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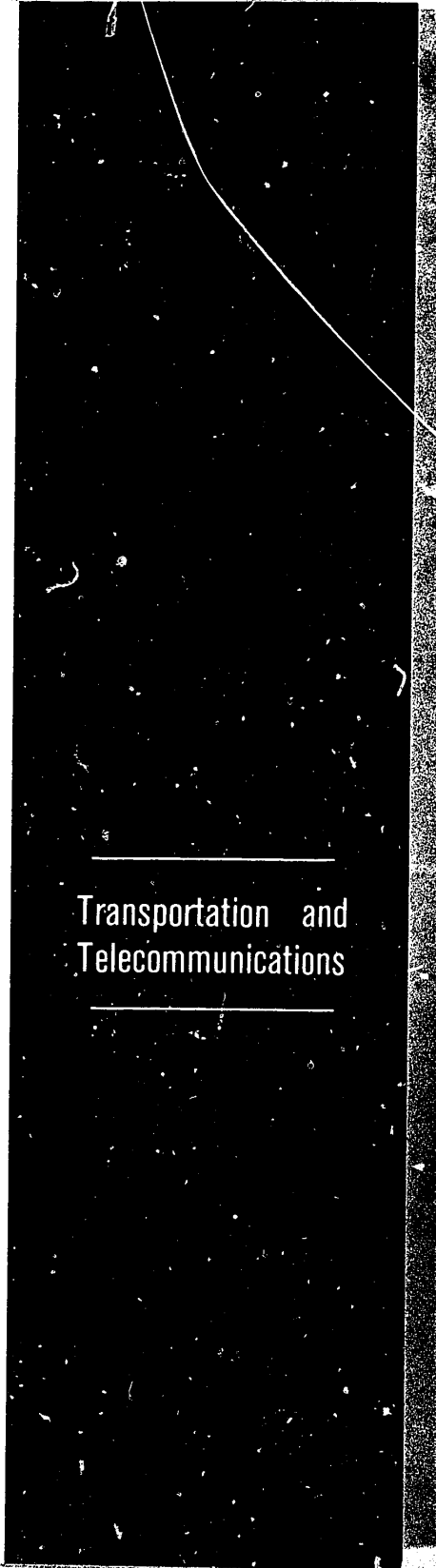
Italy

December 1973

NATIONAL INTELLIGENCE SURVEY

SECRET

48



Transportation and
Telecommunications

NATIONAL INTELLIGENCE SURVEY PUBLICATIONS

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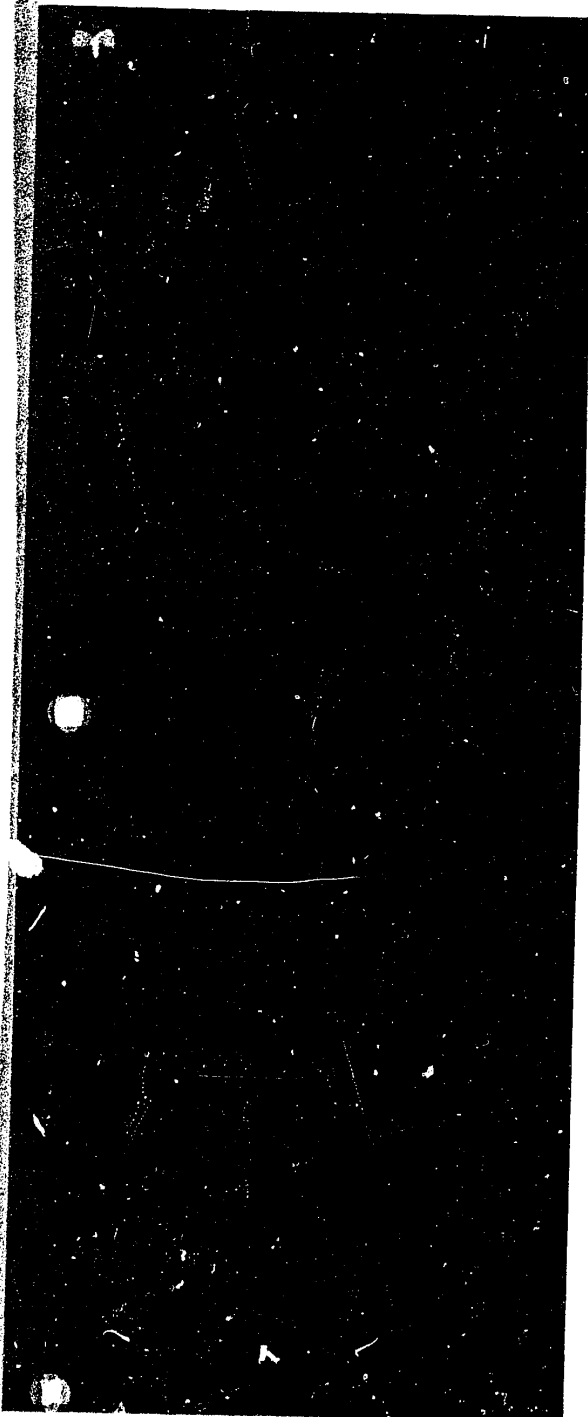
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This chapter was prepared for the NIS by the Defense Intelligence Agency. It includes a contribution on airfields from the Defense Mapping Agency, Aerospace Center, and a contribution on merchant marine from the Department of the Navy. Research was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



ITALY

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Transportation and Telecommunications

A. Appraisal (C)

The transportation and telecommunication (telecom) systems of Italy are adequate to meet its economic and military needs. Although both systems cover the entire country, they are mainly concentrated in the northern plain and along the coasts (Figure 11), where they compare favorably with any in the world. The systems in the interior of the peninsula and on the islands of Sicily and Sardinia are more rudimentary and sparse. International transportation connections by rail and highway are made with France, Switzerland, Austria, and Yugoslavia.

Railroads handle almost half of the passenger traffic and a large part of all long-distance domestic, international, and transit freight traffic. The network is well constructed and equipped and serves all principal cities and ports and all administrative, industrial, and mining areas. The government-owned system constitutes over 75% of the route mileage and is the largest single enterprise in Italy's economy.

Highway transport is growing in importance and accounts for over two-thirds of the total ton-miles produced. This traffic consists mainly of short hauls, but as a result of extensive highway reconstruction it is expanding to include long-distance and international freight movement. All highway transport is privately owned and operated but is under government control.

Inland waterways handle only about 1% of the total cargo moved annually and are of small significance to the transportation system. Activities are mainly restricted to freight traffic on the Po and on five canals

in the Po valley and to passenger traffic across the northern lakes and on the Venetian lagoons. All craft are either privately or municipally owned.

Totalling 649 ships of over 1,000 gross register tons, Italy's merchant marine ranks among the world's larger fleets. The mainland and major island coastlines of over 3,000 miles is served by numerous ports, and there is an average of less than 100 miles between ports capable of berthing oceangoing vessels. Most ports are either owned or controlled by the government.

Civil aviation occupies a prominent role in the national economy. The country is favorably situated on the lucrative commercial air routes which link Europe with Africa, the Middle East, and the Far East. Alitalia, the national airline, has taken full advantage of this favorable location and ranks high among the world's international airlines in the number of passenger-miles flown. The government has sponsored a dynamic program of civil aviation development, and progress has been substantial. The use of air travel for domestic transport is expanding greatly, and most of the country's major airlines are undergoing extensive fleet modernization. Italy has 150 airfields, including large international facilities at Rome and Milan.

Italy is one of the leading nations in Western Europe in the development and use of pipeline systems for both domestic and international movement of crude oil and natural gas. Most of the pipelines are owned and operated by the government.

Telecom facilities are extensive and modern and provide excellent service. High-capacity cable and

radio-relay systems extend throughout the nation, and international services are among the best in the world.

Control of transportation and telecommunications is vested in the Ministries of Transport and Civil Aviation, Post and Telecommunications, Public Works, Merchant Marine, and Defense. Major plans for improvement include modernization of rail equipment, further double tracking of important lines, and completion of the new high-speed Rome-Florence line; expansion of the *autostrade* network; construction of the Milan-Cremona-Po canal and modernization of the Padova-Venice waterway; construction of important gas pipelines; expansion of facilities at several large ports; modernization of the merchant marine fleet; expansion of facilities at several major airfields; and construction of an important coaxial submarine cable between Rome and Cagliari, Sardinia.

B. Strategic mobility (C)

Italy's transportation and telecom systems are capable of supporting large-scale military operations; however, movement across the peninsula and over the Alps would be difficult, particularly in the winter. The well constructed and equipped railroad network serves all major cities and ports and all administrative, industrial, and mining areas. International connections in the north permit through rail service with other European countries and the Middle East. However, bridges and tunnels on several important lines would make them vulnerable to hostile action.

Movement and supply of military forces via highways would be somewhat restricted by the limited number of high quality east-west routes which provide access from coast to coast. The best routes for through movement are the high-speed multilane divided *autostrade*. These routes were constructed for high capacity and are well suited for heavy fast traffic, but they do not afford access to all parts of the country; access, however, is provided to all strategic areas. The *autostrade* are vulnerable to interdiction because of their proximity to the major urban areas and ports which would be targets in the event of hostilities. In addition, thousands of bridges and elevated sections of roadway would be prime targets, and many of the structures are located close to the coast and could be interdicted by naval action.

There are also hundreds of tunnels that could be prime targets for sabotage. Other roads on the system, including state and provincial highways, have many sections that are poorly aligned and have numerous sharp curves (including hairpin curves) and steep

grades ranging up to 15%; many sections of roadway are narrow. Other bottleneck features that would inhibit traffic movement include narrow streets in villages and towns, sharp right-angle turns in towns and at bridge approaches, narrow low-capacity bridges, underpasses, galleries, snowsheds, and tunnels. Movement from the mainland to offshore islands is only possible by vehicle-carrying ferries. Climatic restrictions include rainfall, snow, high temperatures, and fog. Maximum rainfall in northern Italy occurs during the spring (March-May) and fall (September-November). Severe flooding and landslides are precipitated by rainfall, and in some instances roads are damaged or washed out. In the southern part of the country the heaviest rainfall occurs during the fall and winter, causing some flooding of roads in low-lying areas. Snowfall is heavy in the higher elevations of the Apennines and Alps; most Alpine passes are closed from November to May, and in the Apennines roads may be blocked for varying periods of time. Traffic may also be impeded by slippery road surfaces. Temperatures in the southern part of the mainland and on Sicily may reach 110°F., and during dry periods dust restricts visibility on earth and gravel roads. Fog is frequent during the winter in the Po valley and in sheltered areas of the Apennines. Extensive areas throughout Italy are subject to earthquakes of varying intensity and frequency. Roads and bridges may be damaged during periods of seismic activity.

Use of inland waterways for military movement and supply would be minimal. All major maritime ports are well equipped and are adaptable to military requirements. The 236 cargo-type units of the merchant fleet have considerable potential for short-haul (up to 48 hours' steaming) troop lift and logistics support in near-seas operations; a large number of these ships have cargo-handling and stowage characteristics which would enhance their military utility. Cargo-type units employed in cross-trades between foreign countries and those under foreign-charter arrangements might not be readily available for military-support operations under certain emergency conditions. Assuming considerable expansion of the normal passenger capacity and the advantage of relatively high operating speed, the many passenger ships would have extensive potential for longer haul (more than 48 hours' steaming) troop transport. The tankers could provide extensive fleet-oiler or other military-support capability for a short period. In addition to the merchant fleet, about 27 automobile/passenger ferries of 1,000 g.r.t. and over and totaling

about 107,000 g.r.t. could provide troop-lift and logistics support in near-seas operations.

Most of the country's 150 usable airfields could support military operations. Airfields on the mainland are located chiefly in the northern plains and along the east and west coasts; the principal island fields are Cagliari/Elmas on Sardinia and Palermo/Punta Raisi on Sicily. Several large military airfields and two joint fields are home bases for fighter aircraft, and a number of minor military airfields support the Italian army. In the event of a national emergency, the aircraft and personnel of Italy's airlines would be integrated into the military structure. The 130 major aircraft and most of the lighter planes could be used for airlift of troops and equipment, logistical support to NATO forces, and air evacuation.

An excellent mixture of cables and radio-relay systems have overcome negative effects of the largely mountainous terrain and would provide substantial telecom support to major military operations. Except in the highest mountain ranges, climatic conditions are generally favorable for the installation and maintenance of facilities. Intercity and local telecom networks are well protected against disruption by sabotage; cables are buried, and key radio-relay sites are in remote mountainous areas. Multiple circuits and alternate routes are available to insure rapid rerouting of most traffic. Telecom supply and maintenance services are excellent. Adequate stockpiles of materials are maintained by the government, concessionaires, and domestic manufacturers.

C. Railroads (C)

The railroad system of Italy (including Sicily and Sardinia) totals 12,688 route miles and consists of 10,005 route miles of government-owned lines operated by the Italian State Railroads (*Ferrovie dello Stato*-FS) and 2,683 route miles of mostly single-track, non-Federal lines owned and operated by 47 different private and municipal companies. The FS system, which handles most of the long-distance passenger traffic and a large part of the long-distance freight traffic, is adequate to satisfy current traffic demands. The non-Federal railroads, commercially significant only to the areas they serve, have short lengths, low line capacities, and a multiplicity of gages and equipment.

The density of the Italian rail network of about 11.0 route miles of line per 100 square miles compares favorably with the networks of France and Austria, which have 11.8 and 12.8, respectively, but is less

dense than the 23.2 route miles per 100 square miles of West Germany or the 19.7 of Switzerland. The Italian network consists principally of well-distributed lines extending along the east and west coasts of the mainland. Numerous major lines link the larger industrial cities of the Po valley with other river valleys and provide east-west connections at several points along the peninsula. Minor networks on Sicily and Sardinia connect with the mainland via train ferries. As of 31 December 1971, the route mileage of the FS system was as follows:

GAGE	SINGLE TRACK	DOUBLE TRACK	TOTAL
4'8 1/2":			
Electrified	1,987	2,940	4,927
Nonelectrified	4,808	175	4,983
Subtotal	6,795	3,115	9,910
3'1 1/2" (nonelectrified) located in Sicily	95	None	95
Total	6,890	3,115	10,005

Most of the non-Federal railroads are single track. Half of the 1,392 route miles of 4'8 1/2" gage and 30% of the 1,291 route miles of narrower gages are electrified. Since 1965 about 300 route miles of non-Federal railroads have been abandoned. Italy has the third highest percentage of electrified lines, being exceeded only by Switzerland and Sweden.

The condition of FS main lines is good to excellent, but with the exception of the large-city rapid-service commuter lines, non-Federal lines are in poor condition.

Rail lines provide 12 international connections; 10 are on FS standard-gage (4'8 1/2") lines and two are on meter-gage (3'3 3/8") non-Federal lines. Two connections are made with France; five with Switzerland, of which two are on non-Federal lines; three with Austria; and two with Yugoslavia.

The FS is an autonomous agency under the Ministry of Transport and Civil Aviation and is administered by the Railway Board and its director general. The director general is assisted by two deputy director generals, both located in Rome; one is responsible for the Operation and Services Departments and the other for the Central Services Departments. The director general supervises the entire railroad service of the FS system in accordance with directives from the ministry. His subordinates include 15 regional operating district directors who are charged with the actual rail operations. In addition to national memberships in international transport and rail organizations such as the International

Organization for Standardization, the FS is a member of the International Union of Railways (UIC) and its subagencies, which regulate international traffic and standardize freight and passenger car equipment used in international traffic. The FS is a member of the European Freight Car Pool (EUROP), the International Trans-Europe-Express-Merchandises (TEEM), the Trans-Europe-Express (TEE) deluxe passenger-train service, the International Railway-Owned Company for Refrigerated Transport (INTERFRIGO), and the International Transport of Transcontainer (INTERCONTAINER). Non-Federal railroads are granted concessions from the state, which governs their operations under the Ministry of Transport and Civil Aviation.

Railroad employees are well trained. Modern work methods and specialized training of about 28,000 employees annually have increased the efficiency of the work force. Selected employees are sent to universities and training schools for specific courses. The number of employees has increased in recent years; FS had 177,400 employees in 1967 and 200,000 in 1972. Non-Federal railroad companies had 15,670 employees in 1970. The number of working hours for station staff has been reduced from 48 hours a week to 40 hours; a further increase in staff to cope with the workload is expected. FS employees receive many fringe benefits such as housing, medical assistance, and pensions. Employees are well organized into trade unions. Nationwide transportation strikes including the FS system have occurred in recent years.

Major classification yards at Rome, Milan, Bologna, and Alessandria have been modernized with central control systems operated from control towers; modernization has increased their daily classification capacity to 4,000 cars. The Milan classification yard became fully automated during 1972, and the Bologna, Alessandria, and Rome yards are to be automated in the near future. Other major yards having daily capacities of 1,000 to 2,000 cars are located at Novara, Venezia Mestre, Torino, Foggia, Alessandria, Verona, Naples, and Genoa. A new FS policy is to enlarge and modernize major yards and discontinue numerous minor yards.

The Termini passenger station in Rome has been modernized and enlarged to accommodate 35 million passengers annually. Other major passenger terminals serving 8 to 28 million passengers annually are Milano Centrale, Genova Brignole, Genova Piazza Principe, and Torino Porta Nuova.

Container terminals with facilities to handle international container unit trains from North Sea ports and national container trains are located at

Milan, Florence, Rome, Naples, and Bari; others having container handling facilities only are at Aprilia, Asti, Bologna, Brescia, Genoa, Modena, Novara, Padova, Piacenza, Rivalta Scrivia, Torino, Trieste, Verona, and Vicenza.

On main lines maximum grades of 2.2% to 2.5% are common; a 3.5% grade is located about 12 miles north of Genoa, and 3.0% grades exist between Torino and Modane, France, and between Rome and Pescara. The minimum radius of curvature of 820 feet is on the lines from Bolzano to Brennero and from Udine to Tarvisio.

The 43,252 bridges 12 feet and over in length on the FS system have an aggregate length of 204 miles; they consist of 39,540 reinforced-concrete and masonry and 3,712 steel-span structures. The 1,900 tunnels, of which 1,574 are single track and 326 double track have an aggregate length of 607 miles. The longest bridge is a 11,674-foot double-track combination rail-highway masonry-arch structure of 222 spans over the Laguna Veneta between Venice and the mainland. A parallel double-track bridge is to be completed by 1973. Other bridges of greater strategic importance which cross the Po and connect the rail lines of the industrial north with the southern part of the country are located as follows: 13 miles north of Alessandria (1,774 feet); 9 miles north of Voghera (2,506 feet); at Piacenza (2,506 feet); 40 miles northwest of Bologna (1,771 feet); and 32 miles northeast of Bologna (1,378 feet). The 11 1/2-mile double-track Apennine Tunnel (*Galleria dell'Appennino*), 20 miles south of Bologna, is the longest tunnel in Italy. Two tunnels of great international and strategic importance are the Simplon and Frejus (*Galleria del Frejus*) Tunnels. The 12 1/2-mile Simplon, two parallel single-track bores, is located at Iselle and has 6 1/4 miles in Italy and the remainder in Switzerland; the Frejus, an 8 1/2-mile double track bore, is at Bardonecchia and has 4 1/4 miles in Italy and the remainder in France. Numerous snowsheds and galleries protect track in mountainous areas. Double-tracking of the Naples to Reggio di Calabria line and the Ancona to Bari line necessitates additional parallel bridges and tunnels.

The 938 bridges on the non-Federal railroads have an aggregate length of 29.4 miles, and the 350 tunnels total 77.4 miles. Most of these structures are not adequately maintained.

The FS motive power and equipment pool is continuously being modernized in line with high-speed requirements and the closing out of steam traction by the end of 1973. Electric traction is predominant, and the 1,788 electric locomotives in operation (1,658 use direct current at 3,000 volts and

130 use 3-phase alternating current at 3,600 volts) have a total of 5.1 million horsepower. The 957 diesel locomotives have a total of 473,000 horsepower. The 309 steam locomotives that will be held in reserve for emergencies after 1973 have a total of 540,000 horsepower. The FS standard-gage motive power inventory for 1971 was as follows:

ELECTRIC LOCOMOTIVES		DIESEL LOCOMOTIVES	
Number	Horsepower	Number	Horsepower
57	255	250	up to 150
157	1,000 to 2,000	446	151 to 1,000
1,022	2,001 to 3,000	252	1,001 to 2,000
240	3,001 to 4,000		
312	above 4,000		

The FS, in cooperation with leading national locomotive builders, is developing a new high-speed electric locomotive, the E-666, a Co-Co type having 8,000 horsepower and capable of hauling 11 to 12 four-axle passenger coaches or a 627-short-ton trailing load at sustained speeds of 112 miles per hour and a maximum speed of 125 miles per hour. In the meantime the FS is taking deliveries of the E444, a B-B type 4,000-horsepower locomotive having a maximum speed of 125 miles per hour (Figure 1). First placed in service in 1967, over 100 units are now in service. The majority of electric locomotives are Bo-Bo-Bo types having 2,000 to 3,000 horsepower and an average continuous tractive effort of 25,000 pounds at 30 miles per hour.

Major modern repair shops for electric locomotives are at Foligno; for diesels, at Florence (Porta al Prato) and Rimini. Repair shops for steam locomotives are at Verona Porta Vescovo, Bologna Centrale, and Pietrasa.

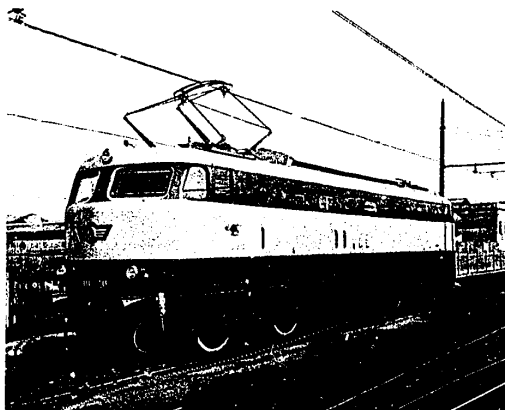


FIGURE 1. FS E444 4,000-horsepower 3,000-volt direct-current electric locomotive. This locomotive has a maximum speed of 125 miles per hour. (U/OU)

For fast intercity passenger service, the FS makes extensive use of railcars and trainsets. In service in 1971 were 422 electric railcars, 23 electric multiple-unit trainsets, 955 diesel railcars, eight diesel multiple-unit trainsets, and 318 gasoline railcars. In service on FS narrow-gage lines in Sicily were 24 diesel and two gasoline railcars.

In 1971 the FS passenger car inventory consisted of 9,417 four-axle coaches of which 2,021 were equipped for international passenger service. In addition there were 2,618 baggage and postal cars and 462 trailer cars for use with electric and diesel railcars. For high-speed passenger service the FS has ordered 1,100 four-axle coaches equipped with disc brakes.

The FS freight-car pool is generally adequate, and by using EUROP, INTERFRIGO, and INTERCONTAINER equipment, the FS meets heavy seasonal demands, particularly during the citrus harvest. In 1971 there were 120,708 standard-gage freight cars, of which 105,319 cars met the standards of the International Freight Car Union—RIV. A breakdown of car types and average capacities (in short tons except where noted) is as follows:

TYPE	AVERAGE CAPACITY
48,697 boxcars	25.0
37,797 gondolas	29.4
13,367 flat cars	34.0
11,896 specialized cars including 8,109 refrigerator cars	20.5
1,304 tank cars (POL)	22.8
100 transcontainer cars (4 axles)	One 40-ft. and one 20-ft. container
50 transcontainer cars (2 axles)	One 40-ft. or two 20-ft. containers
7,497 FS service cars	

An additional 13,150 standard-gage privately owned freight cars are registered with the FS freight car pool; 3,862 of these are POL tank cars having an average 22.8-short-ton capacity, and most are owned by international oil companies. About 10% of rolling stock is undergoing repair at any one time.

The non-Federal railroad motive power and rolling stock inventory is as follows:

	GAGE			TOTAL
	4'8 1/2"	3'3 3/8"	3'1 1/2"	
Steam locomotives	37	0	73	110
Electric locomotives	66	7	10	83
Electric railcars	127	25	68	220
Diesel locomotives	71	0	25	96
Diesel railcars	151	11	148	310
Passenger cars	618	24	362	1,004
Baggage cars	53	0	36	89
Boxcars	697	23	457	1,177
Gondolas	700	43	955	1,698
Special cars (including privately owned cars)	170	1	163	334

From 20% to 35% of the equipment undergoes repair at any given time.

The standard European hook-and-link and screw type coupling with side buffers is used on FS equipment. Couplers and buffers are located 3 feet 6 inches above the top of rail on standard-gage equipment. Passenger and freight cars have Breda or Westinghouse airbrakes, and new and reconditioned equipment is designed to accommodate automatic couplers when conversion begins in 1981, the new date set by the UIC. The maximum authorized gross trailing load is 1,540 short tons, and the average net train load increased from 660 short tons in 1966 to 968 short tons in 1971.

About 50 Italian manufacturers, the largest of which are Asgen, Breda, Fiat, OMC, and Savigliano, produce motive power, rolling stock, and maintenance machinery. They are important in the national economy because of the large volume of their exports.

In addition to the well equipped and dispersed motive power and rolling stock maintenance and repair workshops, the FS contracts about 20% of its rolling stock repair to private companies.

The absolute system of train control is the rule in Italy. Remote control works with pushbutton geographical circuitry panels installed in traffic control towers in major stations and yards. They control the block signals and switches for incoming and outgoing train movement within station and yard complexes. Signals and switches in smaller stations are operated mechanically and manually. On main FS lines the automatic electric block system increased in 1971 to 2,110 route miles and semiautomatic electric block decreased to 3,380 route miles. Secondary lines operate on the manual block and telephone order system. On lines with automatic electric block and lines under reconstruction for high speed operation, the FS installs coded track circuits which repeats the line signals in an apparatus located in the locomotive cab. Color-light line signals have replaced semaphores on main lines and are 2-, 3-, and 4-aspect light units. Combinations of color lights or flashing yellow or green lights indicate restrictions in train speed. Of the 13,500 FS grade crossings, over 1,000, most of which are on secondary lines, are unattended except for fixed warning signals. During the 1962-72 period of the FS improvement plan 2,500 grade crossings were eliminated; 6,000 more are to be improved with automatic barriers and warning light signals.

Electric power is the main source of energy for motive power, and more than 90% of all FS traffic is moved over electrified lines. Hydroelectric power generated in the mountainous northern part of the

country accounts for 65% of the total power generated in Italy. The National Electric Power Agency (ENEL) supplies 130 to 150 kilovolts of current from its national transmission net to FS substations located along electrified lines. This current is converted to 3,000-volt direct current for electric motive power use. In 1971 the FS consumed 3.2 billion kilowatt-hours of electricity, an increase of 345 million kilowatt-hours over 1966. Diesel and fuel oil are obtained from domestic refineries, which import 75% of their crude oil from the Middle East and the remainder from the U.S.S.R. and Africa. Fuel consumption in 1971 was 131,193 short tons of diesel oil, an increase of 34,000 short tons over 1966; 956 short tons of fuel oil, a decrease of 146 short tons over 1966; and 239,350 short tons of coal, a decrease of 184,019 short tons over 1966. Coal is imported from the United States, West Germany, and the U.S.S.R. Water supply for steam locomotives is adequate and is chemically treated.

In 1970 non-Federal railroads consumed 111.3 million kilowatt-hours of electricity, 13,901 short tons of diesel oil, and 5,089 short tons of coal.

On main lines the FS standard FS 60 (121 pounds per yard) and FS 50 (101 pounds per yard) flat-bottom T-section rail in lengths from 118'1 1/2" to 157'6" are in use. Rail is electric-arc welded in workshops into 472-foot lengths, and on site these lengths are Thermit welded into continuous rail. The FS has more than 6,000 track miles of continuous welded rail, and about 350 track miles are added annually. The Piambino rolling mill, a member of the IRI-Finsider group of nationalized steel plants, produces rail 13 miles south of Livorno. Creosote-treated wooden ties predominate and are spaced at an average of 2,680 per mile. Reinforced-concrete ties for type FS 60 rail are spaced 2,700 per mile. Type "K" fastenings and "Pandrol" clips are being used with prestressed concrete ties, and steel tie plates and rail spikes are used with wooden ties. Ballast is crushed stone 1 1/2" to 2 1/2" in diameter. Except for imported wooden ties, all track materials are available locally. The permissible axleload is 22 short tons on main lines and 19.8 short tons on secondary lines.

The average speed is 57 miles per hour for passenger trains and 28 miles per hour for freight trains. Maximum speeds of 100 to 112 miles per hour are authorized on selected sections of about 2,000 route miles of the following double track lines: Torino-Milan, Verona-Padova-Venice, Milan-Piacenza-Bologna, and Torino-Alessandria-Genoa-Pisa-Rome-Naples. A maximum speed of 155 miles per hour is to be possible on the new Florence to Rome line now under construction and scheduled for completion

in 1.5. High speed operation requires increasing the radius of curvature from 9,840 to 14,925 feet and double-track spacing from the customary 11'8" from center to center of track to 13'1 1/2" to allow for the air pressure created by passing trains.

Long periods of heavy rain and early spring floods destroy tracks and wash out bridges and embankments in low-lying areas. Landslides and avalanches add to maintenance difficulties in mountainous areas. Track construction and maintenance are highly mechanized. Routine maintenance is performed by regularly employed personnel, and new construction and major maintenance projects are awarded to private contractors. An adequate supply of modern maintenance machinery and powerful snow-removal equipment permits fast repair and maintenance.

Passenger traffic, the more important type of transport on the FS system, increased in 1971 by 11% over 1967. Due to an economic recession during 1970-71, freight traffic decreased 2.6% over the same period. FS passenger and freight traffic statistics for 1967 and 1971 were as follows:

	1967	1971
Passengers transported (<i>millions</i>)	312.2	347.3
Passenger miles (<i>billions</i>)	17.3	21.0
Passenger-train-miles (<i>millions</i>)	114.7	125.6
Average length of journey (<i>miles</i>)	51.0	60.6
Freight hauled (<i>million short tons</i>)	68.1	59.7
Short-ton-miles (<i>billions</i>)	11.6	11.7
Freight-train-miles (<i>millions</i>)	38.6	39.8
Average length of haul per short ton (<i>miles</i>)	209.0	217.2

The principal types of commodities and percent of the total freight carried in carloads on FS lines are as follows: agriculture products, including foodstuffs, fodder and livestock, 24%; metal products, 17%; machinery, vehicles, and related products, 14%; minerals and scrap metal, 14%; raw and manufactured products and building materials, 13%; chemicals and fertilizers, 9%; petroleum products, 5%; and coal and coke, 4%. In 1971 rail import (64%)=export (36%) traffic amounted to 28.5 million short tons or about 44% of the total FS carload traffic, an increase of 3.5 million short tons over 1967. International container traffic has greatly increased, and 43,590 containers totaling 781,973 short tons were handled at the international container terminal at Milano-Rogoredo in 1970. The annual number of freight cars loaded totaled 3.2 million.

In 1970 non-Federal railroads carried 114.5 million passengers (a decrease of 24 million over 1966) 1.5 billion passenger-miles and hauled 4.8 million short tons of freight 68.6 million short-ton-miles (an increase of 2.6 million short tons over 1966). The average

passenger journey was 11.5 miles, and the average length of haul per short ton was 17.1 miles. Freight consists primarily of consumer goods and construction materials, o.e. and coal.

The FS continues to operate at a loss; in 1960 the operating ratio was 111% compared to 156% in 1970. In 1970 the FS income from all sources, including rail ferry traffic, was equivalent to US\$998 million, and expenditures were US\$1.559 billion. Italian authorities contend that a deficit will continue for years as the government provides inexpensive public transportation and preferential freight rates for its nationalized industry. The annual FS operating deficits are subsidized by the national treasury.

Non-Federal railroads also operate at a deficit; in 1967 the operating ratio was 134%.

The FS has three train-ferry routes in operation, two crossing the Stretto di Messina, from Villa San Giovanni to Messina (5 miles) and Reggio di Calabria to Messina (9.3 miles), and the third crossing the Tyrrhenian Sea from Civitavecchia to Golfo Aranci, Sardinia (132 miles). The train-ferry fleet totals 14 vessels; 7 have a capacity from 14 to 30 two-axle freight cars, and 7 can carry 30 to 43 two-axle freight cars. In addition to rail cars, all train ferries carry trucks, automobiles, and passengers. The two ferry routes to Sicily accounted for 708,988 freight cars and 9.3 million passengers in 1970. The Sardinia route accounted for 58,878 freight cars and 331,474 passengers during the same period. With minor adjustments the ferries can serve any of the three routes. Messina has four train ferry landing slips, Villa San Giovanni has three, and Reggio Calabria, one; Civitavecchia and Golfo Aranci have one each and an additional slip is under construction at each of the two ports.

The 10-year development plan of 1962-72, which provided for expenditures of US\$2.4 billion, did not achieve all its objectives but resulted in increasing FS efficiency and operations. A 6-year extension plan (1972-78) calls for an additional expenditure of US\$1.76 billion partly to help complete work of the 10-year plan and further expand capacity. Initial expenditures of the extension plan include US\$62.9 million for quadrupling tracks from Milano-Rogoredo to Melegnano (7 miles), Venice to Mestre (6 miles), and Florence to Prato (10 miles), and for double tracking from Chiomonte to Bussoleno (8.7 miles) on the Torino to Modane, France, line. An additional US\$66.9 million is to be spent on freight traffic improvements, such as modernizing classification yards and container terminals, and US\$108.8 million

FIGURE 2. Selected FS standard-gage, double-track* electrified (3,000-v.d.c.) lines (C)

TERMINALS	ROUTE MILES	MAXIMUM GRADE		MINIMUM RADIUS OF CURVATURE	REMARKS
		Going	Coming		
Modane, France-Torino-Alessandria-Genoa-Rome	473	1.1	3.5	2,286	7-mile section Modane-Italy border operated by FS. Connects with 1,500-v.d.c. French line at Modane. Single track section MP 23-33 to be double track by 1978. Maximum grade at MP 158.
Rome-Naples	133	1.0	1.0	2,296	Maximum grade at MP 29.
Naples-Reggio di Calabria	294	2.5	2.5	2,298	Connects with 15,000-v. 16 $\frac{2}{3}$ -cycle a.c. Swiss line at Chiasso.
Chiasso, Switzerland-Milan-Genoa	123	1.8	1.4	1,312	Maximum grade at MP 3.
France border-Ventimiglia-Genoa	104	0.7	0.7	2,296	5-mile electrified section (25,000-v. 50-cycle a.c.) France border-Ventimiglia operated by French railroads. Single track MP 7-42, 47-85. Entire line will be double tracked by 1978.
Switzerland border-Domodossola-Milan	83	1.1	2.5	1,150	16-mile electrified section (15,000-v. 16 $\frac{2}{3}$ -cycle a.c.) Switzerland border-Domodossola operated by Swiss railroads. Maximum grade MP 2, 16.
Arona-Novara-Alessandria	64	1.5	1.4	984	Single track MP 0-20. Maximum grades at MP 2, 54. Entire line to be double track by 1978.
Milano-Rogaredo-Piacenza Bologna	336	0.5	0.6	1,312	
Piacenza-Voghera-Alessandria	50	0.6	0.6	1,150	
Bologna-Florence-Rome	256	1.2	1.2	1,150	Maximum grade at numerous locations MP 20-205. Florence-Rome section being rebuilt; line will be shortened by 74 miles; minimum radius of curvature will be 9,800 ft. Completion date, end of 1975.
Florence-Pisa	50	0.5	0.4	1,770	
Brennero-Verona-Bologna	218	0.7	2.3	1,475	Connects with electrified Austrian rail line (15,000-v. 16 $\frac{2}{3}$ -cycle a.c.) at Brennero. Single track MP 147-211. Maximum grade at MP 5.0, 17.0. Entire line to be double track by 1978.
Tarvisio-Udine-Treviso-Venezia Mestre	138	2.2	2.3	985	Connects with electrified Austrian rail line (15,000-v. 16 $\frac{2}{3}$ -cycle a.c.) at Tarvisio. Single track Tarvisio-Udine. Maximum grade and 985-ft. minimum radius of curvature at MP 15.
Udine-Gorizia-Monfalcone	34	0.8	0.8	1,150	1-mile single track nonelectrified branch line Gorizia-border connects with Yugoslav rail system.
Torino-Novara-Milan-Verona-Venice	260	1.6	1.4	1,150	Maximum grade at MP 12.
Venezia Mestre-Trieste	92	2.0	1.5	1,150	Maximum grade at MP 43.
Bivio d'Arzolina-Poggiora-Campagna	8	1.4	Remarks	935	Descending grade coming. No change in electrification at connection with Yugoslavian electrified line at border.
Padova-Bologna	76	1.0	0.6	1,310	
Bologna-Ancona-Brindisi	472	1.5	1.1	1,310	Single track MP 217-309, 403-472. Maximum grade at MP 127. Nonelectrified MP 403-472. 24-mile single track nonelectrified branch line Brindisi-Lecce.
Orte-Falconara Marittima	125	2.2	2.2	984	Single track. Maximum grade at numerous locations crossing Apennines. Longest distance between passing tracks, 7 miles.

Rome-Pescara.....	149	2.8	3.0	984	Single track. Maximum grade at MP 93. Minimum radius of curvature at MP 89, 98. Longest distance between passing tracks, 6 miles.
Aversa-Foggia.....	110	2.3	1.6	1,312	Single track MP 9-105. Maximum grade at MP 71. Longest distance between passing tracks, 6 miles.
Battipaglia-Taranto-Brindisi.....	193	2.6	1.5	984	Single track. Maximum grade at MP 43. Longest distance between passing tracks, 8 miles. Nonelectrified.
Messina-Palermo.....	144	2.5	2.5	984	Double track MP 117-144. Maximum grade at Messina and numerous locations. Longest distance between passing tracks, 7 miles.
Messina-Siracusa.....	133	1.6	1.6	1,148	Single track. Maximum grade at MP 70, 102. Longest distance between passing tracks, 4 miles.
Cagliari-Olbia.....	178	2.5	2.5	328	Single track. Maximum grade at numerous locations. 14-mile single-track line connects Olbia with rail-ferry landing at Golfo Aranci. Nonelectrified. Longest distance between passing tracks, 9 miles.

*Single track sections of line indicated in remarks.

is to be spent on double tracking and electrification of lines in southern Italy.

A further US\$83.2 million is to be used to complete the Rome-Chiusi section (99 miles) of the new Rome-Florence high speed line. To modernize the motive power and rolling stock pool, US\$212.8 million is to be spent for 130 electric and 100 diesel locomotives, 50 three-car electric trainsets, and 1,100 high-capacity freight and container cars.

Characteristics of selected FS lines are given in Figure 2. Selected standard gage lines total 4,296 route miles or 43% of the FS network; they handle almost 90% of all rail freight and long distance rail passenger traffic and have an axleload capacity of 22 short tons. With the exception of 440 route miles of single track nonelectrified lines in southern Italy and Sardinia, all lines are double track and electrified, operating on 3,000-volt direct current with an overhead catenary system. The selected lines make eight international connections with rail networks of four neighboring countries. Rolling stock meeting UIC international specifications is interchangeable at these connections.

D. Highways (C)

The pattern and distribution of Italy's highways have been greatly influenced by the mountainous and hilly terrain that characterizes about four-fifths of the country. The Alps in the north and the Apennines that extend southeast down the peninsula have caused the highways to develop along the coasts and in the river valleys. Relatively few good highways extend east-west across the mountainous spine. Density of the network is greatest in the northern half of the peninsula. In Sicily the better routes extend along the seacoasts, and in Sardinia the network is concentrated in the western part of the island. The overall network is generally adequate to support the economy, but the rapid growth of the motor vehicle inventory is causing increased traffic congestion on routes in and around the larger urban areas. There are good international highway connections with the networks of neighboring France, Italy, Austria, and Yugoslavia. Figure 5 lists characteristics of selected highways.

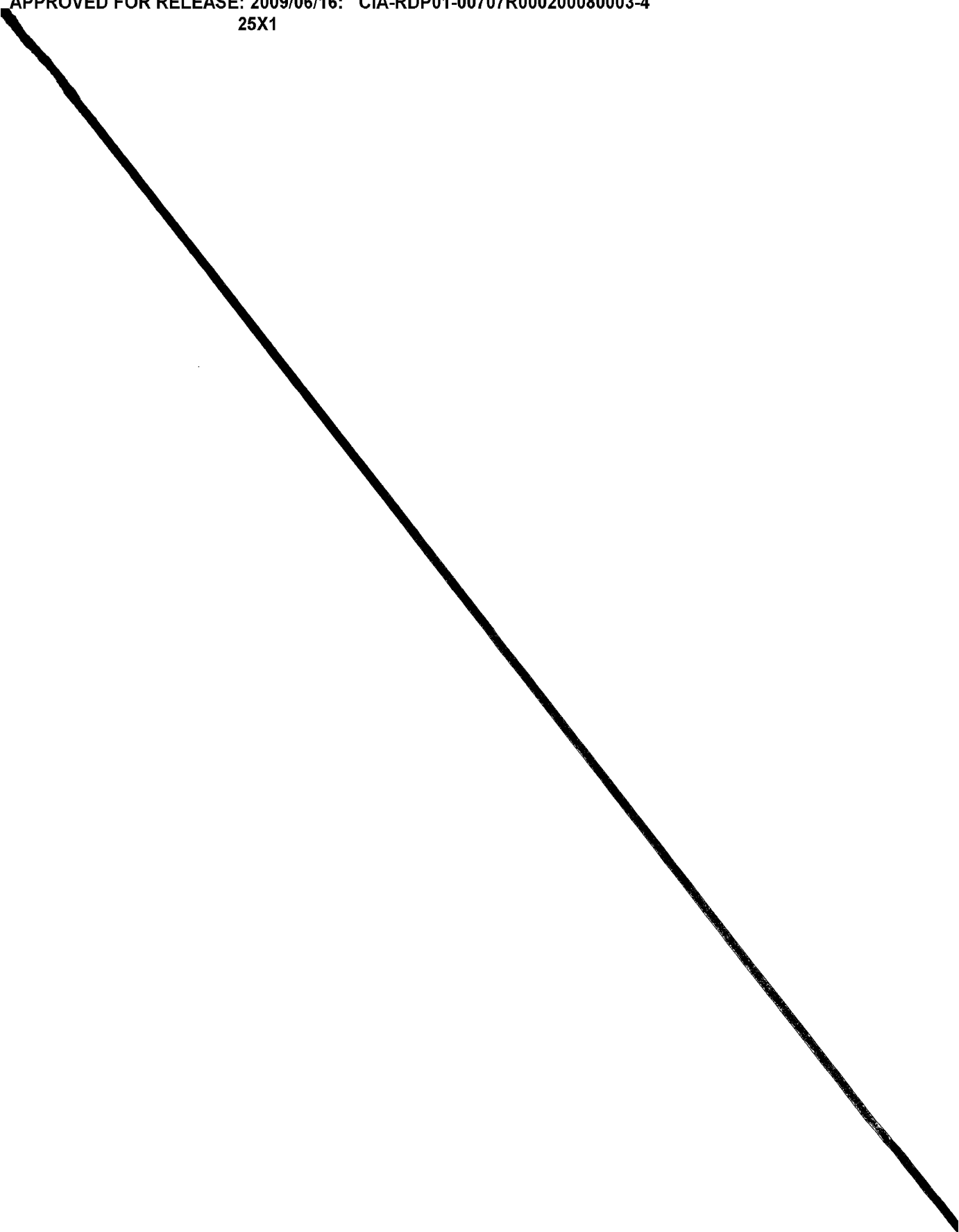
The highway network consists of about 179,000 miles of roads classified as follows: *autostrade*, 3,000 miles (Figure 3); state highways, 25,750 miles; provincial highways, 57,000 miles; and communal highways, 93,250 miles. Of the total, about 159,000 miles are surfaced with concrete, bitumen, or stoneblock; about 15,500 miles are surfaced with gravel or crushed stone; and the remaining 4,500 miles consist of earth roads. The condition of the network

varies; *autostrade* and state highways are maintained at regular intervals and are in better condition than the other classes. Surface widths range generally from 16 to 45 feet; *autostrade* have divided multilane roadways, each lane being 11.5 or 12.5 feet wide. Shoulders range up to about 10 feet wide, but many miles of low-type roads, including some in rural areas, have no shoulders.

Most bridges built before World War II are of brick or stonemasonry arch construction. Newly constructed bridges, especially those on *autostrade*, are of reinforced or prestressed concrete; the most common types of concrete structures are beam, arch, girder, bowstring, and cantilever. Steel bridges are of girder or through truss design, and some lift bridges have been built to permit passage of waterway traffic. The only timber bridges are located on rural roads. Vertical clearances on almost all bridges are unlimited; in the few cases where there is a restriction, the clearance is at least 14 feet. Horizontal clearance on all *autostrade* and on most state highways is equal to the road width. There are a large number of narrow bridges on less used provincial and communal highways. Most structures have high load capacities; the older brick and stonemasonry bridges and the new concrete and steel bridges have load capacities of from 40 to 100 tons. Timber bridges have limited load capacities, generally from 2 to 7 tons. There are numerous tunnels and galleries on the network. The longest is the 7.2-mile Mont Blanc Tunnel that affords an international connection with France. Seagoing ferries offer rail and motor vehicle service internationally and to offshore islands. The two most important routes are the 5-mile crossing between Villa San Giovanni to Messina and the 9.3-mile crossing from Reggio di Calabria to Messina. Ferries also operate from Genoa to Sardinia and Sicily and from Livorno and Civitavecchia to Sardinia.

The National Autonomous Agency for State Highways (*Azienda Nazionale Autonoma delle Strade Statali*—ANAS) is the government agency responsible for the construction and maintenance of state highways and the *autostrade* system. The Minister of Public Works serves as president of ANAS and presides over an Administrative Council that approves the organization's budget, program, and policies. Below the national level, highway technical offices located in the provinces and communes are concerned with the construction and maintenance of roads. The central government has assumed greater control over provincial and communal highways because of the shortage of funds at the local level. The construction

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Provincial and communal highway organizations are responsible for their respective road systems; however, the increased inability of the provinces and communes to support highway development projects has resulted in many miles of provincial highways being reclassified as state highways. Similarly, communal highways are being reclassified as provincial highways.

Significant construction and maintenance problems result from adverse terrain and climate. Road construction in the rugged hills and mountains is costly and difficult, requiring extensive excavation and embankment. Numerous high-level structures are required over streams and valleys, and many tunnels must be constructed. Steep slopes necessitate miles of retaining walls and numerous galleries. Drainage in the hills and mountains requires extensive culvert and ditch construction. Landslides, in many cases precipitated by heavy rains, frequently destroy road sections and require extensive reconstruction and maintenance. Heavy snowfall in the north and along the mountainous spine requires snowsheds in some areas; extensive inventories of snow removal equipment are available to keep roads open during the winter. Flooding is a recurring problem in low-lying areas, often causing severe damage to roads and bridges. Construction materials, including gravel, sand, and stone, are available in most sections of the country. Cement and reinforcing and structural steel are produced locally; adequate supplies of bituminous materials are available as a refinery byproduct. Both skilled and unskilled labor is available, and technical personnel, engineers, and equipment operators are highly competent.

A 10-year phase of the highway development program ended in 1970 but is being continued as a 5-year plan for the period 1971-75. Most development effort has been directed to the construction and expansion of the *autostrade* network, but improvement of selected portions of the state highway systems has been accomplished, and additional improvements are underway or planned. The expansion of the *autostrade* network has been the most significant part of past and present development programs. About 3,000 miles of *autostrade* have been constructed and are in use. Another 700 miles are under construction, and an additional 650 miles are in the planning stage. The 4,350 mile basic network is scheduled to be completed by 1975, but some short routes are programmed for completion after that date. The most

important *autostrade* currently under construction are as follows:

ORIGIN	DESTINATION	MILES
Bari	Taranto	54
Voltri	Gravellona	130
Caserta	Salerno	38
Messina	Termini Imerese	140
Palermo	Mazara del Vallo	75
Ancona	Pescara	95
Vasto	Foggia	70

Autostrade routes on which construction is scheduled to be completed by 1975 are the 200-mile segment from Livorno to Civitavecchia, the 56-mile route from Udine to Tarvisio, the 86-mile route from Taranto to Sibari, and the 125-mile route from Catania to Gela via Siracusa. In addition to these projects, the capacities of some *autostrade* are being augmented by construction of one or more new lanes in each direction; most are limited to the vicinity of major urban areas. A number of the newer *autostrade* have been constructed with three lanes in each direction, and some new segments are planned with four lanes in each direction. Some of the *autostrade* currently being built incorporate additional horizontal clearances on bridges and underpasses to facilitate the construction of extra lanes when traffic growth requires them. About five international tunnels are planned to provide better connections between Italy and France, Switzerland, and Austria. The most important project is the 8-mile Frejus tunnel west of Torino. Designed to provide a year-round road link with France, construction is scheduled to begin in 1973. Another important project is the planned rail-highway crossing from the mainland to Sicily across the strait. About US\$2 million has been expended for feasibility studies, and some preliminary construction is scheduled to begin in 1974.

Movement on the highway system may be restricted by physical bottlenecks (Figure 4) including tunnels, galleries, narrow roadways and streets, sharp turns in towns and villages, underpasses, sharp curves, steep grades, narrow low-capacity bridges, and some ferries. Climatic factors impeding movement include heavy rains which cause flash floods and landslides, and snowfalls which block mountain passes.

Highway transport operations are controlled by the Ministry of Transport and Civil Aviation through its agency, the Inspectorate General of Motorization. Control is exercised through the issuance of licenses authorizing the establishment of a transport line or service. The most common type of license is issued to an individual or firm for truck services and vehicles used exclusively in the conduct of the firm's business



FIGURE 4. Highway bottlenecks (U/OU)

Top. Narrow bituminous surfaced secondary road in a rural area of Sicily

Bottom. The hairpin curves on this bituminous surfaced highway are typical of alignments in rugged terrain in Italy

operations. The second type of license is that issued to a company providing transport services for hire. Most of the trucks registered are owned and operated by firms that employ them in carrying out their own operations. Most of the for-hire transport services consist of single vehicle owner-operators and firms that own less than 25 vehicles. There are some large firms that operate country wide and internationally.

The use of containers is increasing both for domestic and international freight movement. Major container terminals are in operation at Genoa, La Spezia, Livorno, and Naples; smaller facilities are at Ancona, Bari, Cagliari, Civitavecchia, Palermo, Porto Torres,

Reggio di Calabria, Savona, Taranto, Trieste, and Venice. The principal commodities hauled by truck are agricultural products, manufactured goods, raw materials, and petroleum products.

In January 1972 the 12,651,975 registered motor vehicles consisted of 11,643,674 passenger cars and 1,008,301 trucks and buses. Italy is a significant producer of motor vehicles; in 1971 manufacture amounted to 1,817,019 passenger cars. There are about 10 motor vehicle manufacturers; Fiat, the principal producer, accounted for over 80% of the total vehicles produced. There is an important market for exports, and large numbers of vehicles are also

FIGURE 5. Selected highways (C)

ORIGIN AND DESTINATION	DISTANCE Miles	SURFACE TYPE	SURFACE WIDTH Feet	SHOULDER WIDTH	REMARKS
France border to Livorno via Genoa.....	195	Bituminous.....	2 at 25.....	10	
Torino to Trieste via Milan, Padova.....	336	.....do.....	2 at 23 to 25.....	10	
Mile 0 to Mile 331.....	331	.....do.....	24 to 25.....	na	
Mile 331 to Mile 336.....	5	.....do.....	34.....	3	Designated as <i>Autostrade</i> but not built to standard because of mountainous terrain.
Savona to France border via Torino.....	178	.....do.....	.....	.....	.....
Mile 0 to Mile 70.....	70	.....do.....	.....	.....	.....
Mile 70 to Mile 148.....	78	.....do.....	2 at 23 to 24.....	10	
Mile 148 to Mile 178.....	30	.....do.....	Prob. 24.....	na	
Genoa to Switzerland border via Milan.....	113	.....do.....	2 at 24.....	8	
Modena to Austria border via Verona.....	194	.....do.....	2 at 24.....	10	Brenner Pass route.
Palmanova to Tarvisio.....	82	.....do.....	2 at 24.....	10	
Mile 0 to Mile 12.....	12	.....do.....	2 at 24.....	10	
Mile 12 to Mile 82.....	70	.....do.....	18 to 26.....	na	Extension of <i>Autostrada</i> s to Tarvisio (Austria border) planned.
Milan to Ancona.....	254	.....do.....	2 at 24.....	10	
Ancona to Pescara.....	92	Bituminous, bituminous treated.....	20 to 23.....	3	Parallel <i>Autostrada</i> under construction; completion scheduled for spring 1973.
Pescara to Vasto.....	41	Bituminous.....	2 at 24.....	10	
Vasto to Foggia.....	63	.....do.....	21 to 23.....	na	<i>Do.</i>
Foggia to Bari.....	76	.....do.....	2 at 24.....	10	
Bologna to Rome.....	220	.....do.....	2 at 24.....	10	
Rome to Reggio di Calabria.....	430	.....do.....	2 at 24.....	10	
Naples to Canosa di Puglia.....	113	.....do.....	2 at 25.....	8	
Messina to Catania.....	61	.....do.....	2 at 25.....	10	

na Data not available.

imported. In 1971 the 680,500 motor vehicles exported consisted of 640,190 passenger cars, 38,440 trucks, and 1,870 buses; 395,700 passenger cars, 14,508 trucks, and 362 buses were imported. Italy is also an important manufacturer of road construction and maintenance equipment; large quantities are exported, and some special purpose types are imported.

E. Inland waterways (C)

Inland waterways play a minimal part in the economy, but their importance should increase within the next decade upon completion of an extensive waterway development and improvement program now underway. Waterway traffic amounted to 4,070,000 short tons in 1971. Principal commodities hauled were sand and gravel, petroleum products, ore, construction materials, fertilizers, and agricultural products. The waterway network is only marginally adequate for normal requirements.

The inland waterway system provides a total of 1,538 miles of navigable routes; 702 miles are rivers, 529 miles are canals, and 307 miles are lake routes. In terms of navigability based on the largest barge that the waterways can accommodate, this mileage is classified as follows:

MAXIMUM BARGE SIZE short tons	NAVIGABLE MILES
275	447
440	392
715	223
1,100	69
1,650	407

The waterways are concentrated almost entirely in the northeastern section of the country and consist mostly of land-cut canals and improved natural streams. On the Tyrrhenian seacoast, four short canals serve Pisa, Livorno and Viareggio. Except for the Viareggio to Vecchiano canal, which carries about 700,000 short tons annually, none are significant. Further to the south, the Tiber River between Rome and Fiumicino on the coast is classified as a navigable inland waterway, but it carries virtually no commercial traffic. In northern Italy near the base of the Alps, four large lakes, Maggiore, Como, Iseo, and Garda, supply the remainder of the Italian waterway routes. Lago Maggiore provides an international connection with Switzerland.

Of the 1,538 navigable miles, some 935 miles of principal routes are discussed below. Their selection has been based on the length of the routes and their

navigability, annual tonnages, and overall importance to the national network. The selected routes and their lengths in miles are as follows:

WATERWAY	LENGTH
Po river	384
Ferrara canal system	58
Venice-Brondolo-Po waterway	31
Litoranea Veneta	76
Venice-Padova waterway	20
Milan canal system	77
Lakes:	
Maggiore	76
Como	68
Iseo	50
Garda	95

The Po and its navigable tributaries form the nucleus of the Italian inland waterway system and provide 384 miles of routes through the rich agricultural and industrial regions of northern Italy. Its tributaries are the Mincio, Oglio, Ticino, and Adda rivers. The system, by direct or indirect connections, enables vessels to operate from Milan, Pavia, Mantova, and Cremona to Ferrara, Venice, and Sdobbia near Trieste. The river is navigable for 171 miles by vessels of 1,485-short-ton capacity from one of its several mouths at Pila, on the Adriatic Sea, to Cremona. The 33-mile segment between Cremona and Piacenza is usable by 660-ton craft, and the final 56 miles of the Po proper to its upstream limit of navigation at Gerola Nuova are navigable by 330-ton vessels. The only lock on the Po is about midway between Cremona and Piacenza, but some 25 bridges cross the waterway. These have vertical and horizontal underbridge clearances adequate for vessels now using the waterway. Of the tributaries, the 25 miles of the westernmost Ticino river connect the Po with Pavia and with the Milan canal system, but because of inadequate depths and numerous small locks, relatively little tonnage is moved over the route. The Adda river provides about 15 miles of waterway between Formigara and the confluence with the Po upstream from Cremona. There are no locks and only two bridges on this segment, which, although shallow, carries a fair amount of traffic. The Oglio river, which joins the Po at mile 118, is navigable for 100-ton craft for 41 miles to Canneto sull'Oglio. It has no locks, but there are numerous bridges. The Mincio, which is usable for 13 miles from the Po to the important city of Mantova, is the most important of the four Po tributaries and is navigable by 1,485-ton craft. Its structures consist of two locks and six bridges. Petroleum products account for about 75% of the cargo handled.

The 58-mile Ferrara canal system is a group of canals radiating from the agricultural and industrial center of Ferrara and providing an alternate route to the Adriatic generally parallel to but south of the Po. The system consists of the 42-mile Po di Volano, the 3.5-mile Canale Boicelli, the 8-mile Canale Marozzo, and the 4.5-mile Canale Pollotta. Widened and deepened in recent years, the system has a total of five locks and can accommodate 1,485-ton barges. The system joins the Po at Pontelagoscuro north of Ferrara.

The Venice-Brondolo-Po waterway is an important, heavily travelled 31-mile north-south route between Venice and the Po. It is navigable by 1,485-ton craft between Venice and Chioggia and by 660-ton craft between Chioggia and the Po. Structures consist of four single-chamber locks, one double-chambered lock, and seven bridges, three of which have movable spans. Chioggia, about midway on the route, is an important waterway port with waterway connections leading westward.

A northward extension of the Venice-Brondolo-Po waterway, the Litoranea Veneta, extends northeastward from Venice along the Adriatic coast to Sdobbba near Trieste and the Yugoslav border. The 76-mile waterway permits traffic to move from the Po through Venice to Italy's eastern frontier. The Litoranea Veneta is composed of a number of land-cut canals, natural channels, several lagoons, and short river stretches. Craft of 660-ton capacity can navigate throughout its length. A total of 197 miles of navigable rivers and canals branch off the Litoranea Veneta to provincial centers to the north and west. The waterway has five locks and eight bridges with movable spans.

The 19.5-mile Venice-Padova waterway is the most important in the Padova canal system, which has a total of 150 miles of mostly low-capacity but essential routes connecting Venice, Padova, Chioggia, and Vicenza. The Venice-Padova waterway, usable by 330 ton craft, is a canalized stream and has five locks and numerous bridges.

The Milan canal system has three canals, which are important transport arteries in the Lombardia region. The canals provide Milan with access to the Ticino, Adda, and Po rivers and to the lakes Maggiore and Como. The three canals are the Naviglio Grande, which links Milan with Lagodi Como (Lake Como); the Naviglio della Martesana, which connects Milan with the Adda; and the Naviglio di Pavia between Milan and Pavia on the Ticino. Although 77 miles of canals are navigable by vessels of less than 100-ton capacity, the system carries a heavy volume of traffic.

The four most important Italian lakes in descending order of commercial significance are Como, Iseo, Maggiore, and Garda. All four are located near the base of the Alps; all are long, narrow, and deep and are encircled by steep mountains. The northern part of Lago Maggiore lies in Switzerland. Passenger traffic is heavy on the lakes much of the year. The heaviest freight traffic is on 56-square-mile Lago di Como, which transports an annual tonnage ranging between 385,000 and 550,000 short tons. Lago di Iseo and Lago Maggiore each move about 110,000 short tons per year. Lago di Garda, the largest of the four, carries virtually no freight.

Natural traffic interruption factors on the waterways consist of seasonal water-level fluctuations, floods, shifting sandbars, fog, and silting. These factors at times limit navigation and may cause vessels to proceed at reduced draft, but they do not usually bring about any serious suspension of traffic on the principal routes. Ice, which is normally a threat to navigation on other European waterways, rarely occurs on Italian canals and rivers.

The inland waterway ports, with the exception of Venice, which handles large amounts of both inland waterway and maritime traffic, are largely inadequate. In general, they are meager and have rudimentary cargo-handling and berthing facilities and poor clearance. Storage facilities are sparse. In terms of short tons handled, the following were the leading waterway ports in 1970:

Venice	2,000,000
Mantova	800,000
Ferrara	495,000
Cremona	339,000
Ostiglia	290,000
Milan	193,000 (est)

The inland waterway fleet in December 1971 consisted of the following vessels:

TYPE	NUMBER	SHORT-TON-CAPACITY
Self-propelled barges	378	50,000
Self-propelled tankers	42	25,200
Dumb barges	348	50,800
Dumb tankers	34	17,000
Tugs	15	0
Push boats	7	0
Total	824	143,000

Almost all units of the fleet are small, low-capacity craft; only 31 barges have a capacity greater than 1,000 tons. A more recent fleet census has not been published, but the number of larger vessels, particularly tankers, is increasing.

Administration, supervision, and control of the waterways are divided between two government departments. The administrative control of shipping and the ownership and commissioning of vessels is under the Ministry of Transport and Civil Aviation, and the Ministry of Public Works is responsible for the construction and maintenance of waterways and the publication of waterway statistics.

In very recent years some of the inland waterways have been significantly improved, and further improvement and modernization are both in progress and planned. The Po, formerly usable only by 600-ton craft, is now navigable throughout much of its length by 1,485-ton barges as is the Venice-Brondolo-Po waterway. A new waterway, the Milan-Cremona-Po canal (Figure 6) is under construction and, when completed, probably by 1975, will connect Milan with the Po and thus provide direct access from Milan to the Adriatic for 1,485-ton vessels. The new 46-mile canal is to have a 126-foot width and a 12.5-foot depth. New port facilities are under construction at both Milan and Cremona. The 17-mile Venice-Padova canal, also under construction, is scheduled for completion in 1977; it will be navigable by 1,485-ton barges.

Figure 7 lists characteristics of selected inland waterways.

F. Pipelines (C)

Italy is developing extensive pipeline systems in support of a rapidly growing domestic petroleum trade and for the international movement of crude oil from Mediterranean terminals to central Europe. More than 1,100 miles of pipelines transport crude oil, 500 miles of commercial lines are used for the distribution of refined products, and nearly 400 miles of military refined products pipelines serve NATO installations in

Italy. The country's natural gas pipeline network totals more than 6,000 miles and is one of western Europe's largest. Oil and natural gas pipelines are owned and operated by several commercial companies and the National Hydrocarbons Authority (*Ente Nazionale Idrocarburi*—ENI).

Large diameter crude oil lines connect inland petroleum refineries with modern port facilities; more than 60% of these lines connect with marine petroleum terminals in the Genoa area. Two large international pipeline systems transport crude oil from Italian ports to refineries in Austria, Switzerland, and West Germany. One of these, the 420-mile, 18- to 32-inch-diameter Central European Pipeline, extends from Genoa to Ingolstadt, West Germany. At Ferrara Erbognone a branch line extends northwestward to Aigle, Switzerland. The other international system is the 40-inch Trans Alpine Pipeline, which extends 285 miles from the Trieste tanker unloading terminal and extensive crude oil storage facilities through Austria to Ingolstadt, West Germany, refineries. In Austria a branch pipeline serves several petroleum refineries.

Refined products pipelines are mainly concentrated in northern Italy. Commercial lines of 4- to 20-inch diameters connect refineries with distribution facilities and powerplants. The 94-mile line from Trecate to Savona is the longest. Small diameter military pipelines transport fuels from La Spezia to Rivolto, a distance of 267 miles. At Parma, 56 miles northeast of La Spezia, a branch line extends 119 miles across Italy to Ravenna on the Adriatic coast.

An extensive natural gas pipeline network is supplied mainly by fields in the Po valley and by imported liquified natural gas, which is processed and enters the Italian lines at La Spezia. Northern Italy is interlaced with natural gas pipelines, and important trunk lines extend down both coasts. In Sicily natural gas is piped from Gagliano Castelferrato to consumers

FIGURE 6. Recently completed segment of the Milan-Cremona-Po canal. Looking eastward. (U/OU)

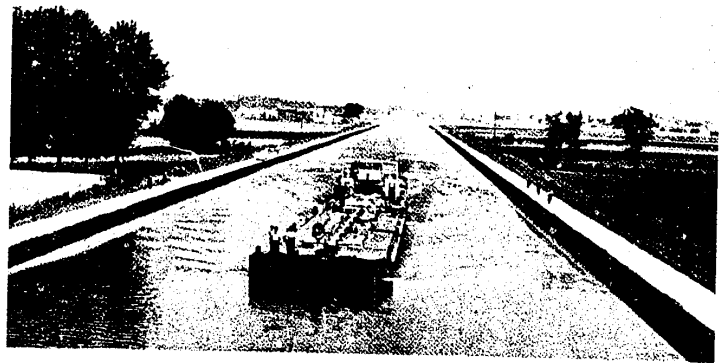


FIGURE 7. Selected inland waterways (C)

NAME, TYPE, AND NAVIGABLE LENGTH	CHANNEL CHARACTERISTICS		CONTROLLING LOCK DIMENSIONS: LENGTH AND WIDTH; DEPTH OVER SILL	CONTROLLING UNDER-BRIDGE CLEARANCES		REMARKS
	Width	Safe draft		Horizontal	Vertical	
Po: Improved natural stream; 260 miles; Pila to Gerola Nuova.	na	8.2 to 11.5	200 x 33; 11.5.....	na	na	One lock; navigable by 1,485-ton craft to Crenonna, by 660-ton craft to Gerola Nuova.
Ticino River: Natural stream; 25 miles; Po milepost 240 to Vigevano.	na	7.2	...	na	na	Navigable by 330-ton craft to Pavia.
Mincio River: Canalized stream; 13 miles; Po milepost 102 to Mantova.	na	10.0	266 x 38; 12.....	na	na	One lock; navigable by 1,485-ton craft.
Canale Pallotta: Improved natural stream; 4.5 miles; Porto Garibaldi to Comacchio.	na	10.0	...	na	na	Part of Ferrara Canal system; entire system navigable by 1,485-ton craft.
Canale Marozzo: Improved natural stream; 8 miles; Comacchio to Codigoro.	na	10.0	266 x 38; 10.....	na	na	Part of Ferrara Canal system; one lock.
Po di Volano: Canalized stream; 42 miles; Codigoro to Ferrara.	na	10.0	230 x 32; 10.....	na	na	Part of Ferrara Canal system; one lock.
Canale Boticelli: Land-cut canal; 3.5 miles; Ferrara to Pontelagoscuro.	na	10.0	450 x 38; 11.....	na	na	Part of Ferrara Canal system; 3 locks; junction with Po at Pontelagoscuro.
Venice-Brondolo-Po waterway: Natural stream and dredged channel; 31 miles; Venice to Po milepost 19.	na	8.2 to 11.0	266 x 33; 12.....	48	na	5 locks; navigable by 1,485-ton craft Venice-Chioggia, by 660-ton craft Chioggia-Po River.
Litoranea Veneta waterway: Lagoons, natural stream, and land-cut channels; 76 miles; Venice to Sdobbba.	39 to 62	6.5	200 x 28; 11.5.....	33	Unlimited	5 locks; extension of Venice-Brondolo-Po waterway; navigable by 660-ton craft.
Venice-Padova waterway: Canalized stream; 19.5 miles; Venice to Padova.	na	8.2	118 x 17; 9.....	na	na	5 locks; navigable by 330-ton craft; new 1,350-ton capacity canal under construction.
Naviglio Grande: Land-cut canal; 32 miles; Milan to Tornavento.	na	3.2 to 12.0	200 x 30; 5.0..... (est)	na	na	Numerous small locks; navigable by 40-ton craft; part of Milan canal system.
Naviglio della Martesana: Land-cut canal; 24 miles; Milan to Adda River..	na	3.0 to 9.2	100 x 17; 8.....	na	na	Numerous small locks; navigable by 25-ton craft; part of Milan canal system.
Naviglio di Pavia: Land-cut canal; 21 miles; Milan to Pavia.....	na	3.5 to 8.8	.....na.....	na	na	3 sm-ll locks; navigable by 40-ton craft; part of Milan canal system.

na Data not available.
... Not pertinent.

in Gela and Termini Imerese and from Bronte to Catania.

No major crude oil or refined products pipelines are planned, but Italy has two important large-diameter international natural gas pipelines under construction. A 500-mile line is being built to bring natural gas to Italy from the Netherlands through West Germany and Switzerland; this line will terminate at Mortara, southwest of Milan. The second international line will allow natural gas from the Soviet Union to be piped across Czechoslovakia and Austria to Tarvisio, Italy. The Italian segment will continue southwestward to its terminal at Seregno, north of Milan. Both lines are scheduled for completion by the end of 1973. In addition, Italy is studying plans to construct a large-diameter natural gas pipeline across the Mediterranean from Algerian fields.

Details of selected pipelines are given in Figure 8.

G. Ports (C)

Oceangoing vessels can berth alongside in the 16 major and 22 significant minor ports, which are located on the mainland and the islands of Sicily and Sardinia.

The mountainous nature of Italy, its geographical position at the crossroads of the Mediterranean, and the fact that over 90% of the country is within 75 miles of the coast have made it one of the leading maritime nations. The relative scarcity of large bays and natural harbors has necessitated the construction of extensive artificial protective works as expansion of ports has taken place. Harbor space in all but a few ports is at a premium. Mediterranean mooring is widely used to conserve space, cargo being lightered ashore.

Most of the major ports are on the mainland and are fairly well distributed along the Adriatic, Ligurian, and Tyrrhenian seacoasts. Catania, Messina, and Palermo are major ports in Sicily; Cagliari is the capital and chief port of Sardinia. Genoa and Savona on the northern part of the west coast and Venice-Marghera at the head of the Adriatic handle the major share of traffic to and from the northern industrial centers. Livorno is an outlet for the north-central cities of Florence, Bologna, and Perugia. Trieste, also at the head of the Adriatic, handles traffic primarily in transit to and from Austria and Czechoslovakia. Naples, second only to Genoa in activity, is the principal focal point for central and southern Italy. Adriatic commerce and trade with the Middle East are carried on through the smaller Adriatic ports of Bari, Brindisi, and Ancona. Barletta, about 35 miles northwest of Bari, is a fishing port that has limited

traffic. Taranto, in southern Italy, and La Spezia are significant as naval bases; the latter is also important commercially.

Most Italian ports are under the direct ownership and control of the state through the Ministry of Merchant Marine. Two exceptions are Genoa and Trieste, which are governed by autonomous port associations. The major ports are well equipped and efficient and are considered adequate for normal requirements. The principal naval bases, La Spezia, Taranto, and Messina, provide varying degrees of operational and logistical support to fleet units.

Various expansion and renovation projects are envisioned for the major ports under a 5-year plan (1971-75). Some of the projects include construction of container terminals, berthing for supertankers, and a bridge over the Messina strait to connect Sicily with the mainland by 1977. Plans are being drawn up for a new port at Voltri, some 4 miles west of Genoa. The earliest date for completion of this project, which includes three container facilities and a number of roll-on roll-off berths, is 1980. Planned for Naples is a container marshalling, storage, and clearance area some 12 miles from the main port. Funds have already been appropriated to modernize and enlarge existing port facilities. Present general cargo traffic is expected to grow considerably because of new industries settling in the Naples area and in southern Italy. Work is proceeding on a new commercial basin at Marghera, to which the free port will later be transferred. In addition, oil traffic is being rerouted via the Malamocco canal to bypass Venice proper to the San Leonardo petroleum docks. This canal is to have depths sufficient for large tankers and is ultimately to extend to Marghera. In Trieste, Pier VII has recently been completed as a facility for container ships, but so far no handling equipment has been provided. Pier VII is a transshipment point for an expected large trade in containerized fruit and vegetables which will move from Greece, Israel, Turkey, and other Middle East ports through Trieste to northern Europe.

Details of the major ports are tabulated in Figure 9.

H. Merchant marine (C)

Despite Italy's heavy reliance on maritime transport, the merchant fleet's carrying capacity has not kept pace with the country's annual growth in international seaborne trade; Italy has increasingly depended upon foreign-flag shipping for the carriage of this trade. In 1969 the fleet carried about 23% of the total volume of seaborne imports and exports and in 1970 about 21%. As a result of more funds paid out

FIGURE 8. Selected pipelines (S)

TERMINALS		LENGTH IN ITALY	DIAMETER Inches	PRODUCTS CARRIED	CAPACITY*	REMARKS
From	To					
Gagliano Castelferrato	Gela	50	6	Crude oil	na	Owned by ENI. Pumping station at Gagliano Castelferrato.
Genoa	Busalla	19	16	do	40,000	Owned by <i>Industria Piemontese Lavorazione Olii Minerali</i> . Pumping station at Genoa.
Do	Cremona	95	12/14	do	100,000	Owned by <i>Amoco Italia, S.P.A.</i> Parallel lines. Pumping station at Genoa.
Do	Rho	81	12	do	80,000	Owned by <i>Shell Italiana, S.P.A.</i> Pumping station at Genoa.
Do	Lacchiarella	67	10	do	50,000	Owned by <i>Continente Italiana, S.P.A.</i> Pumping station at Genoa.
Lacchiarella	Villasanta	25	8	do	30,000	Extension of Genoa-Lacchiarella line. Pumping station at Lacchiarella.
Genoa	Ferrera Erboognone	52	26, 32	do	360,000	Central European Pipeline. Pumping stations at Genoa, Ferrera Erboognone.
Ferrera Erboognone	Chivasso	48	18	do	60,000	Branch of Central European Pipeline. Pumping stations at Ferrera Erboognone, Chivasso.
Chivasso	Et-oubles	75	12, 16	do	60,000	Extension of above branch line; line continues into Switzerland, terminates at Aigle. Pumping stations at Chivasso and Aosta.
Ferrera Erboognone	Icola	126	18 to 26	do	200,000	Branch of Central European Pipeline; line crosses into West Germany, terminating at Ingolstadt. Pumping stations at Ferrera Erboognone, Melegnano, Lecco, Sac Giacomo, Isoia.
Ferrera Erboognone	Bertonico	51	22	do	140,000	Branch of Central European Pipeline placed in service 1972. Owned by <i>Gulf Italiana, S.P.A.</i> Pumping station at Ferrera Erboognone.
Do	Volpiano	57	20	do	120,000	Branch of Central European Pipeline placed in service 1970. Pumping station at Ferrera Erboognone.
Marghera	Mantova	78	10	do	40,000	Owned by <i>Industrie Chimiche Italiane del Petrolio</i> . Pumping station at Marghera.
Ragusa	Augusta	40	14	do	40,000	Pumping stations at Ragusa, Palazzolo Aereide.
Trieste	Timau	90	40	do	1,080,000	Owned by <i>Societa Italiana per l'Oleodotto Transalpino, S.P.A.</i> Italian section of international Trans Alpine Pipeline (TAL) serving refineries near Ingolstadt, West Germany, Lannach and Vienna, Austria. Pumping stations at Trieste, Timau.
Vado Ligure	Treate	94	20	do	160,000	Owned by <i>Societa per Azioni Raffineria Padana Olii Minerali (SARPOM)</i> . Pumping station at Vado Ligure.

Location	City	Refined products	Capacity	Remarks
La Spezia	Parma	Refined products	33,260	NATO. Pumping stations at La Spezia, Pontremoli, Parma. Pipeline occasionally transports commercial products from La Spezia to Fornovo di Taro.
Parma	Treviso	do	17,840	NATO. Pumping stations at Parma, Montichiari, Verona, Vicenza, Treviso.
Treviso	Rivolto	do	6,050	NATO. Pumping stations at Treviso, Roveredo in Piano.
Parma	Bologna	do	17,840	NATO. Pumping stations at Parma, Salvaterra, Bologna.
Bologna	Ravenna	do	6,050	NATO. Pumping stations at Bologna, Mordano.
Arcola	Fornovo di Taro	do	na	Owned by <i>Societa Petroli S.p.A.</i> . Pumping station at Arcola.
Arquata Scrivia	Genoa	do	310,000	Owned by <i>Dott. Edoardo Garrone Raffinaria Petroli S.P.A.</i> ; 5 parallel lines.
Busalla	do	do	20,000	Owned by <i>Industria Piemontese Lanorazione Oli Minerati</i> . Pumping station at Busalla.
Cremona	Piacenza	do	24,000	Owned by <i>Ente Nazionale per l'Energia Elettrica (ENEL)</i> . Heavy fuel oil line; pumping station at Cremona.
Ferrera Erbognone	Chivasso	do	23,000	Owned by <i>Azienda Generale Italiana Petroli (AGIP)</i> . Two lines transport fuel oil to thermal powerplant.
Do	Piacenza	do	na	Pumping station at Ferrara Erbognone.
Do	Rho	do	38,000	Owned by <i>Societa Oleodotti Padani (SOP)</i> . Pumping station at Ferrara Erbognone.
Gagliano Castelferra	Gela	do	7,500	Owned by <i>Azienda Nazionale Idrogenazione Combustibili (ANIC)</i> . Line carries natural gasoline to Gela.
Livorno	Florence	do	Remarks	Pumping station at Gagliano Castelferra.
Sannazzaro de' Burgondi	Le Caselle	do	na	Owned by <i>Staic Industria Petroli S.P.A.</i> . Parallel lines; pumping station at Livorno. Capacity: 26,000 bbl./day for white products, 17,000 bbl./day for black products.
Treate	Chivasso	do	38,000	Owned by SOP. Transports fuel oil to powerplant. Pumping station at Sannazzaro de' Burgondi.
Cortemaggiore	Savona	do	11,400	Owned by SARPOM. Pumping station at Treate.
Do	Torino	Natural gas	100	
Do	Genoa	do	100	
Livorno	Livorno	do	est 275	Branch line to LNG processing facilities at La Spezia.
Do	Piombino	do	na	
Do	Montelupo Fiorentino	do	na	
Montelupo Fiorentino	Rimini	do	na	
Cortemaggiore	Bologna	do	100	
Bologna	Ravenna	do	100	
Alfonseine	San Bonifacio	do	na	

Footnotes at end of table.

FIGURE 8. Selected pipelines (S) (Continued)

TERMINALS		LENGTH		DIAMETER	PRODUCTS CARRIED	CAPACITY*	REMARKS
From	To	IN ITALY	Miles				
Ravenna.....	Minerbio.....		37	30	Natural gas.....	na	
Minerbio.....	Cremona.....		81	22	do.....	na	
Cremona.....	Busto Arsizio.....		75	16	do.....	100	
Cremona.....	Mestre.....		117	16	do.....	100	
Mestre.....	Sabbioncello.....		64	na	do.....	na	
Do.....	Trieste.....		88	16-22-10	do.....	na	
Do.....	Ravenna.....		73	22	do.....	na	
Ravenna.....	Rimini.....		34	26	do.....	na	
Rimini.....	Chieti.....		161	26	do.....	na	
Chieti.....	Vasto.....		30	na	do.....	na	
Vasto.....	Larino.....		na	na	do.....	na	
Larino.....	Colleferro.....		169	14	do.....	95	
Vasto.....	Biccari.....		51	30	do.....	na	
Biccari.....	Rome.....		154	16-12-10	do.....	na	
Rome.....	Cisterna.....		37	10-6	do.....	na	
Cisterna.....	Benevento.....		126	20	do.....	na	
Benevento.....	Candela.....		53	14-8	do.....	na	
Candela.....	Naples.....		107	18-16-14	do.....	na	
Naples.....	Roseto Valfortore.....		69	24-16	do.....	na	
Cellino Attanasio.....	Bussi Officine.....		60	8-6	do.....	na	
Ferrandina.....	Bari.....		42	10	do.....	35	
Bronte.....	Catania.....		37	12-5	do.....	na	
Gagliano Castelferrato.....	Gela.....		55	12-13	do.....	na	
Do.....	Termini Imerese.....		61	20 to 4	do.....	50	
						na	

na Data not available.

*Capacity for petroleum pipelines in bbl. per day, natural gas in cubic meters per day.

FIGURE 9. Major ports (C)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Ancona..... 43°37'N., 13°30'E. 17,000	Only sizable part between Bari and Veniec; noted for shipyards. Headquarters of Adriatic Naval District. Minor naval base. Receipts—coal, crude oil, cereals. Shipments—sulphur, phosphates, farm produce. 1 large, 2 small shipyards. Largest of 4 shipbuilding ways has 830-ft. length.	Well-protected, substantially circular harbor about 1/2 miles in diameter; depths, 9 to 32 ft. Fairway limitations—Seaward approach free and clear; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 44 ft.; tanker would occupy stern-to berth with least depth of 44 ft.; length not limiting in either case.	Alongside—1 large, 6 standard, 8 small ocean-type, 2 standard, 8 small coaster-type cargo vessels; 45 lighters; 1 large, 1 standard, 1 small ocean-type, 1 standard coaster-type tanker; 1 river-type tank barge; 2 medium, 1 small naval vessel. Anchorage—Large numbers of berths for all sizes of vessels N. of harbor entrance in depths 42 to 55 ft. over hard sand; protected from W. and SW. but untenable N. and E. winds. Alongside—3 large, 1 standard, 5 small ocean-type, 3 standard, 11 small coaster-type cargo vessels; 23 lighters; 2 large ocean-type, 1 standard coaster-type tanker. Anchorage—6 large passenger ships N.W. of harbor entrance in depth of 60 ft. over poor holding ground of rock; protected except from SE. Mooring—1 standard ocean-type cargo vessel, 1 standard coaster-type tanker.
Bari..... 41°08'N., 16°31'E. 12,290	Commercial and industrial center. Receipts—crude oil, coal, grain, metals, machinery. Shipments—refined oils, alcoholic beverages, olive oil, vineyard products. Container transshipment facilities available. 4 small shipyards engaged in building and repairing fishing vessels; largest marine railway has 262-ft. length.	Well-sheltered, breakwater-protected, circular harbor; water area, 300 acres; depths, 6 to 49 ft. Fairway limitations—Approach deep and clear, no defined fairway; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 34 ft.; tanker berth with least depth of 35 ft.; length not limiting in either case.	Alongside—2 standard, 2 small ocean-type, 2 standard coaster-type cargo vessels; 7 lighters; 1 small ocean-type tanker. Anchorage—Large number of berths for all sizes of vessels 2 miles W. of harbor entrance, in depths of 49 to 66 ft. over good holding ground of sand and mud; protected except from N.
Barietta..... 41°19'N., 16°17'E. 3,000	Small fishing port; limited traffic. Receipts—coal, iron, phosphate, pyrites, grain, ammonium sulphate, ammonium nitrate. Shipments—salt, pyrite ash, bauxite, cement. 1 small shipyard repairs small fishing and harbor craft; 2 marine railways, hauling capacity, 50 tons each.	Well-sheltered, roughly circular, breakwater-protected harbor; water area, 20 acres; depths, 8 to 30 ft. Fairway limitations—Approach free and clear, but several shoals lie 1,000 ft. N. and NE. of E. breakwater; harbor entrance 775 ft. wide, controlling depth, 28 ft. Largest vessel accommodated—Would occupy alongside general berth with least depth of 28 ft.; tanker berth with least depth of 27 ft.; length not limiting in either case.	Alongside—1 large, 9 standard, 3 small ocean-type, 4 standard, 8 small coaster-type cargo vessels; 14 lighters; 1 large ocean-type (off-shore tanker berth), 3 standard coaster-type tankers; 6 river-type tank barges; 2 medium, 19 small naval vessels. Anchorage—1 ocean-type, 2 coaster-type vessels in outer roadstead in depths of 42 to 100 ft. over good holding ground of mud; exposed from N. Mooring—6 standard ocean-type cargo vessels.
Brindisi..... 40°39'N., 17°39'E. 14,500	Headquarters of Brindisi Naval Defense Command. Receipts—phosphates, oil, timber, coal, cereals. Shipments—wine, wine casks, fruits. 1 large, 2 small shipyards. Largest of 2 floating drydocks has 3,000-ton lifting capacity.	Improved natural harbor consisting of an outer roadstead, outer harbor, and inner harbor; water area about 4 1/2 sq. miles; depths, 16 to 60 ft. Fairway limitations—Approach free and clear; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 26 ft.; tanker would occupy offshore pipeline berth with least depth of 42 ft.; length not limiting in either case.	Alongside—1 large, 9 standard, 3 small ocean-type, 4 standard, 8 small coaster-type cargo vessels; 14 lighters; 1 large ocean-type (off-shore tanker berth), 3 standard coaster-type tankers; 6 river-type tank barges; 2 medium, 19 small naval vessels. Anchorage—1 ocean-type, 2 coaster-type vessels in outer roadstead in depths of 42 to 100 ft. over good holding ground of mud; exposed from N. Mooring—6 standard ocean-type cargo vessels.

*Footnote at end of table.

FIGURE 9. Major ports (C) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Cagliari..... 39°13'N., 9°07'E. 11,400	Chief port and capital of Sardinia; important naval base. Receipts—coal, timber, grain, machinery, containers. Shipments—salt, charcoal, wine, hides, lead, zinc, sugar, cattle, corn, flour, containers. 1 small shipyard; largest repair facility is floating drydock 300 ft. long.	Well-protected, artificial, breakwater-protected harbor; water area 600 acres; depths, 6 to 30 ft. Fairway limitations—Approach free and clear; entrance width, 1,300 ft., depth, 3/8 ft.; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 27 ft.; tanker berth with least depth of 36 ft.; length not limiting in either case.	Alongside—6 standard, 1 small ocean-type, 4 standard coaster-type cargo vessels; 9 lighters; 1 large, 2 small ocean-type tankers; 1 river-type tank barge; 9 medium, 13 small naval vessels. Anchorage—Large number of berths for all sizes of vessels S. of harbor in depths up to 60 ft. over good holding ground of mud; open to SE. Moorings—3 medium, 1 small naval vessel. Alongside—4 large, 1 standard, 9 small ocean-type, 1 standard, 7 small coaster-type cargo vessels; 52 lighters. Anchorage—Large number of berths for all sizes of vessels 1/2 mile SE. of port in depths of 66 ft.; good holding ground of sand.
Catania..... 37°30'N., 15°06'E. 35,000	Shipping center for rich Sicilian agricultural area. Receipts—grain, sulfur ore, coal, lumber. Shipments—refined sulfur, lavatic building stone, citrus fruits, wine, olive oil, fish, many manufactured items. Container transshipment facilities available. 3 small marine railways make minor repairs to small craft.	Artificial, rectangular harbor formed by breakwater and 2 moles; area, 1 sq. mile; general depths, 24 to 36 ft. Fairway limitations—Approach deep and clear; entrance to inner harbor between 2 moles; width, 800 ft.; depths, 33 ft.; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 32 ft., length not limiting.	Alongside—40 large, 41 standard, 19 small ocean-type, 21 standard, 20 small coaster-type cargo vessels; 76 lighters; 10 large, 1 standard, 3 small ocean-type tankers; 1 standard coaster-type tanker. Anchorage—Large number of berths for all sizes of vessels in Gulf of Genoa in 50 to 175 ft. depths over mud and sand; open SE. to NW. Mooring—10 large, 15 standard, 7 small ocean-type cargo vessels; 8 large, 2 standard, 1 small ocean-type tanker.
Genoa..... 44°24'N., 8°56'E. 85,600	Important maritime and industrial center. Receipts—petroleum, metallic minerals, scrap iron, coal, grain, chemical products, foodstuffs, machinery, containers. Shipments—refined petroleum products, machinery, vehicles, textiles, chemical products, glassware, wine, cheese, containers. 3 large, 1 medium, 5 small shipyards engaged in shipbuilding and repair. Largest drydock has 935-ft. length.	Large, breakwater-protected, artificial harbor extending 5 1/2 miles across N. end of Gulf of Genoa; consists of commercial (fronting Genoa proper) and industrial (fronting W. Genoa) divisions; water area, 900 and 300 acres, respectively; general depths, 9 to 60 ft. Fairway limitations—Approach through gulf clear and deep; W. entrance to commercial division, between outer breakwater and head of Nino Romeo mole, is 500 ft. wide and has controlling depth of 33 ft.; E. entrance, customarily used, lies between 2 breakwaters and is 675 ft. wide; controlling depth, 49 ft.; entrance to industrial division, at W. end of harbor between Mulledo breakwater and side of airport area, is 450 ft. wide; controlling depth, 51 ft.; depths leading to berths generally exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 39 ft.; tanker berth with least depth of 52 ft.; length not limiting in either case.	Alongside—40 large, 41 standard, 19 small ocean-type, 21 standard, 20 small coaster-type cargo vessels; 76 lighters; 10 large, 1 standard, 3 small ocean-type tankers; 1 standard coaster-type tanker. Anchorage—Large number of berths for all sizes of vessels in Gulf of Genoa in 50 to 175 ft. depths over mud and sand; open SE. to NW. Mooring—10 large, 15 standard, 7 small ocean-type cargo vessels; 8 large, 2 standard, 1 small ocean-type tanker.

La Spezia
 44°06'N., 9°50'E.
 30,000

Major naval base and headquarters of Upper Tyrrhenian Naval District. Receipts and shipments—coal, petroleum. Container transshipment facilities available. 2 large, 2 medium, 2 small shipyards; largest drydock has 705-ft. length.

Livorno (Leghorn)
 43°33'N., 10°19'E.
 35,000

Principal petroleum center. Receipts—petroleum, wheat, oil seeds, vegetable oils and fats, fish, coffee, woodpulp, cellulose, mineral ores, iron and steel, coal, chemical products, fertilizers, containers. Shipments—hemp, marble, wine, cement, tiles, leather and hides, yarn and textile goods, agricultural products, foodstuffs, fruit, glass, containers. 1 large, 1 medium, 3 small shipyards construct and repair all types of vessels. Largest drydock has 462-ft. length.

Messina
 38°10'N., 15°30'E.
 10,000

Principal naval base. Important Sicilian commercial port. Receipts—coal, lumber, iron, cement, manufactured items, mineral oil. Shipments—fruit, vegetable oils, wines. 1 large, 6 small shipyards. Largest drydock has 492-ft. length.

Naples
 40°50'N., 14°15'E.
 31,000

Largest port in S. Italy; principal passenger port. Headquarters of Lower Tyrrhenian Naval District. Minor naval activity. Receipts—petroleum, coal, cereals, raw and manufactured metals, lumber, fertilizers, general merchandise, containers. Shipments—vegetables, fruits, flour, hemp, cloth, containers. 2 large, 2 medium, 2 small shipyards. Largest drydock has 1,145-ft. length.

Medium-sized, well-sheltered, coastal, breakwater harbor; water area, 5 sq. miles, general depths, 30 to 42 ft.
 Fairway limitations—Approach deep and clear; 2 entrance channels; principal, 935 ft. wide, controlling depth, 42 ft.
 Largest vessel accommodated—Would occupy alongside general berth with least depth 30 ft., length not limiting; naval vessel would occupy berth with least depth of 36 ft., length not limiting; tanker would occupy alongside berth with least depth of 36 ft., length, 722 ft.
 Well-protected artificial harbor about 5 miles long; consists of number of basins; depths, 7 to 40 ft.
 Fairway limitations—S. approach and entrance free and clear; N. approach free and clear but has controlling depth of 24 ft. at entrance.
 Largest vessel accommodated—Would occupy alongside general berth with least depth of 30 ft.; largest tanker would occupy alongside berth with least depth of 31 ft.; length not limiting in either case.

Natural, well-sheltered, circular deepwater harbor; water area, 190 acres; depths, 24 to 200 ft.
 Fairway limitations—Approach free and clear; entrance width, 2,200 ft.; depths leading to berths generally exceed depths in berths.
 Largest vessel accommodated—Would occupy alongside general berth with least depth of 32 ft.; tanker berth with least depth of 26 ft.; naval berth with least depth of 26 ft.; length not limiting in any case.
 Extensive artificial harbor; well protected by 4 breakwaters; length, 3 miles; width, 1/2 mile; depths, 10 to 36 ft.
 Fairway limitations—Approach clear and deep; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general or tanker berth with least depth of 36 ft.; length not limiting in either case.

Alongside—4 large, 2 standard, 13 small ocean-type, 1 standard, 7 small coaster-type cargo vessels; 22 lighters; 3 large, 2 small ocean-type tankers; 2 large, 27 medium, 52 small naval vessels.
 Anchorage—Large number of berths for all sizes of vessels in outer harbor in depths of 20 to 39 ft. over mud; well protected.
 Mooring—4 standard ocean-type, 6 standard coaster-type cargo vessels; 2 large naval vessels.
 Alongside—1 large, 14 standard, 5 small ocean-type, 37 standard, 12 small coaster-type cargo vessels; 49 lighters; 2 large, 5 small ocean-type, 5 standard coaster-type tankers; 3 medium naval vessels.
 Anchorage—Large number of unprotected berths for all sizes of vessels W. and N. of harbor in depths 30 to 36 ft. over mud, sand, weeds; unprotected except from E.

Alongside—3 large, 2 standard, 2 small ocean-type, 2 standard coaster-type cargo vessels; 6 lighters; 1 small ocean-type, 3 standard coaster-type tankers; 1 medium, 14 small naval vessels.
 Anchorage—Large number of berths for all sizes of vessels 1/2 miles N. of entrance in depths of 16 to 140 ft. over good holding ground of fine gravel; fair protection.

Alongside—10 large, 12 standard, 13 small ocean-type, 11 standard, 4 small coaster-type cargo vessels; 28 lighters; 3 large, 1 standard, 3 small ocean-type, 3 standard coaster-type tankers; 11 small naval vessels.
 Anchorage—Large number of berths for all sizes of vessels in Bay of Naples in depths of 65 to 120 ft. over mud and sand; exposed to S.
 Mooring—17 large, 4 standard ocean-type cargo vessels; 1 large, 15 medium naval vessels.

Footnote at end of table.

FIGURE 9. Major ports (C) (Continued)

NAME; LOCATION; ESTIMATED MILITARY PORT CAPACITY*	ACTIVITIES	HARBOR	BERTHS
Palermo..... 38°07'N., 13°22'E. 14,500	Principal port and capital of Sicily. Receipts—coal, cereals, flour, fertilizers, asphalt, cement, petroleum, metals. Shipments—mostly manufactured goods. Container transshipment facilities available. 1 large, 1 small shipyard; largest drydocking facility, 938-ft. floating drydock.	Well-sheltered, artificial, breakwater-protected harbor; water area, 25 acres; depths, 24 to 102 ft. Fairway limitations—Approach free and clear; entrance 800 ft. wide; depths leading to berths generally exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 39 ft.; length not limiting.	Alongside—5 large, 12 standard, 8 small ocean-type, 8 standard, 3 small coaster-type cargo vessels; 30 lighters. Anchorage—4 ocean-type, 1 coaster-type berths 1 mile off harbor entrance over good holding ground of sand; open to N. and E.
Savona-Vado Ligure..... 44°19'N., 8°30'E. 12,000	Important POL and manufacturing center. Receipts—petroleum products, steel, iron, pig iron, salt, fish, phosphate. Shipments—coke, olive oil, tanning extracts, automobiles, machinery. 2 small shipyards build and repair small vessels; 1 end-haul marine railway with a 1,100-ton hauling capacity.	Artificial harbor formed by mainland and mole with breakwater extension to S.; harbor consists of main harbor with 3 basins, water area, 100 acres, depths, 6 to 33 ft., and Rada di Vado, S. of main harbor, forming semicircular area of some 4 1/2 miles, depths, 6 to 60 ft. Fairway limitations—Approach deep and clear; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 30 ft.; tanker would occupy stern-to berth with least depth of 39 ft.; length not limiting in either case.	Alongside—1 large, 8 standard, 3 small ocean-type, 4 standard, 11 small coaster-type cargo vessels; 13 lighters; 3 large, 3 standard ocean-type, 1 standard coaster-type tanker. Anchorage—Large number of berths for all classes in Rada di Albissola, in depths of 36 to 72 ft., over good holding ground of sand; protected except from SE.
Taranto..... 40°28'N., 17°14'E. 25,000	Principal naval operating base. Headquarters of Ionian Naval District. Receipts—wheat, coal, petroleum products, steel, cement. Shipments—wine, licorice roots, olive oil, steel pipe. 2 large shipyards build and repair merchant and naval vessels. Largest repair facility is 869-ft. floating drydock.	Medium-size, fairly well protected, coastal breakwater harbor divided into 2 sections, outer and inner harbor; water area, 16 sq. miles; central depths, 33 to 170 ft. Fairway limitations—Approach deep and clear; inner harbor entrance through artificial passage 190 ft. wide, controlling depth, 39 ft.; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general berth with least depth of 34 ft., tanker berth with least depth of 39 ft., naval berth with least depth of 26 ft.; length not limiting in any case.	Alongside—4 large, 6 standard, 9 small ocean-type, 4 standard coaster-type cargo vessels; 62 lighters; 1 large, 3 standard, 5 small ocean-type, 4 standard coaster-type tankers; 1 river-type tank barge; 25 medium, 16 small naval vessels; 1 medium naval tanker; 1 standard coaster-type tanker (offshore pipeline). Anchorage—Numerous berths for all sizes of vessels in outer harbor in depths 36 to 106 ft. Mooring—10 standard oceangoing cargo vessels; 32 large, 80 medium, 29 small naval vessels.

Trieste..... Commercial center; extensive petroleum products facilities, several large shipyards. Container transshipment facilities available. Receipts—petroleum products, coal, ore, phosphates, scrap iron. Shipments—cellulose, wood, paper, dried fruits, cereals, rice, chemicals.
1 large, 3 small shipyards; largest repair facility is graving dock 1,150 ft. long.

Well-protected artificial harbor consisting of 3 divisions in port proper and 1 division serving series of outlying installations in Baia di Muggia. The 3 divisions are about 3 miles long; general depths, 7 to 30 ft. Other divisions about 3 miles long; width, 3/4 to 2 miles; alongside depths, 13 to 39 ft. Fairway limitations—Approach deep and clear; depths leading to berths exceed depths in berths. Largest vessel accommodated—Would occupy alongside general cargo berth with least depth of 30 ft.; largest tanker would occupy alongside berth with least depth of 39 ft.; length not limiting in either case.

Venice/Marghera..... Venice is mainly tourist center with supporting glass-blowing, lace-making, leather industries. Marghera, the industrial port, is center for metallurgical, chemical, engineering industries. Container transshipment facilities available. Site of minor naval base. Receipts—coal, iron, crude oil, phosphates, bauxite, general cargo. Shipments—refined petroleum products, chemicals, fertilizers, flour, silk, glass, foodstuffs.
2 large, 5 small shipyards; largest repair facility is graving dock 820 ft. long.

Well-protected artificial harbor with widely dispersed facilities interconnected by network of navigable canals. Divided into 2 components—Venice and Marghera; former has principal facilities on E., S., and W. sides of city; the latter, 2 1/2 miles W., has facilities along several canals and basins radiating from harbor entrance. Water area, 18 sq. miles; general depths, 7 to 32 ft.

Alongside—23 large, 12 standard, 29 small ocean-type, 19 standard, 35 small coaster-type cargo vessels; 82 lighters; 7 large ocean-type tankers; 5 river-type tank barges. Anchorage—Large number of berths for all sizes of vessels in open roadstead in depths up to 75 ft. over sand and mud; poor protection.

Well-protected artificial harbor with least depth of 30 ft.; largest tanker would occupy alongside berth with least depth of 39 ft.; length not limiting in either case. Fairway limitations—Approach from Gulf of Venice, Porto di Lido, has length of 2 miles, width of 1,800 ft. at E. end, 985 ft. at W. end, controlling depth of 33 ft.; series of canals leading generally SW. from Porto di Lido have widths varying from 650 to 1,200 ft. and controlling depth of 34 ft.; dredged canal NW. from Venice to Marghera has entrance width of 260 ft. and controlling depth of 36 ft.; approach from Porto di Malamocco NW. to Porto di San Leonardo has length of about 5 miles and dredged depth of 47 ft.; extension to Marghera under construction. Largest vessel accommodated—Would occupy alongside general or tanker berth with least depth of 32 ft.; length not limiting in either case.

*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.

annually to foreign shipping interests than are earned by the domestic-flag fleet, there are substantial deficits in the balance of payments in seaborne transportation. In 1969, the deficit amounted to US\$184 million.

In November 1972 the merchant fleet consisted of the following 649 ships of 1,000 gross register tons (g.r.t.) and over:

TYPE	No.	G.R.T	D.W.T.
Tanker	162	3,874,270	4,804,226
Bulk cargo	126	1,905,002	3,049,982
Tanker/ore carrier	16	826,003	1,467,579
Dry cargo	203	902,980	1,305,612
Passenger	64	74,300	244,400
Liquefied gas tanker	16	120,394	111,479
Refrigerator	19	88,313	76,059
Passenger/cargo	9	43,393	54,446
Other specialized carrier	*34	105,927	142,422
Total	649	7,607,582	11,256,205

*Two asphalt, 2 car, 3 cement, 13 chemical carriers; 2 container, 12 roll-on roll-off/trailer ships.

Additional data on the ships are as follows:

	PERCENT OF D.W.T.	NUMBER OF SHIPS
Size (d.w.t.):		
Less than 20,000	30	499
20,000-99,000	52	138
100,000 and over	18	12
Age (years):		
Under 10	56	192
10-19	35	273
20 and over	9	184
Speed (knots):		
18 and over		*76
15-17		276
11-14		247
Under 11		50
Power:		
Diesel		516
Oil-fired steam		127
Coal-fired steam		6

... Not pertinent.

*43 passenger, 11 roll-on roll-off/trailer, 9 refrigerator, 6 dry cargo, 3 liquefied gas carriers, 2 bulk cargo, 1 passenger/cargo, and 1 container.

Italian-flag ships are employed in liner (scheduled) and tramp (unscheduled) service on major trade routes worldwide, carrying the nation's own trade as well as cross-trades between other countries.

Merchant tonnage is owned by more than 160 domestic and foreign beneficial owners (entities which take the profits from operations). Fourteen beneficial owners, each controlling more than 200,000 d.w.t., account for about 60% of the total fleet deadweight tonnage. One of these owners, Archille

Lauro, controls about 1,254,000 d.w.t., and six others each have more than 400,000 d.w.t. under Italian registry. Finmare (*Societa Finanziaria Marittima*), a government-owned holding company, owns majority shares of *Societa per Azioni di Navigazione Lloyd Triestino* (23 ships, 177,377 d.w.t.), *Societa per Azioni di Navigazione Italia* (17 ships, 161,176 d.w.t.), and *Societa per Azioni di Navigazione Adriatica* (14 ships, 34,318 d.w.t.). Foreign beneficial owners are Standard Oil Co. (New Jersey), New York (seven tankers, 419,412 d.w.t.) and Blue Star Lines, Ltd., London (five refrigerator ships, 17,482 d.w.t.).

Between 1 January 1969 and November 1972 the fleet increased by about 2.6 million d.w.t. During this period, shipowners concentrated on both a structural and technical modernization of their fleets. Many obsolete and unprofitable ships were scrapped or sold, and a significant number of specialized ships were acquired, specifically roll-on roll-off/trailers, liquefied gas tankers, and chemical and tanker/ore carriers.

The relatively slow growth of the fleet carrying capacity during the last few years can be attributed primarily to insufficient capital for investment by many private, unsubsidized shipowners in the development of their fleets. Shipowners have been hampered by continually rising costs in several important areas of their shipping operations as well as increasing costs of ship construction.

While other nations have been phasing out or limiting passenger ship service because of strong competition by air travel, Italy has been increasing such operations and acquiring luxury passenger liners. However, the state-owned Finmare shipping group, which provides most of the fleet's passenger service, has sustained heavy losses during the last few years, particularly in transatlantic and transpacific passenger operations. In 1970, Finmare announced proposals for restructuring operations of each of its companies. These proposals concerned primarily the discontinuance of unprofitable passenger operations and the substitution of the more profitable cruise and cargo-carrying services. Finmare's proposals, which have not had government-wide approval, have been vehemently rejected both by the strong maritime unions, who fear a large displacement of seafaring personnel upon the discontinuance of certain passenger lines, and by private shipowners, who feel they would be in direct competition with the government through Finmare for the carriage of certain trade on the same routes.

In 1970 the government estimated that the volume of annual Italian seaborne trade would amount to about 500 million metric tons by 1975, and in an effort to increase the fleet's participation in the carriage of

this trade, a goal was included within its 5-year plan (1971-75) for a merchant fleet totaling 12 million g.r.t. by 1975. By way of encouraging private shipowners to meet the fleet-expansion objective, the government no longer prohibits shipowners from placing orders for ship construction in foreign shipyards; they may now do so when domestic yards cannot meet domestic fleet requirements.

On 31 July 1972, shipowners had placed on order for delivery between 1972 and 1978 a total of 53 merchant ships amounting to about 3.4 million d.w.t.; however, only three dry cargo ships totaling 33,000 d.w.t. and one 138,800-d.w.t. tanker were to be built in foreign yards. Ship types reflecting the largest amount of tonnage on order were as follows:

TYPE	No.	TOTAL D.W.T.	DELIVERY SCHEDULE
Tanker	20	1,636,000	1972-76
Ore/oil and ore/bulk/oil carrier	17	1,521,000	1972-78
Bulk cargo	3	100,800	1972-73

In addition to ships of 1,000 g.r.t. and over, the fleet includes several hundred smaller merchant ships which are employed in Italy's coastal trade and trade with countries bordering the Mediterranean Sea. In mid-1971 the fishing fleet had 134 vessels between 100 and 499 g.r.t. and 69 between 500 and 1,999 g.r.t.; the 203 units totaled 85,000 g.r.t.

The Ministry of Merchant Marine administers the maritime laws and regulations on both domestic- and foreign-ship operations. Italy 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; Oil Pollution, 1954 and 1962; and Load Lines, 1966.

Despite the government's concern for a fleet that would more adequately satisfy the country's economic needs, it subsidizes only the operations of the Finmare companies and local passenger and mail services of several smaller companies. Indirect government subsidization is provided shipowners through loan extensions for the construction, modernization, or repair of merchant ships; through ship depreciation allowances; and through partial financing of new ships purchased as replacements for scrapped tonnage. Shipowners receive tax benefits in the form of tax-free reserves which have accrued from profits of ship sales and are to be spent for ship-replacement purchases.

Italy neither prohibits Italian shipowners from registering ships under foreign flag nor foreign shipowners registering ships under Italian flag. It has been estimated that between 1.5 million and 2 million

g.r.t. of Italian-owned shipping is registered under foreign flags, including a considerable amount of tonnage under Liberian and Panamanian flags of convenience. Cargo preference laws provide that, without government authorization, no trade can be carried on ships of foreign countries that have discriminated against Italian-flag ships. In addition, the carriage of Italy's coastal trade is restricted to domestic-flag ships.

Of the estimated 37,000 seafaring personnel employed on Italian-flag merchant ships of 100 g.r.t., and over, more than 35,000 are nationals. In addition, an estimated 15,000 Italian seafaring personnel are employed on ships registered under flags of convenience. Because of strong maritime union participation, Italian seafaring personnel are among the world's highest paid, in both wages and other benefits.

The government operates about 25 Nautical Technical Institutes for training deck and engineering officer candidates. They provide 5-year courses in navigation, marine engineering, and ship construction. The government also sponsors about 30 merchant marine schools for training seamen and specialists.

I. Civil air (C)

(*Alitalia-Linee Aeree Italiane* (Alitalia), the national airline, is almost entirely government owned. The state holding company, *Istituto per la Ricostruzione Industriale* (IRI), has the majority of the stock. Alitalia, which ranks high among the world's international airlines in number of passenger-miles flown, serves 78 foreign cities in 60 countries and 11 domestic points (not including those cities served by subsidiary companies under contract). Its fleet consists of 18 *Aerospatiale Caravelle VI*'s, 5 *Boeing 747*'s, 11 *Douglas DC 8-40*'s, 8 *Douglas DC 8-62*'s, 2 all-cargo *Douglas DC-8-62F*'s, 35 *Douglas DC 9-30*'s, 2 all-cargo *Douglas DC 9-30F*'s, and 3 *Douglas DC-30*'s.

Alitalia has three domestic subsidiary airlines: *Aero Trasporti Italiani*, S.P.A. (ATI), *Societa Italiana Esercizio Elicotteri* (Elivie), and *Societa Aerea Mediterranea*, S.P.A. (SAM). ATI and SAM are wholly owned subsidiaries, and Alitalia owns 90% of Elivie's stock. ATI, which has headquarters in Naples, serves 24 domestic points, including cities in Sicily and Sardinia. One of the fastest growing airlines in the world, ATI passengers increased from 632,000 in 1969 to about 1,790,000 in 1971. Elivie, which has been managed by ATI since 1968, operates charter helicopter service to several Italian resort towns; it ceased providing regularly scheduled services in 1971.

SAM, on behalf of Alitalia, operates charter flights from Italy to central and northern Europe.

Rome-based *Aerolinee Itavia, S.P.A.*, which operates four Handley Page Herald 200's, three Fokker F-28's, and three Douglas DC 9-10's, is a privately owned airline providing scheduled service to 17 domestic points and to Basle and Geneva, Switzerland. In addition, Itavia performs domestic and European short-haul charter services.

Alisarda, S.P.A. is a privately owned airline based in Olbia, Sardinia. Formed in 1963 as an air taxi and charter operator, Alisarda now provides regularly scheduled service to five domestic points and seasonal service to Ajaccio, Corsica, and Nice, France. *Aertirrena, S.P.A.*, also privately owned, operates air taxi and charter services and provides seasonal scheduled feeder services in northern Italy. In addition to light aircraft, the Aertirrena fleet has three Soviet-built YAK 40 aircraft. *Compagnia Italiana Elicotteri S.R.L. (CIE)* operates seasonal helicopter service between Rimini and the principality of San Marino.

The following 138 civil aircraft of at least 20,000 pounds gross weight are registered in Italy, including one foreign-owned:

20 Aerospaziale Caravelle VI	3 Fokker F-27-100
1 Boeing 707-120	6 Fokker F-27-200
5 Boeing 747	2 Fokker F-27-400
11 Dassault Falcon 20	2 Fokker F-27-600
11 Douglas DC 8-40	3 Fokker F-28-1000
8 Douglas DC 8-62	1 Grumman G 159
2 Douglas DC 8-62F	1 Grumman G 1159
3 Douglas DC 9-10	4 Handley Page Herald 200
45 Douglas DC 9-30	1 Hawker Siddeley HS-125
2 Douglas DC 9-30F	1 M.B.B. HFB 320
3 Douglas DC 10-30	3 YAK 40

An estimated total of 17,100 persons are engaged in civil aviation activities, including at least 1,200 commercial pilots. Alitalia, Italy's largest airline, has about 14,300 employees, including over 3,500 maintenance personnel and about 1,100 pilots. ATI employs about 750 personnel; Itavia, 400; and Alisarda, 100.

Basic flight training is available through some 60 aeroclubs and several flight training schools. The most important flight training school is the Alitalia Training Center at Rome's Fiumicino Airport. Here, Alitalia offers a complete range of training capable of preparing students with no flight experience to become commercial pilots. The center is equipped with flight simulators for most of the aircraft in the Alitalia fleet. According to the terms of the ATLAS agreement, Alitalia will provide DC 10 flight simulator training for members of the consortium (Air France, Lufthansa, Alitalia, Sabena, and Iberian airlines); however, Boeing 747 flight simulator

training is provided by Lufthansa at its facility in West Germany.

Civil aircraft maintenance is centered primarily at Alitalia's base in Rome. Standards are high, and facilities compare favorably with those of other major international carriers. In addition to its own fleet, Alitalia maintains and overhauls the ATI DC 9 aircraft and the SAM Caravelle and DC 6 aircraft and also performs maintenance for various non-Italian carriers such as Zambia Airways and Somalia Airlines. Alitalia handles powerplant support in collaboration with the Alfa Romeo Company, which takes care of major repair and overhaul work. Maintenance on Alitalia's DC 10 and Boeing 747 aircraft is accomplished in accordance with the ATLAS agreement. In the context of this agreement, Alitalia has no major maintenance responsibility for the DC 10 aircraft but does share responsibility with Sabena to perform systems and electronic overhaul for the consortium's Boeing 747 aircraft. At least 15 commercial enterprises, including Alfa Romeo, provide extensive instrument, electrical, and hydraulic component overhaul.

Responsibility for controlling civil aviation is assigned to the Ministry of Transport and Civil Aviation. However, actual operational responsibility rests with a subordinate agency, the General Directorate of Civil Aviation. The national civil airways system is operated by the Ministry of Defense.

The government subsidizes development of civil aviation, including annual payments to Alitalia and its subsidiary companies. Aeroclubs and training schools are also subsidized.

Italy is a member of the International Civil Aviation Organization and is a signatory of the principal international civil aviation conventions. In the commercial field, Alitalia belongs to the International Air Transport Association and participates in numerous pooling arrangements with foreign airlines. The government has entered into formal or informal civil air agreements with at least 62 countries, including Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, the U.S.S.R., and Yugoslavia. Linking Italy with 114 cities in 75 countries are 62 foreign air carriers, including the national airlines from the above-mentioned countries.

J. Airfields¹ (C)

Italy has 150 usable airfields, 11 seaplane stations, and 79 sites. Of the usable airfields, 54 are military, 19 are civil, 30 are joint military/civil, and 47 are private.

¹For detailed information on individual airfields in Italy, see Volume 13, *Airfields and Seaplane Stations of the World*, published by the Defense Mapping Agency, Aerospace Center, for the Defense Intelligence Agency.

FIGURE 10. Selected airfields (C)

NAME AND LOCATION	LONGEST RUNWAY: SURFACE; DIMENSIONS; ELEVATION ABOVE SEA LEVEL	ESWL*	LARGEST AIRCRAFT NORMALLY SUPPORTED	REMARKS
	<i>Feet</i>				Pounds
Aviano..... 46°02'N., 12°36'E.	Asphalt..... 8,596 x 148 419	80,000	C-141.....	Military. IAF/USAFE. Maintained by USAFE; used by USAFE fighters on TDY status.
Brindisi/Casale..... 40°39'N., 17°57'E.	Asphalt..... 8,662 x 148 48	66,000	C-9A.....	Joint. IAF squadron. International airport used by scheduled and private aircraft.
Cagliari/Elmas..... 39°15'N., 9°03'E.	Asphalt..... 7,260 x 148 12	44,000	DC-9.....	Civil. International airport used by scheduled and private aircraft.
Catania/Fontanarossa..... 37°28'N., 15°04'E.	Asphalt..... 6,603 x 197 42	55,000	DC-9.....	Civil. International airport used by scheduled and private aircraft. Can support C-130 aircraft.
Forli..... 44°12'N., 12°04'E.	Asphalt..... 7,218 x 148 98	66,000	C-124.....	Joint. International airport for nonscheduled and private aircraft.
Cenova/Sestri..... 44°25'N., 8°50'E.	Asphalt..... 7,480 x 148 9	77,000	L-880.....	Civil. International airport for scheduled and private aircraft.
Milano/Linate..... 45°27'N., 9°17'E.	Asphalt..... 8,002 x 197 352	66,000	B-727.....	<i>Do.</i>
Milano/Malpensa..... 45°38'N., 8°44'E.	Asphalt..... 12,844 x 197 767	99,000	DC-8.....	<i>Do.</i>
Napoli/Capodichino..... 40°53'N., 14°17'E.	Asphalt..... 7,218 x 197 289	61,600	C-130s.....	Joint. Civil/NATO maritime airfield. IAF and USN. Joint headquarters COMAIRSOUTH/NATO. International airport used by scheduled and private aircraft.
Roma/Ciampino..... 41°48'N., 12°36'E.	Asphalt..... 7,218 x 197 423	77,000	C-133.....	Joint. IAF, USAF, domestic airlines. International airport used by nonscheduled and private aircraft. Maintenance depot for Alitalia aircraft, including DC-8.
Roma/Fiumicino..... 41°48'N., 12°14'E.	Asphalt..... 12,795 x 197 7	100,000	DC-8.....	Civil. International airport used by scheduled and private aircraft. Closed to military aircraft.
Torino/Caselle..... 45°12'N., 7°39'E.	Asphalt..... 9,843 x 197 986	77,000	B-707.....	Civil. International airport used by scheduled and private aircraft. Fiat aircraft factory on airfield.
Treviso/St. Angelo..... 45°39'N., 12°12'E.	Asphalt..... 7,940 x 151 59	44,000	C-130.....	Joint. International airport used by scheduled, nonscheduled, and private aircraft. Home base for fighter squadrons.
Venezia/Tessera..... 45°30'N., 12°21'E.	Asphalt..... 8,858 x 148 7	99,000	DC-8.....	Civil. International airport used by scheduled and private aircraft. Aeronavali Co. on field.

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

Airfield distribution has been influenced by three factors: the country's terrain, its military posture, and its population centers. Most of the airfields on the mainland are located on the northern plains and along the east and west coastal regions, and the highest concentration is in the vicinity of Rome. Because of the mountainous topography of the major islands, the airfields are generally located on the coast.

The airfield system adequately meets civil and military requirements. Of the 32 international airfields, 19 serve scheduled traffic. The most important fields on the mainland are Genova/Sestri, Milano/Linate, Milano/Malpensa, Torino/Caselle, Roma/Fiumicino, and Venezia/Tessera. On Sardinia and Sicily the most important fields are Cagliari/Elmas and Palermo/Punta Raisi, respectively. Each of these facilities has been developed to meet the specific needs (such as navigational aids, aircraft movement areas, and ground handling) required by short haul and/or long haul operations of airlines using aircraft in at least the C-130 category and some using aircraft in the C-141 category. Roughly 40% of the major military airfields and two major joint airfields serve as home bases for fighter aircraft. Many of the minor military airfields serve the Italian Army, and minor joint military/civil and private airfields serve aero club activities and domestic tourists.

Eighty airfields have hard-surfaced runways which are generally in good condition. Most of these fields also have associated aircraft movement areas which are also hard surfaced. Their general weight bearing capacity varies from C-45 to C-141 aircraft. Runways at the remaining airfields have either natural or temporary surfaces, generally in fair condition. The 11 seaplane stations are available only in emergencies. The 79 sites have reverted to a natural state or are under cultivation, and little remains of them except earth scars.

Efforts constantly are made to improve and modernize the airfields according to the dictates of the International Civil Aviation Organization and the North Atlantic Treaty Organization. Examples of this are the new aircraft movement areas under construction at Roma/Fiumicino, the planning of a third runway at Milano/Malpensa, and the addition of a second runway at Gioia Del Colle. The important military airfields also have expansion potential.

Figure 10 lists characteristics of selected airfields.

K. Telecommunications (C)

The telecommunication (telecom) systems are modern and well developed and provide fast, reliable service that meets the needs of the government,

industry, and the public. The density of facilities compares favorably with those in most other European countries, and Italy's telecom systems generally are being expanded at a faster rate. The number of telephone sets and the mileage of intercity circuits have been increasing by 10% and 14%, respectively, in each of the last 4 years. High-capacity cable and radio-relay systems are employed in nearly equal amounts in the national trunk telecom network; major routes run along both flanks of the Appennine mountains and east-west in the Po valley. Primary switching centers are in Milan, Rome, and Naples. Although the telephone, telex, and broadcast networks are fully automated throughout Italy, the density of these facilities diminishes south of Rome and in Sardinia and Sicily. Excellent international facilities provide immediate worldwide service, and radio-broadcast and TV services are continually being improved for the benefit of the public.

The government either owns or maintains controlling interest in most public telecom facilities through the Ministry of Post and Telecommunications (MPT). Facilities that provide interregional telephone, telegraph, and news service and radio and TV broadcast are wholly owned by the government. The government and a concessionaire share ownership of regional telephone facilities; the State Agency for Telephone Services (ASST) is responsible for the operation and maintenance of long-distance facilities between 37 urban telephone districts, and the Italian Company for Telephone Service (SIP) is licensed to provide local service within these districts and in the remaining 194 telephone districts. Radio and TV broadcast operations, a government monopoly, are delegated to Radio Television of Italy (RAI). The Cable, Radiotelegraph and Radiocommunication Services, Inc. (ITALCABLE) operates all international radiocommunications and some submarine cable facilities. Space Communications, Inc. (TELESPAZIO) is responsible for operating communications satellite ground facilities and related circuits. About 150,000 persons are employed in all facets of the post and telecommunications operations.

The domestic telecom systems consist of interconnected networks of open-wire, coaxial and multiconductor cable, and radio-relay links. The primary transmission systems use high-capacity coaxial cable and radio-relay links to provide intercity circuits. Some multiconductor cables and open-wire lines, which often parallel the coaxial cables, also provide intercity circuits. Submarine cables and radio-relay links are used for service between the islands of the Tyrrhenian Sea and the mainland. Primary 2- and 4-

tube coaxial cable routes have 960 or 2,700 channels per tube. Minor links use small coaxial cables having 300-channel capacities. More recently, sections of the new 60 MHz² coaxial cable having 10,400 channels per tube have been installed on some key routes, and the trend is to expand usage of this newest type cable together with duplicate radio-relay systems on all primary routes. Several types of high-capacity radio-relay equipment are used: one operates in the 4-GHz² band and transmits 4 radio frequencies, each frequency providing 960 telephone channels or 1 TV circuit; another type operates in the 6-GHz band and provides 2,700 channels per radio frequency.

The intercity telephone switching system is divided into 20 regions and 231 districts for operational control. Each region has a main switching center, but the most important centers are at Milan and Rome. Direct-dial service has been in effect throughout all of Italy since October 1970, using electronic exchanges to interconnect all the nearly 10.8 million telephone sets. Telephone density is highest in the northern and central cities, and the largest concentrations are in Rome, Milan, Torino, and Genoa. Distribution in most cities in the southern part of the country is closer to the national average of 17.5 sets per 100 population. Telegraph facilities are located in about 175 cities; 23 of these also have facsimile service. Automatic telex exchanges in more than 35 cities have a combined capacity of about 9,500 lines.

The highly complex and automated network of international services has experienced a 40% to 50% increase in telephone and telex traffic in recent years. The principal control centers for international services are in Rome and Milan. Multiconductor and coaxial cables and radio-relay links carry most of the traffic to European countries. Landlines connect with Austria, France, Switzerland, and Yugoslavia; radio-relay facilities or tropospheric-scatter links provide circuits to Austria, France, Greece, Spain, Tunisia, and West Germany (via Austria). All international HF radiocommunication circuits are operated by ITALCABLE. Telephone, telegraph, telex, and facsimile circuits to over 40 foreign terminals are manipulated from control centers in Rome and two transmitter and two receiver stations located in the Rome area. Coaxial submarine cables, administered by the MPT, provide telephone and telegraph service to Albania, Crete, Egypt, Greece, Libya, Malta, and Tunisia. ITALCABLE shares operation of the 640-channel MAT-1 cable system to Estepona, Spain, where connections are made with several transatlantic

²MHz—million cycles per second; GHz—billion cycles per second.

cable systems in which additional circuits are leased. A communications satellite ground station is located at Cenca del Fucino, about 80 miles east of Rome. The installation has antennas operating with satellites in both the Atlantic and Indian Oceans; direct circuits are available to 21 countries. The station also serves as a major transit center for international traffic between many African, Asian, and Latin American countries.

Special telecom systems are operated by many government agencies and private organizations. Most of these systems lease circuits from the public network, but some large separate systems have been established. A 20-station coastal radiocommunication network is directed from a central station in Rome, and a combined radio-relay and wire network is used by the *Autostrade IRI* for highway traffic control and maintenance. The National Electric Power Agency has a special independent countrywide telecom system, which uses powerline carrier equipment for remote control of electric power switching and telephone services between power stations. A radio-relay system links the 22 provincial headquarters of the Carabinieri with the Rome GHQ, and communication facilities of the signal battalions of the Italian Army are tied into those of the Carabinieri, the Air Force, and the civil telephone system.

Broadcast services compare favorably with those available in other European countries. The AM programs originate at 4 primary and 14 regional studios and are transmitted by 86 stations. Four different programs are presented. The National and Second Programs are most widely disseminated, and only a few stations broadcast special cultural or regional language programs on the Third and Regional Programs. Stations at Rome and Caltanissetta broadcast the foreign service programs on shortwave. Over 1,700 FM transmitters in operation at some 550 separate stations comprise the most extensive FM network in Europe. Only 35 are primary high-power stations; the remainder are repeaters, most less than 100 watts in power output. Each station broadcasts three separate programs. In mid-1972 an estimated 12.6 million broadcast receiver licenses were in force.

Nationwide TV coverage is achieved through extensive use of the radio-relay system and the careful placement of some 1,150 transmitters in 855 different locations. TV studios in Rome, Milan, Torino, Florence, and Naples provide material for the National Program, which is transmitted on channels of the VHF band, and the Second Program, on channels of the VHF band. Some key transmitters have power outputs of 1,000 kw., but the bulk of the stations have

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transmitters of 100 watts or less. Radio-relay links are used to exchange programs with other countries in the Eurovision network. In 1972 an estimated 10.8 million TV receivers served some 65 of every 100 families.

A large, well-diversified telecom industry provides most types of equipment in quantities adequate for both civilian and military needs. The only significant import is components, which are obtained from abroad in large quantities. Such foreign purchases are primarily a reflection of product specialization within the European community. Moderate quantities of telephone switching and radiocommunication equipment are also imported. Exports include large amounts of components as well as radio-relay, multiplexing, and teletype equipment, radio and TV receivers, and military radios. The leading manufacturers are *Telettra, S.P.A.*, *Marconi Lenkurt, S.P.A.*, *Societa Italiana Telecomunicazioni Siemens, S.P.A.*, *Philips Radio, S.P.A.*, and *Selenia, S.P.A.* The principal shortcoming of the industry is the lack of a more significant research and development capability. Most production in this field is based, directly or indirectly, on foreign designs.

The telecom industry has had no difficulty in obtaining technicians, engineers, and scientists to fulfill its needs. Educational standards are high, and liberal scholarship programs are sponsored by the government and industry. The School of Telecommunications of the Armed Forces near Genoa has an attendance of about 2,600 military personnel each year for lengthy courses; it has provided large numbers of telecom and electronic technicians for the civilian industry.

The 5-year plan (1971-75) that SIP has been implementing calls for over 4 million new telephone sets, raising the per capita ratio to 28 sets per 100 population. Significant projects include a 1,380-channel coaxial submarine cable between Rome and Cagliari, Sardinia, construction of more 60-MHz cable systems, and installation of the first computer-controlled telephone exchange for the Naples area. The MPT has ordered new transmitters in sufficient numbers to completely overhaul the coastal radiocommunication network, and a 1,840-channel submarine cable connecting Italy with France and Israel is to be put into operation by 1975.

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

	COORDINATES				COORDINATES				COORDINATES		
	°	'N.	° 'E.		°	'N.	° 'E.		°	'N.	° 'E.
Abruzzi (admin).....	42	15	13 45	Galleria del Appennino (tunnel).....	44	03	11 11	Pordenone.....	45	57	12 39
Adda (strm).....	45	08	9 53	Garigliano (strm).....	41	13	13 45	Porto Corsini.....	44	29	12 17
Agrigento (pror).....	37	27	13 30	Gela.....	37	04	14 15	Porto di Lido (inlet).....	45	26	12 25
Aigle, Switzerland.....	46	19	6 58	Genoa.....	44	25	8 57	Porto di Malamocco (inlet).....	45	20	12 20
Ajaccio, Corsica.....	41	55	8 44	Genova, Golfo di (gulf).....	44	10	8 55	Porto Garibaldi.....	44	41	12 14
Alberobello.....	40	47	17 16	Genova (pror).....	44	30	9 04	Porto Torres.....	40	50	8 24
Alessandria.....	44	54	8 37	Genova Brignole (rr sta).....	44	24	8 57	Porto Vesme.....	39	12	8 24
Alfonsine.....	44	30	12 03	Genova Piazza Principe (rr sta).....	44	24	8 54	Postitano.....	40	38	14 29
Alghero.....	40	33	8 19	Gerola Nuova.....	45	02	8 54	Postojna, Yugoslavia.....	45	47	14 14
Altamura.....	40	49	16 33	Gioia Tauro.....	38	25	15 54	Potenza (pror).....	40	55	15 44
Ancona (pror).....	43	33	13 10	Golfo Aranci (rr sta).....	41	00	9 37	Pozzuoli.....	40	49	14 07
Ancona.....	43	38	13 30	Gorizia (pror).....	45	55	13 30	Prato.....	43	53	11 06
Anzio.....	41	27	12 37	Gorizia.....	45	57	13 38	Predazzo.....	46	19	11 36
Aosta (pror).....	45	46	7 25	Gravellona.....	45	20	8 46	Puglia (admin).....	41	15	16 15
Aosta.....	45	44	7 20	Grosseto (pror).....	42	50	11 15	Rada di Albissola (anch).....	44	19	8 30
Apennines (mts).....	43	00	13 00	Guidonia.....	42	01	12 45	Ragusa.....	30	55	14 41
Aprilia.....	41	36	12 39	Imperia (pror).....	43	58	7 47	Ravenna.....	44	25	12 12
Arcola.....	44	07	9 54	Imperia.....	43	53	8 03	Reggio di Calabria (pror).....	38	19	16 05
Arno (strm).....	43	41	10 17	Innsbruck, West Germany.....	48	46	11 26	Reggio di Calabria.....	38	06	15 39
Arona.....	45	46	8 34	Innsbruck, Austria.....	47	16	11 24	Rho.....	45	32	9 02
Arquata Scrivia.....	14	41	8 53	Ionian Sea (sea).....	39	00	19 00	Rimini.....	44	04	12 34
Ascoli Piceno.....	42	51	13 34	Iselle.....	46	12	8 12	Rivaltà Scrivia.....	44	51	8 49
Asiago.....	45	52	11 30	Isernia.....	41	36	14 14	Rivolto.....	45	57	13 01
Asti (pror).....	44	55	8 10	Isola.....	46	26	9 19	Roma (pror).....	41	58	12 40
Asti.....	44	54	8 12	Ispra.....	45	49	8 57	Roma Porta San Paulo (rr sta).....	41	52	12 29
Augusta.....	37	13	15 13	Ivrea.....	45	28	7 32	Rome.....	41	54	12 29
Avellino (pror).....	40	59	15 09	Klagenfurt, Austria.....	46	38	14 18	Roseto Valfortore.....	41	22	15 06
Avellino.....	40	54	14 47	Lacchiarella.....	45	19	9 08	Roveredo in Piano.....	46	61	12 37
Aversa.....	40	58	14 12	Lago di Bracciano (lake).....	42	07	12 14	Rovigo (pror).....	45	02	11 50
Bardonecchia.....	45	05	6 42	Lago di Como (lake).....	46	00	9 17	Sabaudia.....	41	18	13 01
Bari.....	41	08	16 51	Lago di Garda (lake).....	45	40	10 41	Sabbioncello.....	45	22	11 59
Bari.....	41	19	16 17	Lago d'Isco (lake).....	45	43	10 04	Salerno.....	40	11	14 47
Barletta.....	41	19	16 17	Lago Maggiore (lake).....	45	57	8 39	Saluggia.....	45	14	8 00
Basilicata (admin).....	40	30	16 30	La Maddalena.....	39	09	9 01	Salvaterra.....	44	36	10 46
Battipaglia.....	40	37	14 58	Lannach, Austria.....	46	59	15 19	San Bonifacio.....	45	24	11 16
Bellinzona, Switzerland.....	46	12	9 01	L'Aquila.....	42	22	13 22	San Giacomo.....	42	47	12 45
Benevento.....	41	08	14 45	Larino.....	41	48	14 54	San Giorgio a Cremano.....	40	50	14 20
Bergamo.....	45	41	9 43	La Spezia.....	44	07	9 50	San Giovanni Rotondo.....	41	42	15 44
Bergamo (pror).....	45	50	9 48	La Spezia (pror).....	44	15	9 42	San Marino, San Marino.....	43	55	12 28
Bertonico.....	45	14	9 40	Latina.....	41	27	13 06	Sannazzaro de' Burgondi.....	45	06	8 54
Bicari.....	41	24	15 11	Latina (pror).....	41	28	12 52	Santa Massenza.....	40	04	10 59
Bivio d'Aurisina (rr sta).....	45	45	13 39	Latina.....	41	28	12 52	Sardegna (admin).....	40	00	9 00
Bologna.....	44	29	11 20	Lazio (admin).....	42	00	12 30	Sardinia (isl).....	40	00	9 00
Bologna (pror).....	44	28	11 26	Le Caselle.....	39	43	16 25	Sassari.....	40	43	8 31
Bologna (Centrale (rr sta).....	44	30	11 21	Lecco.....	40	23	18 11	Sassari (pror).....	40	40	9 00
Bolzano.....	46	43	11 30	Lecco (pror).....	40	13	18 10	Savona (pror).....	44	18	8 16
Bolzano (pror).....	46	31	11 22	Liguria (admin).....	45	51	9 23	Savona.....	44	17	8 30
Borgo Piave.....	41	29	12 52	Litoranea Veneta (canal).....	44	30	8 50	Scarlino.....	42	51	10 51
Bracciano.....	42	06	12 10	Livorno (pror).....	43	14	10 35	Sdobba.....	45	44	13 31
Brennero.....	47	00	11 30	Livorno.....	43	33	10 19	Seregno.....	45	39	9 12
Brenner Pass (pass).....	47	00	11 30	Ljubljana, Yugoslavia.....	46	03	14 31	Sibari.....	39	45	16 27
Brescia.....	45	33	10 15	Loano.....	44	08	8 15	Sicilia (admin).....	37	45	14 15
Brindisi.....	40	38	17 56	Locorotondo.....	40	45	17 20	Sicily (isl).....	37	30	14 00
Brondolo (rr sta).....	45	11	12 17	Lombardia (admin).....	45	40	9 30	Sicily, Strait of (str).....	37	20	11 20
Bronte.....	37	47	14 50	Lucea (pror).....	44	02	10 27	Sienna.....	43	19	11 21
Buonvicino.....	44	34	8 37	Lucea.....	43	12	13 10	Simplon Tunnel (rr tunnel).....	46	12	8 14
Bussi Officine.....	42	11	13 50	Macerata (pror).....	43	18	13 27	Siracusa (pror).....	37	03	15 00





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