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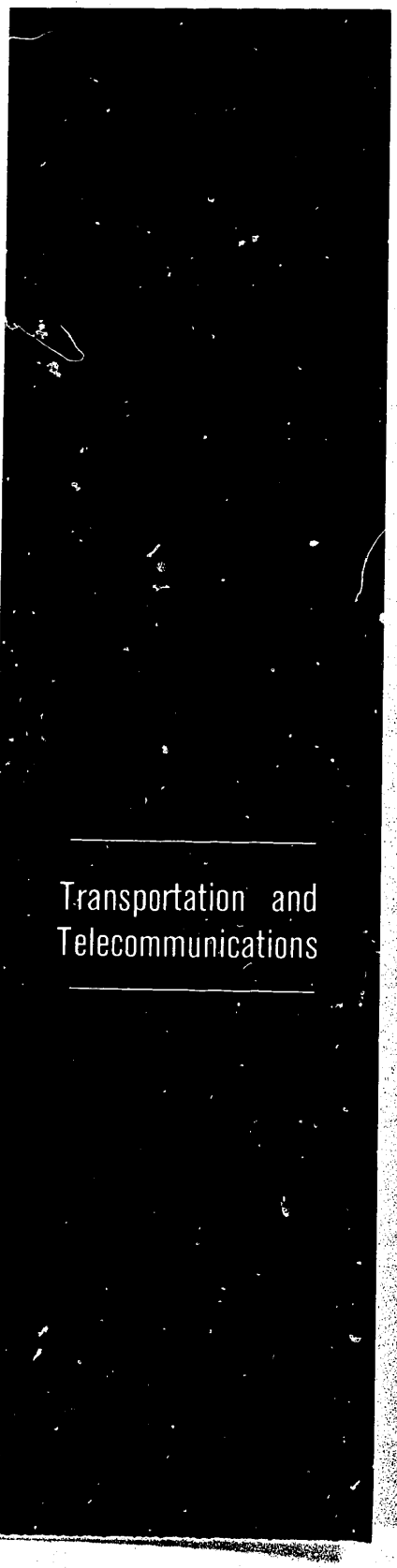

Transportation and Telecommunications

South Korea

October 1973

NATIONAL INTELLIGENCE SURVEY

SECRET

36

APPROVED FOR RELEASE: 2009/06/16: CIA-RDP01-00707R000200080010-6

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South Korea

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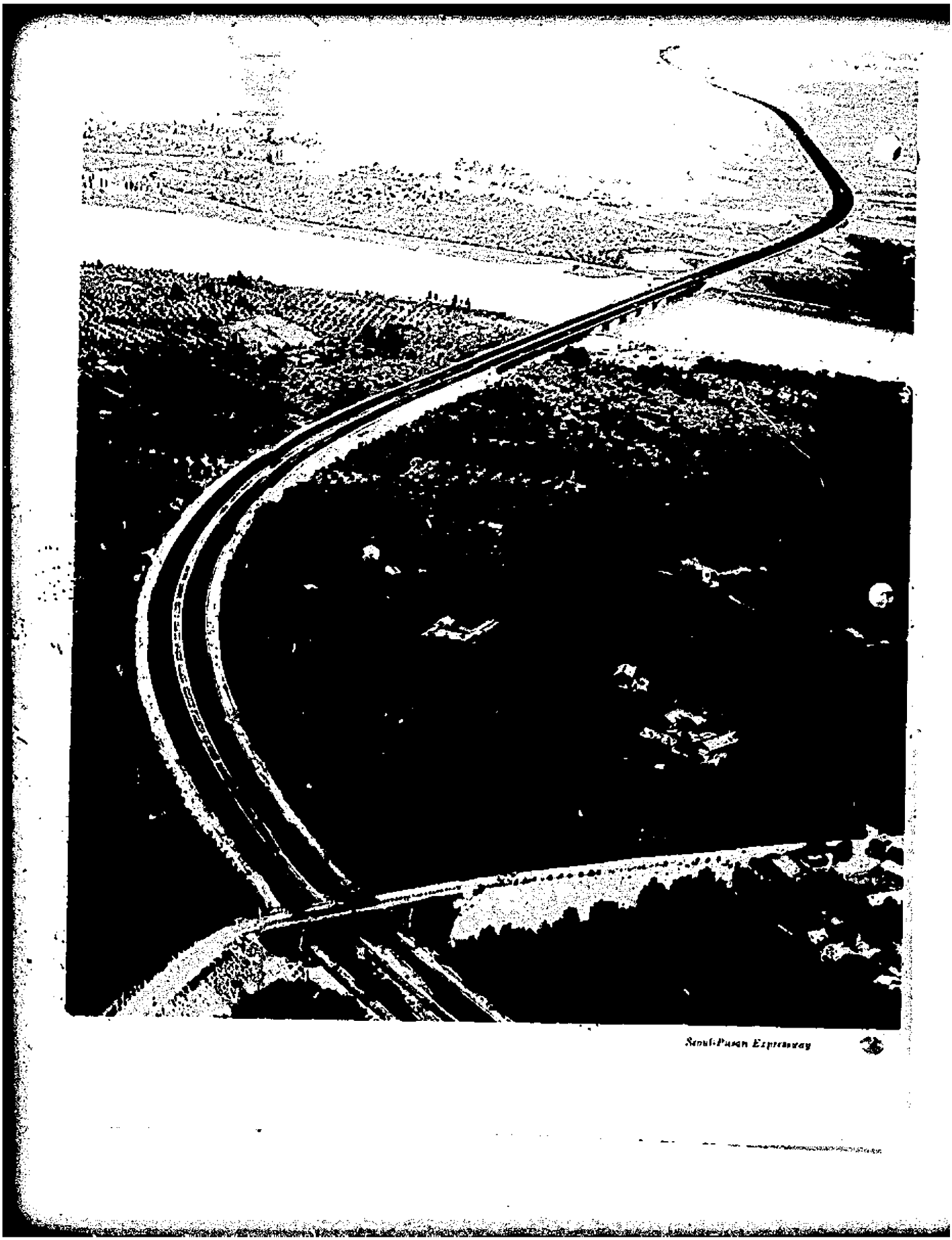
This chapter supersedes the transportation and telecommunications coverage in the General Survey dated February 1970.

FIGURES



Seoul-Pusan Expressway

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Transportation and Telecommunications

A. Summary (S)

1. Systems

The transportation and telecommunication (telecom) systems of South Korea are laid out generally on a north-south axis, primarily between Seoul and Pusan. Secondary routes and lines branch off to the east and west from the main lines of communication (see Figure 14, the Terrain and Transportation map at the end of the chapter). The Korean systems were developed by Japan during the early years of the present century to support Japanese military and economic operations on the Asian mainland. Consequently, routes were not built primarily to serve the needs of the domestic economy of the peninsula. Furthermore, the division of Korea along the 38th parallel by the U.S. and U.S.S.R. occupation agreement in 1945 resulted in a split of the original Japanese networks—with some segments in North Korea and others in South Korea. The South Korean transportation and telecom systems were heavily damaged in the Korean war but subsequently were restored with foreign assistance; in many cases major improvements have been made.

The mountainous eastern half, in which construction of surface routes and landlines is difficult, has sparse networks, but the relatively flat western half is better served. Rail is the chief transportation mode and carries most long-di ...ance freight and passenger traffic. The highway network serves as a feeder to the railroads, but is also important in short-haul traffic and as the only mode reaching many remote areas. The highway system has been significantly expanded, and its use has increased appreciably. However, despite the improvements of highway transport facilities, requirements for the expansion of the highway transport industry have not been met. Inland waterways are unimproved natural streams, utilized mostly by small craft, which function as a supplement to rail and highway transport in the movement of local commerce. A major petroleum cross-country pipeline for military products extends from near P'ohang, on the southeast coast, to Seoul. The 258-mile, 8-inch line has a capacity of 40,000-50,000 barrels per day; the excess capacity of the line is leased to oil companies. The only other pipeline of significance is a 6-inch line connecting Inch'on[1] and Seoul, a distance of about 20 miles.

The port system consists of 10 major and 18 minor ports. The largest of the major ports, Inch'on and Pusan, handle most of the foreign commerce as well as the unloading of U.S. military and other foreign economic assistance supplies. The other ports are scattered along the coasts and serve their hinterlands as fishing and coastal shipping centers. The merchant marine plays a major role in the economy of the country, and in 1971 about 27% of the nation's international trade was carried in Korean-flag vessels. Because of an extensive expansion program, South Korea's oceangoing tonnage has increased more than threefold since 1967. Civil air is a small but increasingly significant supplement to the surface networks, and the numerous airfields, many of them military fields built during the Korean war, make feasible an increasing role for aviation. Telecom facilities provide essential services to the government, industry, and the general public. Most cities are interconnected by radio, radio-relay links, or underground cables. Small towns and some rural areas are served by open-wire lines, but some areas have no telecom service.

The government is the dominant force in transportation. Through the Ministry of Transportation it operates the railroads, ports, and one of the

[1] For diacritics on place names see the list of names on the apron of the Terrain and Transportation map and the map itself.

larger shipping companies. The ministry also administers and regulates highway transportation, maritime affairs, and civil air activities, but construction and maintenance of highways are the responsibility of the Ministry of Construction and other governmental agencies, and the military. Telephone and telegraph facilities are under the Ministry of Communications; radio and television are administered by private corporations.

Generally the systems are better than those of North Korea but are much inferior to those of Japan. The international connections with North Korea are blocked near the DMZ; previously there were two rail and five highway connections.

2. Strategic mobility

Though generally sparse, transportation and telecom facilities would suffice for the military needs of the country. In war damaged condition they supported large U.N. and South Korean military forces in sustained combat operations from 1950 to 1953; since 1953 many improvements have been made. The railroads are adequate for military requirements. In spite of recent highway improvements, the low supporting characteristics of a large portion of the road network, physical bottlenecks, rugged terrain, and seasonal weather conditions would hamper any sustained military operations. The waterways would be important for their transloading capabilities from anchorages in coastal areas.

The cargo-type ships (81 dry cargo, two timber carrier) have a considerable potential for logistic support and for short-haul (up to 48 hours steaming) troop lift in nearseas operations. These ships have a military lift and supply transport potential of 447,910 cargo deadweight tons. The self-loading and unloading capability of the dry cargo units is enhanced by 31 units having large hatches (more than 50 feet in length), three having heavy-lift booms (40 tons or more), and one with both heavy-lift booms and large hatches. With the expansion of the normal passenger capacity, the two combination passenger-cargo ships would have a moderate potential for longer haul (more than 48 hours steaming) troop transport. The 24 tankers, with an estimated capacity of about 5.7 million barrels (U.S.) of petroleum and related products, could provide a considerable military support capability; however, many of the tankers are employed in coastrades between foreign countries and might not be readily available for military-support operations under certain emergency conditions.

All registered aircraft and aviation personnel would be subject to mobilization assignments in the event of national emergency. The major transports could substantially aid in the transportation of troops and cargo. All civil airfields would revert to military control. Eight airfields are capable of supporting operations by aircraft weighing up to 200,000 pounds and two are capable of supporting operations by aircraft weighing up to 155,000 pounds. The minor operational airfields are capable of supporting sustained operations by liaison/light-cargo aircraft.

The telecom systems, although well developed, are highly vulnerable because most primary switching centers are concentrated within five cities—Kwangju, Pusan, Seoul, Taegu, and Taejon—and because of the extensive use of open-wire lines. Interruption at any one of the principal switching centers or landline networks could disrupt regional service. Total disruption is unlikely as alternate routing is available through the combined high-capacity, interconnected civil and military radio-relay systems.

B. Railroads (S)

As the most important mode of transportation, the railroads carry the greatest share of long-distance freight and passenger traffic. They are government owned and are operated by the Korean National Railways (KNR), which is under the Ministry of Transportation. The railroad network consists of about 1,910 route miles of standard-gage (4'8½") lines and 77 route miles of 2'6" narrow-gage (the latter between Yoju and Inch'un) and interconnects the industrial, agricultural, and mining communities and the ports. The system suffered extensive damage in the Korean war, but since 1958 the network has been completely rehabilitated, expanded, and partially modernized with considerable assistance from the United States, and is adequate for the needs of the present economy.

The network is laid out on a generally north-south axis between Pusan and Seoul, with secondary lines branching to east and west from the main lines. There is a total of about 325 miles of double-track lines, consisting of the 280-mile line connecting Pusan with Seoul (Figure 1) via the major industrial centers of Taegu and Taejon, the 18-mile Inch'on-Seoul line, 15 miles between Taejon and Iri, and some 12 miles of additional double-track lines in the Seoul area. An alternative Pusan-Seoul line is located east of the main line and traverses rugged terrain, passing through Yongch'on, Andong, and Chech'on. On the Pusan-Seoul main line the maximum grade is 1.1%, and the minimum radius of curvature is 760 feet; on the alternate line, the maximum grade is 2.5%, and the

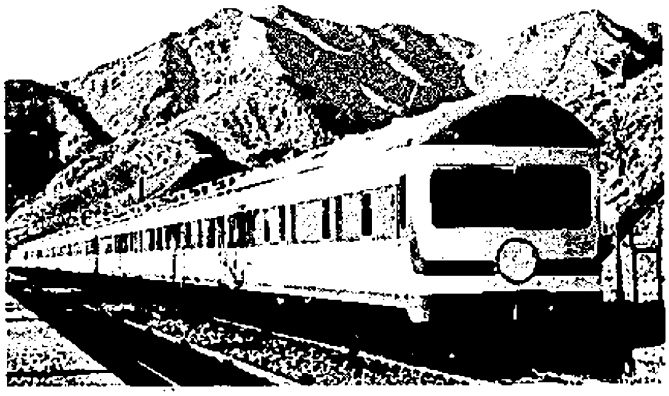

FIGURE 1. The Kwangwang-ho super-express train can run the 280-mile distance between Seoul and Pusan within four hours (U/OU)

minimum radius of curvature is 984 feet. The narrow-gage line between Suwon and Yeju was closed for use in April 1972.

The major operating problems are caused by insufficient supplies of suitable coal, inadequate numbers of freight cars, and a long turnaround time. Traffic interruptions occur when torrential spring and summer rains wash out lines and cause landslides. Improvements in drainage on the plains and protective measures on hillsides are alleviating these difficulties. Construction and maintenance are the responsibilities of the Engineering Bureau. Railroad maintenance sections are 3 to 5.5 miles in length, and section gangs consist of six to eight men. A high percentage of work is performed manually; efforts are being made to increase mechanization, particularly for new construction, but labor is cheap and plentiful, whereas mechanical equipment is expensive and scarce.

Developments under the Third Five Year Plan (1972-75) include the electrification of suburban and industrial lines, construction of new railroad lines, modernization of signal and communication facilities, track renewal and bridge strengthening, acquisition of freight and passenger cars, and improvement of maintenance facilities. Electrification of the industrial lines, scheduled for completion in late 1974, is intended to alleviate the increasing transportation demand resulting from the rapid industrialization of the east coast. Electrification of the lines in the Seoul suburban area is expected to be completed by the end of 1973.

There are approximately 1,800 bridges 12 feet and over in length and 300 tunnels on the KNR. The total length of the bridges is about 45 miles, of the tunnels about 65 miles. The longest bridge is 3,655 feet in length (across the Han-gang at the south edge of Seoul), but only about one-third of the bridges exceed 80 feet in length or have more than four spans. The 14,760-foot Chungsong Tunnel, about 4 miles northwest of P'angju is the longest on the network.

The double-track Pusan-Seoul line is laid with 100-pound-per-yard rail, most other lines are laid with 65- or 75-pound rail except the single-track 2'6" narrow-gage line, on which rails weigh 25, 45, or 50 pounds per yard. Rails are imported from Japan and the United States. Timber ties, cut from a variety of indigenous hardwoods, are used on all lines, however since 1962, worn timber ties have been replaced with prestressed reinforced concrete ties manufactured locally. Wooden ties and bridge timbers are impregnated with a half-and-half mixture of creosote and petroleum. Broken stone and river gravel are used for ballast.

The KNR uses various signals to implement a train control system that in general corresponds to an absolute block operation. Centralized traffic control has been completed between Seoul and Chech'on. Communications are maintained principally by telephone, with radio and teletypewriters also in service.

Coal, fuel oil, and diesel oil are used as fuel on the KNR. Korean anthracite coal, in its natural state is unsuitable for locomotive use. Bituminous coal is imported from Australia, Taiwan, and Japan. Fuel and diesel oils are also imported, mostly from the Persian Gulf area. Water is available in sufficient quantity but is of poor quality; water treatment plants are in operation at several key points.

FIGURE 2. 800-horsepower diesel locomotive in use on the KNR (C)

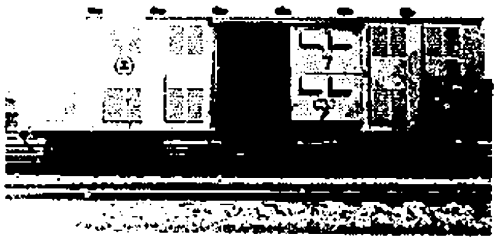

FIGURE 3. KNR standard-gage, 33 short-ton, ventilated boxcar (C)

In 1968 KNR transported 128.1 million passengers and 33.8 million short tons of freight, producing 5.4 billion passenger-miles and 5.1 billion short-ton-miles. The overall trend of freight traffic has been generally upward, while passenger traffic has declined. Principal commodities hauled include coal, grain, forest and marine products, cement, and petroleum. The average passenger journey was about 42 miles, the average length of haul, 153 miles.

The inventory of equipment as of December 1972 consisted of 80 steam locomotives, 337 diesel locomotives (Figure 2), 15,189 freight cars (Figure 3), 1,621 passenger cars, and about 138 railcars. Plans call for the rapid replacement of all steam locomotives.

Equipment repair centers capable of doing general overhaul and making major locomotive and rolling stock repairs are at Pusan, Inchon, and at Yongsan (Figure 4) and Yongdungpo-dong, both near Seoul. Only the Pusan shop is capable of repairing diesel locomotives; the Inchon shop mainly assembles cars. Running repairs are made at the enginehouses located at various points on the system. Spare parts are imported from Japan and the United States.

The KNR has about 34,161 employees. A transportation high school and a training center are maintained for railroad employees. Training of key employees is supplemented to some extent by sending them abroad for advanced training.

C. Highways (C)

Highways in the Republic of Korea are essential to both the economic development and the security of the country. The road network, though sparse by western European and U.S. standards, is of relatively high density for an Asian country. Although railroads account for most of the country's long-distance hauling, highways provide short-haul and feeder service to the railroads, intercity movement, farm-to-

FIGURE 4. Yongsan rail yard near Seoul (C)

market transport, and access into remote areas not served by the rail system. However, because of the construction of hard-surfaced expressways and the bituminous surfacing of other portions of the road net, highway transport is of increasing importance in the movement of freight and passengers. Despite some major improvements of highway transport facilities, requirements for the expanding transport industry have not been attained.

The highway network consists basically of five north-south through routes connected by several east-west routes. Distribution is fairly even, except where terrain and sparse population limit development. Road density is greater in the flat western lowlands, especially in the vicinity of Seoul, than in the rugged mountainous regions in the northeast and east. The overall density of 0.67 mile of road per square mile of area compares favorably with the 0.27:1 density of North Korea and the 0.08:1 of China. There are several highway connections with North Korea, but they are not used as no traffic is permitted to cross the demilitarized zone between the two countries. This situation may change in the future if current negotiations between the two countries result in some type of workable agreement.

The highway network totals about 25,650 miles, of which 5,700 miles are national highways (primary and secondary) and 19,950 miles are classified as provincial, municipal, or local roads. National highways form the main arterial routes and interconnect the major industrial centers, large urban areas, and major ports. Provincial and local roads link rural areas and villages with the national highway system and provide farm-to-market routes. Concrete and bituminous (including bituminous surface treatment) comprise 1,845 miles of the total mileage; gravel, crushed stone and/or stabilized soil surfaces make up 13,610 miles; 3,200 miles are improved earth roads; and 1,995 are unimproved earth roads.

The newly completed expressways and those still under construction have either asphalt concrete, as in the case of the Pusan-Seoul Expressway, or intermediate bituminous surfacing with four-lane widths, 3- to 7-foot median strips, and 4- to 11-foot shoulders. Bituminous and concrete surfaces on roads other than expressways are generally 16 to 24 feet wide. Gravel and crushed stone surfaces range from 12 to 36 feet, with 14- to 18-foot widths predominating. Earth roads are generally narrow (less than 13 feet) and one lane. Base types are telford macadam, crushed stone, or gravel and range in thickness from 6 to 8 inches. Shoulders are of earth or gravel and range from 1 to 14 feet in width; the inferior roads have no shoulders. The principal routes have limiting curves with radii of 50 to 120 feet and maximum grades of 10%. Sharp curves and steep grades are encountered mainly on the east-west mountain roads and, to a lesser extent, on the north-south mountain roads.

There are approximately 6,685 bridges with lengths of 20 feet and over on the road network, of which about 3,371 are on the national highway system and 3,317 on provincial and local roads. The most common type is the reinforced concrete deck or slab type, averaging 18 feet in width and capable of supporting loads of 30 to 60 short tons. There are also about 920 steel through-truss or girder types (Figure 5) with vertical clearances ranging from 12 to 27 feet. Most bridges, however, have unlimited vertical clearance and are in good condition; there are only 13 timber bridges remaining on the national highway system. Although some timber and Bailey-type bridges still exist on the provincial and local networks, these bridges, including those with temporary spans, are being replaced with reinforced concrete or steel structures. In remote areas and on poor local roads, bridging remains inadequate. There are 16 tunnels with lengths ranging from 73 to 3,550 feet, 99 fords, and 15 ferries on the national highway system; on the provincial and local roads there are 5 tunnels, 222 fords, and 31 ferries. Ferry crossings range from 100 feet to several miles in width.

Construction and maintenance on the national system is the responsibility of the Ministry of Construction, which is charged with the formulation of nationwide development plans, and coordination, control, and supervision of all projects and activities accomplished by the Public Highway Section of the

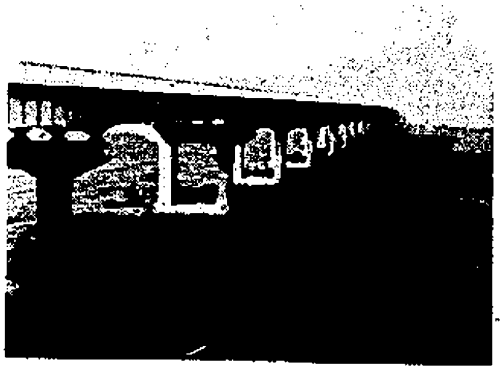

FIGURE 5. The Han River bridge on the Inch'on-Seoul Expressway is a four-lane, steel girder type with reinforced concrete deck (U/OU)

Bureau of Public Roads, provincial and regional construction bureaus, and the Korea Highway Corporation. The responsibility of the latter is to develop the national highway system and facilitate land transportation. Actual work on highways is performed by a combination of privately owned construction firms, government agencies, public works units, and in some cases by units of the armed forces. Provincial and local roads are maintained by conscripted local residents who are bound by law to work on roads within specified areas, and in some instances by units of the local public works offices. Major construction and maintenance problems arise from topographic and climatic conditions, the limited supply of roadbuilding materials, and the shortage of skilled labor. In the mountainous regions, road construction is difficult and costly because it requires extensive through and side-hill cutting, heavy grading, and extensive bridging; maintenance also requires considerable effort because of floods, washouts (Figure 6), and landslides. In the lowlands, flooding is a major problem requiring roads to be constructed on embankments.

South Korea is deficient in some construction materials. Portland cement and steel are still imported, but local production continues to increase and imports of cement have steadily declined. Sand, gravel, and stone are available in sufficient quantities throughout the country. Bitumen in limited quantities is produced from imported crude oil. Mechanized equipment for highway construction and maintenance is imported, mainly from the United States and Japan. It is estimated that some 1,000 to 1,200 pieces of mechanized equipment are available, including such items as bulldozers, tractors, earth movers, scrapers, graders, pavers, compactors, rock crushers, and asphalt plants.

To meet the increase in transportation demands owing to the rapid growth of the national economy, the government initiated a series of 5-year economic development plans in 1962 to improve and rehabilitate the road net of the country. The First Plan (1962-67) and the Second Plan (1967-71) resulted in significant improvement and, in some cases, realignment and new construction. The Second Plan, together with the Third Plan (1972-76), provides for the completion of construction, realignment, rehabilitation, and surfacing of 3,580 miles of existing roads, including 990 miles of expressways; and the construction, replacement and/or renovation of bridges on the national highway system. Plans are to construct 1,367 miles of new expressways by 1981, of which 402 miles have already been completed. Expressways completed include the Inch'on-Seoul, Seoul-Pusan, Onyang-Ulsan, and portions of the Seoul-Kangnung and Chonju-Taejon expressways. Feasibility studies are in progress on six other expressways with completion dates set for 1976. These

FIGURE 6. Severe washout on National Secondary Route 44 between Hwangjong and Hangch'on (U/OU)

expressways are to be four-lane highways on a 75-foot right-of-way. The Ministry of Construction recently announced a plan to build another expressway between Seoul and Inch'on paralleling the existing expressway with a completion date in 1975. The development plan also includes the expansion of 10 existing public roads into modern highways totaling 870 miles.

The Korea Highway Corporation, formed in 1969, functions as the builder and manager of expressways and turnpikes. The corporation is responsible for meeting traffic demands by constructing and maintaining modern toll highways, establishing and operating pay parking lots and filling stations serving the toll roads, acquiring and managing real estate for the construction of highways, and other functions related to the operation of the expressways and turnpikes. In addition, it also constructs and/or improves roads on a contractual and consignment basis for provincial, local autonomous bodies, and other agencies upon request. As an added feature in its transportation improvement plans, the government developed and promulgated a new route-numbering system for the road network which includes road classifications established by law: Expressways, Primary and Secondary National Highways, Provincial Roads, and Local Roads.

Movement on the road network is restricted by various physical bottlenecks and by weather conditions. Traffic restrictions include narrow roadways sharp curves, steep grades, numerous fords, ferry crossings, tunnels, underpasses, and some narrow and low-capacity bridges. Heavy rains from June through August curtail traffic for short periods and cause damage to road surfaces and bridges; in the lowlands and along river valleys, the highways are sometimes inundated. In mountainous terrain, landslides and washouts often occur and the numerous fords are usually impassable during these periods. During dry weather, traffic may also be slowed or even interrupted by dust conditions, and in winter it may be interrupted by snow at the higher elevations and mountainous areas.

The Ministry of Transportation is responsible for the administration of land transportation, both rail and highway. Highway transport operations are accomplished by 774 trucking firms, 328 bus companies, and 854 taxi companies; all are either commercially or privately owned and operated. For the year ending 31 December 1971, trucking firms operated a total of 45,918 vehicles that transported over 67 million tons of cargo over 2,083 million ton-miles; bus companies, operating 14,193 buses, transported 2,769 billion passengers over some 32 million passenger-miles, taxis carried some 1,118 billion fares in 31,148 vehicles. Bus and trucking operations are conducted throughout the country and efforts are being made to improve and expand both passenger and commodity transport, especially in those remote areas not serviced by the railroads. Principal commodities transported via trucks include agricultural products, fertilizers, construction materials, fabrics, machinery, ores, and petroleum products. Large numbers of animal-drawn vehicles continue to operate on provincial and local farm-to-market roads.

In January 1969 the Economic Ministers Council adopted a comprehensive transportation plan designed to ease the almost exclusive dependence on railroads. It prohibits the receipt by the railroads of freight bound for destinations within a 31-mile radius and permits the Ministry of Transportation to limit the receipt of freight bound for destinations within 62 miles of the railroads. Freight charges have also been adjusted to expedite the use of highway transport in lieu of rail transport where short-haul services are concerned.

As of November 1972, total vehicle registrations numbered 129,371 vehicles—60,677 passenger cars, 48,901 trucks, 15,985 buses, and 3,808 special-purpose vehicles. Seating capacity of buses ranges from 10 to 45, truck capacities range from ½ to 5 tons, while some special-purpose vehicles are capable of handling 15 tons or more. Available data indicates that the average age of vehicles has been substantially reduced and is now estimated to be less than 5 years. Poor roads and inadequate facilities for vehicle repair and maintenance continue to be major problems. There are 633 repair and maintenance shops, 50 inspection shops, and an estimated 4,960 trained mechanics engaged in such activities. As a result of government support under the second and third 5-year plans, the automobile industry has achieved a marked development in the past several years. The industry consists of four major automobile companies with six assembly plants and approximately 141 separate firms involved in the production of various parts, accessories, and components. Domestically produced parts amount to roughly 50% of the value of all parts, and motor vehicle manufacturers now have an obligation to raise this percentage steadily each year. The government planned to produce a completely domestically built small passenger car by 1972; however, the detailed plans are still in the formative stage. Actual production of vehicles for the year 1971 was 11,512 passenger cars, 3,302 buses, 3,191 trucks, and 5,046 three-wheeled trucks—a total of 23,045

units. Vehicle imports during 1970 totaled 22,322 units, of which 14,087 were passenger cars and 8,235 were trucks and buses. Major suppliers of vehicle imports are the United Kingdom, Japan, Italy, West Germany, and the United States.

D. Inland waterways (S)

South Korea has about 1,000 miles of navigable waterways. They are widely distributed over the western and southern portions of the peninsula and are generally unimproved natural streams. For the most part, navigation is restricted to small native craft which function as a supplement to rail and highway transport in the movement of local commerce.

In the north the Han-gang, the Imjin-gang, and their tributaries form a connected navigable inland waterway system totaling about 509 miles. The Han-gang, an improved stream, flows from Yongwol, 217 miles southwestward, northwestward, and then westward to discharge into the Yellow Sea. From its mouth to a point 36 miles upstream, at the confluence with the Imjin-gang, it forms the boundary between North and South Korea. The Han-gang is important in the movement of freight upstream from the maritime port of Inch'on. It is navigable at high water by craft of 30 to 100 tons capacity for a distance of 60 miles, while small craft with shallow draft can navigate an additional 157 miles to Yongwol. Transloading can be accomplished at the port of Seoul, the only port installation of any consequence on the Han-gang; minor landings are located at many towns and villages along the river.

The Imjin-gang is the most important tributary of the Han-gang. It is a natural stream flowing southwestward through narrow valleys and rugged mountains for 55 miles from Hoengsan-ni, near the border, to its confluence with the Han-gang. It provides the only waterway route into North Korea. Craft of 32-ton capacity can move 24 miles upstream during periods of favorable tides, and craft of 20-ton capacity can navigate an additional 31 miles to the DMZ. Transshipment can be accomplished at Kumgp'o-ri.

The Kum-gang in west-central Korea is a natural stream navigable for 79 miles above its mouth. From Taep'yong-ni it flows southwestward and empties into the Yellow Sea. Small oceangoing coasters can navigate 16 miles upstream to the maritime port of Kunsan. During periods of favorable tides craft of 16-ton capacity can navigate an additional 24 miles to Kunggyong, while small craft can ascend the remaining 45 miles to Taep'yong-ni. The maritime port of Kunsan, with its auxiliary port of Changhang, is the only developed port site on the waterway. Limited transshipment facilities are located at Kunggyong, Taep'yong-ni, and a number of minor villages and towns along the waterway. Estuaries of the Ansong-ch'on, Man'gyong-gang, and Yongsan-gang provide about 100 miles of minor waterways in the western part of the country.

In the south the Somjin-gang, a natural stream, flows southeastward for 89 miles from Chosa to empty into Korea Strait. Small steamers can navigate in the lower reaches, and small craft can ascend to the head of navigation at Chosa. Traffic consists mainly of agricultural products which can be transshipped at Hadong, Haep'yong, and Chosa.

The Naktong-gang, the longest navigable waterway in the southern part of South Korea, flows generally west, south, then eastward for 209 miles from Andong to the maritime port of Pusan. Navigation is affected by tidal rises in the lower reaches which allow craft of 16-ton capacity to ascend 34 miles; small craft can navigate the remaining 155 miles to Andong. Transshipment can be accomplished at Sammangjin, Moraedong, Waegwan-ni, and Andong.

Except for maritime ports situated on river estuaries, transshipment facilities on the inland waterways consist generally of small, undeveloped landings that are used by flat-bottomed rivercraft and junks. Cargo is usually worked by hand. There are no locks on the waterways.

Freight transported on waterways consists of general cargo, foodstuffs and other consumer goods, agricultural produce, and firewood. Both oceangoing coasters and small craft handle a moderate volume of passenger traffic. Inland waterway transport operations are generally irregular and unregulated and have continued to diminish in importance as competing modes of transport have developed.

Inland waterway traffic is restricted by the flooding that comes with the heavy rainfall of June, July, and August, and by ice from December to early March. Typhoons may affect inland waterway transport in the late summer and early autumn. Significant waterway usage is limited to the lower reaches as an adjunct to maritime activity.

Types of vessels in use on inland waterways include small coasters, launches, sail and motor junks, sampans, and barges. Junks, the most widely used craft, have capacities generally of 1 to 20 tons and drafts of 1.5 to 6 feet. A census of inland waterway craft is not available, but the Korean Marine Ship Registry lists 41 steel-hull craft and 5,714 wooden-hull

craft under 20 tons. These craft, in addition to selected vessels of greater tonnage, could be utilized on sections of the waterways.

Major waterway improvements are in progress in the Han-gang basin, including construction of a tidal basin and two navigation locks in the Inch'on area. Current information indicates that a navigable canal may be constructed between the ports of Inch'on and Seoul. Maintenance consists of control of sedimentation and removal of silt in the lower reaches of the larger rivers.

E. Pipelines (C)

The Republic of Korea has a major pipeline system, known as the Trans-Korean Pipeline, extending from near P'ohang, on the southern east coast, to Seoul. Begun in early 1969 and completed in 1971 by the U.S. Army Corps of Engineers, the pipeline is owned and operated by the U.S. Army. It supplies major U.S. installations throughout Korea with diesel and jet fuel, and gasoline which had previously been delivered by truck and rail. The pipeline is 258 miles long and passes through Waegwan-ni, Taejon, P'yongt'aek, Osan, and Suwon, with terminals near P'ohang, Waegwan-ni, Taejon, P'yongt'aek, and Seoul. The underground pipeline is 10 inches in diameter from P'ohang to Osan and 8 inches in diameter from there to Seoul. It is capable of delivering between 40,000 and 50,000 barrels a day. In May 1971, agreements with Gulf and Caltex Oil Corporations were signed to allow these companies to lease excess line capacity. A branch line is under construction to link the Korea Oil Company installation near Ulsan with the Trans-Korea Pipeline at Waegwan-ni.

Other pipelines in South Korea are of relatively minor importance, with the exception of a 6-inch pipeline, about 20 miles in length, connecting Inch'on and Seoul.

F. Ports (S)

The peninsular position and mountainous terrain of South Korea and the lack of a fully integrated and efficiently operated inland transportation system have forced the country to depend, to a large degree, on sea transportation and ports to handle both domestic and international commerce. The ports also support the island trade and the relatively large fishing industry which supplements the predominantly agricultural economy with food for domestic use and export. The port system was largely developed by the Japanese during that country's occupation of Korea, and since the end of World War II individual ports have been further developed, primarily with U.S. assistance. The heavy damage inflicted on some ports during the Korean war has been largely repaired. The system is considered adequate for normal peacetime needs; for wartime use, however, only Pusan and Chinhae have more than limited capability.

There are 16 major ports, nearly equally divided along the three coastal segments, and 18 minor ports—14 along the south and east coasts, 3 on the island of Cheju-do about 50 miles south of the mainland, and 1 on the west coast. The largest of the major ports, Inch'on and Pusan, accommodate oceangoing vessels and are important centers of transportation, receiving military and economic assistance cargoes as well as handling commercial cargoes. Chinhae is the site of a naval base. The remainder of the major ports—Kunsan, Mukho, Mukhojin-ni, Mokp'o, P'ohang (Figure 7), Ulsan (Figure 8), and Yosu—and the minor ports serve the coastal shipping trade, the fishing industry, and the agricultural regions in which the ports are located. Since the end of World War II receipts have far exceeded shipments. Storage facilities are concentrated primarily in the port cities.

The Marine Bureau of the Ministry of Transportation administers all the ports except Chinhae, which is controlled by the navy. The U.S. Army and the ROK Army jointly operate, with the Marine Bureau, their facilities at Inch'on and Pusan.

Some development is being undertaken in several of the ports. A three-phase improvement plan for Inch'on was started in 1966. The first phase entails lock construction between two islands; the second phase involves construction of a tidal basin (Figure 9); and the third phase provides for the closing of the present entrance. At Pusan (Figure 10), studies are being made for the purpose of expanding and modernizing the port facilities to accommodate deeper draft vessels. In several other ports, dredging is being carried out to deepen access channels and to maintain existing depths. Details of the major ports are tabulated in Figure 11.

The 18 minor ports are Cheju, Chonghae-ri (near Samch'ok), Chukpyon, Chumunjin, Ch'ungmu, Haemuhae, Hup'o-ri, Kamp'o, Kunggu, Kuryonggi'o-ri, Pangojin-hang, Samch'nop'o, Sokch'o, Sogwi-ri, Songp'o, Songsan-ni, Taehyon, and Wonwonjong.

G. Merchant marine (C)

Merchant shipping is of paramount importance to the Republic of Korea whose economic development and survival depend on international seaborne trade. Despite heavy reliance on maritime transport, the merchant fleet capacity has not kept pace with the country's rapid growth in foreign trade. In 1971, South Korean-flag ships carried only about 6.9 million tons (27%) of the country's total international seaborne

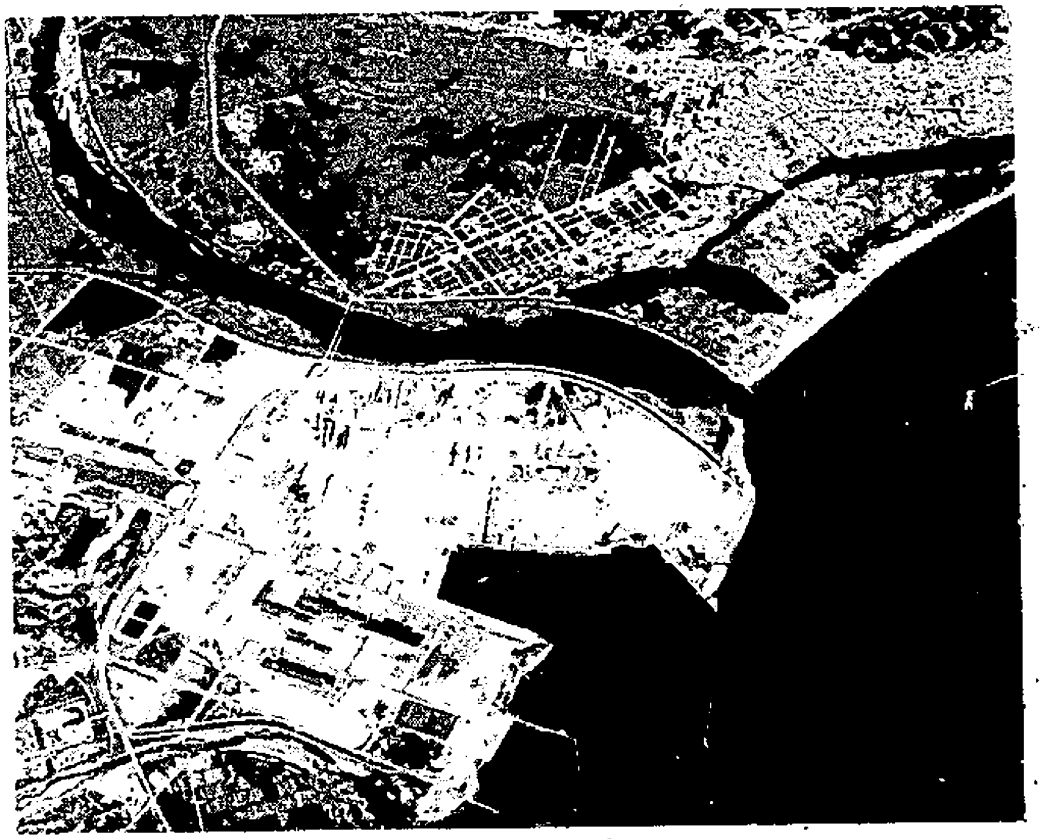

FIGURE 7. The port of P'ohang on the mouth of the Hyongsan-gang has a harbor area protected by breakwaters. The new port facilities, begun in 1968, will serve the iron and steel mill (dark roofs near the harbor). (U/OU)

trade of about 26.2 million metric tons. However, during 1971 the merchant fleet earned US$33 million in foreign exchange through its employment in crosstrades between foreign countries.

In October 1972, the merchant fleet consisted of 126 ships of 1,000 gross register tons (g.r.t.) and over totaling 934,323 g.r.t. or 1,543,053 deadweight tons (d.w.t.), as follows:

Type	No.	G.R.T.	D.W.T.
Dry cargo	81	340,340	520,658
Tanker	24	386,615	698,000
Bulk cargo	12	168,033	270,487
Combination passenger-cargo	2	12,109	14,098
Cement carrier	3	10,902	16,336
Chemical carrier	2	8,351	12,909
Timber carrier	2	8,070	12,565
Total	126	934,323	1,543,053

South Korean-flag ships are characteristically small and slow. About 55 of the total fleet deadweight tonnage (48 ships) is less than 10 years old, about 30% (38 ships) is 10 to 19 years old, and about 25% (40 ships) is 20 years or older. There are 87 ships (about 28% of the total fleet d.w.t.) under 10,000 d.w.t., 28 ships (about 25% of the d.w.t.) are between 10,000 and 19,999 d.w.t., and eight ships (about 23% of the d.w.t.) are between 20,000 and 55,000 d.w.t. The largest ships are three tankers ranging between 120,000 and 153,300 d.w.t. Eighty-nine ships have normal operating speeds of less than 14 knots, 33 have speeds of 14 to 17 knots, and four dry-cargo ships have speeds of 18 knots and over. A total of 105 ships use diesel power; 18 have oil-fired boilers, and three have coal-fired boilers.

FIGURE 8. The rapidly expanding port of Ulsan has many sections along the harbor that have been reclaimed for increased berthing facilities, industrial use, and POL storage (U/OU)

FIGURE 9. The port of Inch'on has a tidal basin under construction, and land shown at left center and at lower right has been reclaimed. Locks are under construction at the harbor entrance. (U/OU)

Fleet ownership is divided among 38 government and private domestic beneficial owners (entities which assume profit or loss from operations). The five largest owners, each with more than 100,000 d.w.t., control more than 70% of the total fleet deadweight tonnage as follows: the joint government private enterprise, Korea Shipping Corporation, Ltd.—KSC (25 ships, 214,249 d.w.t.); and four privately owned shipping companies—Samyang Navigation Co., Ltd. (three ships, 373,850 d.w.t.); Pan Ocean Bulk Carriers, Ltd. (nine ships, 215,529 d.w.t.); Korea United Lines, Inc. (seven ships, 132,360 d.w.t.); and Far Eastern Marine Transport Co., Ltd. (five ships, 130,332 d.w.t.).

Three private beneficial owners of South Korean-flag ships also own a total of six ships of about 30,000 d.w.t. under Panamanian flag. In addition, there are four South Korean nationals with a total of five ships totaling about 34,000 d.w.t. under Panamanian and Liberian registry.

The oceangoing merchant fleet operates in scheduled (liner) and nonscheduled (tramp) service. KSC and Far Eastern Marine Transport Co., Ltd.,

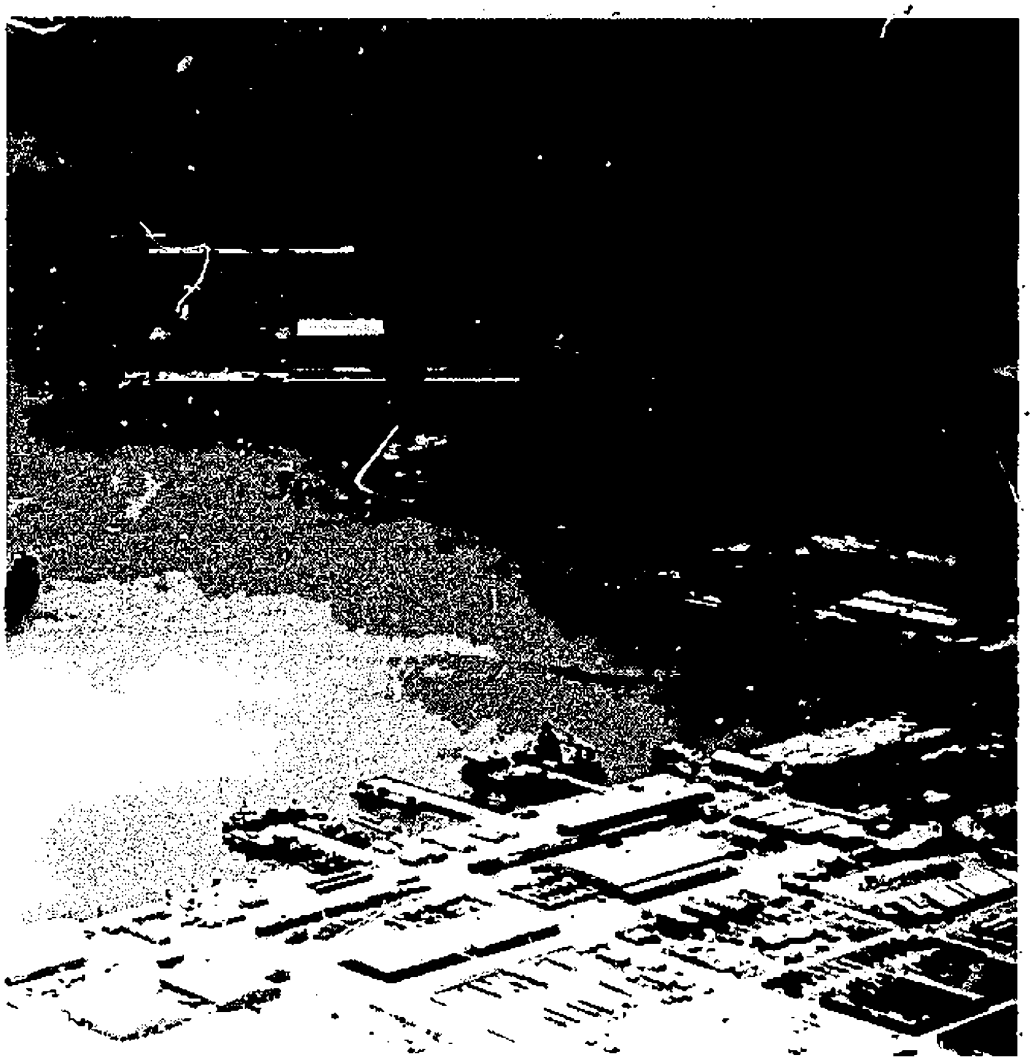

FIGURE 10. Main wharves and port facilities along west side of north inner harbor at Pusan (U/OU)

maintain liner service between the Republic of Korea and the east, west, and gulf ports of the United States, and ports in Far Eastern and Southeast Asian countries including Japan, Taiwan, Hong Kong, Singapore, Malaysia, and Thailand. Samwang Navigation Co., Ltd., and Pan Ocean Bulk Carriers, Ltd., with a combined fleet of 12 oil tankers totaling 619,379 d.w.t., and Korea United Lines, Inc., with 7 bulk carriers totaling 132,360 d.w.t., are engaged primarily in worldwide tramp operations.

The government, through a series of 5-year economic development plans, has supported a progressive fleet development program. The Second Five Year Plan (1967–71) allocated funds for the acquisition of a large number of foreign-built used ships available on easy credit terms and foreign-built new ships financed with foreign credits. During this period, the fleet was increased from 58 ships of 153,200 d.w.t. to 116 ships of 1,453,800 d.w.t.—an average annual increase of 200,320 d.w.t. This growth

FIGURE 11. Principal ports (C) (*Continued*)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY[a]	ACTIVITIES	HARBOR	BERTHS
Inch'on 37°25'N., 126°38'E., on estuary of Som-ha 22 miles W. of Seoul. 5,000; 7,000 supplemental	Second largest port in country; principal maritime terminal for Seoul; major storage area for U.S. military materiel; one of the largest POL terminals. Shipments—agricultural products. Receipts—general cargo, coal, and POL products. Naval station in Inner Harbor provides operational and logistic support to naval craft in area; several small boatyards in port.	Improved river, consists of Outer Harbor and Inner Harbor; water area 9[b] square miles; controlling depth in Outer Harbor 35 feet; controlling depth in entrance to Inner Harbor 10 feet (31 feet at high water). Inner Harbor entrance protected by breakwater. Controlling depth over sill of wet dock in Inner Harbor 25 feet. Tidal rises: MHWS 28.9 feet, MHWN 21.7 feet, MLWS 9.5 feet, MLWS 2.1 feet.	Alongside—For 9 small ocean-type cargo vessels, 2 standard and 1 small coaster-type cargo vessels, 4 large and 1 standard ocean-type tankers (offshore pipeline). Anchorage—For numerous vessels of all classes in Outer Harbor and in river estuary downstream of port.
Pusan 35°06'N., 129°03'E., on S. coast. 17,500	Provincial capital, second largest city, commercial center, and largest port in the country; important shipbuilding and ship repair center. Shipments—agricultural and mineral products. Receipts—lumber, cement, petroleum, military supplies, and manufactured goods. Small naval base provides limited logistic support to patrol craft; site of merchant marine academy; shipyard capable of major repairs of all kinds; largest graving dock 480 feet long.	Improved natural, comprised of 4 sections; water area 9 square miles. Controlling depth in North Inner Harbor entrance 31 feet, and in South Inner Harbor entrance 12 feet. Inner Harbor area protected by surrounding terrain and by breakwaters. Tidal rises: MHWS 4.0 feet, MHWN 2.8 feet, MLWN 0.7 foot, MLWS 0.1 foot.	Alongside—For numerous large and standard ocean-type cargo vessels, several small ocean-type cargo vessels, several standard coaster-type cargo vessels, numerous small coaster-type cargo vessels, numerous lighters, and 2 standard ocean-type tanker. Anchorage—For numerous vessels of all classes, in two outer harbors.
Chinhae 35°08'N., 128°40'E.; on S. coast 20 miles W. of Pusan. 5,000	Principal naval operating, training, and repair base; provides operational and logistic support to fleet; site of naval academy; other components include ordnance, communications, and medical facilities; shipyard engages in repair of South Korean naval vessels.	Improved natural; coastal; comprised of Inner Harbor and Outer Harbor; area 135 acres. Controlling depth in Inner Harbor 18 feet, controlling depth in Outer Harbor 35 feet. Inner Harbor protected by breakwater and land. Tidal rises: MHWS 6.4 feet, MHWN 4.7 feet, MLWN 2.2 feet, MLWS 0.3 foot.	Alongside—For 3 destroyers, numerous ocean and coastal minesweepers, motor torpedo boats, and 2 gasoline tankers. Fixed mooring—For 2 escort vessels. Free-swinging mooring—For 1 light cruiser, several frigates, 1 destroyer, 1 escort vessel, and several ocean minesweepers. Anchorage—For numerous naval vessels of all classes.
Kunsan 35°59'N., 126°43'E., on Kum-gang estuary 100 miles S. of Inch'on. 2,200	Important maritime terminal for W. coast agricultural region. Shipments—agricultural products. Receipts—grain, coal, fertilizer, salt, and lumber. No naval activities. Shipyards engage in minor above-water repairs to large vessels; also, repair and construction of barges and small craft.	Improved natural river; 2 sections formed by 2-mile stretch of river between Kunsan and Changhang. Controlling depth over bar in outer harbor fairway 7 feet (21.7 feet MHWN); inner harbor fairway depths 13-30 feet. Tidal rises: MHWS 20.5 feet, MHWN 15.7 feet, MLWN 5.7 feet, MLWS 0.9 foot.	Alongside—For several small ocean-type cargo vessels, 1 lighter and 1 standard coaster-type tanker. Anchorage—For numerous coaster-type cargo vessels in outer harbor.
Masan 35°11'N., 128°34'E., on S. coast 25 miles W. of Pusan. 7,000	Distribution center for large agricultural area. Shipments—marine products. Receipts—grain, fertilizer, and coal. No naval activities. Shipyards for building and repair of small craft.	Natural, coastal; water area 6 square miles. Controlling depth imposed by depth of 21-feet alongside wharves; natural protection to NW. and S. Tidal rises: MHWS 6.4 feet, MHWN 4.6 feet, MLWN 2.2 feet, MLWS 0.3 foot.	Alongside—For 2 standard ocean-type cargo vessels, 1 small ocean-type cargo vessel, 4 small coaster-type cargo vessels, and 33 lighters. Anchorage—For 8 ocean-type cargo vessels and 30 coaster-type cargo vessels in harbor.

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Mokp'o..... 34°47'N., 126°23'E.; near SW. corner of Korea 150 miles W. of Pusan. 750; 750 supplemental	Commercial and maritime center of region. Shipments—agricultural and fish products. Receipts—general cargo. Small naval marine facility provides limited logistic support to patrol craft. Six shipyards engage in the repair of small craft.	Improved river, 2-mile stretch of Yongsan-gang estuary. Controlling depth imposed by 31-foot depth and 555-foot length alongside wharves; natural protection, well sheltered. Tidal rises: MHWS 12 feet, MHWN 9 feet, MLWN 3.4 feet, MLWS 0.9 foot.	Alongside—For 1 standard ocean-type cargo vessel and 4 motor torpedo boats. Fixed mooring—For 1 standard ocean-type cargo vessel. Anchorage—For 6 ocean-type and 3 coaster-type cargo vessels in harbor.
Mukhojin-ni..... 37°33'N., 129°07'E.; on E. coast 160 miles N. of Pusan. 3,500	Important coal shipping port. Other shipments—graphite and cement. Receipts—general cargo. Small naval station. Three shipyards engage in repair of small craft.	Improved natural, coastal; water area 110 acres. Controlling depth imposed by 31-foot depth alongside wharves. Protected by breakwaters E. and S. Tides negligible.	Alongside—For 2 large, 1 standard, and 1 small ocean-type cargo vessels and 19 lighters. Fixed mooring—For several small ocean-type cargo vessels. Anchorage—For 3 small ocean-type cargo vessels in free-swinging berths within harbor and for numerous vessels of all classes in exposed berths outside breakwaters.
P'ohang..... 36°02'N., 129°22'E.; on E. coast 90 miles N. of Pusan. 5,600	Most important fishing port on E. coast. Shipments—fish and agricultural products. Receipts—general cargo. No naval activities; 4 shipyards engage in repair of small craft.	Improved inlet; water area 57 acres. Controlling depth 15 feet over bar in approach to inner harbor, 47 feet in outer harbor; breakwater protected. Tides negligible.	Alongside—For 32 lighters and 1 large ocean-type tanker (offshore pipeline). Anchorage—For numerous vessels of all classes.
Ulsan..... 35°30'N., 129°23'E.; on E. coast 30 miles N. of Pusan. 6,200; 2,000 by lighters	Third ranking port on E. coast next to Pusan and P'ohang; important POL center. Shipments—POL and coal. Receipts—POL and general cargo. No naval or shipyard activities.	Natural, coastal; water area 1 square miles. S. half of harbor not limited by length or draft; N. half limited by fairway depth of 35 feet; outer harbor depth 70 feet; natural protection except from S. Tidal rises: MSWS 2.0 feet, MHWN 1.7 feet, MLWN 0.4 foot, MLWS 0.2 foot.	Alongside—For 2 large and 2 standard ocean-type cargo vessels, 1 small coaster-type cargo vessel, 18 lighters, 1 large ocean-type tanker, 5 standard coaster-type tankers, 1 representative sound- and river-type tank barge, and 2 large ocean-type tankers (offshore pipeline). Anchorage—For 1 large passenger vessels, 16 ocean-type cargo vessels, and numerous coaster-type cargo vessels.
Yosu..... 34°44'N., 127°45'E.; on S. coast 75 miles WSW. of Pusan. 6,000; 3,000 by lighters	Alternate port for Pusan; large fish processing center. New POL terminal and refinery 7 miles N. of port. Shipments—POL and agricultural and marine products. Receipts—grain, coal, and fertilizer. No naval activities. Six shipyards engage in building and repair of small vessels.	Improved natural, coastal; water area 450 acres. Controlling depth in North Harbor 24 feet, in South Harbor 33 feet. North Harbor protected by 3 breakwaters and causeway. Tidal rises: MHWS 10.8 feet, MHWN 7.8 feet, MLWN 3.9 feet, MLWS 0.9 foot.	Alongside—For 2 standard and 3 small ocean-type and 2 small coaster-type cargo vessels, 41 lighters. At POL terminal—1 large ocean-type tanker (offshore pipeline berth), 1 small ocean-type tanker and 2 standard coaster-type tankers at pier. Anchorage—For numerous ocean-type and coaster-type cargo vessels in harbor; numerous berths for all classes in roadstead.

*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.

rate compares favorably with the maritime fleets of the more progressive developing nations, such as India and Taiwan. During the Third Five Year Plan (1972-76) a total of 1.2 million g.r.t. or 1.9 million d.w.t. of ship tonnage is scheduled to be added to the fleet. A bilateral shipping agreement with Japan was to be concluded in late 1972, in which South Korea would receive $50 million in shipbuilding credits to finance ship imports from Japan. The Ministry of Transportation plans to use this credit to acquire 20 ships ranging between 4,000 and 10,000 d.w.t. to bolster the merchant fleet. As of August 1972, six ships totaling 36,510 d.w.t for South Korean registry were on order with delivery scheduled between 1972 and 1973. Included are four dry-cargo ships (one 4,000 d.w.t. one 3,450 d.w.t., and two 2,500 d.w.t. each) to be constructed in Japanese shipyards, and one 18,600-d.w.t. bulk carrier and one 5,460-d.w.t. tanker to be constructed in a domestic shipyard. New ship construction contracts with foreign shipyards for South Korean account which are pending or under negotiation total 18 ships aggregating 1,730,000 d.w.t. (eight 200,000-d.w.t. tankers and ten 15,000-d.w.t. dry-cargo ships).

The fleet consists of 83 used ships and 43 ships acquired new. Only 12 new ships, ranging between 1,600 and 6,000 d.w.t., were built in domestic yards. South Korea's reliance on foreign shipyards for the bulk of its fleet tonnage requirements involves a substantial expenditure of foreign exchange. To partially offset this foreign-exchange drain, the government has provided funds to finance expansion of facilities at the government-controlled Korean Shipbuilding and Engineering Corporation (KSEC) at Pusan, permitting construction of ships up to 100,000 d.w.t. Currently under construction at KSEC are six tankers ranging between 20,000 and 50,000 d.w.t. for foreign-flag interests and a 18,600-d.w.t. bulk carrier for Pan Ocean Bulk Carriers, Ltd., a domestic shipowner. In addition, the new Hyundai Shipyard at Ulsan, being built in collaboration with European financial interests, will begin construction in early 1973 of two 259,000-d.w.t. tankers scheduled for delivery in 1974. Although these tankers are for foreign-flag interests, it is envisaged that tankers of comparable tonnage for domestic account will be constructed at this shipyard.

With a coastline of about 1,500 miles, coastal shipping is essential to the nation's economy, and it serves as an adjunct to relieve the heavy burden placed on land modes of transportation. Foreign-flag ships are permitted to carry the country's coastal trade only when domestic ships are not available; most of this trade is carried by South Korea's merchant ships. Of the ships employed in the coastal trade, about 65 domestic ships, utilized primarily in coastal shipping and nearseas trade with Japan and Taiwan, are between 100 and 999 g.r.t. and total about 32,800 d.w.t.

In 1970 the fishing fleet consisted of more than 50,000 craft totaling more than 230,000 g.r.t., and included 8,500 motorized units. As of January 1972, the nation's worldwide oceangoing fishing fleet consisted of 340 vessels totaling 102,000 g.r.t. A total of 148 vessels of 39,000 g.r.t. are government controlled.

Jurisdiction over maritime matters is exercised by the Ministry of Transportation through the Marine Bureau, which consists of the Administration and Marine Affairs Offices. South Korea is a member of the Inter-Governmental Maritime Consultative Organization (IMCO) and a party to the following IMCO conventions: Safety of Life at Sea, 1948 and 1960; Prevention of Collisions at Sea, 1960; and Load Lines, 1966.

Government maritime policy advocates a viable, modern merchant fleet capable of carrying a larger proportion of the nation's total seaborne trade in order to conserve foreign exchange and to lessen dependence on foreign shipping. In consonance with this aim, KSC, the national shipping line, has strong government support in its bid to become a member of the Japan-Europe Freight Conference and to carry an equitable share of import-export cargoes between South Korea and Europe. These cargoes, which are being carried exclusively by foreign-flag shipping, account for annual foreign exchange expenditures of US$30 million in freight payments.

Although no direct operating subsidies are provided shipowners, the government extends loans at reduced rates for the acquisition of new and used ships from abroad. The government-controlled KSEC and privately owned shipyards are eligible for low-interest government loans, and shipbuilding equipment and materials are exempt from customs duty.

In late 1970 there were about 32,000 South Koreans registered for employment with the Maritime Union of the Federation of Korea Trade Unions (FKTU). This large number of registered nationals far exceeds domestic and foreign demand. More than 4,600 nationals are employed aboard domestic-flag ships and a considerable number serve on foreign-flag ships. Compared to European standards, South Korean seafaring wages and compensation are low; however, maritime employment is attractive because of certain fringe benefits.

The Merchant Marine College at Pusan offers officer candidates a 4-year course consisting of 3 years of classroom work and 1 year of practical training aboard ship. Graduates are commissioned in the navy or marine reserve and are obligated to spend 2 years on active duty in the navy or aboard designated merchant ships. In addition to receiving a B.S. degree, graduates are licensed as Class "A" deck or engineering officers under the Ship Crew Law. Two training ships, the 1,300-g.r.t. Hanbada and the 630-g.r.t. Gunnyong, are maintained for shipboard instruction. Because of their skill in seamanship, South Korean seamen are sought for employment aboard foreign-flag ships.

H. Civil air (C)

Though still in the early stages of development, civil aviation is very significant. The small size of the country and the fact that both rail and highway systems reach most of the major mainland cities and towns have tended to minimize the need for an extensive civil air network. However, government needs and increasing commercial activities have begun to make the speed and flexibility of civil aviation valuable supplements to the other forms of transportation. In addition, air transportation provides an instrument for promoting and maintaining international relationships, national defense, political integration, and cultural interchange. The island of Cheju-do, about 50 miles off the southern coast, depends heavily on air services as the only speedy connection with the mainland. Civil air also serves the growing tourist trade now being encouraged by the government.

Civil aviation is provided for and regulated under the Ministry of Transportation, which is charged with responsibility for development, maintenance, and operation of air traffic control and air navigation systems of South Korea and those areas for which the government has accepted responsibility by virtue of international agreements. The Civil Aviation Bureau (CAB) has the essential responsibilities which relate to a staff function for the Ministry of Transportation. The CAB is presently organized into four divisions: Aviation Affairs, Flight Operations, Civil Engineering, and Communications and Electronics. The Republic of Korea Airspace Committee (KAC), established in 1965 by agreement between the Ministries of Defense and Transportation and U.S. Forces Korea, is responsible for airspace actions, air traffic control, and safe navigation. The KAC is chaired by a representative of the Ministry of Transportation and includes one member each from the ROK Air Force, ROK Army, United Nations Command/United States Forces Korea, U.S. Air Force Korea, and the U.S. Army.

There are 19 major transports in the 20,000-pounds-or-greater gross weight category. Korean Air Lines (KAL), owned by the Hanjin Transportation Co., is the international flag carrier and the principal scheduled domestic air carrier. Of the 19 major transports registered in the country, 17 are owned by KAL (2 Boeing 707s, 2 Boeing 720s, 3 Fokker F-27s, 1 Lockheed, 2 Douglas DC-3/C-47s, 1 Douglas DC-4, 2 Douglas DC-6s, and 4 NAMC YS-11s); the carrier also leases 2 Fokker F-27s, 2 Fairchild F-27s, 3 NAMC YS-11s, and 1 Boeing 727. One additional Boeing 727 was to be leased from Japan Air Lines during November 1972 and another at a later date. KAL has on order 2 Boeing 747 freighters (scheduled for delivery during 1973-74), 1 Boeing 727, and 1 Douglas DC-9. The 2 major transports not owned by KAL are a DC-3 owned by Far East Airways and a C-47 owned and operated by the Ministry of Transportation. In addition to the large transports, approximately 50 small aircraft are operated by the Ministry of Transportation, the Ministry of Education, the National Aviation School, air work companies, and various private operators, including newspaper companies. These aircraft include Beech, Stinson, Cessna, and Aeronca types, plus several Hughes and Bell helicopters.

KAL serves eight foreign cities and 12 cities within South Korea. The foreign cities include Tokyo, Hong Kong, Bangkok, Taipei, Fukuoka, Osaka, Los Angeles, and Honolulu. In addition to the flights conducted by KAL, several small air operators provide limited scheduled domestic services and nonscheduled and charter flights; among the more important of these is Far East Airways, which operates one DC-3 and several small aircraft. The government is promoting a plan to open a new flight service to Europe which could materialize in 1973. A bilateral aviation agreement is being planned with France and certain Scandinavian countries, as well as with Great Britain and Australia.

The domestic network of civil air carrier routes connects every major South Korean population center. Beginning in 1974, plans call for air routes which would connect the larger cities with the small and medium sized ones, and also join inland areas with remote islands. The ultimate goal would be to reduce the whole area of the country to one-day air travel time. If planning goes well, South Korea will have a fully developed civil air transportation system, both

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for freight and passengers, during the latter half of the 1970's. Domestic service will provide the major thrust of aviation development well into the first half of the 1970's. The number of domestic airline passengers and the quantity of cargo (domestic) are expected to maintain high levels of annual growth during the next two decades, although at a fairly lower rate than for the past few years. KAL, along with the smaller airlines of the country, flew about 8,880,000 miles during 1970 (the latest date of information). In 1971, a total of 1,105,000 domestic and 408,000 international passengers were carried; for the first five months of 1972, 437,000 domestic and 257,000 international passengers were carried.

South Korea is a member of the International Civil Aviation Organization and is signatory to the principal international conventions on civil aviation. The government has entered into formal and informal civil air agreements or arrangements sanctioning the exchange of scheduled air services with 10 countries: the United States, Japan, Great Britain, South Vietnam, Thailand, Malaysia, the Philippines, Singapore, the Netherlands, and Taiwan. Japan Air Lines, Northwest Orient Airlines, Cathay Pacific, and China Airlines conduct around 50 flights per week into South Korea.

As of late 1971, an estimated total of 2,450 personnel were engaged in civil aviation activities. The figure includes an estimated 1,950 personnel employed by KAL, 15 by Far East Airways, and the rest by miscellaneous air operators, as well as those engaged in government and nongovernment activities. The approximate breakdown of the total number of skilled aviation personnel shows 300 pilots, 550 skilled mechanics, and 1,600 supporting personnel.

The South Korean Air Force is still believed to be the major source of skilled aviation personnel for KAL. The National Aviation School, located just north of Seoul, is thought to be the principal civil aviation facility for training purposes. Courses are offered in communications, aircraft maintenance, engine maintenance, air traffic control, flight training, aeronautical electronic engineering, and administration. Training is provided by KAL for its own flight and maintenance personnel. Several aeroclubs are available for the training of private pilots.

South Korea has no separate facilities for major overhaul or repair of civil aircraft. Major overhaul of KAL aircraft, formerly accomplished outside of the country, is now performed at the ROK Air Force Maintenance Depot at Taegu on a space-available basis. This installation also does maintenance and repair work on the aircraft of some of the small airlines and private companies. Routine, limited maintenance is performed by KAL at Kimpo International airport near Seoul. The Korea Aircraft Service Co., Ltd., located at Kimpo International airport, provides both domestic and foreign aircraft with ground handling and refueling services.

I. Airfields[2] (C)

The air facilities system of South Korea consists of 126 airfields, 136 airfield sites, and 2 seaplane stations. Of the airfields, 105 are military, 2 joint civil/military, and 19 are civil. There are no private airfields within the country.

The greatest concentration of airfields is within an area about 50 miles wide which is parallel to and south of the Demilitarized Zone. The remaining airfields are scattered along river valleys and coastal areas.

Of the 10 major airfields, 2 (Kwangju and Kimpo International) are used jointly by civil and military aircraft. Pusan International is a civil airfield. Kangnung, Kimhae AB, Kunsan AB, Osan AB, Seoul AB, Suwon, and Taegu International are military airfields. Details of 16 selected airfields are given in Figure 12.

There are 50 hard-surfaced airfields in South Korea: 4 are in poor condition, 10 are in fair condition, and 36 are in good condition. Twenty-eight of these airfields have runways with lengths in excess of 4,000 feet and can accommodate C-119 aircraft, or larger.

The major airfields have good link, parallel, and perimeter-type taxiways, the minor airfields contain, at most, only link-type taxiways.

Cargo-handling capabilities at the major airfields are good, but at minor airfields are limited or nonexistent. As the mission of the air facilities system is primarily military, civil airline operations are available at only a few of the major airfields.

Of the 67 temporary-surfaced airfields, 5 are in poor condition, 43 are in fair condition, and 19 are in good condition. All of the foregoing airfields are capable of supporting liaison and light logistical field operations.

Approximately 30% of the 136 airfield sites could undergo some form of rehabilitation; the remaining 70% of the sites are no longer recognizable as airfields. The two seaplane stations, Chinhae and Chinhae South, have limited support facilities and are usable in an emergency.

[2]For detailed information on air facilities in South Korea see Volume 20, *Airfields and Seaplane Stations of the World*, published by the Defense Mapping Agency Aerospace Center for the Defense Intelligence Agency.

FIGURE 12. Selected airfields (C)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA LEVEL	ESWL*	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	Feet	*Pounds*		
A-511 38°58'N., 127°02'E.; SW. of P'yongt'aek.	Asphalt 6,030 x 150 45	35,500	C-130	Military. Used by U.S. Army Aviation and jet fuel available.
Cheju International 33°30'N., 126°30'E.	Asphalt 5,200 x 100 68	35,500	Lockheed 382B	Civil. International airport. Used by Korean Air Lines (KAL)
Kangnung 37°45'N., 129°57'E.	Asphalt 7,410 x 100 18	50,893	C-121	Military. Used by KAL. Aviation and jet fuel available.
Kimhae AB 35°11'N., 128°56'E., NW. of Pusan.	Concrete 9,000 x 150 12	50,893	do	Military. ROK Air Force (ROKAF) primary training school. Aviation fuel available.
Kimpo International 37°33'N., 126°48'E.; W. of Seoul.	Asphalt 10,500 x 150 61	60,560	C-141	Joint. International airport. Aviation and jet fuel available.
Kunsan AB 35°54'N., 126°37'E.	Concrete 9,000 x 150 32	65,100	do	Military. USAF and ROKAF jet fighter base. Aviation and jet fuel available.
Kwangju 35°07'N., 126°40'E.	Concrete 9,300 x 150 42	65,100	do	Joint. ROKAF jet fighter base. Aviation and jet fuel available.
Osan AB 37°05'N., 127°03'E.; N. of P'yongt'aek.	Concrete 9,000 x 150 33	65,100	do	Military. PSAF jet fighter base. Aviation and jet fuel available.
Pohang 35°59'N., 129°23'E.	Asphalt 6,500 x 150 66	35,500	C-130	Military. ROK 1st Marine Division. Aviation fuel available.
Pusan International 35°10'N., 129°08'E.	Asphalt 6,600 x 150 6	35,500	Lockheed 382B	Civil. International airport. Used by KAL. Aviation and jet fuel available.
R-813 35°08'N., 128°42'E.; 8°S of Chinhae.	Asphalt 4,150 x 150 8	35,500	C-130	Military. Location of ROK Army Transportation School. Aviation fuel available.
Sachon 35°05'N., 128°05'E.	Concrete 4,920 x 197 25	4,470	U-21	Military. ROK Army airfield. Aviation and jet fuel available.
Samchok 37°30'N., 129°08'E.; E. coast adjacent to Songjong-ni.	Asphalt 4,274 x 100 8	83,000	Lockheed 382B	Civil. Used by KAL. Aviation fuel available.
Seoul AB 37°31'N., 126°56'E.	Concrete 8,600 x 150 67	60,100	C-121	Military. Headquarters of ROKAF Flight Squadron. Aviation and jet fuel available.
Suwon 37°14'N., 127°01'E.; S. of Seoul.	Concrete 9,000 x 150 86	65,100	C-141	Military. ROKAF jet fighter base. Aviation and jet fuel available.
Taegu International 35°53'N., 128°40'E.	Concrete 9,038 x 150 116	65,100	do	Military. International airport. ROKAF jet fighter and training base. Used by KAL. Aviation and jet fuel available.

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

Maintenance of the major airfields is good but that of the minor airfields is inadequate. Servicing and support facilities at most airfields are adequate for the individual airfield operations performed.

New airfield construction is in progress at Seoul AB. Major rehabilitation construction is taking place at Kunsan AB, Kimhae AB, Kwangju, Osan AB, Pohang, K-813, Suchon (completion scheduled for 1974), and Taegu International. Five portions of the hard-surfaced highways have been marked off and delineated as highway strips; more are being contemplated. Some minor airfields are undergoing minor extension and resurfacing.

J. Telecommunications (C)

Most telecommunication (telecom) systems are government owned and operated although separate facilities associated with public and special-purpose networks are frequently interconnected. The civil system is capable of providing essential services for the administration, the general public, and industry. A well-developed defense system connects with the civil system and substantially increases the overall telecom capability. Radio relay and underground cable represent the principal intercity circuits. Small towns and some rural areas are served by open-wire lines, but some areas have no telecom service. Radiocommunication stations and a communications satellite station (Figure 13) maintain circuits for international service and for some domestic communications. Adequate broadcast coverage is afforded by radio, TV, and wired facilities.

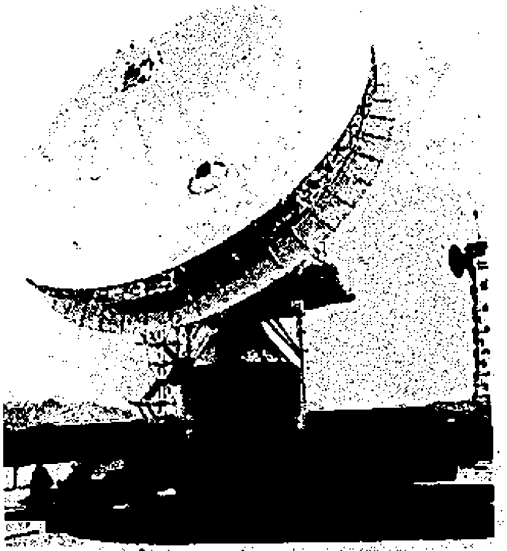


FIGURE 13. Ground station at Kunsan for the satellite communications system dedicated in June 1970 (U/OU)

The Ministry of Communications has the responsibility for providing both domestic and international telephone and telegraph service. The Ministry of Culture and Public Information oversees radio and TV broadcasts. Government agencies which control and operate key special-purpose telecom facilities include the Ministry of Transportation, the Ministry of National Defense, and the national police.

South Korea is a member of the International Telecommunication Union (ITU) and the International Telecommunications Satellite Consortium (INTELSAT). The recently inaugurated Korean Broadcasting Corporation (KBC) replaced the government-financed Korean Broadcasting System (KBS) which was a member of the Asian Broadcasting Union.

According to government data, in October 1972 domestically owned radiobroadcast facilities consisted of 67 AM and 6 FM stations, located in about 45 towns, which provide adequate coverage over most of the country. U.S. Armed Forces also operate 17 AM and 3 FM broadcast stations. In October 1972 there were about 3.7 million radio receivers, a density of about 11 receivers per 100 persons, which are concentrated in the vicinity of the larger cities. Wired-broadcast installations in 139 centers include about 1.3 million speakers and about 7,300 amplifiers which are located mainly in rural areas to supplement radiobroadcasts. TV broadcasts are transmitted by 27 stations, 16 of which are operated by the Korean Broadcasting Corporation and 11 by private companies. The U.S. Armed Forces also have seven VHF-TV broadcast stations. In April 1973 there were an estimated 1 million TV receivers, or nearly three per 100 persons.

Terrain and climate affect the installation and maintenance of telecom facilities. The mountains in the central and western areas restrict the routing of wire lines and limit radiobroadcast reception; they are, however, ideal radio-relay sites for networks that span the country. High humidity prevails throughout the year along the coastal regions and necessitates tropicalization of electronic equipment.

Modernization and expansion of facilities with financial assistance from the United States and technical guidance and equipment from West Germany continues to improve the system. Telephone switching is provided by automatic and manual exchanges. Total installed exchange capacity is 560,000 lines. Automatic exchanges in 15 cities have a

capacity of 450,000 lines and common battery switchboards have a total of 34,000 lines. Locally produced magneto exchanges have a capacity of about 96,000 lines. The three major telephone exchange areas are in Seoul, Pusan, and Taegu: Seoul has about 20 automatic exchanges which serve over 300,000 telephones; four exchanges in Pusan connect about 61,600 telephones; and two exchanges in Taegu have lines for about 35,000 telephones. The total number of telephones has increased significantly from 421,000 in 1968 to 748,474 in 1972, equating to a ratio of 2.3 telephones per 100 inhabitants, 80% of which are automatic. Most telegraph service is provided by teleprinter equipment connected to automatic exchanges in about 70 cities with a total capacity of about 800 lines. Manual telegraph key is still used in many rural areas. Intercity carrier-equipped, open-wire lines provide three to 12 telephone channels. Multiconductor cables connect Seoul with Inch'on, Munsan-ni, Ch'orwon, Taejon, Taegu, and Pusan.

Two modern radio-relay networks became operational in 1968—the Korean military system consisting of 932 telephone channels, of which 144 are for government use, and the Ministry of Communications civil system, which has 2,200 telephone, 270 telegraph, and 36 program channels, and a duplex TV channel between Seoul and Pusan. The systems are interconnected at four key points and provide high-capacity service throughout most of the country. High-frequency and very-high-frequency radio facilities extend to areas not reached by other means. The former tropospheric-scatter link between Mokp'o and the offshore island of Cheju-do has been replaced by a high-capacity radio relay link.

International telephone and telegraph connections consist of high-frequency radiocommunications to Hong Kong, Japan, Taiwan, the Philippines, South Vietnam, the United States, and West Germany. An international submarine cable link to Japan is no longer operational. A tropospheric-scatter radio link to Japan became operational in May 1968, with a capacity of 120 telephone channels between Muryong-san and Hamada, Japan. A second tropospheric-scatter link was installed in 1970, with a capacity of 300 telephone channels, connecting Chang-san to Fukuoka, Japan. The newly established satellite terminal at Kunsan provides a total of 36 circuits for communication via the Pacific Ocean Satellite to Taiwan, Hong Kong, the Philippines, Hawaii, and the U.S. mainland.

The telecom systems are highly vulnerable because most primary switching centers are concentrated within five cities (Kwangju, Pusan, Seoul, Taegu, and Taejon) all located in the coastal areas, and because of the extensive use of open-wire lines. Interruption at any one of the principal switching centers or landline networks could disrupt regional service. Total disruption is unlikely as alternate routing is available through the combined high-capacity, interconnected civil and military radio-relay systems.

The Third Five Year Plan (1971-76) calls for modernization of the long-distance telephone network, to include: installation of direct-distance dialing, increased number of automatic telephone exchanges, automatic dial circuits, and telex multiplex circuits, and expansion of the military and government radio-relay systems; increased capability for Kunsan satellite station for transmission via the Indian Ocean Satellite; expansion of the railroad telecom system; increased TV and radio-relay broadcast and relay-transmission facilities; and planning for a submarine cable link to Japan.

The electronics industry produces a significant volume of telecom equipment. A large number of native-owned firms assemble products from foreign and local materials and also make some components. Foreign and jointly owned firms specialize in producing components, of which significant quantities are shipped to parent firms in the United States and Japan.

Output of radio and television receivers and telephone equipment is sufficient to satisfy most domestic requirements and permit modest export. Complex equipment, including most of that required for commercial and military use such as radio and television broadcast and radio-relay facilities, is imported. Nearly all of the military and advanced nonmilitary items are obtained from the United States, but significant quantities of more sophisticated nonmilitary products are purchased from Japan.

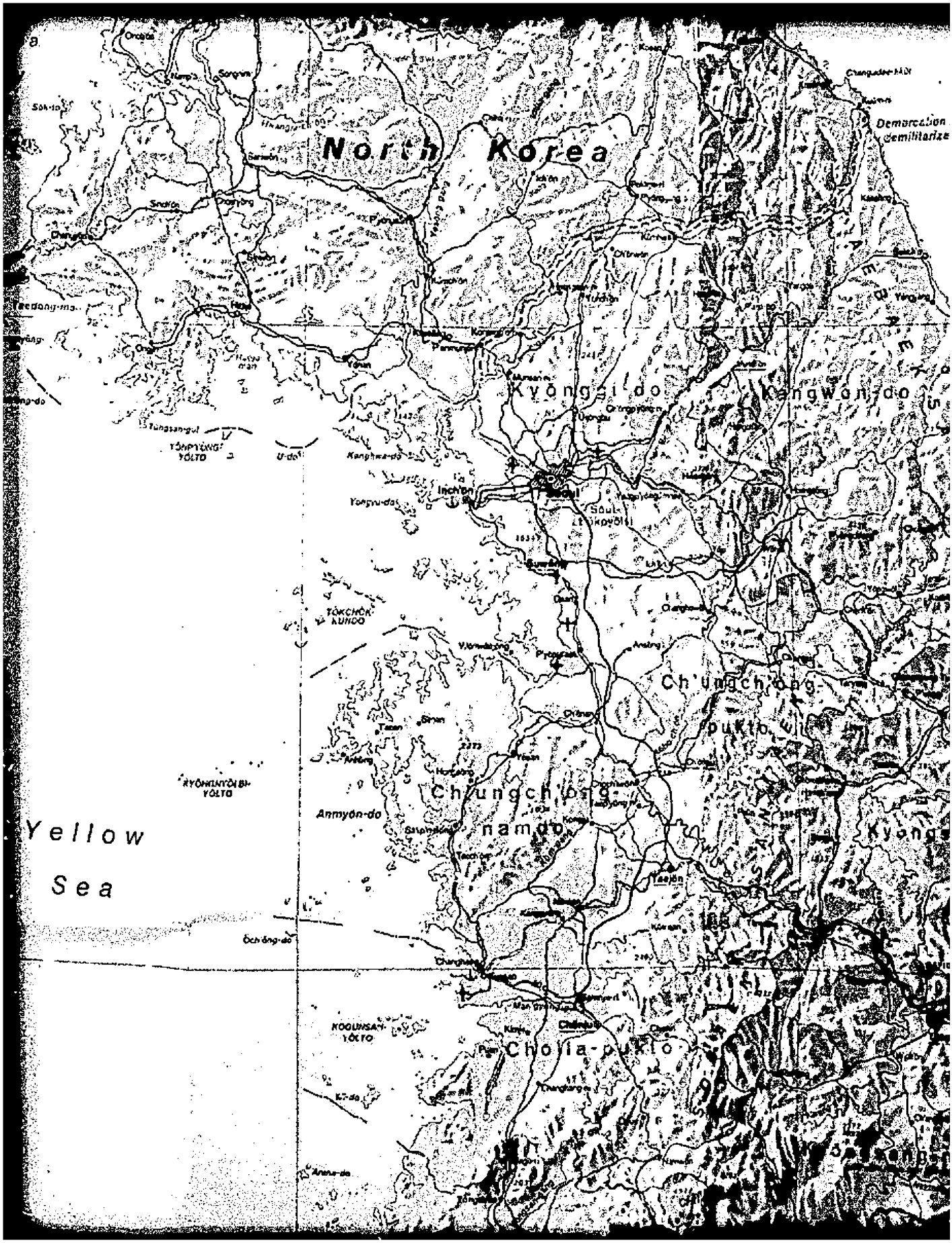
Places and features referred to in this General Survey (u/ou)

	COORDINATES			
	°	'N	°	'E
Andong	36	31	128	44
Ansŏng-ch'ŏn (strm)	36	54	126	51
Changhang	36	03	126	12
Changhang-ni (bldg)	35	38	126	55
Chang-san (mtn)	35	12	129	09
Chech'ŏn	37	08	128	12
Cheju	33	31	126	32
Cheju-do (isl)	33	20	126	30
Chinhae	35	08	128	40
Ch'ŏnan	36	48	127	09
Chŏnghŭa-ri (bldg)	37	26	126	31
Ch'ŏngju	36	38	127	30
Ch'ŏngnyangsan-dong	37	31	127	03
Chŏnju	35	49	127	09
Ch'ŏrwŏn	38	15	127	13
Chosa	35	11	127	24
Chukpyŏn-ni (bldg)	37	03	129	25
Chumunjin	37	53	128	49
Ch'unch'ŏn	37	52	127	44
Chungang-myoji (anch)	34	50	128	12
Chungju	36	14	126	42
Ch'ungmu	34	51	128	26
Chungyŏng-gul (railroad tunnel)	36	56	128	26
East China Sea	29	00	125	00
Hadong	35	04	127	45
Haep'yŏng	35	10	127	31
Haeundae	35	09	129	10
Halla-san (mt)	33	22	126	32
Hamhŏng, North Korea	39	54	127	32
Hangch'on	34	32	126	44
Han-gang (strm)	37	45	126	41
Hoengsan-ni (bldg)	38	07	126	59
Hong-do (isl)	34	44	125	43
Hŭngnam, North Korea (rsta)	39	50	127	38
Hup'o-ri (bldg)	36	41	126	28
Hwangji-ri (bldg)	37	10	128	50
Hwangjŏng	37	33	127	43
Hyŏngsan-gang (strm)	36	01	126	23
Imjin-gang (strm)	37	47	126	48
Inch'ŏn	37	28	126	38
Iri	35	56	126	57
Japan, Sea of	43	30	135	45
Kaesŏng, North Korea	37	58	126	33
Kamp'o	35	48	129	30
Kanggu	36	22	129	24
Kangnŭng	36	09	127	01
Kangtŏng	37	41	128	54
Kimhae	35	14	128	53
Kimp'o	37	38	126	42
Kodubawi	37	09	128	50
Kohan-ni (bldg)	37	12	128	52
Korangp'o-ri (bldg)	37	50	126	50
Korea Strait	34	00	129	00
Kŏje-gang (strm)	36	06	126	40
Kŏmdo-gang (strm)	35	50	128	29
Kunsan	35	59	126	43
Kuryongp'o-ri (bldg)	35	59	129	34
Kwangju	35	09	126	55
Kyŏngju	35	50	129	13
Man'gyŏng-gang (strm)	35	53	126	40
Masan	35	11	128	34
Mokp'o	34	47	126	23
Moraedŭng	35	33	128	22
Mosŭlp'o	33	13	126	15
Mukhodŏn-ni (bldg)	37	33	129	07
Munsan-ni (bldg)	37	51	126	47
Muryong-san (mtn)	35	35	129	24
Naju	35	02	126	43
Naktong-gang (strm)	35	07	128	57
Nonsan	36	12	127	05
Ŏnyang	35	34	129	07

	COORDINATES			
	°	'N	°	'E
Osan	37	09	127	01
Paengnyŏng-do (isl)	37	57	124	39
Pangŏjin-hang (harbor)	35	20	129	20
P'anmunjŏm, North Korea	37	59	126	40
P'aro-ho (reservoir)	36	07	127	52
P'ohang	36	02	129	22
Pukp'yŏng-ni	37	20	129	08
P'unggi	36	52	128	32
Pusan	35	06	129	03
P'yŏnggang, North Korea	38	25	127	17
P'yŏngt'aek	36	50	127	05
P'yŏngyang, North Korea	39	01	125	45
Sach'ŏn	35	05	128	00
Samch'ŏk	37	27	129	10
Samch'ŏnp'o	34	55	128	04
Sannamgjin	35	23	128	50
Seoul	37	34	127	00
Sŏgwi-ri	33	14	126	34
Sokch'o	38	12	128	36
Sŏkp'o-dong	36	28	126	37
Sŏnjin-gang (strm)	34	58	127	10
Songhyŏn-ni (bldg)	37	28	127	38
Songjŏng-ni	37	30	129	08
Songni-ri (bldg)	34	55	128	39
Sŏngsan-ni	33	27	126	56
Soyang-gang (strm)	37	52	127	60
Suwŏn	37	16	127	01
Suyŏng	35	10	129	07
Taehyŏn	35	13	129	14
Taegu	35	52	128	36
Taehŭng-ni	35	53	127	02
Taejŏn	36	20	127	26
Taep'yong-ni (bldg)	36	28	127	10
Ulchin	36	59	129	21
Ulsan	35	33	129	19
Ulsan-man (bay)	35	30	129	21
Waegwan-ni	35	59	128	23
Wŏlgan-ni (bldg)	37	46	126	30
Wŏnju	37	21	127	58
Wŏnsan, North Korea	39	10	127	26
Wŏnwŏnjŏng	36	59	126	50
Yangp'yŏngbanmae	37	20	127	30
Yellow Sea	36	00	124	00
Yŏju	37	18	127	38
Yŏm-ho (strm)	37	35	126	34
Yŏngch'ŏn	35	58	128	56
Yŏngdong	36	10	127	47
Yŏngdŭngp'o-dong	37	31	126	54
Yŏngju	36	19	128	37
Yongsan (rsta)	37	32	126	58
Yŏngsan-gang (strm)	34	54	126	32
Yŏngwŏl	37	11	128	28
Yŏsu	34	44	127	44

Selected airfields

A 511	36	58	127	02
Cheju International	33	30	126	30
Kangnung	37	45	128	57
Kimhae	35	11	128	56
Kimpo International	37	33	126	48
Kunsan AB	35	54	126	37
Kwangju	35	07	126	49
Osan AB	37	05	127	02
Pohang	35	59	129	25
Pusan International	35	10	129	08
R-813	35	08	128	42
Sachon	35	05	128	05
Samchok	37	30	129	08
Seoul AB	37	31	126	56
Suwon	37	14	127	01
Taegu International	35	53	128	40



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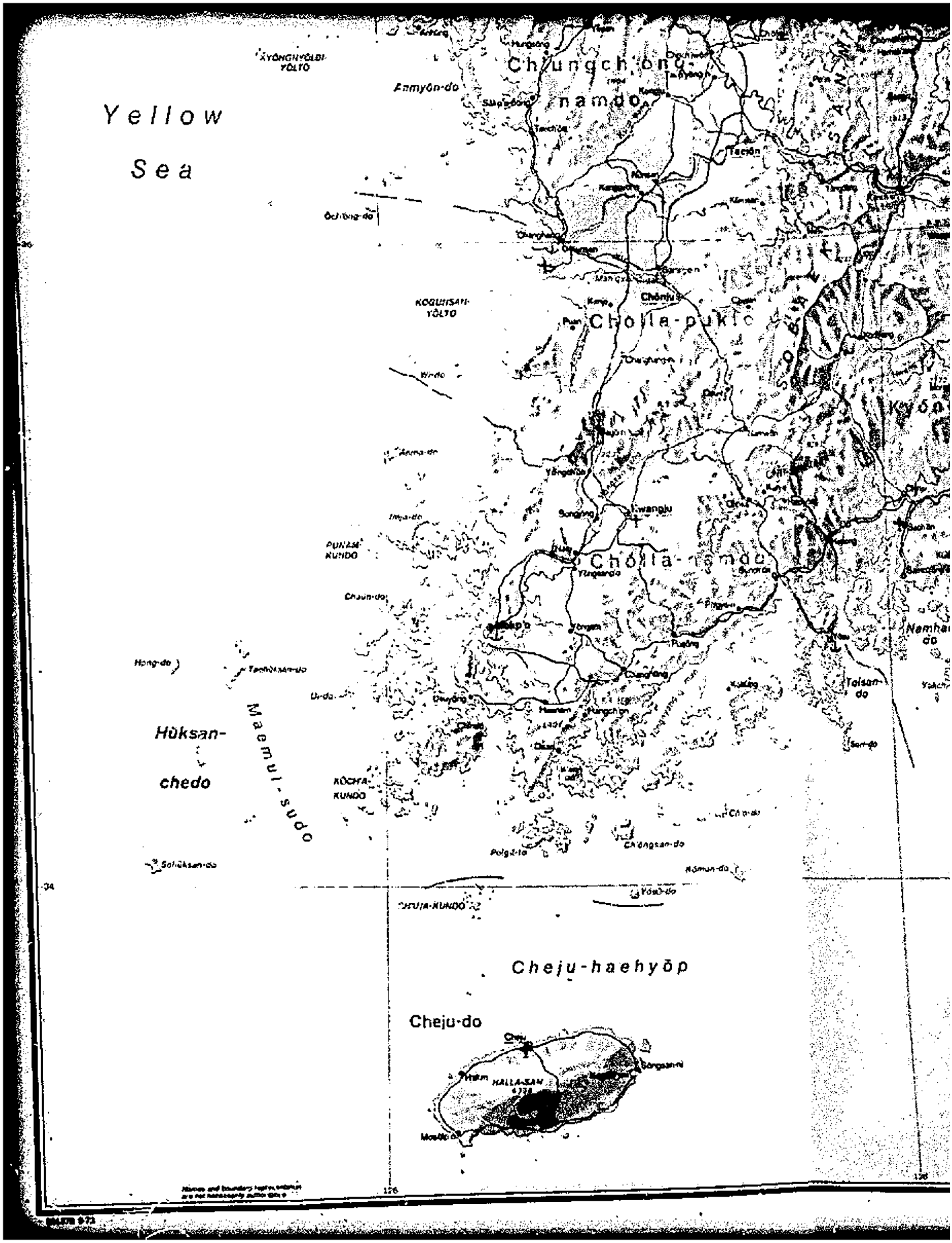

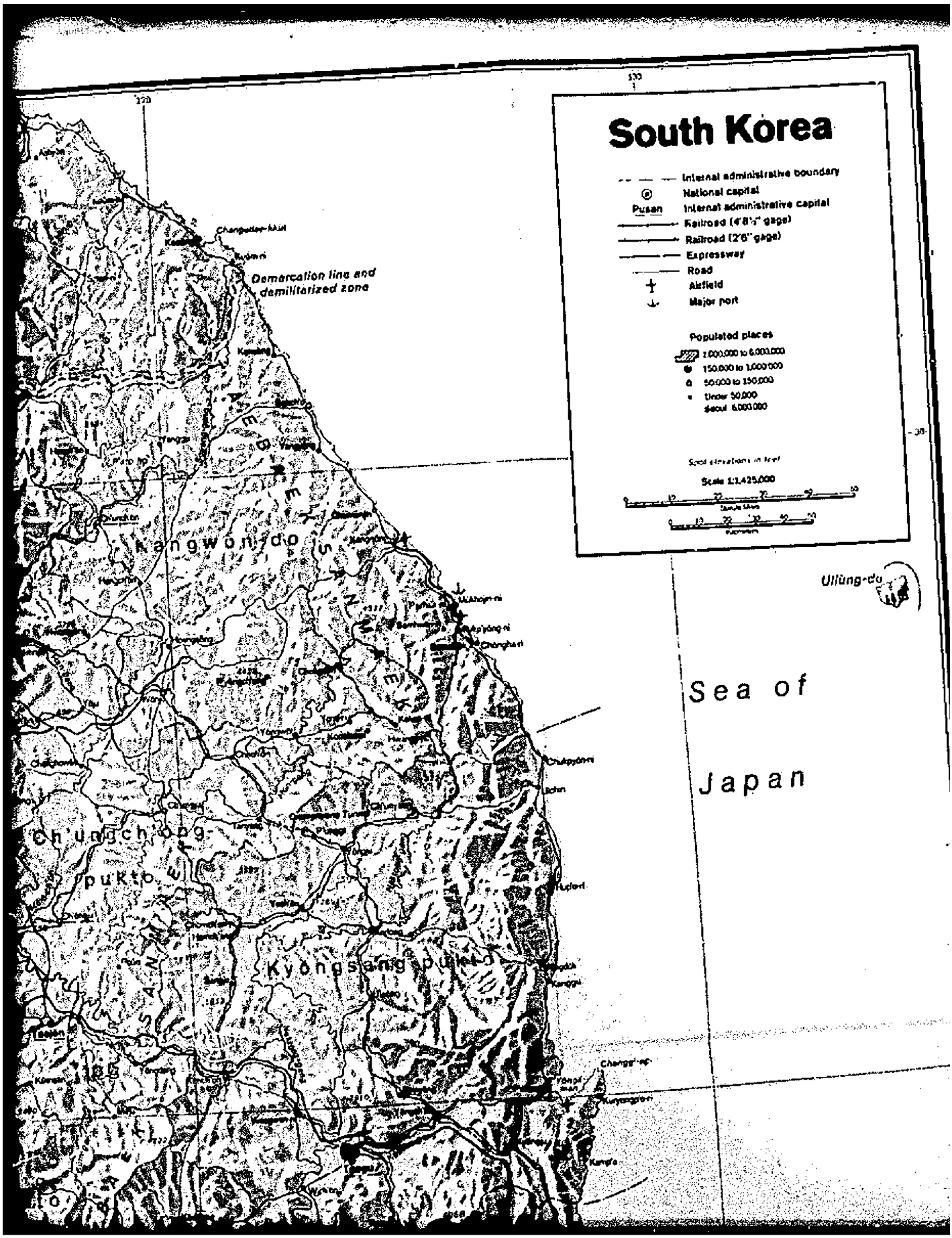

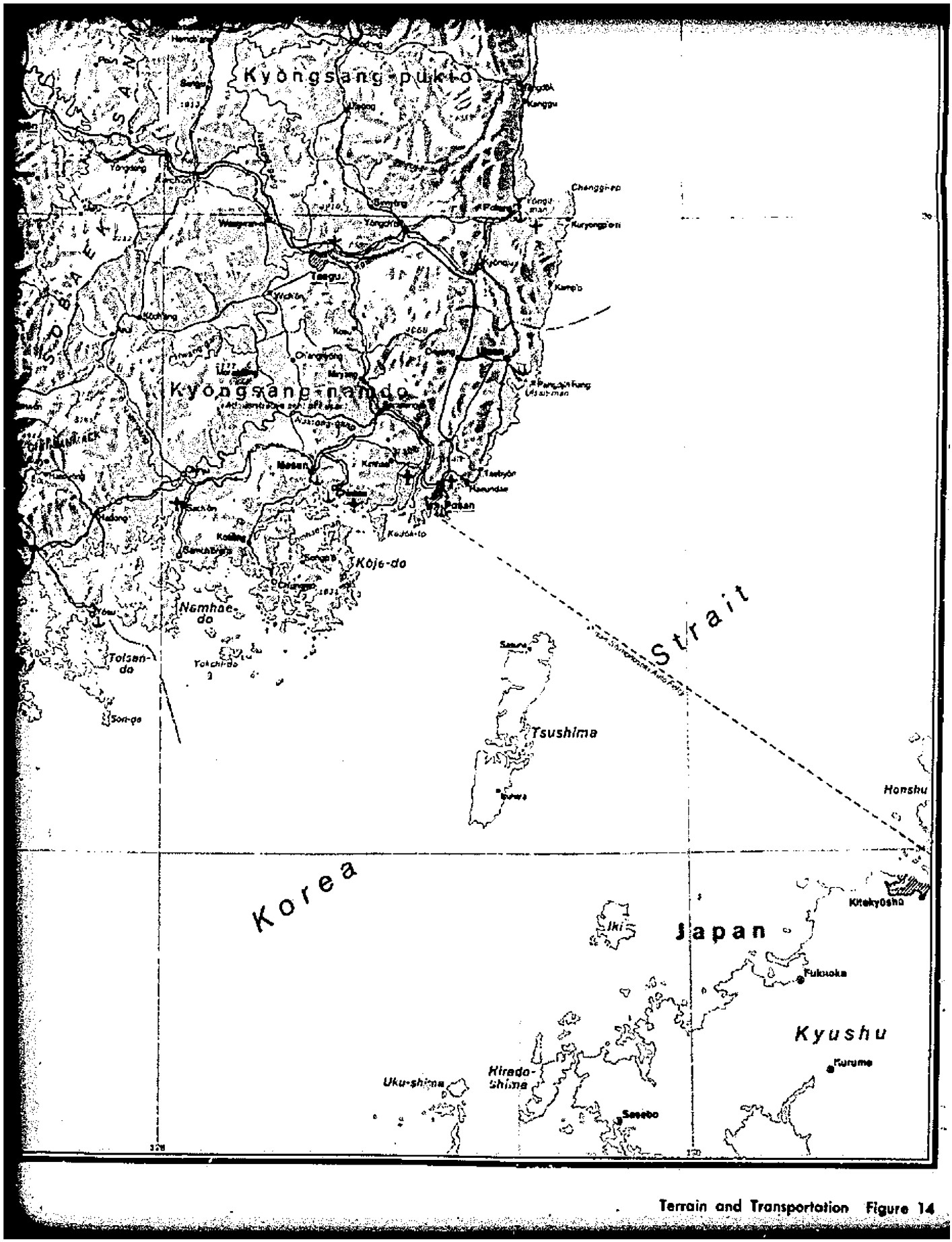

Terrain and Transportation Figure 14