Chapter 3
Evacuated Tube Transportation

Learning Objectives
1. To understand the importance of transportation
2. To know the five main modes of transportation
3. To learn transportation geography

Skill Development Objectives
1. Communication skills in talking about shipment conditions
2. Communication skills in advancing the shipment date
3. Communication skills in shipment terms
The Evacuated Tube Transportation (I)

Construction of Evacuated Tube Transportation (ETT) line will be a sequent evangel for human beings after trains, automobiles, airplanes and information technologies. Especially, ETT will pull the transportation out from the present morass radically, bringing new changes to the global economic and life style. Thus, there are some issues that we have to discuss right now. For example, what will be the role and position of ETT in the future comprehensive transportation? What will be the relationship between ETT and existing transportation styles such as the railway, the highway and the airplane, competition, substitute or mutual supplement? It is respectively reviewed the situation of existing 5 transportation styles, analyzed and reasoned above issues. Finally, some results came out. ETT will bring some competitive pressure on existing railway, highway and aviation industries, sharing market freight and passenger resource. However, ETT wouldn’t replace existing transportation styles, only being a makeup or replacing part functions of existing transportation styles, for example, replacing the international express mission of aviation, and some distance transfer function may turn to ETT from trains, cars and airplanes. In addition, the attribute of ETT will be a combination of the railway and the tube transportation.

ETT will be a new transportation style with high potential. For the hypervelocity, low energy consuming, low noise, no pollution and high security, ETT is more beneficial and more promising than existing railway, highway and airplane. From the technology view point, carrying out ETT is much easier than spaceflight aviation and out-space exploring. And, technologies for creating ETT have been existed at present. Construction of Evacuated Tube Transportation line will be a sequent evangel for human beings after trains, automobiles, airplanes and information technologies. Especially, ETT will pull the transportation out from the present morass radically, bringing new changes to the global economic and life style.

Anyway, there are some issues that we have to discuss right now. For example, what will be the role and position of ETT among the future comprehensive transportation system? What will be the relationship between ETT and existing transportation styles such as the railway, the
highway and the airplane, being competition, substitute or mutual supplement relationship?

**On Marine** A long history was accompanied with water carriage. Watercraft was the main means to complete the long distance transport of passengers and freight before the application of railway, highway, aviation and pipeline transportation. Although there are manpower and domestic animal to transfer freight inside a country or among different countries on the mainland in the ancient, such as shouldering, jinricksha, carriage and camel, they were not transportation tools on the modern meaning, not in the list of 5 modern transportation modes that we are discussing.

1405–1433, Chinese navigator Zheng He led on big scale fleets to voyage to the west coast of the Europe from the east of China 7 times. 1492–1502, Spanish navigator Columbus voyaged to east and found the America New Mainland. They used sail boats driven by manpower.

The traffic tools that people spanned over the ocean had been the boats before the airplane was invented in begin of the 20th century. Afterwards, airplanes replaced steamboats gradually, becoming the main means to span oceans.

During the past 100 years, the development character of steamboats was as following.

In aspect of passenger transport, the passenger proportion became little and little, and, the position of steamboats as a main means to go through oceans faded away. In aspect of freight transport, as the international trade grew up constantly, the freight amount that ocean steamboats carried also grew up continuously. In aspect of the boat volume, steamboats became big and big.

When the boat runs in water, the water resistance is proportional with the cube of speed. Therefore, according to the technology characteristic of boat, it is certainly the slowest, being difficult to parallel with trains, autos and airplanes.

No matter for passenger transport or freight, the steamboat size had been become big and big. It’s a reality we had seen. And, bigger boats will be built in the future.

As for the freight boat, it is an argumentative topic if the bigger boat should be built. A view point is that bigger boats, higher efficiency. Another view point is that, people should modestly look into the large-scale bulk-cargo boat and container boat, because the larger the boat, the longer the freight collection time and unload time. It is contrary to the anticipant for high speed, high efficient and just in time of logistics.

As for the passenger boat, its function as the travel means had retreated from the history stage. However, the function as the wandering boat had shown the unique fascination. It means that the boat as the place for entertainment, making holiday and business room on sea, should be created with larger volume, setting grand guest room, meeting room, amusement hall, dinning hall, theater, natatorium and playground. It is also reasonable to build a boat
like a community or a city.

**On Railway Transport** Railway is a transport method fitting to transport a large amount of freight and a large number of passengers in a long distance.

In the latter half of the 19th century, Europe and America entered into “Railway Age”. America constructed 5 transcontinental railway lines, constituted the vertically and horizontally railway meshwork, which was the important power to drive American economic. Since begin of the 20th century, China never stopped her steps to construct railway. There was some slang such as “Railway No. 1”, “Train Loud, Gold Millions” from 50s to 70s of the 20th century, which indicated that railway is the most prominent symbol in China, standing on the first position among all industries. After 80s of the 20th century, as the highway and aviation transport developed rapidly, railway lost the position as “Railway No. 1”.

The railway comes through such a kind of history: Silver Age→Stagnancy→Silver Age. Nowadays, high-speed railway plans and Maglev plans have been constituted in many countries, meaning that the railway is going into a new Silver Age. The following picture (Figure 3-1) shows the foretime, nowadays and future of the railway.

![Figure 3-1 Foretime, Nowadays and Future of the Railway](image)

When the ETT is put into use, most of passenger trains will not be charged with transporting people who are engaged in official affairs or business. The passenger train will be a good touring tool. People in trains with the speed 100~500km/h could trip to everywhere that they want to go, looking around beautiful natural sights. A fact that passenger steamboat as the early primary traffic tool for transporting have been changed to the pleasure ground on sea, declares publicly the direction that the passenger train will go to in the future. And, another fact that the newly constructed Qinghai-Tibet railway is pitched as the touring line, carriages equipped by the standard of the luxury junketing car, is a sample and outset of that judgment.

As for railway freight, it will be the primary method for long distance freight on mainland before ETT is put into use. As more tube lines for oil, gas, coal and ore, etc., are constructed, as well as ETT attracts some pieces and grocery freight that is expected to be transported very fast, the proportion of the railway freight will be reduced gradually. Then the primary mission of railway is to transport large-scale and heavy equipments, because those equipments are not fit to be transported by ETT or pipeline with a small diameter. Even if SwissMetro or AmericanMetro
with a large tube diameter such as 5 meter or more, we must see that the Maglev is not fit to transporting very heavy equipments. (To be continued)

**Dialogue 5**

**Saving Money on Transportation**

With a soft economy and an uncertain stock market, more and more people are keeping an eye on spending, and they are interested in getting more for their money. Kyle Busch has over a quarter-century of experience saving money on transportation. He answers ten commonly asked questions about purchasing vehicles and saving money.

**Q: Why does it make sense to consider buying used vehicles?**

**A:** Transportation is a depreciating asset that loses value, especially during the first three years of ownership. Buying a 2 to 3 year-old used vehicles will provide about a one-third reduction in the cost. Additionally, the initial owner will have “test driven” the vehicle for the second owner.

**Q: What is a common error than many people make when buying transportation?**

**A:** A common error when buying transportation involves buyers not thoroughly identifying their transportation needs and then purchasing a vehicle that does not entirely meet those needs. For example, a buyer might choose a mid-size family sedan that satisfies many of his or her needs. However, six months after the purchase, the buyer realizes that another vehicle in the same category provides a softer ride, better fuel economy, etc. and would have better satisfied his or her driving needs.

**Q: After identifying transportation needs, what should buyers do next?**

**A:** It is worthwhile to visit a local public library to research which vehicle(s) will indeed satisfy specific transportation needs and then identify those that have good reliability ratings.

**Q: Is it best to buy a vehicle from a specific source?**

**A:** Each transportation source has certain advantages and disadvantages. However, the important thing to keep in mind is that a number of vehicle sources should be considered (i.e., private owners, rental car companies, company vehicles, off lease vehicles, new car dealerships, bank repossessions, the Internet). When buyers inform a vehicle source that they are also considering the other sources, better deals are usually obtained.
Q: What questions should buyers ask by telephone to better determine if a vehicle is worth their time to investigate?

A: How many miles has the vehicle been driven (the average is about 12,000 to 13,000 miles per year)? Is the transmission an automatic, a semi-automatic, or a manual? If the transmission is not what the buyer wants, there is no need to ask further questions. Has the vehicle been repainted and if so, why? It is best to avoid repainted vehicles.

When are the next state inspection and emissions standard test due? The vehicle should have a minimum of at least eight-months remaining until the next required state inspection and emissions test. How often were the engine oil and the oil filter changed, and who performed the service? An acceptable answer would be every 3,000 to 3,500 miles or about every three to four months.

Are you the original owner of the vehicle? Original owners tend to take better care of vehicles. What is the reason that the vehicle is being sold? It is encouraging if the individual is the original owner and if he or she is planning to again buy the same make of vehicle.

Q: What if the owner is lying when answering questions about a vehicle?

A: It is worthwhile to obtain as much information about a vehicle as possible; therefore, buyers should ask questions. The interior and exterior inspections and vehicle test-drive help to verify the information provided by the owner.

Q: How long should the vehicle test-drive take?

A: It is worthwhile to test-drive a vehicle for a minimum of 20 minutes on two separate occasions. The test drive should include a variety of roads that buyers will drive day-in and day-out.

Q: Should buyers take a vehicle to a mechanic before making a purchase?

A: A mechanic should confirm what buyers have concluded after they have inspected and test-driven a vehicle. Buyers should request that the vehicle be raised on a lift for the mechanic’s inspection and that the mechanic test-drives the vehicle.

Q: Of course buyers what to save money, but what protection do they have when purchasing a 2 to 3 year-old vehicle?

A: Many vehicles have manufacturers’ bumper-to-bumper warranties of three years/6,000 miles or four years/50,000 miles in addition to five years/60,000 miles on the drive train (i.e., engine and transmission). The warranties are transferable to buyers who purchase the vehicles. The warranties begin on the date that vehicles are first purchased from new car dealers. The buyers’ best interests are also served when they have performed
research to identify vehicles that have favorable reliability ratings.

**Q: What is a long-term benefit of saving one-third when buying vehicles?**

**A:** The average new vehicle costs about $15,000.00 to $18,000.00. Most 2 to 3 year old vehicles will easily provide five or more years of trouble free driving. If buyers invest the savings (i.e., $5,000.00 to $6,000.00) and they are able to add $800.00 per year toward transportation, after a five-year period, they will have the money needed to purchase another 2 to 3 year-old vehicle without straining their budget.

### New Words and Phrases

- **evacuated** 撤退者的
- **sequent** ['si:kwaunt] adj.接续而来的
- **evangel** [i'vendʒəl] n.福音（书），佳音
- **morass** [mɔ'ræs] n.沼泽
- **hypervelocity** ['haipə(:)vɪləsɪtɪ] n.超速，极高速
- **watercraft** ['wɔ:təkræft, 'wɔ-; -kræft] n.船只
- **jinricksha** n.人力车，黄包车，东洋车
- **camel** ['kæməl] n.骆驼，[船]（打捞用的）浮简
- **fade away** 逐渐凋谢，慢慢减弱
- **amusement** [ə'mju:zmənt] n.娱乐，消遣，娱乐活动
- **natatorium** ['neɪtə'tɔrɪəm] n.游泳场，游泳池
- **slang** [sleŋ] n.俚语，行话 v.用粗话骂，用俚语说
- **stagnancy** ['stæɡnənsi] n.停滞，迟钝
- **maglev** ['mæglev] n.磁力悬浮火车（的）
- **foretime** ['fɔ:taim] n.已往，过去
- **junketing** ['dʒʌŋk'tiŋ] n.宴请，旅游
- **depreciate** [di'prɪ:ʃeit] v.折旧，（使）贬值，降低，贬低，轻视
- **sedan** [si'dən] n.私家轿车，轿车
- **bumper-to-bumper** ['bʌmpətə'bʌmpə(r)] adj.一辆接一辆的
- **without strain** 自然地，毫不费力地
The Evacuated Tube Transportation (II)

On Highway Transport In the latter half of the 20th century, America said good-bye to her “Railway Age”, going to her “Auto Age”, and called “A Country on Car Wheels”. At the same time, auto became the most important thing that affects the social economic and life in Europe and some other developed countries. Afterwards, especially in the past 20 years, highway mileage and auto’s yearly transport volume have exceeded the railway in some developing countries like China.

The auto is a flexible and convenient transport tool, with a good flexibility. It’s inconceivable for military affairs and other economic fields if no autos. It’s impossible that the function of the auto is replaced by other transport tool in the future comprehensive transportation system. However, it does not mean that the proportion of the highway transport will increase ceaselessly. It’s anticipatory that the proportion of the highway transport volume will go down, as the pipeline logistics and ETT are used widely. One reason is that a lot of cargos could be transported by the capsule pipeline or ETT at a low cost except the short distance transfer, special and dangerous goods. Another reason is that in the situation with troppo autos in most of countries all over the world, the road traffic is becoming crowded and crowded, the highway establishments bear over charges, and this morass couldn’t be radically solved by building more new roads.

Highway transportation is the primary consumer of the oil; however, the situation of the oil resource lack is serious and serious. The oil supply will certainly become tensional, even if the oil consuming of autos is kept on the present level. Although electric, hydrogen fuel and solar energy vehicles are being developed or made, the practical application effect of those vehicles might not be ideal. And, those new vehicles are not able to solve the problem on road jams.

Automobile casualty has become another type of wars we have to face to everyday. In fact, the number of people killed by automobiles might exceed the number of people killed by some wars. In recent years, more than 100,000 people were killed each year in traffic accidents in China. According to the public data by Chinese authority, more than 12,000 people were killed in auto traffic accidents in 2005. By estimate, the number of wounded people is more than 10 times of death people in traffic accidents. It’s a pity that commenter always criticize drivers, road
status and administrative departments, overlooking an indeed reason of traffic accidents — the comparatively disorder of the highway traffic and the uncertainty of human as an operator. When we realized this deep reason, we could put forward a logical suggestion on the development of highway transportation: transfer part of highway transportation tasks to railway and tube transport.

Based on above 3 view points, we can sketch a blueprint for the role and position of autos in the future comprehensive transportation system: Auto will be a good tool to sport, play and entertainment for people, not as a traffic method that we have to rely on, especially in long distance trip or freight. At that time, more than 50% of autos in the highway are for playing and entertainment, and the number of running vehicles in the highway will be much less than the number of present vehicles in the highway.

**On Aviation Transport** The history of aviation transportation is about 100 years. In the past 100 years, the proportion of freight and passenger transport in the comprehensive transportation system was going up continuously, so the transport volume too. In a long term in the future, for example, 30 or 50 years, aviation transport industry will continue to go up. Anyway, as the evacuated tube transportation is put into use widely, such going-up trend of aviation transport will stop, and the character of the aviation transport will change structurally.

Airplane is a transport tool with high flexibility which other transport modes couldn’t provide. It could span almost any barrier on the land. Even if ETT could be built on the seabed, the flexibility of ETT couldn’t be mentioned in the same breath with the airplane. Therefore, the important role of the aviation transport among 5 transportation styles wouldn’t be changed in any case.

Airplane is a transport tool to consume a large amount of oil. As the short of the oil supply becomes serious and serious, the cost of the aviation transport will go up constantly. Then, a large part of the long-distant passenger transport and freight mission borne by the aviation industry would turn around ETT which is low cost and faster.

In order to increase the transport efficiency, we see a trend that more and more airplanes with a large size have been made. For example, Airbus A380-800 with 555 seats and A380-800F freighter version with150 tone payload. However, this trend is incompatible with the request for super-speed logistics and transportation in the future. Just like the case of containers with large size, large-scale bulk cargo vessels and long-large trains, large size means to prolong waiting time, boarding time and distributing time. It’s satiric that the waiting and boarding time is often more than the flight time in the air when we travel by the airplane today. Thus, researchers and experts on the transportation field should be cautious to the large-scale trend of the airplane. We
should realize that the anticipant transport mode is to depart at once without any waiting, just like taking on a taxi. In fact, it’s possible that ETT would be more convenient than the taxi, having ETT vehicles wait for passengers in any time. Even a passenger could leave for his destination at once after boarding on ETT vehicle without waiting.

Now that airplane shouldn’t become larger and larger, we can sketch a blueprint for the airplane development in the future when ETT era comes out: Based on the high flexibility of airplanes, they will also be important in military affairs; in the aspect of civil affairs, developing small airplanes, helicopters and private airplanes is the right direction. The function of small airplanes is similar to the function of cars, mainly existing as a tool for people’s sports, touring and entertainment.

**On Pipeline Transport** Like the case of airplanes, both the proportion and the transport volume of the pipeline transport among 5 transport styles have been increasing since 60s of the 19th. It’s creditable that the tube or pipeline transport is the most potential mode in the future among 5 transport styles, and it will be the high-rank transport style. From today, we should clear up a misunderstanding on the pipeline transport, namely “the pipeline transport is a transport mode only for liquid, gas and granule cargo.” We should see other two important development directions of pipeline transport: capsule pipeline logistics and ETT. Of course, we can put cargo capsules in a vacuum tube, namely ETT logistics.

It is put forward that “Pipeline Transport is the High-rank Transport Style”. Such a saying is based on a logical reasoning that things certainly go to order from disorder. So do traffic and transportation certainly. Figure 3-2 shows such a development rule.

![Figure 3-2 The Traffic and Transportation Development from Disorder to Order](image)

Pipeline transport will go into its high-rank stage when ETT and capsule pipeline logistics are used widely. At that time, a majority of the passenger transport and freight volume borne by vessels, autos, trains and airplanes, could be charged with pipeline or tube transport at a faster speed, more efficiency, less energy consuming, less noise and less pollution, at the same time, better security.

ETT would compete with existing railway, highway and aviation, sharing much market resource of passengers and cargos. ETT would be the supplement for existing transport styles, not replacing anyone among marine, railway, highway and aviation, while ETT might replace some functions of existing transport styles, such as the express mission borne by the aviation, as well as
the long-distance traveling borne by the airplane, the railway and the auto.

The railway has some advantages such as the spacious carriages, and not so high-speed when touring for enjoying the scene, so that it fits to large-scale cargos in freight and fits to be the tools for entertainment and enjoying the sights in the passenger transport. Highway is able to go through any place you want to go, and the auto is high flexible, so they will be fit to logistics distribution, city traffic, short-distance trip, family touring and self-driving traveling. Especially, the car is a good tool for sports and entertainment. It isn’t certainly for an airplane to follow a fixed line. An airplane is able to span any landform and barrier on the ground, thus it will be fit to special delivering mission and travel which requests the high flexibility. At that time, the large civil airplane will lost its market and value, and, small airplane and private airplane with high flexibility when either taking off or landing on will be the main mode for the traffic in the air. In addition, like autos, besides the military purpose and for some special missions, airplanes will also be good tools for sports and entertainments. (End)

Dialogue 6

Common Auto Transport Questions

**Q: How much will it cost to ship my vehicle?**

**A:** There are many factors that go into this, so it’s impossible to give a one size fits all answer. When you get a quote from an auto transport company, you will be asked several questions, like:

- Do you need your vehicle delivered by a specific date?
- How far will you be traveling?
- How large is the vehicle you will be transporting?
- Do you want door-to-door service, or will you be dropping off and collecting your car at a terminal?

These questions are necessary in order to give you a more approximate estimate. Obviously, the larger your vehicle and the longer the distance to ship, the more you will pay.

**Q: How can I locate auto transport companies?**

**A:** There are many ways to find a car-shipping provider: browsing through advertisements in local newspapers, phone books or the Internet, or asking friends, colleagues or your moving
Relocation.com matches individuals with industry professionals who provide superior service. If looking for a vehicle-transport company, simply submit a request for a quote on our site. If you incur any difficulty locating an auto shipper nearby, inquire about local terminals or carriers where you can drop off or pick up your vehicle. These terminals are most likely associated with a company located elsewhere.

**Q: What should I look for when selecting an auto transport company?**

**A:** Selecting an auto transport company you can trust with your vehicle is no easy task. Before making your decision, it is necessary to inquire whether the company is licensed and bonded. This will help you determine if they are regulated by the United States Department of Transportation (DOT).

The Interstate Commerce Commission (ICC), which was terminated in 1995, transferred its safety guidelines over to the Department of Transportation. This assisted in elevating the status of the DOT in the world of transportation. You can refer to the DOT and Better Business Bureau to determine whether your auto transport company meets the regulations for secure transporting or if any complaints have been made against them.

**Q: What is an oversize fee?**

**A:** An oversize fee is an additional fee for vehicles larger than the average size. Cars in this category generally include SUVs (Sport Utility Vehicles), vans or pickup trucks. This fee is applied because these vehicles take up more space on the carrier. Consult with your car transport company about whether this charge applies to you prior to signing the contract.

**Q: How far in advance should I schedule my pick-up?**

**A:** Make arrangements at least two weeks in advance, especially if you will be traveling a long distance. The earlier you schedule your pick-up, the better your chances of having your vehicle picked up on the date you request. Companies will also have an immediate pick up option available at an additional fee. An important point to keep in mind is that pick up and delivery dates are not guaranteed, so you need to plan appropriately.

**Q: Where will my car be picked up and delivered?**

**A:** Generally, there are two types of services you can request:

- **Door to Door** This includes a home pick up and delivery. Although it is the most convenient option, you will pay extra for it. However, you may be asked to meet the carrier at a nearby location if the truck carrier is too big to enter your neighborhood.

- **Terminal Service** With this service you are required to drop off and pick up your vehicle at an auto transport terminal. This may be inconvenient for you if you only have one vehicle
because you may have to travel a long distance to get to the nearest terminal.

**New Words and Phrases**

- inconceivable [ɪnˈkənəsi:vəbl] adj. 不能想像的，难以相信的
- ceaselessly adv. 不停地，不断地
- anticipatory [ænˈtɪsɪpeɪtəri] adj. 预料的，预想的
- lot cargo 一批大宗货物
- capsule [ˈkæpsju:l] n. (植物)蒴果，胶囊，瓶帽，太空舱
- troppo [trɒpəu] adv. [音] 太多，过度，过于
- tensional adj. 紧张的，张力的
- casualty [ˈkæzjjuəlti] n. 伤亡
- satiric adj. 讽刺的，挖苦的
- granule [ˈɡrænju:l] n. 小粒，颗粒，细粒

**Reading Material 3**

**Basic Means of Transportation**

Transportation concerns the movement of products from a source — such as a plant, factory, or work-shop — to a destination — such as a warehouse, customer, or retail store. Transportation may take place via air, water, rail, road, pipeline, or cable routes, using planes, boats, trains, trucks, and telecommunications equipment as the means of transportation. The goal for any business owner is to minimize transportation costs while also meeting demand for products. Transportation costs generally depend upon the distance between the source and the destination, the means of transportation chosen, and the size and quantity of the product to be shipped. In many cases, there are several sources and many destinations for the same product, which adds a significant level of complexity to the problem of minimizing transportation costs. Indeed, the United States boasts the world’s largest and most complex transportation system, with four million miles worth of roads, a railroad network that could circle the earth almost seven times if laid out in a straight line, and enough oil and gas lines to circle the globe 56 times.

The decisions a business owner must make regarding transportation of products are closely
related to a number of other distribution issues. For example, the accessibility of suitable means of transportation factors into decisions regarding where best to locate a business or facility. The means of transportation chosen will also affect decisions regarding the form of packing used for products and the size or frequency of shipments made. Although transportation costs may be reduced by sending larger shipments less frequently, it is also necessary to consider the costs of holding extra inventory. The interrelationship of these decisions means that successful planning and scheduling can help business owners to save on transportation costs.

**Basic Means of Transportation** There are five basic means of transporting products utilized by manufacturers and distributors: air, motor carrier, train, marine, or pipeline. Many distribution networks consist of a combination of these means of transportation. For example, oil may be pumped through a pipeline to a waiting ship for transport to a refinery, and from there transferred to trucks that transport gasoline to retailers or heating oil to consumers. All of these transportation choices contain advantages and drawbacks.

**Air Transport** Air transportation offers the advantage of speed and can be used for long-distance transport. However, air is also the most expensive means of transportation, so it is generally used only for smaller items of relatively high value—such as electronic equipment—and items for which the speed of arrival is important—such as perishable goods. Another disadvantage associated with air transportation is its lack of accessibility; since a plane cannot ordinarily be pulled up to a loading dock, it is necessary to bring products to and from the airport by truck.

According to Transportation and Distribution, air cargo remains a comparatively small segment of total freight transportation volume when measured by tonnage (12.5 billion domestic ton-miles of freight annually). But L. Clinton Hoch noted in the magazine that “access to air transportation is expected to become increasingly important since a growing number of customers (such as hospitals and electronic manufacturers) depend upon ‘just in time’ delivery systems as well as the increasing number of high-tech industries (such as computer manufacturers) adopting the ‘build-to-order strategy.’ These trends, coupled with increased pressure on consumer goods manufacturers to deliver products quickly to 1) meet customer expectations and 2) reduce inventory and other supply chain costs, are expected to “fuel the demand for expedited services,” wrote Hoch. “Accordingly, competition is heating up among the major air cargo and express carriers who are building specialized hubs to handle larger aircraft and major sorting facilities.”

**Railways** The rail transportation network in the United States included about 120,000 miles of major rail lines in the late 1990s, on which carriers transported an estimated 1.3 million tons of freight annually. Trains are ideally suited for shipping bulk products, and can be adapted to meet specific product needs through the use of specialized cars—i.e., tankers for liquids, refrigerated
cars for perishables, and cars fitted with ramps for automobiles.

Rail transportation is typically used for long-distance shipping. Less expensive than air transportation, it offers about the same delivery speed as trucks over long distances and exceeds transport speeds via marine waterways. In fact, deregulation and the introduction of freight cars with larger carrying capacities has enabled rail carriers to make inroads in several areas previously dominated by motor carriers. But access to the network remains a problem for many businesses.

**Motor Carriers** Accessible and ideally suited for transporting goods over short distances, trucks are the dominant means of shipping in the United States. In fact, motor carriers account for approximately $120 billion in annual revenue, much of it due to local shipments (shipments to and from business enterprises in the same community or local region). This industry sector underwent tremendous change in the 1990s with the introduction of deregulation measures that removed most state and federal regulations in the areas of pricing and operating authority. “With few exceptions, motor carriers are now free to operate wherever they wish and to charge any rates that are agreeable to the shipper and the carrier,” wrote Hoch, although he noted that trucks are still subject to federal laws on vehicle specifications and the parameters of the sanctioned truck routes of the Surface Transportation Assistance Act of 1982.

**Water Transport** Water transportation is the least expensive and slowest mode of freight transport. It is generally used to transport heavy products over long distances when speed is not an issue. Although accessibility is a problem with ships — because they are necessarily limited to coastal area or major inland waterways — piggybacking is possible using either trucks or rail cars. However, industry observers note that port terminal accessibility to land-based modes of transportations is lacking in many regions. The main advantage of water transportation is that it can move products all over the world.

**Pipeline Facilities** Most pipeline transportation systems are privately owned. Generally used for transport of petroleum products, they can also be used to deliver certain products (chemicals, slurry coal, etc.) of other companies. According to Transportation and Distribution, the nation’s natural gas line networks include 276,000 miles of transmission pipe and more than 919,000 miles of distribution lines, which combine to deliver nearly 20 trillion cubit feet of gas on an annual basis.

Transportation was a form of punishment devised in England to exile convicted criminals to the American colonies from c. 1650 and after the War of Independence to Australia between 1788 and 1868, when it was abolished. The system arose out of England’s lack of state-organized prisons and the overcrowding of what few prisons there were, including converted warships.
(hulks) anchored in the river Thames. It is estimated that some 210,000 convicts were exiled between 1650 and 1868; 50,000 to the American colonies, the remainder to Australia.

**Transportation over Land** Land transportation first began with the carrying of goods by people. The ancient civilizations of Central America, Mexico, and Peru transported materials in that fashion over long roads and bridges. Primitive peoples used a sledge made from a forked tree with crosspieces of wood. The Native Americans of the Great Plains made a travois consisting of two poles each fastened at one end to the sides of a dog or a horse, the other end dragging on the ground; the back parts of the two poles were attached by a platform or net, upon which goods were loaded.

The first road vehicles were two-wheeled carts, with crude disks fashioned from stone serving as the wheels. Used by the Sumerians (c.3000 B.C.), such simple wagons were precursors of the chariot, which the Egyptians and Greeks, among others, developed from a lumbering cart into a work of beauty. Under the Chou dynasty (c.1000 B.C.), the Chinese constructed the world’s first permanent road system. In Asia the camel caravan served to transport goods and people; elsewhere the ox and the ass were the beasts of burden. The Romans built 53,000 mi (85,000 km) of roads, primarily for military reasons, throughout their vast empire; the most famous of these was the Appian Way, begun in 325 B.C.

Four-wheeled carriages were developed toward the end of the 12th cent.; they transported only the privileged until the late 18th cent., when Paris licensed omnibuses, and stagecoaches began to operate in England. In the United States the demands of an ever-extending frontier led to the creation of the Conestoga wagon and the prairie schooner, so that goods and families could be transported across the eastern mountains, the Great Plains, and westward.

The great period of railroad building in the second half of the 19th cent made earlier methods of transportation largely obsolete within the United States. Where just a self-sufficient settlement might have been established before, a metropolis would come into existence, with isolated farms tributary to it. After World War I, however, automobiles, buses, and trucks came to exceed the railroads in importance.

**Transportation across Water** Little is known of the origins of water transportation. As long ago as 3000 B.C. the Egyptians were already employing large cargo boats. The first great system of transportation by sailing vessels, that of the Phoenicians, connected the caravan routes with seaports, chiefly those in the Mediterranean area. Goods of high value and little bulk, such as gems, spices, perfumes, and fine handiwork, made up the cargoes; to King Solomon came “ships of Tarshish bringing gold, and silver, ivory, and apes, and peacocks” (2 Chron. 9.21). As metropolitan centers developed, the transportation of grain became important. In addition to the
network of paved roads they built throughout their vast empire, the Romans made much use of ships.

In the late Middle Ages, leadership in transportation by sea passed to Spain and Portugal. Maritime transportation between Europe and North America in the Age of Discovery began the English dominance of the seas that lasted until World War I. The forests of New England encouraged the building of wooden sailing vessels, and American schooners and clippers came to carry a large share of the world’s shipping, until they were supplanted by steel-hulled steamships in the late 19th cent. Diesel power soon replaced steam, and in the mid-20th cent. The first nuclear powered vessels were launched. Inland water transportation grew with the extensive canal construction of the 16th and 17th cent.

**Transportation through the Air** The first practical attempts at air transportation began with the invention of the hot-air balloon in 1783. However, transportation by air didn’t become a reality until the beginning of the 20th cent. with the invention of the rigid airship (or Zeppelin) in 1900 and the first heavier-than-air flight by the Wright brothers in 1903. Although passenger flights were inaugurated after World War I, air transportation did not blossom until after World War II. The modern jet airplane now makes possible comfortable travel to virtually any point on the globe in just one day.

An essential part of the livestock industries. It is an expensive on-cost to a farming enterprise. It also represents a source of contact infection and of stress and reduced resistance to infection, and of shrinkage in animals, from 4% to 9% in cattle transported long distances over 3 to 4 days. Codes of ethics and guidelines for structure and use of transportation facilities are enforced in many countries.

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Exam Paper 3

**Transportation & Traffic Engineering**

Time: 3 hours

Maximum Marks: 70

Note: Attempt all questions.

1. Answer any two of the following: \((2 \times 5 = 10)\)

(a) Describe the role of transport in defense needs, tourism development, social development and disaster management.