovak transit cargo; Wroclaw on the Oder, a key manufacturing, shipbuilding, and transportation center; and Warsaw—including the port facilities in the suburb of Zeran—on the Vistula and the Kanal Zeran-Zegrze, the largest industrial center and transport hub on the Vistula system. Other ports of significance are Plock, Elblag, and Malbork on the Vistula system; Bydgoszcz and Kostrzyn on the Oder-Vistula waterway; and Cigacice, Glogow, Malczyce, Nowa Sol, Opole, and Scinawa on the Oder system as well as the river port areas along the banks of the Oder in Szczecin. These 16 ports provide an estimated 158,456 linear feet of suitable berthing space for waterway craft. The four principal ports provide about one-third of this total berthage and yearly handle about two-thirds of the total port turnovers. They also have the highest rates of tons handled per linear foot per day.

On 1 January 1971 the inland fleet consisted of 918 dumb barges, 345 self-propelled barges, 281 tugs, and 93 passenger vessels. The fleet has no tanker barges. The total cargo capacity amounted to 565,000 short tons, of which 30% was provided by self-propelled barges, 40% by dumb pusher barges, and 30% by conventional dumb barges. The aggregate cargo fleet horsepower approximated 158,000, of which 56% was supplied by self-propelled barges, 30% by pusher tugs, and 14% by conventional tugs. The 93 vessels of the

passenger fleet have a total seating capacity of roughly 18,000. Most of the fleet cargo capacity is allocated for use on the Oder and Oder-Vistula system. The fleet, largely dieselized, has undergone substantial modernization and as a result is adequate in size and capacity for current traffic demands. A total of 14 principal shipyards, including a new yard at Kozle, and 37 minor yards adequately supply and maintain the domestic fleet; they also produce some vessels for export, mostly to the Eastern European Communist countries and to Indonesia. Poland is a major contributor to the CEMA plan for standardizing inland vessel designs and operations.

About 75% of the commercial waterway freight is handled by tug-pushed or tug-towed dumb barges. Most of the remainder is shipped via 500- to 600-ton self-propelled barges which operate only on the Oder and Oder-Vistula waterway. On the Vistula system 100- to 300-ton craft are most common. On all waterways, tug and dumb-barge operations are limited to conventional tows of one to four units astern or one to two units pushed in line-ahead formation. Pusher operations are now practiced on all principal routes (Figure 4).

Aided by the variety of shore-based and floating navigational aids, two-way navigation is normally practiced on all the principal routes. Round-the-clock operations are practiced on the Oder as far upstream as Wroclaw. Elsewhere on the principal routes navigation is limited to a maximum of 18 hours per day.

The principal traffic interruption factors are ice and seasonal water level variations. Ice conditions interrupt navigation for up to 90 days annually between mid-December and mid-March. Icebreakers operate on the lower Oder and Vistula; army-engineer



FIGURE 4. Pusher operation on the Oder river. The tug is pushing two 600-ton dumb barges. (U/OU)

blasting is also used to break jams and prevent buildups. The lack of sufficient retention reservoirs, most apparent on the Vistula, results in abrupt fluctuations in the water level. Other traffic interruption factors are spring floods, the more intensive of which may halt traffic for periods of 2 weeks, and fog on the lower Oder and Vistula, which can suspend operations temporarily for short periods in November and December.

Insufficient depths remain a major operating problem on the middle Vistula and require the light-loading of barges by 40% of payload capacity except at high water. Other problems are insufficient numbers of high-capacity cargo-handling equipment, limited amounts of covered storage, and inefficiency in water-rail transshipping. The comparative imbalance of operating conditions on the Oder and Vistula prohibit a countrywide interchange of craft between systems.

The Ministry of Shipping has jurisdiction over waterway transport policy and operations. Administration is delegated to the ministry's Department of Inland Navigation, and departmental directives are implemented and executed by the Wroclaw-headquartered Union of Inland Navigation and River Shipyards. Construction and maintenance is largely planned, coordinated, and administered by the Central Office of Water Economy; suboffices of 11 District Water Administrations manage the waterways within their geographic regions.

The slow development of waterway transportation in the past has been the result of its low priority in the national budget. Despite this, considerable fleet expansion and modernization has been achieved, modest advances made in waterway regulation and lock enlargements, and significant port improvements accomplished. Partial regulation of the lower Vistula was accomplished in 1969 by the Wloclawek lock and dam, one of nine installations scheduled for that section of the river. Oder regulation has progressed significantly faster, and construction projects underway are expected to provide year-round river stabilization upstream to Raciborz by 1980. The new river-maritime port at Police on the Oder is operational, and expansion of Warsaw port at nearby Zeran continues, as does fleet development in the form of improvement of its mobility and capacity through use of standard-design pusher tugs and barges. Experiments are being conducted toward the eventual inauguration of 24-hour shipping on all principal waterway routes.

Long-range plans through 1985 include complete regulation of the Vistula and Oder and extension of

the Kanał Gliwicki eastward to the Przemyska, a Vistula tributary, thus forming an Oder-Vistula connection in southern Poland. Development plans through 1975 include expansion of port facilities at Korze, Gliwice, and Opole on the Oder; at Bydgoszcz on the Oder-Vistula system; and the Plock and Warsaw in nearby Zecan on the Vistula system. New river ports at Poznan on the Warta, and Wloclawek and Toszan on the Vistula are planned.

F. Pipelines (S)

Poland's estimated 3,170 miles of pipeline form one of the better systems among the Eastern European countries. About 575 miles are used for transporting crude oil, 175 miles for refined products, and an estimated 2,100 miles for natural and manufactured gas. Some 770 miles of new lines are under construction, more than half of which are to be used as gas carriers (Figure 5).

The most important pipeline in the operating system is a branch of the CEMA I (Friendship) International pipeline network which transports crude oil from the Urals-Volga region in the U.S.S.R. to member countries in Eastern Europe; this line is controlled by the CEMA Petroleum and Gas Industry Commission. The CEMA I line was completed in 1963 and comprised two segments: the first part extends from the U.S.S.R. border near Michnik to a refinery at Plock, is 24 inches in diameter, and has a potential capacity of 12 million metric tons of crude oil per year; the second segment extends from Plock to an East German refinery at Schwedt, has a 20-inch diameter,



FIGURE 5. New gas pipeline being constructed between Warsaw and Gdansk. Much of the pipeline system expansion now underway is for the natural gas industry. (C)

and has a potential capacity of 8 million tons of crude oil per year. Paralleling the CEMA I line is CEMA II, a crude-oil line which was completed in early 1970. The segment from the U.S.S.R. to Plock is 32 inches in diameter, and the second segment is estimated to be 24 inches in diameter. With the completion of the CEMA II line, Polish oil-refining facilities are to be expanded by 1975 to a capacity of 12 million metric tons. A significant international crude-oil pipeline in the planning stage will link the oil port of Bakar, Yugoslavia, with petrochemical complexes in Hungary, Czechoslovakia, and possibly Poland, by 1976.

The refined products pipeline system is approximately 450 miles long. Two recently completed lines extend from the petrochemical plant at Blachownia Slaska, one to Wroclaw and the other to Gliwice. The Plock-Lodz line is being extended beyond Lodz to Blachownia Slaska via Czestochowa and Bytom. A product line is reportedly under construction between Plock and Gdansk.

The natural gas industry relies on imports from the U.S.S.R. to meet its requirements. Three main natural-gas pipelines extend from gasfields in the U.S.S.R. and southeastern Poland to the east-central and southwestern sections of the country. Two of the lines extend northward from Przemysl in Warsaw. These run generally parallel as far as Stalowa Wola where they separate, one continuing via Krasnik, Puluska Wies, and Olawek and the other via Starachowice and Radom. Each line is about 225 miles long. The third major line, actually a system consisting of two main pipelines and numerous sections of dual piping, transports gas from Przemysl to Myslowiec in Upper Silesia, a distance of about 166 miles. Poznan is the hub of a major gas system in the western part of the country. Existing lines connect Poznan, via Krolia, to Zielona Gora and Turin. Branch lines are under construction from Poznan to Swieczin, Pila, and Bydgoszcz. A pipeline under construction from Warsaw to Gdansk should be completed by early 1974. Plans call for building a pipeline from Gdansk to Swieczin, but information is not available as to when construction will begin. The Association of the Gas Industry, a unit of the Ministry of Mining and Power, controls the natural-gas lines.

Details of selected pipelines are given in Figure 6.

G. Ports (S)

The Polish seaports can be divided into two groups: 1) the major ports for shipment and distribution—Gdansk, Gdynia, Swieczin, and Sopot; and 2)

the minor ports of local importance—Kolobrzeg, Darlowo, Ustka, Wladyslawowo, Jastarnia, and Hel. In 1971, the major ports, which are of essential importance to the national economy and foreign trade exchange, handled 37.3 million metric tons, mostly bulk goods such as coal, coke, ores, timber, and grain. Szczecin/Swinoujscie had the largest turnover (17.3 million tons), followed by Gdansk (10 million tons) and Gdynia (9.7 million tons).

Szczecin, situated on the Oder nearly 40 miles from the Baltic Sea and close to East Germany, is Poland's largest port and serves both maritime and inland-waterway traffic. It is the principal outlet for coal and manufactured products from the important Upper Silesian industrial region. The principal industries allied with port operations are iron-ore smelting, shipbuilding and repair, marine engineering, and plants for producing artificial fibers, fertilizers, sulfuric acid, and paper.

Swinoujscie, at the sea entrance of the waterway channel to Szczecin, is important as a port for handling bulk cargoes (Figure 7), for being able to accommodate deep-draft ships that cannot proceed to Szczecin, and as a naval base and fishing port. Regular automobile and passenger ferry service is maintained between the port and Ystad, Sweden.

The Szczecin/Swinoujscie complex has been greatly expanded to ensure greater handling capacity, improvement of the quality of port services, acceleration of ship turnarounds, and the creation of facilities for handling large bulk carriers. A new approach channel has been dredged to make the port complex accessible to ships to 35 feet draft and up to 55,000 deadweight tons (d.w.t.). Because it is strategically close to Baltic outlets (the Kiel Canal and the Danish Straits) and has excellent surface transportation connections with the inland industrial

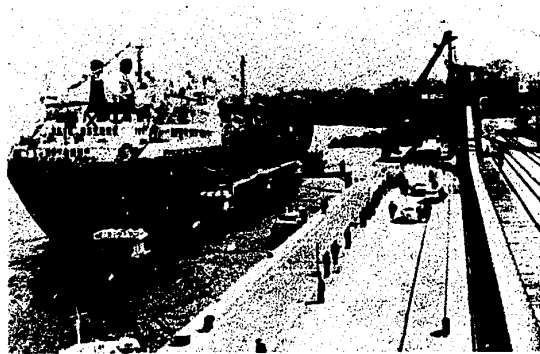


FIGURE 7. High-speed coal-loading unit loading a ship at Swinoujscie (U/OU)

regions of Poland and central Europe, the port complex is an important asset of the Soviet-oriented countries.

Gdynia and Gdansk form a loosely knit conurbation in north-central Poland, extending for some 20 miles from the northern limit of the former to the southern limit of the latter. Gdynia, Poland's major general-cargo port, is located on the southwestern shore of the Gulf of Danzig and is protected from the north by a large peninsula (Mierzeja Helska); Gdansk is a short distance southeast at the mouth of a branch of the Vistula river. These two ports serve Polish foreign trade on a coordinated basis; both handle incoming iron ore and outgoing coal, and both have shipyards.

At Gdynia, containers have been handled as a matter of routine for several years; 100 large 20-foot units are now in use, and construction is soon to start on a full-time container base. In the interim a temporary container facility, equipped with a special 34-ton-capacity crane, is capable of handling up to 300 containers daily. New equipment for the transfer of bulk goods has been obtained. Two highly efficient floating elevators for the transfer of alumina have been obtained from West Germany, and new equipment for the rapid transfer of coal and coke has been installed. Existing storage space is being expanded, and the port's rail and road systems are being reconstructed.

At Gdansk, a new facility for the transfer of phosphates (Figure 8) and a new base for the export of sulphur are in operation and can accommodate ships of 30,000 d.w.t. The installations are modern and fully mechanized, providing a large handling capacity and rapid transfer between ship-storage areas and rail cars. In addition, other quays in the port have been reconstructed and equipped with new cranes from Finland and West Germany.

The first stage of the largest deepwater port in Poland, Polnocny, a new outport for Gdansk, is under construction and should be completed by 1976. Plans call for this new facility to handle about 11 million metric tons of cargo annually—5 million tons of coal and 6 million tons of petroleum products. The port will be capable of handling ships of up to 120,000 d.w.t.

Polish ports are adequate for normal shipping requirements and could be of considerable military importance. New heavy-duty equipment makes the system adaptable for shuttling military shipments across the Baltic Sea from U.S.S.R. ports.

Polish port administrations are under the control of the Ministry of Shipping. Naval bases and military ports are under the jurisdiction of the Polish Navy.

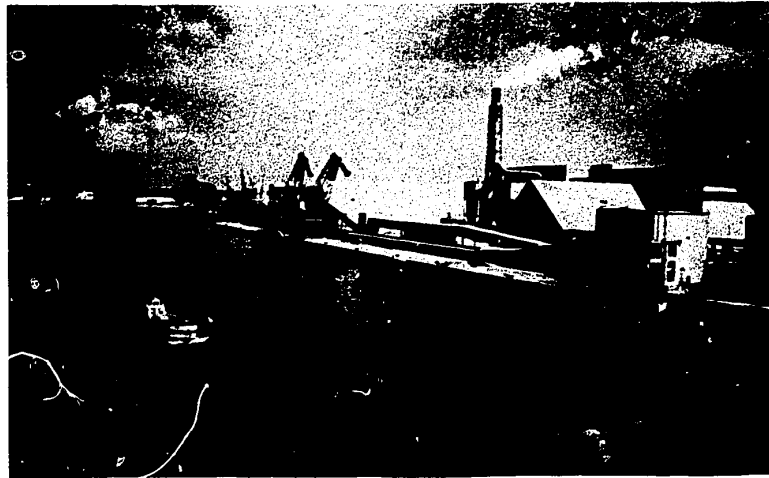
Details of the major ports are given in Figure 9.

FIGURE 6. Selected pipelines (S)
(Lines under construction or planned have been included)

TERMINALS		LENGTH Miles	DIAMETER Inches	PRODUCTS TRANSPORTED	CAPACITY Bbl./day	REMARKS
From	To					
U.S.S.R. border.....	Plock.....	174	24	Crude.....	250,000	CEMA I pipeline. Transports crude oil from U.S.S.R. Pumping stations at Mielnik and Wegrow.
Do.....	.....do.....	174	32	.....do.....	300,000	CEMA II pipeline.
Plock.....	East Germany.....	245	20	.....do.....	170,000	CEMA I pipeline extension from Plock to refinery at Schwedt, East Germany. Pumping stations at Radziwie, Klezew, Kazmierz, and Gorzow Wielkopolski.
Do.....	.....do.....	245	*28	.....do.....	na	CEMA II pipeline.
Czechoslovakia border.....	Blachownia.....	30	na	.....do.....	na	Planned; part of international line from Yugoslav port of Bakar to Poland via Hungary and Czechoslovakia.
Plock.....	Lodz.....	60	8	Refined.....	na	
Do.....	Warsaw.....	65	na	.....do.....	na	
Kozle.....	Nysa.....	40	na	.....do.....	na	
Brzozow.....	Krosno.....	10	na	.....do.....	na	
Lodz.....	Blachownia Slaska.....	125	na	.....do.....	na	Under construction. Via Czeszochowa and Bytom. Planned. May be under construction.
Plock.....	Gdansk.....	133	na	.....do.....	na	
Blachownia Slaska.....	Wroclaw.....	84	na	.....do.....	na	
Do.....	.....do.....	50	na	.....do.....	na	
Przemysl.....	Warsaw.....	225	na	Natural gas.....	na	
Do.....	.....do.....	225	na	.....do.....	na	
Do.....	Glitwie.....	186	na	.....do.....	na	
Tarnow.....	Myslowice.....	70	na	.....do.....	na	
Sedziszow.....	Sandomierz.....	50	na	.....do.....	na	
Starachowice.....	.....do.....	35	na	.....do.....	na	
Krosno.....	Kielce.....	30	na	.....do.....	na	
Opole Lubelskie.....	Rzeszow.....	30	na	.....do.....	na	
Zarudzie.....	Lublin.....	30	na	.....do.....	na	
Jasio.....	Radlin.....	25	na	.....do.....	na	
Cieszyn.....	Czechowice.....	20	na	.....do.....	na	
Gorlice.....	Sedziszow.....	48	na	.....do.....	na	
Poznan.....	Krynica.....	75	na	.....do.....	na	
Krobia.....	Krobia.....	na	na	.....do.....	na	
Do.....	Zielona Gora.....	170	*32	.....do.....	na	Under construction (Fig. 5). Completion expected early 1974.
Poznan.....	Gdansk.....	120	*23	.....do.....	na	Under construction.
Do.....	Pila.....	50	na	.....do.....	na	Do.
Do.....	Bydgoszcz.....	62	na	.....do.....	na	Do.
Szczecin.....	Gdansk.....	170	na	.....do.....	na	Planned.

na Data not available.
*Estimated.

FIGURE 8. Gdansk phosphate fertilizer plant. Facilities include portal-jib cranes and a high-speed conveyor system. (U/OU)



H. Merchant marine (S)

As of 31 October 1972 the Polish merchant fleet consisted of 252 commercial ships of 1,000 gross register tons (g.r.t.) and over, totaling 1,792,473 g.r.t. and 2,528,331 deadweight tons (d.w.t.). This represents an increase since 31 December 1969 of 15% in the number of ships, 30.5% in g.r.t., and 32.8% in d.w.t. Composition of the fleet is as follows:

TYPE	No.	G.R.T.	D.W.T.
Dry cargo	166	959,824	1,293,450
Refrigerator cargo ...	4	8,050	9,199
Bulk cargo	76	756,112	1,137,792
Tanker	4	52,430	80,508
Passenger	2	16,057	7,382
Total	252	1,792,473	2,528,331

The 149 Polish-built units of the fleet account for almost 57% of the total deadweight tonnage. The remaining 103 ships were built in foreign shipyards, principally in Denmark, Bulgaria, Romania, and Yugoslavia. Heretofore, foreign-built ships accounted for the greater part of the fleet tonnage, but the situation has reversed because of the increased capability of Polish shipyards to build larger ships. Since 1969 the Paris Commune Shipyard at Gdynia has delivered two 55,000-d.w.t. bulk-cargo carriers of the Manifest Lipcowy class, and the Adolf Warski Shipyard at Szczecin has completed five 32,300-d.w.t. bulk-cargo carriers of the Powstaniec Slaski class.

Over 55% of the fleet (140 ships) has been in service less than 10 years; and with an overall average age of less than 9 years, the fleet is relatively young. About 75% of the total deadweight tonnage is made up of 67

dry cargo ships, 47 bulk cargo ships, and four tankers of over 10,000 d.w.t. each. Of the 25 steamships, 16 have oil-fired and nine have coal-fired boilers, and all have reciprocating engines. The remaining 227 vessels are equipped with diesel engines. Three-fourths (188) of the ships have speeds of 14 to 22.5 knots; the remainder have speeds of 9.5 to 13.9 knots.

In addition to the commercial fleet of the merchant marine, there are five special-service ships over 1,000 g.r.t.—the passenger/car ferries *Gry* (2,977 g.r.t.), *Gustav Vasa* (3,801 g.r.t.), and *Skandynawia* (2,821 g.r.t.); the training frigate *Dar Pomorza* (1,561 g.r.t.); and the icebreaker *Perkun* (1,152 g.r.t.).

The merchant marine is a state-owned enterprise under the general administration of the Ministry of Shipping. Operational control of all oceangoing ships employed in foreign trade is exercised by two shipping companies, the Polish Ocean Lines (PLO) and the Polish Steamship Company (PZM). Previously both companies were engaged in regular-route shipping and in tramp service. However, to improve operating efficiency and to increase foreign exchange earnings the companies were reorganized. On 1 January 1970 PLO became responsible for regular cargo and passenger service, with the tramp and tanker fleets being operated by PZM. PLO has offices in Gdansk and Gdynia to run the American, Asian, and African lines, and in Szczecin to run the short-range lines and the passenger/car ferry service to Ystad, Sweden. PZM operates its short-distance and oceangoing tramp services from offices in Szczecin and tanker service from Gdansk.

PLO has 12 dry-cargo ships operating under time charter to the Chinese-Polish Shipbrokers Company,

FIGURE 9. Major ports (S)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Szczecin..... 53°25'N., 14°35'E.; on Oder River about 35 nm. from its mouth. 62,000	Largest Polish port. Principal maritime outlet for Upper Silesian industrial region. Principal receipts—ore, oil, timber, grain, general cargo. Principal shipments—coal, iron, lumber, sugar, cement, grain, general cargo. Ship-repair yard can effect all types of floating repairs; has floating drydocks with 8,200-ton lifting capacity. Second-ranking seaport of Poland. Leading shipbuilding and ship-repair center. Principal receipts—ores, apatites, phosphorites, timber, grain, cellulose, citrus fruits, general cargo. Principal shipments—coal and coke, gypsum, stone, kaolin, clinker, glass, sulphur, lumber, potatoes, cement, sugar, trucks, iron goods, machines, chemicals. Ship-repair yard can perform all types of repairs; 6 floating drydocks, largest has 11,000-ton lifting capacity. Site of Port Polnochny, under construction, to be largest deep-water port in Baltic Sea and able to accommodate 120,000-d.w.t. vessels.	Improved natural river harbor consists of 5-mile stretch of Oder and adjoining network of waterways. Controlling depth of channel from Baltic to harbor and principal quays 30 ft.	Alongside—For 57 standard, 39 small ocean-type cargo vessels; 23 standard, 44 small coaster-type tankers; 1 sound-and-river-type tanker; 1 sound-and-river-type tank barge. Fixed mooring—4 standard, 1 small ocean-type cargo vessels.
Gdansk..... 54°21'N., 18°40'E.; at mouth of Martwa Wisla, branch of Vistula emptying into Gulf of Danzig 9 miles SE. of Gdynia. 52,928	Third most important Polish port in amount of cargo handled. Headquarters of Polish Navy and principal naval operating base. Important shipbuilding and ship-repair center; now being expanded and will build 100,000-d.w.t. vessels. Principal receipts—general cargo, alumina, iron ore, grain, containerized cargo. Principal shipments—general cargo, coal, coke, lumber. All types floating repairs possible at 2 commercial yards; drydocking repairs limited by lifting capacity of largest floating drydock to 3,500 tons. Large graving dock (805 ft. long) used for construction but capable of accommodating oceangoing ships when not in use.	Improved natural river harbor consists of 8-mile stretch of river with adjoining basins; central depths in channel at entrance 38 ft., decreasing gradually to 4 ft. at S. limit of port.	Alongside—For 58 large, 10 standard, 17 small ocean-type cargo vessels; 16 standard, 14 small coaster-type cargo vessels; 23 lighters; 2 small ocean-type tankers; 1 standard coaster-type tanker; 1 sound-and-river-type tank barge; 6 ocean minesweepers. Fixed mooring—None. Anchorage—For large number of vessels of all sizes in open roadstead outside harbor.
Gdynia..... 54°30'N., 18°33'E.; on SW. shore of Gulf of Danzig. 62,000		Artificial, breakwater protected; consists of outer and inner harbors with basins separated by moles; total water area 550 acres. Controlling depth through entrance to inner harbor about 40 ft.	Alongside—For 24 large, 31 standard, 25 small ocean-type cargo vessels; 8 standard, 8 small coaster-type cargo vessels; 12 lighters; 1 small ocean-type tanker; 1 coaster-type tanker; 15 large (destroyer leaders), 32 medium (destroyers, destroyer escorts, ocean-type minesweepers), 20 small (coastal-type minesweepers, MTE) naval vessels. Anchorage—For 5 large passenger ships or aircraft carriers; 18 ocean-type cargo vessels or light cruisers in designated area immediately E. of harbor.

Ltd. (CHIPOLBROK), a joint shipping company organized in 1950. Although the original agreement specified equal partnership and control, a subsequent agreement was signed in November 1966 whereby the People's Republic of China acquired the controlling interest—51%. These ships do not participate in PLO's operations in Polish seaborne trade.

PZM has a 10,180-d.w.t. dry-cargo ship (*Mickiewicz*) on time charter to the Korean-Polish Shipbrokers Company, Ltd. (CHOPOLSHIP), a joint shipping company formed in November 1966 and headquartered in P'yongyang, North Korea. Although the *Mickiewicz* reportedly was purchased outright by North Korea in September 1970, it still flies the Polish flag and moves regularly from North Korea to North Vietnam, Hong Kong, and Japan.

By mid-1972 PLO was operating 32 lines serving 40 routes worldwide. Of these, 23 lines function under PLO exclusively, and the rest operate jointly with other Communist and non-Communist steamship companies; i.e., INDOPOL (Poland and India), BALTAFRICA (Poland and East Germany) UNIAFRICA and BALTAMERICA (Poland, East Germany, and U.S.S.R.), and CUBALCO (Poland, Czechoslovakia, East Germany, and Cuba). Polish ships call at major world ports, carrying such cargoes as coal and coke, sugar, grain, timber, cement, ores, petroleum, fertilizers, rolled steel, trucks, metals and metal products, machinery and equipment, rubber, and textiles. In 1971 the country's seaborne foreign trade amounted to about 30.7 million metric tons, almost 47% of which was transported in domestic bottoms.

Poland's Five Year Plan (1971-75) calls for expansion of the merchant fleet to 3.5 million d.w.t. with the aim of transporting two-thirds of the country's total seaborne foreign trade. Planned additions to the fleet are to concentrate primarily on bulk cargo ships for PZM (58 ships, 1.5 million d.w.t.). PLO is scheduled to receive 44 ships (327,000 d.w.t.), and the major function of their operations is to improve and modernize existing services. This acquired tonnage (about 1.8 million d.w.t.) is to come from both domestic and foreign shipyards. Meanwhile, disposals would account for about 860,000 d.w.t.

One of the most significant factors contributing to the growth of the Polish merchant marine is the rapidly expanding domestic shipbuilding industry. The industry is not only meeting the program for the expanding domestic fleet but is also building a

number of ships for foreign owners. Prior to 1971 the greater part (59% in 1969, 55% in 1970) of the deadweight tonnage produced in Polish shipyards went to the U.S.S.R. In 1971 the situation changed, and the U.S.S.R. received only 13% of the annual output. This downward trend appears to be continuing, since only 7% of the tonnage completed by 31 October 1971 was destined for the U.S.S.R. Poland's shipbuilding industry, almost nonexistent in 1946, now ranks 13th among the shipbuilding nations of the world, producing 1.9% of total world ship production. Polish shipyard production of merchant and fishing vessels over 1,000 g.r.t. in 1971 was as follows:

DOMESTIC			
TYPE	No.	G.R.T.	D.W.T.
Dry and bulk cargo	12	141	200
Refrigerator cargo	0	0	0
Training	0	0	0
Scientific research	0	0	0
Fishing vessels	5	13	9
Total	17	154	209
EXPORT			
TYPE	No.	G.R.T.	D.W.T.
Dry and bulk cargo	18	209	301
Refrigerator cargo	5	27	23
Training	2	12	11
Scientific research	3	10	3
Fishing vessels	7	63	45
Total	35	321	383

NOTE—G.R.T. and D.W.T. figures are in thousands.

Plans for expansion of the shipbuilding industry in the 1971-75 period call for about 350 ships totaling 3.6 million d.w.t. to be constructed for Polish (800,000 d.w.t.) and foreign owners. Most of these ships are to be series of completely new types of ships. By 1975 Gdansk is to be producing 3,600-d.w.t. factory supertrawlers and 24,000-d.w.t. bulk carriers. Gdynia is to specialize in big bulk carriers and tankers, and the first Polish-built 100,000-d.w.t. ore/bulk/oil carrier (OBO) was to be launched in April 1973. The yard's future production is to comprise chiefly bulk carriers up to 400,000 d.w.t. and tankers ranging from 20,000 to 25,000 d.w.t. Szczecin is to build the prototype of a roll-on/roll-off (RO/RO) trailership for PLO operation in the Baltic and North Seas. In addition, Poland is to continue to purchase modern ships from abroad. As of 31 October 1972 the merchant marine

Swinoujscie.....
 53°55'N., 14°15'E.; at mouth
 of Swina river 2 miles E. of
 East Germany border.
 37,000

Operating base for patrol, mine, and landing craft
 of Polish and Soviet Navies. Commercial out-
 port for Szczecin. Home port for fleet of fishing
 vessels. Terminus of car and passenger ferry
 from Ystad, Sweden. Commercial activity
 consists mainly of loading coal and coke and
 discharging cargoes from ships having too great
 a draft to proceed to Szczecin. Ship-repair yard
 for fishing vessels. New shipyard facilities
 include 3,500-ton floating drydock. New quays
 and handling equipment for bulk cargoes. Naval
 base has 2 small shipyards, storage facilities for
 material, ordnance, and petroleum products, in
 addition to communications, training, and
 medical facilities.

Improved natural river harbor; consists
 of 3-mile stretch of Swina river and
 adjacent basins. Channel leading from
 Baltic to harbor has depth of 39 ft.

Alongside—For 3 large, 10 standard, 5 small
 ocean-type cargo vessels; 7 standard, 12 small
 coaster-type cargo vessels; 55 lighters; 1 small
 ocean-type tanker; 24 medium (destroyers,
 destroyer escorts, gasoline tankers, submarines,
 ocean-type minesweepers), 78 small (coastal-
 type minesweepers, MTB's) naval vessels.

Anchorage—For 5 large passenger ships or air-
 craft carriers; 18 ocean-type cargo vessels or
 light cruisers in designated area immediately
 E. of harbor.

*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.

had the following types of ships on order from foreign shipyards:

	G.R.T.	D.W.T.	No.	SOURCE	SCHEDULED DELIVERY
Bulk carrier ..	30,380	51,300	3	Denmark	1974
Dry cargo	na	15,100	2	Finland	na
Sulphur carrier ..	na	7,800	2	Italy	1974

na Data not available.

Augmenting the larger units of the merchant marine is the following fleet of ships under 1,000 g.r.t.:

TYPE	No.	G.R.T.	D.W.T.
Dry cargo	29	17,194	24,187
Cattle carrier	2	984	1,075
Timber carrier	1	809	1,075
Tanker	4	2,225	2,925
Passenger	1	407	50
Training	3	1,068	670
Icebreaker	1	833	330
Total	41	23,520	30,312

The United Fishing Industry, a department subordinate to the Ministry of Shipping, is responsible for operation of the following fishing fleet:

TYPE	No.	G.R.T.	D.W.T.
Over 1,000 g.r.t.:			
Factory trawler	61	133,422	75,403
Fish factory	2	27,747	19,399
Refrigerated transport	3	10,043	9,354
Fish base ship	1	8,280	10,021
Total	67	179,492	114,177
Under 1,000 g.r.t.:			
Trawler	102	52,552	36,755
Cutter	80	8,959	4,426
Research	4	1,280	682
Total	186	62,791	41,863
Grand total	253	242,283	156,040

About 11,000 officers and men are engaged as crew members aboard oceangoing and coastal ships of the Polish merchant marine. Another 2,500 persons are employed in land-based operations of the shipping companies. Maritime personnel are subject to compulsory military service. Officers are required to attend special training courses and must pass examinations to receive naval reserve officer commissions. Officer candidate students of the state maritime schools receive military training in those schools and obtain reserve commissions upon graduation.

It is estimated that one-third of the Polish seamen are members of the Communist party. An officer now must be a party member to become a master, but there are nonmember masters who obtained their certificates prior to this requirement. Reportedly, in recent years some of the latter have been relieved by younger masters educated in Communist doctrine. Since 1957 each master has been responsible for the political education of the men aboard his ship.

The continuing emphasis on improvement and expansion of the maritime educational facilities reflects the priority role given the merchant marine in national economic development. Three major institutions, all with university status, provide training for merchant marine officers. The State Maritime School at Gdynia, founded in 1920, offers a 3-year course; the Higher Nautical College, opened in 1969 at Szczecin, has 3- and 4 1/2-year programs particularly emphasizing technical subjects related to engineroom and bridge automation; and the Gdansk University, opened in early 1970, specializes in maritime economics. Early in 1972 the Higher Nautical College and the Maritime School for Navigation and Ship Engineering in Warnemunde, East Germany, formalized a 3-year experimental cooperative program providing for exchanges of scientific workers and information on scientific and didactic achievements; technical scientific collaboration among research stations, laboratories and libraries; exchange of students (for both studies and practical application); and organization of joint scientific conferences and participation in conferences organized by particular maritime schools. Candidates for admission to the maritime schools must be high school graduates; if military service has been completed, candidates must be under 30 years of age, and if without military service, under 23.

I. Civil air (S)

After years of neglect the Polish state air carrier LOT appears to be headed for a vigorous period of expansion and growth. A variety of factors contributed to the past decline of LOT, chief of which was the lack of political recognition of the multiple benefits accruing from modern civil aviation. This lack of awareness at policymaking levels was compounded by the scattered division of authority that was shared by a number of ministries holding varying degrees of decisionmaking power over Polish civil aviation.

The legal framework for Polish civil aviation was contained in the Aviation Law of May 1962, which stated that the Minister of Transportation was

responsible for the regulation and control of this mode of transport. Directly subordinate to the Minister were: LOT, the national air carrier; Department of Civil Aviation, the policymaking and regulatory agency; and Air Traffic and Airports Administration, the technical body providing and administering airfields, navigational aids, and air traffic control.

While the chain of command appears intact on paper, it, in fact, had been seriously impinged upon by a number of different ministries which had gained some degree of control over various aspects of civil aviation. Each of these ministries has different priorities and missions which further tended to erode the policymaking power of LOT officials and added to the stagnation that plagued LOT operations throughout the 1960's.

This situation began to change quickly in 1971 with the advent of the Gierk administration, which planned systematically to modernize air transport. An interagency commission was formed to study and recommend solutions for the centralization of civil aviation under a single authority. Full Politburo approval remains the only barriers to this necessary administrative unification. The Gierk administration also announced a Five Year Plan to modernize airports, renovate equipment, expand air routes, and purchase new equipment for air traffic control. LOT planners have managed to establish service to 28 airports in Europe and feature stops in Nicosia, Cairo, and Beirut. Current LOT regional route planning points to stabilizing European operations with some thought of extending services to Munich, Oslo, Manchester, and Barcelona. Present emphasis by LOT planners is to expand international routes to North and South America and Africa. LOT has charter flights to New York and planned scheduled service between Warsaw and New York in the spring of 1973. The routes to North Africa are soon to be extended to Dakar and, in the longer term, services are to be extended to South America. Plans are also in hand for developing routes to East Asia and the Middle East. Ambitious route exploration by LOT planners can be noted in the announcement that a LOT Il-62 was to have made two chartered flights to Australia late in 1972. Another indicator of LOT expansion is noted by the fact that in 1971, for the first time, LOT transported over one million passengers. These statistics appear impressive until compared with those of neighboring Czechoslovakia. In 1969 the Czechoslovak national carrier, CSA, transported well over one million passengers, considerably more than LOT. The Czechs received their first jet transports, the

Tu-104, from the Soviet Union in 1957, but LOT did not receive their Tu-134's until late in 1968.

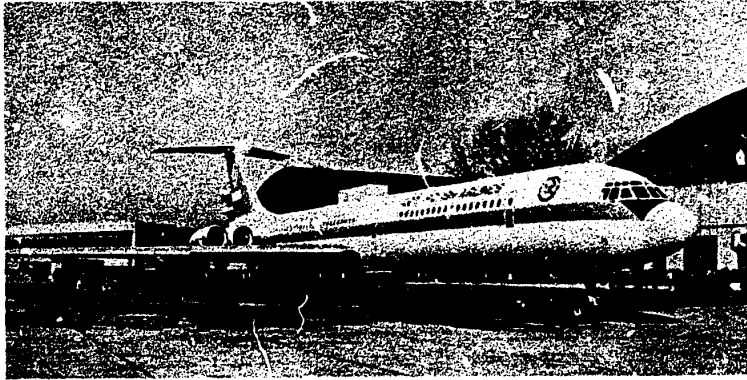
In an effort to overcome the stagnation of their air service, LOT officials have moved vigorously to update airports, aircraft, and service. International routes, according to Polish aviation economists, have been profitable, but internal air routes have yielded quite different results. Domestic services are operated primarily from the Warsaw/Okecie airport to Gdansk, Krakow, Katowice, Poznan, Wroclaw, Koszalin, Rzeszow, and Bydgoszcz.

Polish civil aviation authorities continue to be frustrated by the inefficiency of the domestic flight system. Air service has been hampered by the fact that airports in Poland lack modern equipment and trained personnel. Most of LOT's domestic schedule is confined to daytime (visual flight regulations or VFR) flights. This inflexibility has been the basic cause for inconvenient, unreliable scheduling, often resulting in changes or cancellation of flights, and consequent inefficient utilization of aircraft. Polish authorities, moving to correct this situation, have initiated a strong public relations program designed to attract government officials, merchants, and tourists.

LOT officials hope to increase their hold on the traveling public by modernizing their international and domestic airfleets. The 48 major civil transport aircraft (20,000 pounds or greater gross weight) are all of Soviet manufacture and consist of three CLASSIC (Il-62), eight COOT (Il-18), six CRUSTY (Tu-134), 14 COKE (An-24), and 17 CRATE (Il-14) aircraft. Acquisition of the two large Il-62 transports in 1972 was part of a plan to upgrade service of the international routes and to release a number of the older Il-18 aircraft for domestic flights. LOT officials believe that the Il-18 will be more efficient on heavily traveled routes than the obsolete piston-engine Il-14 aircraft, which have been used since 1953 and are gradually being withdrawn from service. The COKE aircraft will continue to be alternated between domestic routes and some limited international service. If traffic increases sufficiently, LOT will probably buy the Il-86, which is a wide-bodied medium-range transport now being developed in the Soviet Union. Two LOT aircraft are shown in Figure 10.

It is estimated that LOT employs over 3,500 personnel, among whom are about 200 transport pilots, 200 to 300 other technical flight personnel, over 500 administrative personnel, and over 1,000 maintenance technicians.

The only facilities for basic flight training other than those available in the air force are offered by the Aeroclub of the Polish People's Republic through its



A. Long-range Il-62 transport. Polish aviation officials hope to use this aircraft for extension of international services to Africa and North America.

B. Soviet-built AN-24 aircraft, workhorse of Polish air fleet on internal routes



FIGURE 10. LOT aircraft (U/OU)

system of about 37 regional aeroclubs. This organization has close liaison with the military establishment, and many of its top positions are held by military officers. Although training activities are conducted primarily in the interests of military aviation, civil aviation training needs are also fulfilled. LOT officials have sponsored two schools located in Warsaw to train qualified students for future positions with the airline. The first school, known as Economic School Number 1, is designed to produce skilled and administrative personnel such as fare calculators, ticket agents, hostesses, and publicity agents. The school accepts high school graduates of both sexes for a 2-year study course. The second school, the Basic Vocational School of the Polish Railroads, admits only males who have a primary-school certificate and trains them over a period of 3 years to be airplane mechanics. It is claimed that these mechanics are in great demand, and the best graduates of the school can continue their study at Wroclaw Aircraft Engine Design Technical College. Personnel working for the aeroclub's Utility Service Air Group (LZUG) are trained to perform agricultural and forestry aerial spraying and dusting operations and various other services including firefighting, aerial mapping, and air/sea patrol and rescue. The Central Air Ambulance Group (CzUS), under the direction of the Ministry of

Health, operates air-ambulance services in 15 cities throughout the country. Its flight personnel are recruited from the aeroclubs and air force reserve. A majority of the LOT flight personnel have received training in the Polish Air Force and remain in reserve status. LOT has some capability to provide advanced instruction for flight crews in its own training program. Polish pilots are sent to the U.S.S.R. for advanced aviation and transition courses offered in schools that are jointly run by Aeroflot and the Soviet Air Force. Proficiency continues to be relatively high, and LOT has a fair safety record.

Maintenance facilities for LOT aircraft are located at the Warsaw/Okecie airfield. This facility is permitted to perform aircraft maintenance up to minor overhaul service on both the Il-18 and Tu-134, while major aircraft maintenance is performed in the U.S.S.R. The facility in Warsaw performs all maintenance, including major overhauls, on the Il-14 and other smaller aircraft. A sufficient supply of parts is always on hand, but they do not meet quality control standards in all cases. LOT does not have the capability to perform major maintenance and overhaul on the Il-62, which must be returned to the Soviet Union for that purpose.

In addition to air transport services, there are general aviation and sports aviation, but private

aviation is forbidden. The previously noted CZLS acts in a supervisory role over the activities of the Polish Air Ambulance Service. This small ambulance service has a staff of about 200 people, including pilots, doctors, medical assistants, and aircraft mechanics. The service transports patients, supplies, and medical personnel in emergency situations.

Agricultural aviation plays a large role in Poland and is a source of foreign currency. LZUG operates 100 light aircraft for agricultural spraying and has sprayed crops and forests in the Federal Republic of Germany, Austria, Libya, Tunisia, Egypt, Sudan, Finland, Bulgaria, and Czechoslovakia. Of 60 Polish aircraft stationed in Africa, 42 PZL-101 "Gawron" and 18 COLT (AN-2) are prepared to fly agroaviation missions. Negotiations have been initiated to provide similar services to Ethiopia, Kenya, and Uganda. It is expected that Polish agricultural aviation will continue to expand.

Principal international conventions and multilateral agreements relating to the conduct of international air services to which Poland is a party are the 1944 Convention of International Civil Aviation and the International Air Services Transit Agreement, which led to Poland's becoming a member of the International Civil Aviation Organization (ICAO). In November 1958 LOT was one of the first Eastern European Communist carriers to become a member of the International Air Transport Association (IATA). Bilateral air agreements with 34 other countries sanction the exchange of air services between Poland and those countries. These include 26 agreements with West European, North American, Middle Eastern, and African states and agreements with all the Eastern European Communist states. In addition LOT is party to the multilateral Six-Pool Agreement with the air carriers of Bulgaria, Czechoslovakia, Hungary, East Germany, and Romania. At present 17 foreign carriers serve Poland, including Aeroflot (U.S.S.R.) and all the European Communist international carriers. Non-Communist carriers serving Warsaw are Air France, Pan American, Alitalia, BEA-British European Airways, SABENA-Belgian Airlines, Lufthansa, KLM-Royal Dutch Airlines, SAS-Scandinavian Airlines System, Swissair, and Austrian Airlines.

J. Airfields² (S)

Poland has a total of 146 known airfields, 85 of which have runways 6,000 feet or more in length.

²Detailed information on airfields in Poland is contained in Volume 14, *Airfields and Seaplane Stations of the World* (ASSOTW), published by the Defense Intelligence Agency.

There are no active seaplane stations. Of the larger airfields, 65 have permanent runways; about half of these are in the northwest quadrant of the country, and the remainder are about equally divided along the southwestern and southern frontier and around the Warsaw area. The air facilities system is more than adequate to meet existing military and civil air requirements. Nine of the larger airfields with permanent runways, which are used by regularly scheduled LOT flights, are Warsaw/Okecie, the international airport of entry; Poznan/Lawica, the alternate international airport; Rzeszow/Jasionka; and Zendeck, Zegrze Pomorskie, Balice, Goleniow, Bydgoszcz, and Wroclaw/Strachowice. Of these, all but Poznan/Lawica and Rzeszow/Jasionka support home-based Polish Air Force and civil aircraft. Gdansk (54°24'N., 18°36'E.), also serving civil airline flights, is to be replaced by a new airfield under construction (Gdansk/Rebiechowo, 54°23'N., 18°28'E.) about 4 miles west of the city.

In the early 1960's the runways at most operational airfields were extended to accommodate FISHBED jet fighters. In the mid- to late 1960's runways were added at Wilcze Laski (54°36'N., 16°43'E.), Broczyno (54°31'N., 16°17'E.), Kakolewo (52°14'N., 16°15'E.)—all formerly sod-surfaced deployment fields—and at Olesnica (51°13'N., 17°26'E.), an Officers Technical Training School. In the early 1970's runways were added at Ploty (53°45'N., 15°17'E.), Bednary (52°32'N., 17°13'E.), and Labien (54°40'N., 17°45'E.), all formerly sod-surfaced deployment fields, and runways were extended at Balice, Mirslawiec, and Sochaczew/Bielice. The development of Warsaw/Okecie, continued through the 1960's and the early 1970's, included extensions to both runways, additional taxiways and aprons, and a modern terminal building. Facilities at Rzeszow/Jasionka are being improved, with the reported intent of making it an alternate international airport. In the late 1960's and early 1970's, airfield defenses were added at most active military fields. This included SA-3 (SAM sites) and hardened hangarettes at all the Soviet-occupied fighter bases and antiaircraft artillery and aircraft revetments at Polish Air Force airfields. At some of the latter, hardened hangarettes were being added in 1971-72, and more are expected to be built.

Of the 65 larger airfields with permanent runways, 28 have regularly assigned tactical aircraft—20 by the Polish Air Force (including Modlin, which has an advanced training mission); one (Cewice) by the Polish Naval Air Arm; and seven (Kolobrzeg on the Baltic Coast, Stargard, Konigsberg (Chojna), Zagan, Szprotawa, and Osla along the western frontier, and

FIGURE 11. Selected airfields (S)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA LEVEL	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	<i>Feet</i>		
Babimost..... 52°08'N., 15°48'E.	Concrete..... 8,200 x 200 190	FRESCO.....	Polish Air Force (PAF) fighter base.
Balice..... 50°05'N., 19°47'E.	Concrete..... 7,900 x 200 800	CUB.....	PAF transport base, also used by LOT.
Brzeg..... 50°50'N., 17°25'E.	Concrete..... 8,200 x 200 500	BEAGLE.....	Soviet Air Force (SAF) light bomber base.
Bydgoszcz..... 53°06'N., 17°59'E.	Concrete..... 8,200 x 260 230	FITTER.....	PAF fighter base; also used by LOT.
Cewice..... 54°25'N., 17°46'E.	Concrete..... 6,600 x 200 492	BEAGLE.....	Naval air base.
Debrzno..... 53°32'N., 17°16'E.	Concrete..... 8,200 x 200 515	FISHBED.....	PAF fighter base.
Gdynia..... 54°35'N., 18°30'E.	Concrete..... 8,200 x 260 147	do.....	Do.
Goleniow..... 53°35'N., 14°54'E.	Concrete..... 8,200 x 200 150	do.....	PAF fighter base; also used by LOT.
Kolobrzeg..... 54°12'N., 15°41'E.	Concrete..... 8,200 x 200 20	do.....	Do.
Konigsberg (Chojna)..... 52°56'N., 14°25'E.	Concrete..... 7,500 x 200 180	FISHBED.....	SAF fighter base.
Lask..... 51°33'N., 19°11'E.	Concrete..... 8,200 x 260 630	do.....	PAF fighter base
Leznica Wielka..... 52°00'N., 19°09'E.	Concrete..... 8,200 x 200 400	do.....	Do.
Malbork..... 54°02'N., 19°08'E.	Concrete..... 8,200 x 200 20	do.....	Do.
Minsk Mazowiecki..... 52°12'N., 21°39'E.	Concrete..... 8,200 x 200 540	do.....	Do.
Mirowslawiec..... 53°24'N., 16°05'E.	Asphalt..... 8,200 x 200 490	FRESCO.....	Do.
Modlin..... 52°27'N., 20°39'E.	Concrete..... 8,200 x 260 340	FISHBED.....	PAF advanced training/transition.
Osla..... 51°19'N., 15°44'E.	Concrete..... 8,200 x 200 680	FITTER.....	Do.
Pila..... 53°10'N., 16°43'E.	Concrete..... 7,600 x 200 265	FRE CO.....	PAF fighter base.

Footnote at end of table.

FIGURE 11. Selected airfields (S) (Continued)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA LEVEL	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
Powidz..... 52°23'N., 17°51'E.	Concrete..... 11,500 x 260 374	BEAGLE.....	Largest PAF base.
Poznan/Krzesiny..... 52°20'N., 16°58'E.	Concrete..... 8,200 x 200 276	FISHBED.....	PAF fighter base.
Poznan/Lawica..... 52°25'N., 16°50'E.	Concrete..... 7,100 x 160 300	COKE.....	Alternate international airport of entry.
Rzeszow/Jasionka..... 50°07'N., 22°01'E.	Concrete..... 8,200 x 260 700	COKE.....	LOT civil airport.
Slupsk..... 54°29'N., 17°06'E.	Concrete..... 7,900 x 200 225	BEAGLE.....	PAF fighter base.
Smardzko..... 53°47'N., 15°50'E.	Concrete..... 8,200 x 230 377	FRESCO.....	Do.
Sochaczew/Bielice..... 52°12'N., 20°18'E.	Concrete..... 8,200 x 200 300	FISHBED.....	Do.
Stargard..... 53°17'N., 14°58'E.	Concrete..... 8,200 x 210 90	...do.....	PAF fighter base.
Szprotawa..... 51°34'N., 15°35'E.	Concrete..... 8,200 x 200 410	FRESCO.....	Do.
Warsaw/Boernerowo..... 52°16'N., 20°56'E.	Concrete..... 8,200 x 340 360	BEAGLE.....	Warsaw Air Defense Sector Headquarters.
Warsaw/Okęcie..... 52°10'N., 20°58'E.	Concrete..... 9,800 x 190 345	COOT.....	Joint PAF/civil. Airfield of international entry; principal civil airfield.
Wroclaw/Strachowice..... 51°06'N., 16°53'E.	Concrete..... 8,200 x 200 395	FISHBED.....	PAF fighter base; also used by LOT.
Zagan..... 51°38'N., 15°25'E.	Concrete..... 8,200 x 160 500	...do.....	Do.
Zegrze Pomorskie..... 54°03'N., 16°16'E.	Concrete..... 8,200 x 200 246	...do.....	Do.
Zendek..... 50°28'N., 19°05'E.	Concrete..... 7,900 x 200 980	FARMER.....	Do.

NOTE—All above airfields have on-base fuel storage; however, exact storage capacity cannot be determined.

Brzeg in the southwest) by the Soviet Air Force. Of the remaining 37 airfields, seven are militarily active with other than fighter or bomber aircraft, three are strictly civilian in usage, 16 are dispersal/deployment airfields, and 11 are highway landing strips, most of which were built in the early 1970's.

Poland has only one flight information region, the Warsaw FIR. The airways system is so designed that civil air traffic does not overfly military airfields. A new system of controlled airspace in the Warsaw FIR was introduced in March 1968.

Details of airfields used by operational combat units of the Polish and Soviet Air Forces, and the one naval airfield, are summarized in Figure 11. Warsaw/Okecie, Warsaw/Boernerowo, Balice, Rzeszow/Josionka and Poznan/Lawica are also included because of their special importance.

K. Telecommunications (S)

Poland's strategic location makes it a vital transit center for communications with the U.S.S.R., Czechoslovakia, East Germany, and the Scandinavian countries. The basic national telecommunication (telecom) system has been developed primarily to fulfill requirements of the state, and the needs of the general public have been a secondary consideration. The networks are relatively modern and effective; however, the facilities are somewhat less developed than those of the neighboring countries—Czechoslovakia, East Germany, and the U.S.S.R. Services include domestic and international telephone, regular telegraph, telex (private teleprinter subscriber service), facsimile, data transfer, AM and FM radio broadcasting, wired broadcast, and TV. Nearly 50% of the villages have telephone connections, and most industrial towns have automatic local exchanges. Telegraph facilities are also available in most communities, but they handle only a small portion of the telecom traffic.

The resources, administration, and operation of the civil telecom systems are the responsibility of the Ministry of Communications (MOC), which is directly subordinate to the Council of Ministers.

All civil telecom systems are based on the organization and facilities available at the provincial level of administration. All trunk and most district channels are in underground cables, and an extensive open-wire system still exists in rural areas. Both old cables and newly laid special carrier-frequency (CF) cables use 12-, 24- and 60-channel CF equipment. The main center for switching intercity telecom traffic is in Warsaw, where telegraph circuits can be

automatically switched between major cities. On 1 January 1972, telephones, the most important means of communications, numbered 1,970,856 units or about six per 100 population. Over 85% of the telephones are connected to automatic exchanges, which have capacities ranging from 200 to 15,000 lines.

Radiobroadcast service is provided by 28 AM transmitters and 40 FM transmitters and reaches about 96% of the population. Three national programs originate at the main studios in Warsaw and are transmitted from main stations in the Warsaw suburbs. Program I is transmitted by a low-frequency AM transmitter station in Marysin, Program II is transmitted by a medium-frequency transmitter station in Wola Raszewska, and Program III is an FM program transmitted from the Marysin station and carried by regional network FM stations. The foreign-language broadcasting service operates 12 MF-HF transmitters and provides programs for audiences in Europe, Australia, Africa, and South America. As of June 1972 there were 5.7 million radiobroadcast receivers in use.

A single program is transmitted to about 78% of the population by 18 regional TV transmitters. Nearly all programs originate in the main TV studios at the Warsaw Palace of Culture and Science. The principal transmitters and studios in the TV network are joined by microwave relay routes; international links are available with the U.S.S.R. and East Germany. An experimental color TV program is transmitted weekly by transmitters in Katowice, Lodz, Warsaw and Wroclaw. About 5.3 million TV receivers were in use as of August 1972.

International landlines are an extension of the domestic wire networks. The most significant line is an underground four-tube coaxial cable interconnecting Poland with the U.S.S.R. and Czechoslovakia via Katowice. This cable also provides for exchanging international TV broadcasts. Radio-relay links extend to Czechoslovakia, East Germany, and the U.S.S.R. Coaxial and single-conductor submarine cables provide international connections to Scandinavian and Western European countries via Denmark. Poland has direct telegraph channels to 27 countries; the automatic public telegraph (GENTEX) exchange in Warsaw has direct channels to Prague, Budapest, Moscow, and East Berlin, and access to the GENTEX network of Western Europe is provided via Hamburg.

Special-purpose telecom systems are operated by various government organizations, including the Agency for Electrical Power, the state railroads, public safety security forces, and the Ministries of Internal

SECRET

Affairs, Foreign Affairs, and Mining and Power. The main exchange in the state railroads system is located at the MOC in Warsaw, and zone exchanges are situated at the regional directorates in Gdansk, Katowice, Krakow, Lublin, Poznan, Szczecin, and Warsaw. Connections between the main and zone exchanges are fully automatic. The Ministry of Mining and Power has its own telephone and telegraph carrier-frequency system between the ministry offices and its district administrations. Coastal radio stations are located at Gdynia, Szczecin and Wlowno.

Polish armed forces also operate special-purpose telecomm systems. Service units at all levels of command are linked by a wire-line network backed up by radio facilities. Higher echelons of command use fixed radio facilities. The Soviet Northern Group of Forces (NGF) maintains and operates an open-wire network entirely independent of the MOC net. The system includes a transit route from the U.S.S.R. to the Group of Soviet Forces, Germany, headquarters at Zossen, East Germany, with a spur to the Northern Group of Soviet Forces, Poland, at Legnica, Poland. A interwave radio-relay link, employing a tropospheric scatter system, extends to the headquarters of the Central Group of Forces at Milovice, Czechoslovakia.

Climatic conditions do not significantly affect the construction, maintenance, or operation of the telecomm systems. Overhead lines are used in preference to underground cables where marshy areas occur in the eastern part of the country and in mountainous terrain in the southeast. To prevent sabotage, guards are stationed at all key terminal installations and at storage and repair centers in each administrative

district. Ring cables are installed around major urban centers so that traffic can be diverted during emergencies, and, in addition, reserve terminal centers are located in underground bunkers.

There are adequate facilities and trained personnel to support the national telecomm complex. Engineers and technicians are trained at basic vocational, technical-vocational, and academic schools. Basic and technical-vocational schools give 2- and 4-year courses in the administration, operation, and maintenance of telecomm services and facilities. The academic schools offer telecomm engineering degrees.

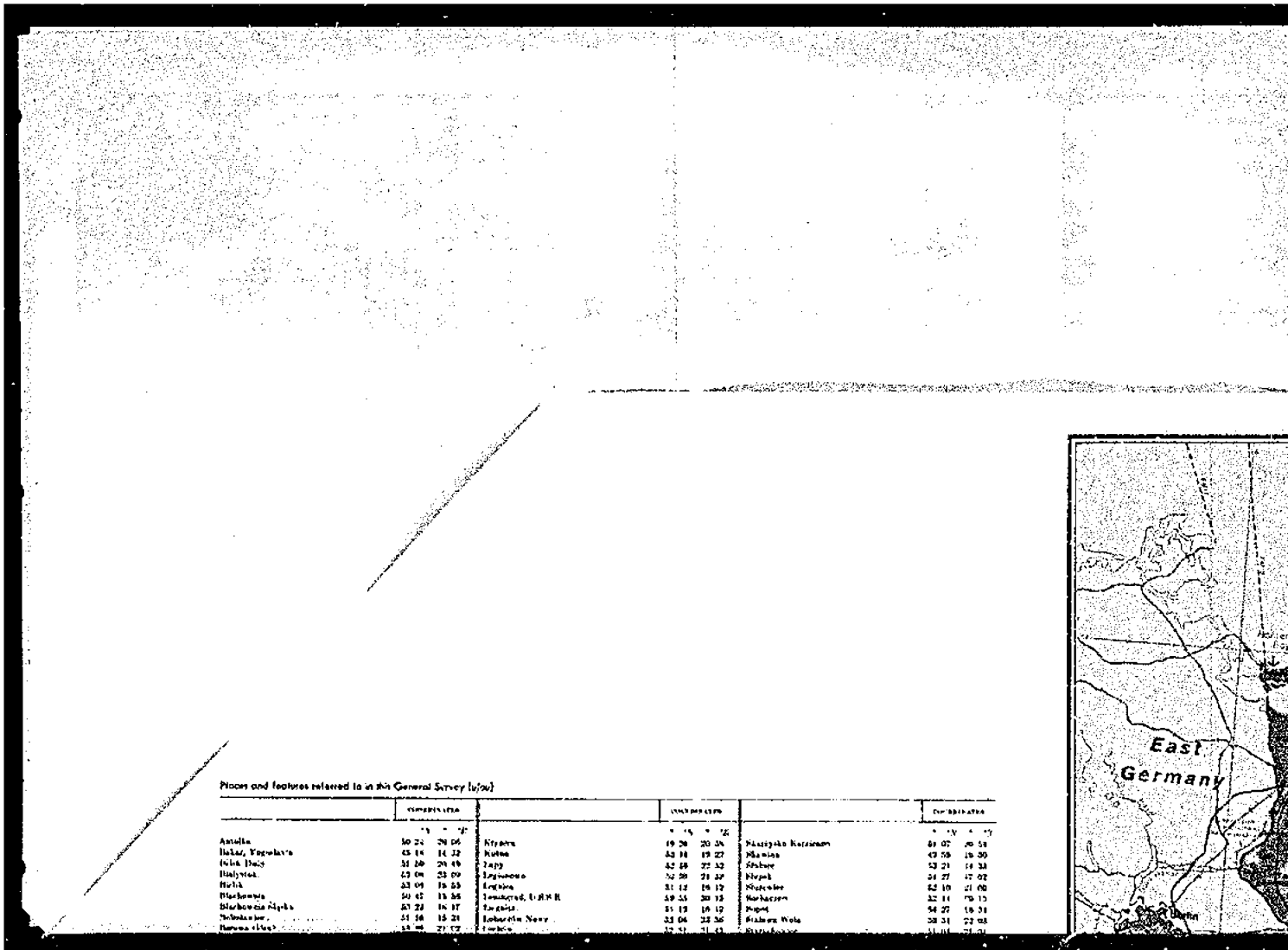
The telecomm equipment industry in Poland ranks third behind East Germany and Czechoslovakia in Eastern Europe, excluding the U.S.S.R. The industry comprises 21 major equipment producers and over 30 additional facilities that manufacture components, subassemblies, and cable. Types of wire equipment produced include automatic telephone exchanges, manual switchboards, telephone handsets, telegraph equipment, carrier and repeater devices, and coastal and multiconductor cable. Radio-relay equipment having capacities of up to 24 channels is produced domestically, but a significant number of Free World and Soviet radio-relay systems have also been installed. Most of the broadcast transmitters are imported. The development of telecomm services continues under the 1971-75 Five Year Plan; primary emphasis is on renovating and improving intercity networks and expanding telephone facilities using modern cross-bar automatic switching equipment. Nationwide telephone direct distance dialing and the automation of telegraph services are also to be expanded. Broadcast facilities are scheduled for modernization and improvement.

Glossary

Abbreviation	Function	Estimate
APRL	<i>Aero-Lok Polityczno-Rozpoznawczy Lotowcy.</i>	Armchrb of the Polish People's Republic
CZSA	<i>Centralny Zesp. Lotniczy Sanitarny.</i>	Central Air Ambulance Group
LOT	<i>Polskie Linie Lotnicze</i>	Polish Airlines
LEUC	<i>Lotniczy Zesp. Uslug Gaspalarnych.</i>	Utility Service Air Group
PKP	<i>Polskie Koleje Państwowe</i>	Polish State Railroads
PKS	<i>Państwowa Kopalnia (Lotna) Samochodowa</i>	State Motor Transport
PLD	<i>Polskie Linie Odrodzenia</i>	Polish Ocean Lines
PKM	<i>Polskie Zluzowa Morska</i>	Polish Steamship Company
ZNTK	<i>Zaklady Naprawy Taboru Kolejowego.</i>	Railroad Rolling Stock Repair Shops

23

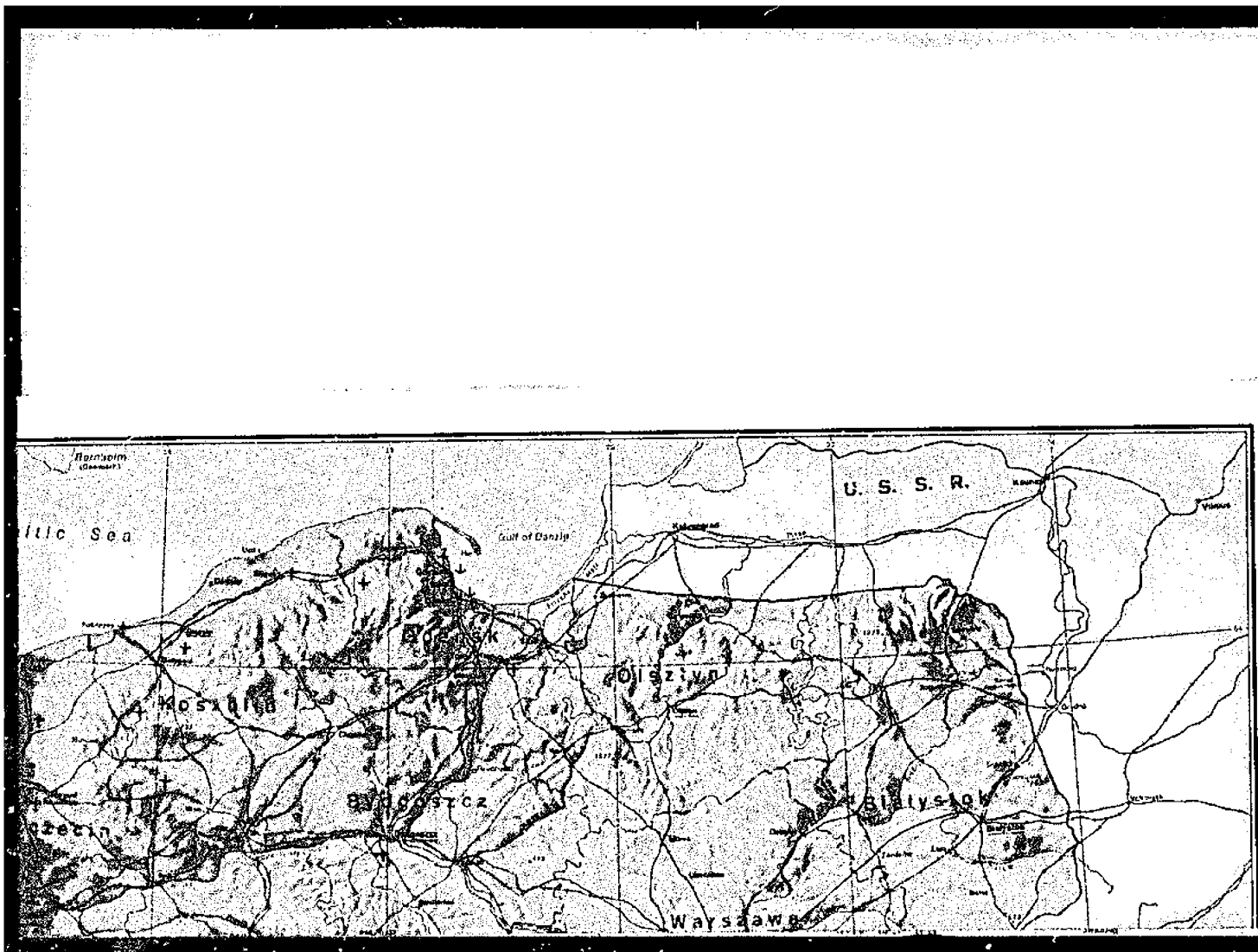
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Places and features referred to in this General Survey (1/20)

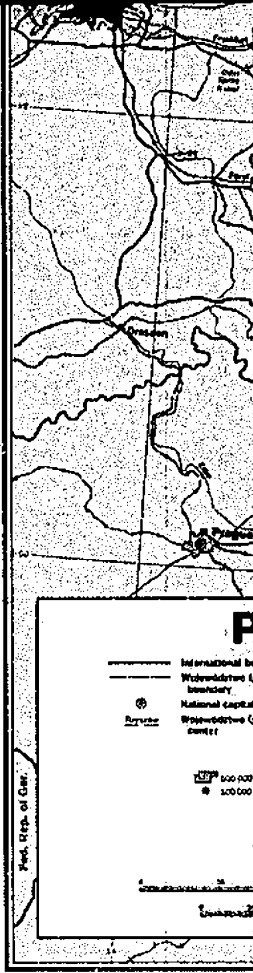
	Coordinates		Coordinates		Coordinates
Austria	46 24 20 06	Kyrgyz	41 15 41 12	Naryn	41 15 41 12
Baku, Yevlax's	43 14 14 12	Kyrgyz	41 20 20 06	Naryn	41 20 20 06
Black Sea	41 20 20 49	Kyrgyz	41 18 18 27	Naryn	41 18 18 27
Bulgaria	43 04 23 09	Kyrgyz	41 22 22 02	Naryn	41 22 22 02
China	43 09 18 53	Kyrgyz	41 25 25 12	Naryn	41 25 25 12
Czechoslovakia	49 45 13 56	Kyrgyz	41 28 28 12	Naryn	41 28 28 12
Dobruja, N. part	43 23 16 17	Kyrgyz	41 31 31 12	Naryn	41 31 31 12
Dobruja, S. part	43 18 16 21	Kyrgyz	41 34 34 06	Naryn	41 34 34 06
East Germany	51 18 18 21	Kyrgyz	41 37 37 00	Naryn	41 37 37 00
East Germany	51 18 18 21	Kyrgyz	41 40 40 00	Naryn	41 40 40 00

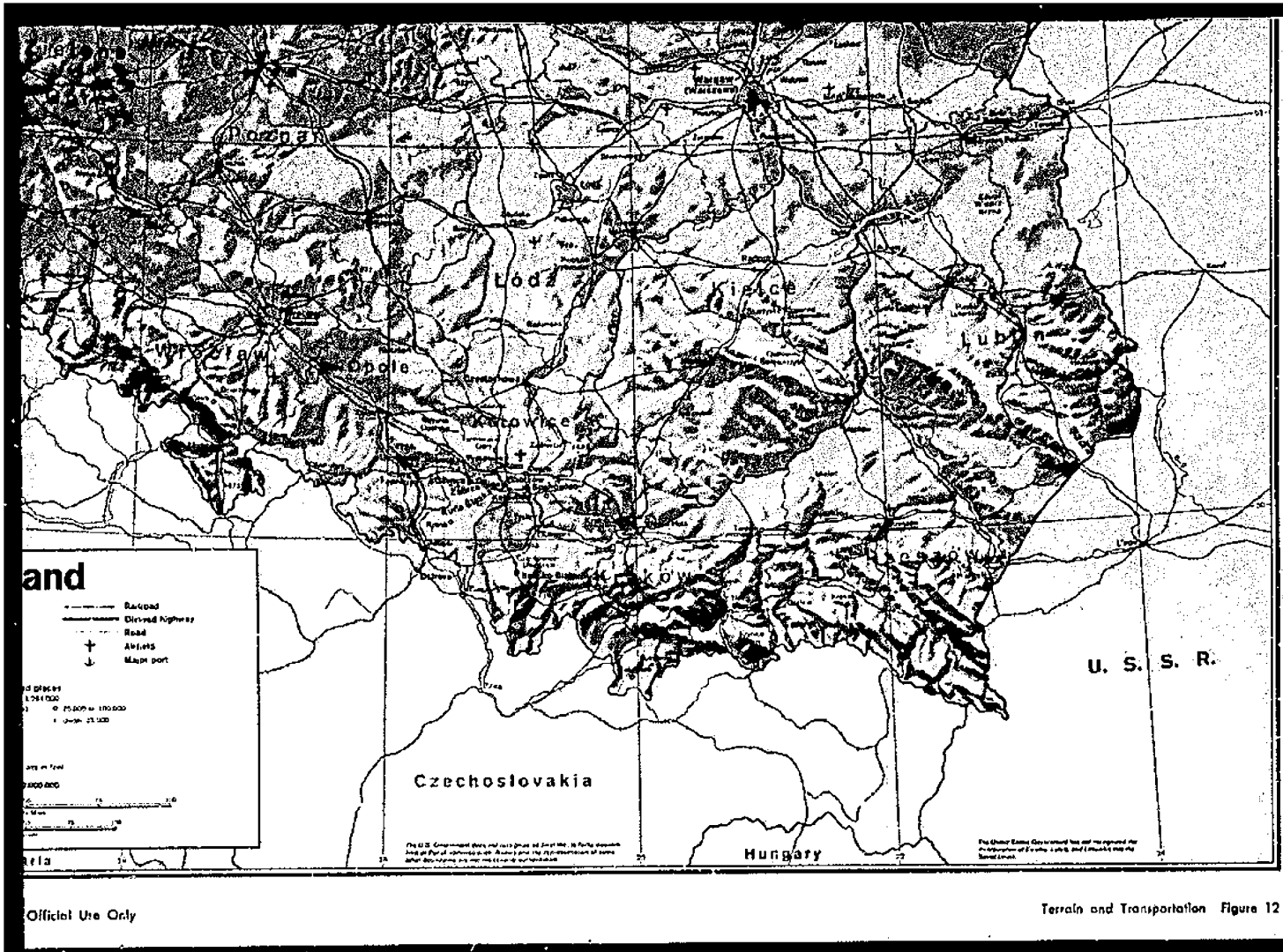
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Table with columns for country names and numerical data. Includes entries for Albania, Algeria, Angola, Argentina, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belgium, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burma, Cambodia, Canada, Chad, Chile, China, Colombia, Costa Rica, Cuba, Cyprus, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Finland, France, Germany (West and East), Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Korea, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Taiwan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, USSR, Venezuela, Vietnam, Yugoslavia, Zambia, Zimbabwe.





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