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ABSTRACT

This guide is designed to provide an overview of careers in transportation, a critical field employing about 10 million people in the United States. The guide is organized in seven sections that cover the following occupational clusters: (1) vehicle operation; (2) passenger assistance; (3) vehicle assembly and maintenance; (4) planning, engineering, and construction; (5) safety and the environment; (6) behind the scenes; and (7) special opportunities in transportation. For each occupation, the number of people working in the occupation, the types of jobs available, the training needed, the expected salary range, and the job duties are summarized. A short eighth section encourages readers to think about transportation in the 21st century. An appendix profiles occupational trends, and seven sources of information are listed. (KC)

CAREERS IN TRANSPORTATION

Moving Everyone and Everything—Everywhere

U.S. Department of Transportation

CAREERS
IN TRANSPORTATION
Moving Everyone and Everything—Everywhere

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Dear Students,

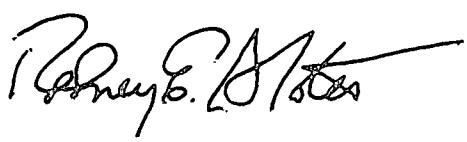
If you're tired of being asked the same old question, "What do you want to be when you grow up?," take a minute to consider this. You're a teenager and the time has come to explore careers and think seriously about your future. It is both an exciting and daunting challenge. As U. S. Secretary of the Department of Transportation, I want to make sure that when you're thinking about the opportunities ahead of you, you think about the field of transportation. That is why I started the Garrett A. Morgan Technology and Transportation Futures Program—with the goal to make sure that we have the best prepared transportation workforce for the 21st century.

The program's inspiration came from the work of Garrett A. Morgan, an African-American who lived from 1877 to 1963. As a teenager, Garrett recognized the importance of education and continued studying beyond his formal elementary education. He worked hard, discovered he was very good at fixing things, and eventually started his own business. He was always looking for better ways of doing things, and that creativity led him to become an inventor. As he looked at the world around him, Morgan dreamed of how he could use his skills to make the world a better place.

Garrett belonged to a generation that was part of a revolutionary change in transportation—the introduction of the automobile into a horse- and-buggy world. The automobile was a wondrous invention, but after he witnessed a collision between an automobile and a horse-drawn carriage, Garrett became concerned about the new dangers it posed. His response was to invent and patent the first three-position traffic signal. His invention saved lives then, and it is still saving lives today.

Garrett A. Morgan was the right man for his time. He did what was needed to move the world safely forward into the 20th century. As we enter the 21st century, I am asking you to be the right men and women for your time. Like Garrett A. Morgan, you have talents and skills that you can apply to achieve rewarding careers to make the world a better place for yourselves and for generations to come. The transportation field offers many opportunities for achievement and service. One in seven jobs in America is transportation-related. And, it may surprise you, but of all the major sectors of our economy, transportation offers the highest paid jobs in the nation. America's transportation network is the envy of the world, and whether you become a bus driver, an engineer, an air traffic controller, or an environmentalist, you can be a part of one of the finest transportation networks in the world.

Through the Garrett A. Morgan Technology and Transportation Futures Program, we want you to help us build the transportation systems of the future, and we want to help you develop the math, science, and technology skills needed for tomorrow's transportation jobs. As part of the program, the Department of Transportation has prepared this handbook to help you learn more about the exciting careers in transportation. I hope that Garrett A. Morgan will be your inspiration as you make one of the most important decisions of your life—what career is best for you.



Rodney E. Slater
Secretary of Transportation

CAREERS IN TRANSPORTATION
Moving Everyone and Everything—Everywhere

TRANSPORTATION IN AMERICA

Freedom to travel binds the nation together and links us to the rest of the world. Secretary of Transportation, Rodney E. Slater, has said that nothing is more essential to the well-being of the American public than our transportation network. The United States has the largest transportation system in the world. It is a vast and complex network of highways, airways, railways, rivers, and pipelines that serves 260 million people and 6 million business establishments.

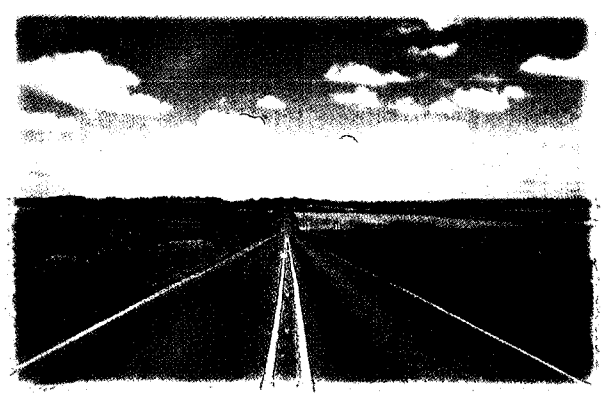
When we use the transportation system, we don't pay much attention to how it works or who makes it work—unless, of course, we are caught in a traffic jam, involved in an auto crash, or sitting in a plane delayed on a runway. But every day and every hour, around the clock, our transportation system is moving everyone and everything—everywhere.

Moving America today requires skills and talents as vast and complex as the transportation system itself. Until the 20th century, America's transportation systems were relatively simple and unconnected. There were no airplanes and few automobiles. Some people used only one form of transportation over the span of their entire lives, and cities grew along rivers and ports or near railroad depots. Along with the 20th century came more, better, and faster ways of getting around. With improved transportation came the suburbs and rural development. Large cities, small towns, and country villages were brought closer together by an intricate web of highways, railroads, waterways, and airports. Now, it is common for a person to use multiple forms of transportation every day, and goods are routinely transported using airplanes, ships, railroads, and trucks in combination.

The network of bridges, roads, tracks, and runways used to move people and goods are made of asphalt, concrete, and steel, but the transportation system is more than just materials. It is the truck driver, air traffic controller, locomotive engineer, ship builder, engineer, planner, computer programmer, and many others who make it work.

Almost 10 million people, or about 7 percent of U.S. workers, are employed in the many careers in transportation. By choosing a transportation career, you can enter a field of work that is as old and important as the first wheel and as new and exciting as space travel. And, as you build a rewarding life for yourself, you will be touching the lives of all Americans.

When you think of jobs in transportation, what comes to mind? Most of us, since we were small children, think of transportation as trains, boats, planes, trucks, and cars and the people who operate them. But there are many other visible and behind-the-scenes transportation jobs. One of them might be just right for your individual interests, gifts, or skills, and all of them are necessary to keep the cars and trains rolling, the ships afloat, and the planes in the air. This handbook will help you learn more about these occupations.




GUARD

TRUCK DRIVERS

The toy trucks that fill thousands of toy store shelves and toy boxes are a reflection of how important trucks are in our modern, industrial society. In 1993, the U.S. transportation system carried more than 12 billion tons of goods. Six billion tons were moved by trucks. Trucks dominate shipping of goods, especially for distances of less than 500 miles. They move all kinds of products—food, natural resources, furniture, computers, paper, and even other vehicles—from the people who supply them to the people who need them.

How many people drive trucks?

There are nearly 3 million truck drivers. Some truck drivers work for trucking companies; others for wholesalers or retailers such as auto parts stores, department stores, and food distributors; and still others work for government agencies or are self-employed. Opportunities should be favorable for persons who are interested in truck driving. This occupation has among the largest number of job openings each year.

What's it like to be a truck driver?

Not all truck-driving jobs are the same. Trucks may be large or small, and they may be designed with special features, such as refrigeration. Some drivers travel long distances and others work locally. The size and type of truck, the distance traveled, the length of trips, and the demands of the job will differ depending on the employer and the products the truck is transporting.

Usually, local truck drivers are paid by the hour and receive extra pay for working overtime (after 40 hours in a week). Long-distance drivers are generally paid by the mile, and their rate per mile can vary greatly based on mileage driven, seniority, and the size and type of truck.

Truck Drivers at a Glance	
How many people drive trucks:	3 million
Types of jobs available:	Jobs vary according to the size of the truck, the distance to be traveled, and whether the trucks have special features.
Training needed:	Commercial Driver's License is required for trucks carrying more than 26,000 pounds. Special training may be needed to operate large trucks.
Expected salary range:	Salaries vary according to the type of truck and distance driven.

How do I become a truck driver?

Of course, being a good and safe driver is a basic qualification for all truck-driving jobs. For truck driving or any kind of vehicle operation, mental alertness is a must, and physical health is important. But there are also some specific qualifications that are established by State and Federal regulations. In addition to a driver's license issued by the State where you live and a good driving record, you will need a special commercial driver's license to drive any truck designed to carry 26,000 pounds or more. You can learn truck-driving skills and prepare to get your commercial license by taking driver training courses or by enrolling in the tractor-trailer driver training programs that many private and public technical-vocational schools offer.

BUS DRIVERS

Many American children learn to sing "the wheels on the bus go 'round and 'round" and look up to the bus driver as one of their first role models. That's because bus drivers provide transportation for millions of Americans every day, and most bus drivers operate school buses. In addition to getting kids to school on time, bus drivers take people of all ages to work, to appointments, and on vacation. Almost everyone has a reason to ride a bus at one time or another. Because buses are used in small towns as well as large cities, they are our most available alternative to the car. They offer affordable local and long-distance travel and contribute to our country's efforts to cut traffic congestion and reduce air pollution.

How many people drive buses?

As of 1994, more than half a million people were bus drivers. However, about three out of four bus drivers are school bus drivers, and these are frequently part-time jobs. Over the period from 1994 to 2005, projections are that the population will grow, more children will enter school, and more people will move to suburbs. Bus ridership should increase because of these factors, and people seeking jobs as bus drivers should encounter good opportunities. Employment of bus drivers is expected to increase about as fast as the average for all occupations through the year 2005, primarily to meet the transportation needs of the growing school-age population.

What's it like to be a bus driver?

You can be an intercity, local-transit, or school bus driver. Each job has different demands and benefits, but all bus-driving jobs have certain common features.

If you enjoy driving, have a good driving record, are responsible enough to work without direct supervision, and enjoy dealing with people, then a career as a bus driver may be just right for you. If you want to be a school bus driver, you must have the patience and capability to deal with children—lots of them. All bus drivers interact with people every day, so courtesy is an important part of the job. While bus drivers have set schedules and their days may seem routine, they have to learn to expect the unexpected—bad weather, traffic jams, passenger complaints, and being behind or ahead of schedule.

Intercity and local-transit bus drivers

Intercity bus drivers take people from place to place within a State or several States. Local-transit bus drivers operate within a metropolitan area or county. These bus drivers pick up and discharge passengers at bus stops or stations. They collect fares, answer questions about routes, and sometimes announce stops.

The pay and fringe benefits for intercity and local-transit bus drivers vary widely, depending on the area where the bus drivers work. Most of these bus drivers are union employees and have benefit packages. They usually receive paid health and life insurance,

Bus Drivers at a Glance	
How many people drive buses:	568,000
Types of jobs available:	Jobs include those for intercity, local-transit, and school bus drivers.
Training needed:	Commercial driver's license is required.
Expected salary range:	Salaries vary according to the type of bus driven.

sick leave, and free bus rides on any of their systems' regular routes. Drivers who work full-time may get as much as 4 weeks of vacation. Most local-transit bus drivers are also covered by dental and pension plans. Earnings for local-transit bus drivers depend on the size of the metropolitan area where they drive and the bus company. On average, they can earn between $11.00 to almost $17.00 an hour. Salaries for intercity bus drivers depend on the number of miles they drive. In 1994, intercity bus drivers worked about 6 months out of the year and earned about $22,000. Many drivers who had more experience and worked all year earned more than $48,000.

School bus drivers

If you become a school bus driver, you will pick up children at corners or in front of houses to take them to and from school and school events. Because school bus drivers must manage the children and keep them safe, they must apply the same rules used by the school system.

School bus drivers work only when school is in session, and many work 20 hours or less, with one or two morning and afternoon routes. For some parents, college students, and others, this offers an excellent opportunity for part-time work. The average hourly rate for a school bus driver (as of 1994) ranges from $9.00 to almost $12.00 an hour. Most school bus drivers have sick leave and many are covered by health, life, and pension plans.

How do I become a bus driver?

Bus driver qualifications and standards are established by State and Federal regulations. Federal regulations require drivers who operate vehicles designed to transport 16 or more passengers to obtain a commercial driver's license from the State in which they live. To be licensed, you have to pass a knowledge test and demonstrate that you have the skills necessary to operate a commercial motor vehicle safely.

SUBWAY AND STREETCAR OPERATORS

As Americans have become more concerned over environmental protection, we have begun to recognize that even personal travel to work and other activities creates air pollution, particularly the "smog" in some of our largest cities. To improve the environment, we continue to look for ways to transport large numbers of people going to similar locations quickly and efficiently, with as little harm to the environment as possible. Subways and streetcars are not new means of transportation, but they have taken on a new importance. Although computer technology contributes to the operation of some of these systems, human operators are still necessary to make them work.

How many people operate subways and streetcars?

Subway and streetcar operators accounted for 12,000 jobs in 1994, which is a relatively small job market. However, as cities build new rail systems and add new lines to existing systems, the number of subway and streetcar operators is expected to grow faster than the average for other occupations.

Subway and Streetcar Operators at a Glance	
How many people are subway or streetcar operators:	12,000
Types of jobs available:	Subway operators control trains that usually run underground throughout a city and its suburbs. Streetcar operators drive streetcars or trolleys on tracks recessed in city streets.
Training needed:	Usually required to complete a training program for new operators. May be required to drive a bus for a specified period of time.
Expected salary range:	People in this field earned as much as $19.00 an hour in 1994.

What's it like to be a subway or streetcar operator?

Subway operators control trains that transport passengers throughout a city and its suburbs. The trains usually run on tracks in underground tunnels, but some systems run in part on tracks on the surface or elevated above streets.

Streetcar operators drive electrically powered streetcars or trolleys that transport passengers. Streetcars run on tracks that may be recessed in city streets, so operators must observe traffic signals and cope with car and truck traffic.

According to the American Public Transit Association, in 1994, subway operators earned about $19.20 an hour.

How do I become a subway or streetcar operator?

Some systems require subway operators to work as bus drivers for a specified period of time. New operators generally are placed in training programs that last from a few weeks to 6 months. Some operators who have sufficient seniority can advance to station managers.

TAXI DRIVERS AND CHAUFFEURS

Sometimes people have special requirements for getting from one place to another. They may have a specific schedule, route, destination, or purpose that rules out mass transit. Unless they drive themselves, they depend on taxi drivers and chauffeurs to get them where they want to go.

How many people are taxi drivers or chauffeurs?

In 1994, there were 129,000 taxi drivers and chauffeurs. The majority of them worked for companies and businesses. About a third were self-employed, and others worked for car rental dealerships, private households, and funeral homes. About 31 percent of those working for companies and businesses worked for local and suburban transportation companies, and about 21 percent worked for taxicab companies.

What's it like to be a taxi driver or chauffeur?

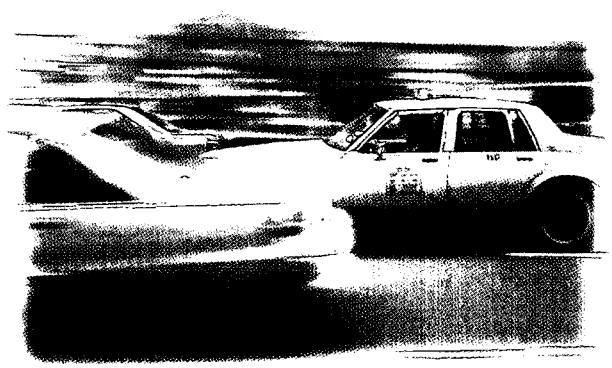
Taxi drivers take passengers to such places as hotels, airports, convention centers, business locations, and places of entertainment. Taxi drivers get their customers from phone calls to taxi companies, by cruising the streets, and by waiting at cab stands or in taxi lines at airports and hotels. In addition to driving, they have to make sure that their cabs are in good working condition, collect fees, keep logs of trips, and help passengers with their luggage. Taxi drivers who do not own their own cars must report daily to a garage or cab service, where they are assigned a taxi.

Full-time taxi drivers usually work one shift a day, which may last from 8 to 12 hours. Part-time drivers may work half a shift each day or a full shift once or twice a week. These shifts could be any time of the day or night, and hours can change from day to day or be the same every day.

Chauffeurs who work for a single employer may be on call most of the time. Those who work for limousine services work a lot on evenings and weekends.

Good opportunities are available if you are interested in a job as a taxi driver or chauffeur. You can also expect some competition for these jobs because they offer regular hours, fairly good earnings, and attractive working conditions. As local and intercity travel increases with population growth, the number of taxi drivers and chauffeurs is expected to grow faster than the average for all occupations.

The majority of independent taxi owner-drivers earned from about $20,000 to $30,000, including tips, in 1994. Many chauffeurs who worked full-time earned from $25,000 to $50,000, including tips.



Taxi Drivers and Chauffeurs at a Glance	
How many people are taxi drivers and chauffeurs:	129,000
Types of jobs available:	Taxi drivers can work for cab companies or be self-employed. Chauffeurs can work for a single employer or a limousine service.
Training needed:	Qualifications vary depending on local government regulations. A taxi driver or chauffeur license is required, in addition to a regular driver's license.
Expected salary range:	Independent taxi owner-operators earned from $20,000 to $30,000 a year, including tips, in 1994. Full-time chauffeurs made $25,000 to $50,000, including tips.

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How do I become a taxi driver or chauffeur?

Because local governments regulate taxicabs, set standards, and administer tests for taxi driver and chauffeur licenses, the requirements differ. Most local governments, however, have minimum qualifications for age and driving experience. Many companies require a higher minimum age and prefer that drivers be high school graduates. If you are interested in driving a limousine or taxicab, you must first have a regular driver's license. You must also get a chauffeur or taxi driver license.

MATERIAL-MOVING EQUIPMENT OPERATORS

The people who operate transportation vehicles move more than just people. Some use machinery to move construction materials, manufactured goods, earth, logs, petroleum products, grain, coal, and other heavy materials. They move materials over short distances—around a construction site, factory, warehouse, or on and off trucks and ships.

How many people are material-moving equipment operators?

In 1994, a million people were employed in material-moving equipment occupations, but this career is not growing as fast as most, because fewer operators are needed as automation and equipment improve. This occupation will, however, still offer opportunities for new workers to replace experienced operators who transfer to other occupations or leave the labor force.

What's it like to be a material-moving equipment operator?

Material-moving equipment operators are classified by the type of equipment they operate. Those who run bulldozers, cranes, loaders, and similar equipment are often called construction equipment operators. Others drive industrial trucks and tractors and similar equipment in manufacturing plants and warehouses. Some operate many kinds of equipment; others use only one.

Crane-and-tower operators lift and move materials, machinery, or other heavy objects using mechanical or hydraulic booms and tower and cable equipment. Excavation and loading-machine operators run and tend machinery equipped with scoops, shovels, or buckets to excavate earth at construction sites and to load

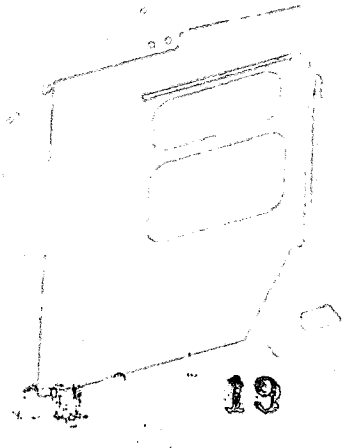
Material-Moving Equipment Operators at a Glance	
How many people work as material-moving equipment operators:	1 million
Types of jobs available:	Jobs are classified by type of equipment used. Many jobs are construction-related; others are in the manufacturing, logging, transportation, and mining industries.
Training needed:	High school diploma or equivalency and on-the-job training are usually required. Some operators are trained in formal apprentice programs.
Expected salary range:	Earnings vary considerably. One study showed the median earnings for all material-moving operators were $459 a week in 1994.

and move loose materials. Grader, dozer, and scraper operators remove, distribute, level, and grade earth using vehicles equipped with blades. Hoist-and-winch operators lift and pull loads with power-operated equipment. Most jobs in loading operations are in construction, manufacturing, logging, transportation and public utilities, and mining. Operating engineers are qualified to operate more than one type of construction equipment, and many work for State and local governments.

If you are interested in a career as a material-moving operator, be prepared to work outdoors, in hot and cold weather, and sometimes in rain or snow. Earnings for material-moving equipment operators vary considerably. In 1994, median earnings of all material-moving operators were $459 a week.

How do I become a material-moving equipment operator?

To become one of these operators, you should be a high school graduate. You will learn how to operate material-moving equipment on the job. Mechanical aptitude and high school training in automobile mechanics would be helpful, so that you can do some maintenance on the machines. Some construction equipment operators are trained in formal 3-year apprenticeship programs.



LOCOMOTIVE ENGINEERS

Rail transportation workers operate our Nation's trains to deliver travelers and freight to destinations throughout the country. When most of us think of jobs in the rail industry, however, we usually think of locomotive engineers—the ones who blow the whistles. But they do much more than that. Locomotive engineers are among the most highly skilled workers on the railroad.

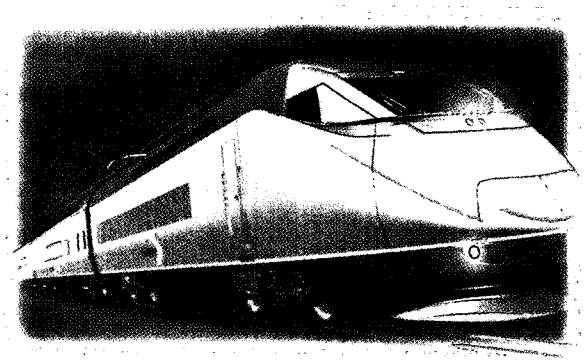
How many people are locomotive engineers?

There are about 35,000 locomotive engineers. Employment opportunities should remain good through the year 2005.

What's it like to be a locomotive engineer?

Locomotive engineers operate trains carrying cargo and passengers between stations. They control the throttle to start and accelerate the train and use air brakes or dynamic brakes to slow and stop it. They monitor gauges and meters that measure speed, fuel, temperature, battery charge, and air pressure in the brake lines. They must have a thorough knowledge of the signal systems, yards, and terminals along their routes and be constantly aware of the condition and makeup of their trains. Most engineers run diesel locomotives, but a few run electric locomotives. Before and after each run, engineers check locomotives for mechanical problems and make minor adjustments on the spot.

Because trains operate 24 hours a day, 7 days a week, you may have to work nights, weekends, and holidays. As you gain seniority with the railroad, you will be able to work the shifts most desirable for you. According to the Brotherhood of Locomotive Engineers, in



1993, passenger engineers earned an average of about $63,900 a year; through-freight engineers, about $62,900; local-way freight engineers, about $60,800; and yard engineers, about $47,700. Locomotive engineers receive extra pay for overtime work. Most are union employees and have benefit packages.

How do I become a locomotive engineer?

Railroads prefer that you be at least 21 years old, have a high school diploma, and pass a physical examination. Engineer jobs are often filled by workers who have experience in other railroad occupations, such as brake operators or conductors. If your goal is to be an engineer, it's a good idea to start at a lower-level job in the rail industry and work your way up. The Federal Railroad Administration at the Department of Transportation requires you to be certified before you are permitted to operate a locomotive. To become certified, you will undergo a training program that lasts a minimum of 6 months and includes both classroom and hands-on instruction in locomotive operations. At the end of the training program, you will have to pass tests covering locomotive equipment, air brake systems, fuel economy, train-handling techniques, and operating rules and regulations.

Locomotive Engineers at a Glance	
How many people are locomotive engineers:	35,000
Types of jobs available:	Jobs are classified as passenger, through-freight, local-way, and yard engineers.
Training needed:	The Federal Railroad Administration requires all locomotive engineers to be certified through a training program. Most railroads also require a high school diploma and a physical exam.
Expected salary range:	In 1993, salaries ranged from $47,700 a year to $63,900, depending on the type of engineering position.

RAILROAD CONDUCTORS

To make the railroad system operate smoothly, someone has to be in charge. That person is the railroad conductor.

How many people are railroad conductors?

There are approximately 26,000 railroad conductors. Employment opportunities should remain stable through the year 2005.

What's it like to be a railroad conductor?

You can work either as a road conductor or a yard conductor. Conductors usually remain one or the other for their entire careers.

As a road conductor, you will be assigned to a freight or passenger train. If you are assigned to a freight train, you will record each car's contents and destination and make sure that cars are added and removed at the proper points along the route. If you are assigned to a passenger train, you will collect tickets and fares and assist passengers. You will be working a lot with the engineer during the trip. At stops, you will signal engineers when to pull out of the station. Before the train leaves the terminal, you and the engineer will discuss the train's route, timetable, and cargo. During the trip, you will receive additional information by radio, such as news about track conditions ahead or instructions to pull off at the next available stop to let another train pass. You will use a two-way radio to pass on this information to the engineer. You will also work with the brake operators regarding any equipment problems.

Yard conductors supervise the crews that assemble and disassemble trains. Some cars are sent to special tracks for unloading, while the rest are moved to other tracks to await assembling into trains destined for different cities. Yard conductors also work closely with engineers and brake operators. You will tell the engineers where to move the cars and tell the brake operators which cars to bring together

Railroad Conductors at a Glance	
How many people are railroad conductors:	26,000
Types of jobs available:	Road conductors are in charge of either freight or passenger trains. Yard conductors supervise assembly and disassembly of trains.
Training needed:	Conductor jobs are usually filled by experienced brake operators who have passed tests on signals, timetables, and other subjects.
Expected salary range:	Yearly earnings were about $40,000 in 1994.

or take apart and which switches to throw to redirect the cars to the proper tracks. If you are a yard conductor, you will spend most of your time outdoors in all kinds of weather.

In 1994, annual earnings of conductors averaged about $40,000. Most are union employees and receive benefit packages.

How do I become a railroad conductor?

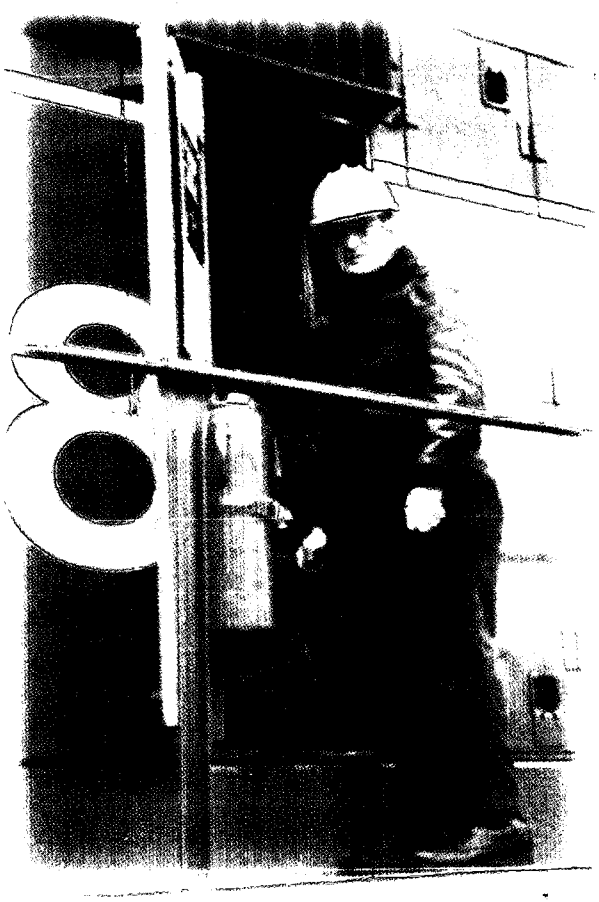
Conductor jobs are usually filled by experienced brake operators who have passed tests covering signals, timetables, operating rules, and related subjects. Some companies require these tests to be passed within the first few years of employment. Until permanent positions become available, new personnel substitute for experienced conductors who are absent. Seniority is usually the main factor in determining promotion from brake operator to conductor.

BRAKE OPERATORS

The engineer and the conductor are the most familiar people associated with trains, but there are other crew members that are just as necessary to keep the trains running safely and smoothly. Even through they are not as visible, brake operators are also part of the crew responsible for operating the train.

How many people are brake operators?

There are about 18,000 brake operators, also known as trainmen. The outlook for brake operators' jobs is not as promising as it is for locomotive engineers and conductors, because new technology may affect the number of brake operators needed. However, this will still be an important entry-level position for other railroad operating jobs.



What's it like to be a brake operator?

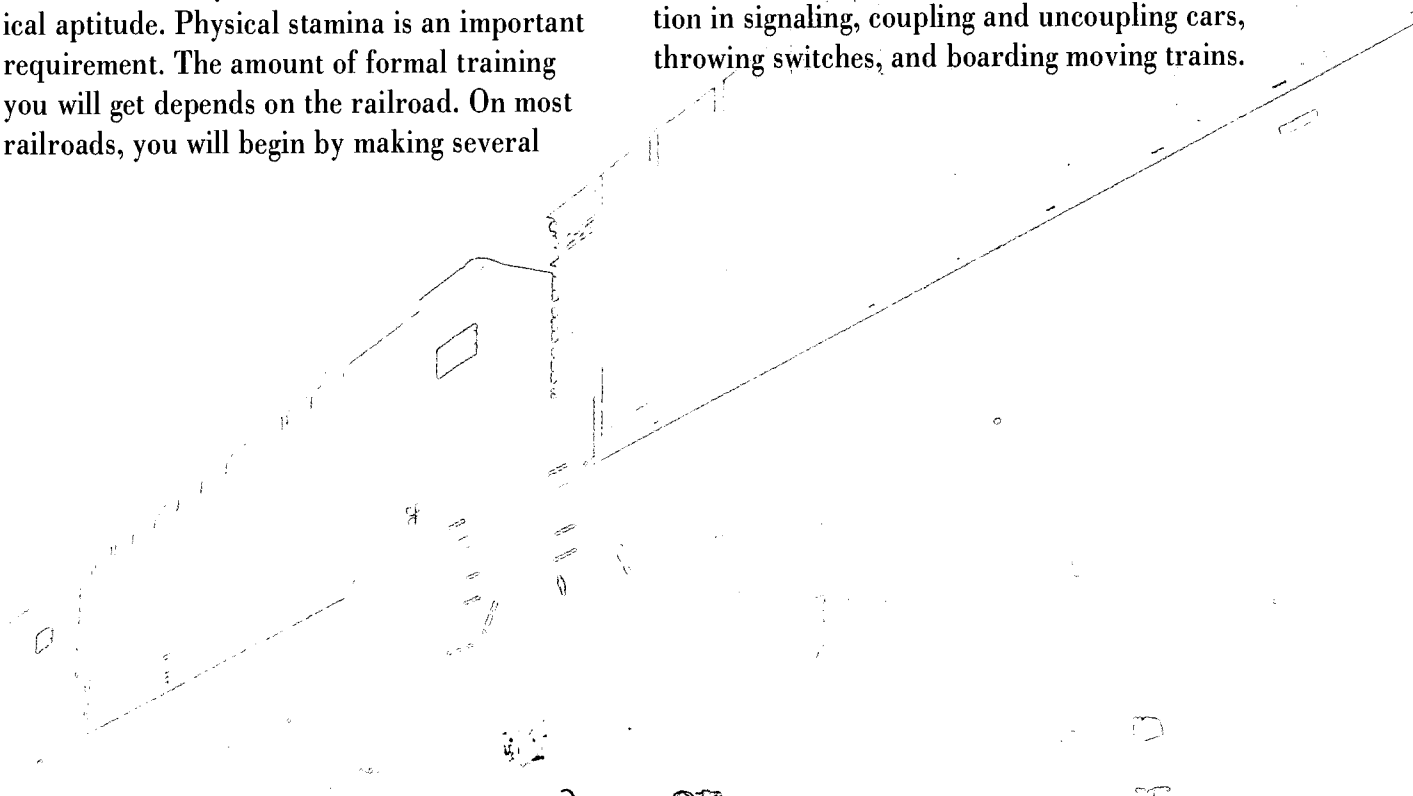
Brake operators make locomotives and cars into trains. Working under the direction of conductors, they do the physical work involved in adding and removing cars at railroad stations and assembling and disassembling trains in railroad yards. Freight train crews include one trainman who assists in inspecting the train to make sure that all couplers and airhoses are fastened, handbrakes are released, and air brakes are functioning properly. During the trip, brake operators regularly look for smoke, sparks, and other signs of sticking brakes, overheated axle bearings, and other equipment that may be faulty. When freight trains approach an industrial site, the brake operators get off and run ahead to switch the train to the proper track. They uncouple the cars and throw track switches to route the cars to certain tracks, if they are to be unloaded, or to an outgoing train, if their final destination is further down the line. The work of brake operator is physically demanding. Climbing up and down and getting off moving cars is strenuous and requires that the brake operator always be alert.

Brake operators average about $30,000 a year. Most are union employees, and they have benefit packages.

Brake Operators at a Glance	
How many people are brake operators:	18,000
Types of jobs available:	Being a brake operator is a physically demanding job that involves assembling and disassembling trains, as well as inspecting and monitoring brake systems during travel.
Training needed:	High school graduation is required. Most brake operators receive on-the-job training from experienced personnel; some railroads require more formal instruction.
Expected salary range:	Brake operators earned about $30,000 a year in 1994.

How do I become a brake operator?

You should have a high school education and have good hearing, eyesight, and color vision, as well as hand-eye coordination and mechanical aptitude. Physical stamina is an important requirement. The amount of formal training you will get depends on the railroad. On most railroads, you will begin by making several trips with conductors and experienced operators to become familiar with the job. On some railroads, however, new brake operators undergo extensive training, including instruction in signaling, coupling and uncoupling cars, throwing switches, and boarding moving trains.



AIRCRAFT PILOTS

People have dreamed of the ability to fly for thousands of years. Yet, as recently as the beginning of this century, anyone who took the idea of a "flying machine" seriously was considered a crackpot. Now flying is a part of everyday life. To be an airline pilot is to have one of the most exciting "action" jobs open to men and women. Every year there are more airliners in the sky, flying more people and more goods to distant places around the country and the world. Airline pilots make it all possible with the help of many different occupations in the aviation industry.

How many people are aircraft pilots?

Aircraft pilots held 90,000 jobs in 1994. Pilots are expected to face considerable competition for jobs through the year 2005, because the number of applicants for new positions is expected to be greater than the number of job openings. The reason for the competition is that many of airline companies have merged and several have gone out of business. Also, with reductions in the military, many pilots have been forced to leave the armed services. These and other qualified pilots seek jobs in this occupation, because it offers high earnings, glamour, prestige, and free or low-cost travel benefits. However, as time passes, some pilots will fail to maintain their qualifications, and the number of applicants competing for each opening should decline. Employment opportunities for pilots can also be affected by changes in the economy. During good times, the need for pilots is high, while during recessions, or times when the economy is not doing well, there is usually a decline in the demand for air travel.

Earnings of airline pilots are among the highest in the Nation. The 1994 average starting salary for airline pilots ranged from about $13,000 a year at the smaller turboprop airlines to as high as $200,000 a year for some senior captains on the largest aircraft.

Aircraft Pilots at a Glance	
How many people are pilots:	90,000
Types of jobs available:	Jobs vary from pilots of turboprop planes at local airports to captains of large airliners. Flight crew members usually include a captain, first officer, and flight engineer.
Training needed:	Military background in flying or pilot training in specialized courses. A college degree is not required, but is desirable, and knowledge of mathematics, science, and engineering is helpful.
Expected salary range:	Earnings for airline pilots are among the highest in the Nation. In 1994, starting salaries ranged from $13,000 a year at small airlines to $200,000 a year for senior captains on large aircraft.

What's it like to be an aircraft pilot?

Except on small aircraft, two pilots usually make up the cockpit crew. Generally, the most experienced pilot, the captain, is in command and supervises all other crew members, usually a first officer and a flight engineer. The captain always sits in the left-hand seat, with the first officer on the right. In front of each pilot is a panel of instruments and displays that tells the pilots what the airplane is doing—its direction, altitude, speed, and so forth. New technology can perform many flight tasks, however, and almost all new aircraft now fly with only two pilots, who rely more heavily on computerized controls.

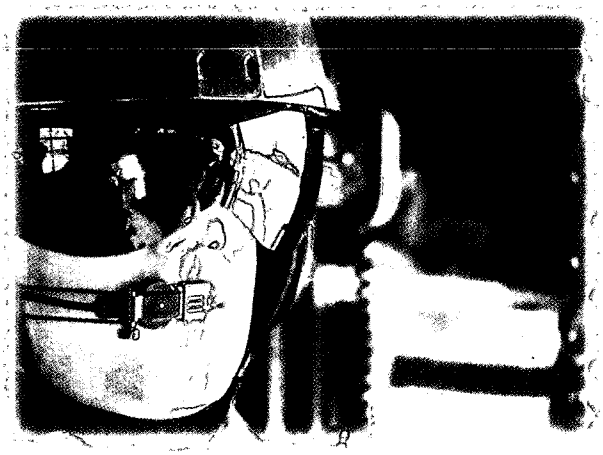
Before departure, pilots plan their flights carefully. They thoroughly check their aircraft to make sure that the engines, controls, instruments, and other systems are functioning properly. They also make sure that baggage or cargo has been loaded correctly. The pilot talks with flight dispatchers and aviation weather forecasters to find out about weather conditions during the flight and at the destination. Airplane pilots, with the assistance of autopilot and flight management computers, steer their planes along planned routes and are monitored by air traffic control stations they pass along the way. Once on the ground, pilots must complete records on their flights for their companies and the Federal Aviation Administration.

How can I become a pilot?

For many years, the U. S. military was the source of many trained pilots who left the service after their tours of duty and became commercial airline pilots. However, the military has undergone significant downsizing, and the airline industry has had to look at alternative sources for pilots. In some cases, airlines take carefully selected individuals who have no flying experience and put them through pilot training courses designed to meet the airline's specific needs.

Anyone applying to become a pilot will be tested for physical fitness, eyesight, leadership qualities, mental alertness, and motivation. After all, human lives depend on your fitness. Although it is not required, a college degree is desirable for pilots. Mathematics, science, and engineering may be especially helpful in your academic background.

Information about job opportunities and qualifications for a particular airline may be obtained by writing to the personnel manager of the airline or talking with someone who operates aircraft at local airports.



SHIP CAPTAINS AND PILOTS

You don't have to be in the military or fly an airplane to be a captain or a pilot. There are also captains and pilots in water transportation occupations who operate and take care of all kinds of waterborne craft in all types of waters. There are deep-sea merchant ships, tugboats, towboats, ferries, dredges, and research vessels traveling on the oceans and the Great Lakes, in harbors, and on rivers and canals.

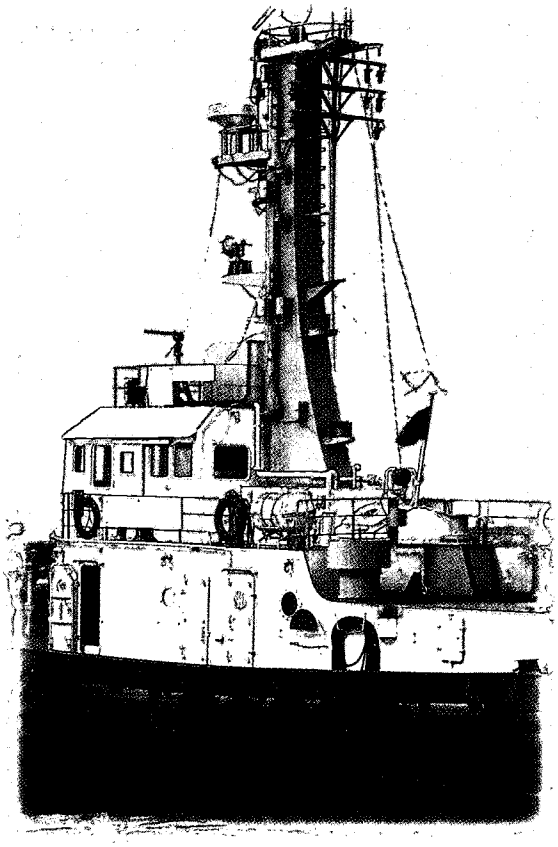
How many people are ship captains and pilots?

In 1994, there were about 2,500 jobs for ship captains, often called masters, and pilots. Opportunities for these jobs have been declining over the past several years because of automation and a large increase in the size of modern ships. This trend is expected to continue for a few years but may level off with shipping industry changes.

What's it like to be a ship captain or pilot?

A ship's captain is the highest ranking person in charge of the operation of a vessel and is responsible for supervising the work of the other officers and the crew. The captain sets course and speed, moves the vessel to avoid hazards and other ships, and periodically determines position using navigation aids, celestial observations, and charts. Captains direct crew members and ensure that proper procedures and safety practices are followed. They check that machinery and equipment are in good working order and oversee the loading and unloading of cargo and passengers. They also keep logs and other records of ships' movements and cargo carried.

Ship Captains and Pilots at a Glance	
How many people are ship captains and pilots:	2,500
Types of jobs available:	Ship captains set courses and speeds, steer ships, and supervise crew members. Marine pilots guide ships in and out of harbors, through straits, or on rivers.
Training needed:	Experience, courses in seamanship, and independent study are required to pass the U.S. Coast Guard's qualifying exam to be a pilot or captain. Harbor pilot training usually involves an apprenticeship with a shipping company or pilot employees' association.
Expected salary range:	The annual salary for ship captains was about $80,000 in 1994.



Marine pilots guide ships in and out of harbors, through straits, and on rivers and other confined waterways where a knowledge of local water depths, winds, tides, currents, and hazards is important. Pilots on river and lake vessels are regular crew members, while harbor pilots are employed by local pilots' associations who assign the pilots to accompany and guide vessels while they enter or leave port. These pilots handle several ships in a single day.

The typical annual salary for these jobs is about $80,000.

How do I become a captain or pilot?
The U.S. Coast Guard, which is part of the U. S. Department of Transportation, establishes entry, training, and educational requirements for captains, pilots, and almost all other water transportation occupations. You will have to pass a Coast Guard exam to qualify as a pilot or captain. You can learn what you need to know to pass the exam through experience, courses in seamanship schools, and independent study. Harbor pilot training usually includes an apprenticeship with a shipping company or a pilot employees' association. Competition is very keen for these jobs; only one out of every hundred qualified applicants is accepted.

MATES

It takes a lot of people besides the captain to maintain and operate a large oceangoing vessel. If you like the sea, are interested in a career that involves travel, and are willing and able to take responsibility, you may want to become a mate. Mates are the captain's "right hands"; they are the officers who assist the captain directly.

How many people are mates?

In 1994, there were approximately 2,500 jobs for mates. Competition for these jobs is considerable and is expected to continue, as it will for captains.

What's it like to be a mate?

Mates, also called deck officers, assist the captains on large vessels. Merchant marine vessels—those carrying cargo overseas—have a chief or first mate, a second mate, and a third mate. Mates oversee the operation of the vessel or "stand watch" for assigned periods of time. On smaller vessels, there may be only one mate who alternates watches with the captain. Typical annual earnings for new mates are about $36,000.

How do I become a mate?

You will need to be a high school graduate and receive a license from the U.S. Coast Guard. The best path to a license as a mate is to graduate from the U.S. Merchant Marine Academy (USMMA) or one of the six State academies and pass a written examination.

The State maritime academies are in Texas, California, Maine, Massachusetts, New York, and Michigan. The Great Lakes Maritime Academy, in Michigan, trains officers just for Great Lakes vessels. USMMA is a military academy located in Kings Point, New York, and is run by the U.S. Department of Transportation. The Academy will prepare you to serve as a licensed officer on merchant vessels and as commissioned officer in the U.S. Naval Reserve. The Academy offers a 4-year undergraduate program that leads to a Bachelor of Science degree and a U.S. Coast Guard license as a third mate or third assistant engineer or both. To be admitted to the Academy, you have to be nominated by a member of Congress representing your State of residence. Your acceptance will also depend on your SAT scores, overall academic record, extracurricular activities, and leadership potential. Before graduation, you are required to apply for a commission as an ensign in the Merchant Marine Reserve or U.S. Naval Reserve.

Mates at a Glance	
How many people are mates:	2,500
Types of jobs available:	Mates assist captains on both large and small vessels.
Training needed:	High school graduation is required. Training is available from the U.S. Merchant Marine Academy or one of six State academies. A U.S. Coast Guard license is required.
Expected salary range:	The typical annual salary for mates was about $36,000 in 1994.

A physical examination and drug test are also required. You can also become licensed if you have 3 years of appropriate sea experience and pass the Coast Guard's written exam. You will need a good deal of formal schooling or independent study to pass the exam. Because seamen may work only 6 months a year or less, it can take 5 to 8 years to accumulate the necessary experience. The academies offer 4-year bachelor's degree programs in nautical science, marine transportation, or engineering. With experience and by passing additional exams, third mates or third assistant engineers may qualify for higher ranks. Because of keen competition, however, officers on oceangoing ships may have to take jobs below the grades for which they are qualified.

Merchant marine officers, both experienced and beginners, are hired for voyages through union hiring halls or directly by shipping companies.

SHIP ENGINEERS

If you like fixing mechanical things, want to go to sea, are a hard worker, and can take responsibility, your potential to be a licensed ship engineer. The job of ship engineer calls for specific qualifications, so if that is your career choice, you should begin planning early.

How many people are ship engineers?

There are approximately 3,600 licensed ship engineers on oceangoing ships, and there is a lot of competition for these jobs. Graduates from the U.S. Merchant Marine Academy and the State maritime academies may have difficulty finding licensed shipboard jobs in the U. S. merchant marine, although most do find maritime-related jobs.

What's it like to be a ship engineer?

Marine engineers operate, maintain, and repair diesel and steam propulsion power-plants, boilers, generators, pumps, and other machinery. Merchant marine vessels usually have four engineering officers—a chief engineer and a first, second, and third assistant engineer. Assistant engineers stand periodic watches, overseeing the operation of engines and machinery.

Annual earnings for new licensed engineers can be as high as $36,000.

How do I become a ship engineer?

You must receive a Coast Guard license to be an engineering officer. A good way to qualify for an entry-level third assistant engineer license is to attend the USMMA or one of the six State maritime academies described in the section on mates.

Ship Engineers at a Glance	
How many people are ship engineers:	3,600
Types of jobs available:	Jobs involve operating and maintaining machinery on ships as chief engineer and first, second, or third assistant engineer.
Training needed:	A U.S. Coast Guard license is required. Training is available at the U.S. Merchant Marine Academy or one of six State maritime academies.
Expected salary range:	Starting salaries for ship engineers were as high as $36,000 a year in 1994.

UNLICENSED SEAMEN

For as long as there have been ships, young people have dreamed of going off to sea. If that's your dream, you may want to consider a job as an unlicensed seaman. But be prepared—the adventure of a seagoing career is accompanied by a lot of hard physical work and a lot of time away from home.

How many people are unlicensed seamen?

In 1994, there were approximately 12,400 unlicensed seamen.

What's it like to be an unlicensed seaman?

Deck seamen, most often called ordinary seamen, able seamen, or boatswains, operate the vessel and its deck equipment under the direction of the ship's officers. They also keep the nonengineering areas in good condition. They stand watch, looking out for other vessels, obstructions in the ship's path, and aids to navigation. They also steer the ship, measure water depth in shallow water, and maintain and operate deck equipment, such as life boats, anchors, and cargo-handling gear. They perform maintenance chores, such as repairing docking or mooring lines, chipping rust, and painting and cleaning decks and other areas.

Unlicensed engineers, who may be called wipers, oilers, firemen, or electricians, work below decks under the direction of the ship's engineering officers. They lubricate the moving parts of engines and motors such as gears, shafts, and bearings; they read pressure and temperature gauges and record data; they may repair and adjust machinery; and they may stand four watches, so that the ship's machinery can operate 24 hours a day.

A third area for unlicensed engineers is the stewards department. The stewards department does not have any officers, so these unlicensed personnel are in charge. Unlicensed personnel in this area are called chief cooks, bakers, stewards, messmen, and steward utilities. These personnel are responsible for food

Unlicensed Seamen at a Glance	
How many people are unlicensed seamen:	12,400
Types of jobs available:	Deck seamen, who operate the vessel and its deck equipment; unlicensed engineers, who work on machinery below decks; and stewards, who are responsible for food service and laundry.
Training needed:	No license is required. Training at an industry or labor union school is recommended.
Expected salary range:	Typical earnings for unlicensed seamen were between $18,000 and $25,000 a year in 1994.

service and laundry. A ship's crew must have good food and a healthy diet to sail on overnight ocean voyages and work well. Ship steward personnel can receive special training at maritime industry training schools.

How do I become an unlicensed seaman?

These jobs do not require a license, but you will still need to obtain a merchant mariner's document, sometimes referred to as a seaman's certificate. A medical certificate of excellent health and a certificate attesting to vision, color perception, and general physical condition will be required. No experience or formal schooling is required, but training at an industry school or a school operated by a labor union is strongly recommended. Beginners are classified as ordinary seamen and may be assigned to the deck or engineering department.

Typical annual earnings for unlicensed seamen range between $18,000 to $25,000. This depends on the state of the industry and how many jobs are available. The number of job openings for unlicensed seamen is declining, as it is for the officers.

Other Maritime Jobs

There are many other types of jobs available on commercial vessels. These vessels sail on the rivers, lakes, canals, and harbors of the United States and aboard vessels support the offshore oil and gas industry in such areas as the Gulf of Mexico and Alaska. Vessels include towboats, passenger and car ferries, large commercial fishing vessels, and offshore crew service and supply boats. The jobs are somewhat similar to those for captains and pilots, mates and engineers, and unlicensed seamen. Some of the jobs available include towboat operator, harbor pilot, ferry operator, and river pilot.

There are about 50,000 of these jobs, and the need for new personnel is expected to stay steady. The salaries vary greatly but may be a little less than the salaries paid on oceangoing ships. Most of these jobs are specialized and require some training. Graduates of maritime academies qualify for many of these jobs, too.

II. PASSENGER ASSISTANCE: The People Who Help Us Get Where We're Going

TRAVEL AGENTS

Affordable airfares, interstate highways, higher education levels, a global economy, more leisure time, and even television have all given Americans a different perspective on travel. Businesses operate and interact with other businesses all over the world, and the family vacation has expanded beyond the yearly trip to the beach to include road trips, air travel, train trips, and cruises to resorts and tourist attractions in every State, country, and continent. Arranging a trip that offers the right transportation and accommodations at the best fares is a time-consuming task. Many companies and individual travelers rely on travel agents to get them there and back on time, comfortably, and at the best price.

How many people are travel agents?

There were about 122,000 travel agents in 1994, in every part of the country. Most work for travel agencies, but a few are self-employed. Future opportunities are good for travel, because spending on travel is expected to increase significantly through the year 2005.

What's it like to be a travel agent?

Travel agents plan trips for individuals and businesses. They make arrangements for transportation, hotel accommodations, car rentals, tours, and recreation. They may also advise clients on weather conditions, restaurants, and tourist attractions. For international travel, agents also provide information on customs regulations, required papers, and currency exchange rates.

If you are interested in becoming a travel agent, you should have a basic love of traveling, like dealing with people, have some sales ability, and understand computers. A travel agent spends most of his or her time behind a desk talking with customers, doing paperwork, contacting airlines and hotels for travel arrangements, and promoting group tours. Travel agents may be under a great deal of pressure at times, such as during the vacation season. Many agents, especially those who are self-employed, frequently work long hours.

Salaries for travel agents depend on experience, sales ability, and the size and location of the travel agency. In 1994, earnings ranged from $16,000 to almost $30,000.

Travel Agents at a Glance	
How many people are travel agents:	122,000
Types of jobs available:	Plan trips for businesses and individuals; opportunity for self-employment.
Training needed:	High school graduation is usually required. Special training is available in vocational schools, at community and 4-year colleges, and through the American Society of Travel Agents or the Institute of Certified Travel Agents.
Expected salary range:	Yearly salaries ranged from $16,000 to about $30,000 in 1994.

How do I become a travel agent?

You will need to graduate from high school to be a travel agent. Computers are changing the way travel agents work, and a formal training program beyond high school is becoming more important. Many vocational schools offer 6- to 12-week travel agent programs. Travel courses are also offered in public adult education programs and in community and 4-year colleges. A few colleges offer bachelor's or master's degrees in travel and tourism. Courses in accounting and business management are also important, especially for those who want to manage or start their own travel agencies. Other desirable qualifications include good typing and letter-writing skills and an ability to work with computers. You could also take a correspondence course offered by the American Society of Travel Agents that provides a basic understanding of the travel industry. Experienced travel agents can take advanced study courses from the Institute of Certified Travel Agents to become a Certified Travel Counselor.

FLIGHT ATTENDANTS

Except for an occasional "hello" or "goodbye" before or after a flight, few travelers interact with airplane pilots, but everyone who flies is greeted and served by flight attendants. Flight attendants carry out some rather ordinary tasks, but they also have crucial responsibilities for their passengers' safety. Because they represent the airline as the customer's most personal point of contact, they also have a major public relations role.

How many people are flight attendants?

Flight attendants held about 105,000 jobs in 1994. Most flight attendants work for commercial airlines, but a small number work for large companies that operate their own aircraft. Opportunities for a job as a flight attendant should be good through the year 2005. As the population increases and incomes rise, air travel is expected to increase and so will the need for flight attendants.

What's it like to be a flight attendant?

The flight attendant's job is to see that all passengers have a safe, comfortable, and enjoyable flight. The most important responsibility of the flight attendant is to help passengers if there is an emergency. Flight attendants have certain duties to perform before, during, and after the flight. They are briefed by the pilot on weather conditions and any special passenger problems before each flight. They make sure that the passenger cabin is in order and that first aid kits and other emergency equipment are on board and working. As passengers board, the flight attendants greet them, check their tickets, and assist them in storing carry-on luggage. Before the plane takes off, they show passengers how to use emergency equipment and check to see that seat belts are fastened. During the flight, they serve beverages and distribute precooked meals. After the plane

Flight Attendants at a Glance	
How many people are flight attendants:	105,000
Types of jobs available:	Jobs are available on commercial airlines or at large companies that operate their own aircraft.
Training needed:	High school graduation is required. Four- to six-week training courses are provided by airlines. Refresher training is required annually. Some college background or knowledge of foreign languages is frequently desirable.
Expected salary range:	In 1994, beginning flight attendants earned an average of $12,700 a year, and senior flight attendants earned up to $40,000 a year.

lands, flight attendants assist passengers as they leave the plane. They then prepare reports on medications given to passengers, lost-and-found articles, and cabin equipment conditions.

Beginning flight attendants earned an average of $12,700 a year in 1994; some senior flight attendants earned as much as $40,000 a year. If you are a flight attendant, you will receive extra pay for overtime, night, and international flights. You and your immediate family will also receive reduced airline fares. Many flight attendants belong to unions and have benefits. Flight attendants wear uniforms and receive a small allowance to cover cleaning.

How do I become a flight attendant?

You must be a high school graduate, at least 19 to 21 years old, and in excellent health. The airlines prefer that you have some college education or experience in dealing with the public. If you are interested in international flights, you should be able to speak a foreign language fluently. Some airlines prefer that you speak two principal foreign languages. Once hired, you will receive 4 to 6 weeks of intensive training given by the airline. You will learn emergency procedures, flight regulations, and company policies. Each year you will receive 12 to 14 hours of refresher training in emergency procedures and passenger relations. After completing the training program, you will be placed on "reserve" status and will staff extra flights or fill in for flight attendants who are sick or on vacation. Flight attendants are on reserve for at least 1 year and, in some cities, up to 5 years. Once you are no longer on reserve, you can bid for regular assignments. The flight attendants who have been with an airline the longest have first choice of flights.

RESERVATION AND TRANSPORTATION TICKET AGENTS AND TRAVEL CLERKS

Each year, millions of Americans travel by plane, train, ship, bus, and car. When they make reservations for travel or accommodations, purchase tickets, or check their luggage, they deal with reservation and transportation ticket agents and travel clerks.

How many people are reservation agents, transportation ticket agents, and travel clerks?

There were about 139,000 people in reservation, ticketing, and clerical travel jobs in 1994. Most of them work for airlines. Others work for the railroads, bus lines, and other companies that provide transportation services. Most work in large metropolitan areas. These occupations are not expected to see much growth in the future, because automated reservations and ticketing will reduce the need for some of these jobs.

What's it like to be a reservation or ticket agent or a travel clerk?

Reservation agents usually work for large hotel chains or airlines helping people plan trips and make reservations. They spend a lot of time on the telephone quoting fares and room rates, making and confirming transportation and hotel reservations, and selling tickets. They use computers to make, change, or cancel reservations. Transportation ticket agents work in airports and train and bus stations selling tickets, assigning seats to passengers, and checking baggage. Most travel clerks work for auto clubs. They plan trips, calculate mileage, and offer travel suggestions to club members. In all three of these positions, you must know about your company's policies and industry procedures. You also must be able to use computers to do your job.

In 1994, reservation agents, ticket agents, and travel clerks earned about $407 a week. They also receive other benefits, such as free or reduced-rate travel on their companies' carriers for themselves and their immediate families.

How do I become a reservation agent, ticket agent, or travel clerk?

You should be a high school graduate, enjoy dealing with people, and have some ability to use a computer. Most airline reservation agents receive formal training given by the airline. After completing the classroom training, they will work closely with a supervisor or more experienced agent. Auto clubs, railroads, and bus lines train their ticket agents and travel clerks on the job. Many people who want to get into the airline industry or travel business start out in

Reservation and Transportation Ticket Agents and Travel Clerks at a Glance	
How many people work in reservations and ticketing:	139,000
Types of jobs available:	Reservation agents work for large hotel chains; ticket agents work in airports and bus or train stations; and travel clerks work mainly for auto clubs. All three use computers to help travelers plan their trips.
Training needed:	High school graduation is usually required. Classroom and on-the-job training are provided by airlines, railroads, auto clubs, and bus companies.
Expected salary range:	Earnings were about $407 a week as of 1994.

PRECISION ASSEMBLERS

Workers who put together the parts of manufactured products are called assemblers. Precision assemblers are the highly experienced and trained workers who assemble complicated products.

How many people are precision assemblers?

In 1994, there were about 324,000 precision assemblers; about 57,000 of them worked in transportation equipment manufacturing (autos, aircraft, trucks, diesel engines that power locomotives, and buses). As equipment becomes more automated and many firms have their products assembled in other countries, the demand for precision assemblers is expected to decline.

What's it like to be a precision assembler?

The work of precision assemblers requires a high degree of accuracy. Workers must be able to interpret detailed specifications and instructions and use independent judgment. Precision aircraft assemblers put together and install parts of airplanes, space vehicles, or missiles, such as wings or landing gear. Precision machine builders construct, assemble, or rebuild engines and turbines. The manufacturing process is changing as a result of new technology, and precision assemblers have had to learn to use new machines and adapt to changes in work processes. As technology advances and the United States is faced with competition from other countries, the manufacturing business will continue to change and so will the jobs of precision assemblers.

Earnings information is somewhat limited for precision assemblers. In 1994, full-time workers who assembled electrical and electronic equipment had median weekly earnings of about $330. Most precision assemblers receive typical benefits, such as health and life insurance, a pension plan, paid vacation, and sick leave. Many precision assemblers are members of labor unions.

How do I become a precision assembler?

To be a precision assembler, you must have the ability to do accurate work at a fast pace. You can become a precision assembler by starting at a lesser skilled job in the same firm and working your way up. Good eyesight is required for assemblers who work with small parts. There is room for advancement as you become more experienced. You can move into product repair to fix defective articles or advance to a quality control job. Those who have backgrounds in math, science, and computers can advance to programmers or operators of more highly automated production equipment.

Precision Assemblers at a Glance	
How many people are precision assemblers:	324,000
Types of jobs available:	Employment in transportation equipment manufacturing includes assembling parts of airplanes, spacecraft, cars, trucks, buses, and diesel engines for locomotives.
Training needed:	Precision assembly jobs may be filled by lower level manufacturing employees.
Expected salary range:	Median weekly earnings for precision assemblers of electrical and electronic equipment were about $330 in 1994.

MECHANICS

Automotive Mechanics

If you've ever been in a car that has broken down, you know the importance of a mechanic's job. If your problem is hard to diagnose, you especially know the value of a good mechanic.

How many people are automotive mechanics?

There were approximately 736,000 automotive mechanics in 1994. The job outlook for this occupation is good. With more cars on the road, it is expected that the need for automotive mechanics will increase through the year 2005.

If you become an automotive mechanic, you will probably work for a car dealer, an independent automotive repair shop, or a gasoline service station. Repair shops are sometimes located in department, automotive, and home supply stores. Taxicab companies and Federal, State, and local governments also employ mechanics to work on their vehicle fleets. You could also be your own boss and own your own repair shop.

What's it like to be an automotive mechanic?

If you become an automotive mechanic, you will repair and service cars, vans, and pickups that have gasoline engines. You will perform routine service to inspect, lubricate, and adjust engines and repair or replace parts before they cause breakdowns. As a mechanic you will usually follow a checklist to be sure you examine all important parts, such as belts, hoses, steering systems, spark plugs, brake and fuel systems, and wheel bearings. The most challenging part of your job will be to diagnose those "hard-to-find" problems that cars often have. When these problems occur, you will work with the owner to get a description of the symptoms. You may have to test-drive the

Automotive Mechanics at a Glance	
How many people are automotive mechanics:	736,000
Types of jobs available:	Automotive mechanics work at car dealerships, independent repair shops, and service stations, as well as at some discount stores, taxicab companies, and Federal, State, and local government shops. Opportunities for self-employment are available.
Training needed:	A training program is recommended. Many are offered in high schools, community colleges, and vocational and technical schools.
Expected salary range:	Automotive mechanics earned between $308 and $624 a week in 1994.

vehicle or use a variety of testing equipment to locate the problem. Once you find the cause of the problem, you will make the proper repairs or adjustments.

Mechanics use a variety of tools in their work. You will have to know how to use power tools, such as pneumatic wrenches, to remove bolts quickly; machine tools, such as lathes and grinding machines, to rebuild brakes and other parts; welding and flame-cutting equipment to remove and repair exhaust systems; jacks and hoists to lift cars and engines; and a growing variety of electronic service equipment, such as computerized diagnostic devices. You will also use many common hand tools such as screwdrivers, pliers, and wrenches to work on small parts and in hard-to-reach places.

Most automotive mechanics work a standard 40-hour week, but if you have your own business, you may work longer hours. Mechanics usually work indoors, but you can expect to be working with dirty and greasy parts. In 1994, automotive mechanics earned between $308 and $624 a week. Some mechanics are members of labor unions and have benefits.

How do I become an automotive mechanic?

Automotive mechanic training programs are offered in high schools, community colleges, and public and private vocational and technical schools. Because automotive technology is becoming more sophisticated, you will have an advantage if you complete a formal training program after graduating from high school.

Courses in automotive repair, electronics, physics, chemistry, English, computers, and mathematics can provide a good basic educational background for a career as an automotive mechanic. Beginners usually start as trainee mechanics performing routine tasks. It takes about 1 or 2 years to get enough experience to quickly perform the more difficult types of service and repairs.

Once you gain experience, you may be able to advance to shop supervisor or service manager. If you work well with customers, you may become repair service estimator. There are also opportunities to open your own repair shop.

Diesel Mechanics

Most of the trucks that are so important to shipping goods all over America have diesel engines. So do locomotives and the heavy equipment used in construction. To keep America moving and building, the diesel engines have to keep working. We rely on diesel mechanics to make sure they do.

How many people are diesel mechanics?

Diesel mechanics held about 250,000 jobs in 1994. They are employed in every section of the country, but most work in towns and cities where trucking companies, bus lines, and other fleet owners have large repair shops. Employment of diesel mechanics is expected to increase through the year 2005.

What's it like to be a diesel mechanic?

Diesel mechanics repair and maintain diesel engines that power transportation equipment, such as heavy trucks, buses, locomotives, bulldozers, cranes, and tractors. A small number work on diesel-powered automobiles. Diesel mechanics usually work indoors but occasionally make repairs on the road. If they work for organizations that have their own fleets of vehicles, they will spend a lot of time doing preventive maintenance to make sure the vehicles don't break down. During routine maintenance, mechanics have a checklist to follow. In some shops, mechanics do all kinds of repairs; in others, they specialize in one or more types of work. They use a variety of tools and testing equipment.

Most mechanics work a standard 40-hour week, although the hours tend to increase if you are self-employed. Mechanics employed by truck and bus firms that provide service around the clock may work evenings, nights, and weekends, but they usually receive more pay for working these hours. According to a 1993 survey, diesel mechanics earned between $12.00 and $17.49 an hour. Many diesel mechanics are members of labor unions and receive benefits.

How do I become a diesel mechanic?

You should be a high school graduate, but most employers prefer to hire graduates from formal training programs in diesel mechanics. Community colleges and vocational and technical schools offer 1- to 2-year programs. These programs provide a good foundation in the basics of the latest diesel technology and electronics. Another good way to learn diesel mechanics is through a formal 4-year apprenticeship program. However, competition is great for these programs and fewer employers are offering them, because diesel mechanic programs in the schools are becoming more available. Even though employers prefer to hire graduates of formal diesel training programs, the demand for mechanics is so great that employers are also hiring unskilled beginners who can work their way up to helpers and, eventually, to mechanics.

Diesel Mechanics at a Glance	
How many people are diesel mechanics:	250,000
Types of jobs available:	Diesel mechanics usually work for trucking companies, bus lines, and other vehicle fleet owners in large repair shops. Some opportunities for self-employment are available.
Training needed:	High school graduation is usually required. Completion of a training program at a community college or vocational-technical school is desirable. Some four-year apprentice programs are available.
Expected salary range:	Diesel mechanics earned $12.00 to $17.49 an hour in 1993.

Aircraft Mechanics at a Glance	
How many people are aircraft mechanics:	119,000
Types of jobs available:	Opportunities exist at smaller commuter and regional airlines, at FAA repair shops, and in general aviation, as well as at large airline companies.
Training needed:	A certificate in airframe mechanics, power-plant mechanics, or repair is usually required. The FAA has accredited 192 trade schools to offer training for these certificates.
Expected salary range:	The median annual salary for aircraft mechanics was $36,858 in 1994.

Completion of high school is still required for the unskilled jobs. High school courses in automotive repair, electronics, English, mathematics, and physics provide a good basic educational background for a career as a diesel mechanic.

Aircraft Mechanics

To keep aircraft in peak operating condition, aircraft mechanics perform scheduled maintenance, make repairs, and complete inspections required by the Federal Aviation Administration (FAA). Mechanics may work on one or many different types of aircraft, such as jets, propeller-driven airplanes, and helicopters, or for efficiency, they may specialize in one section of a particular type of aircraft, such as the engine, hydraulic, or electrical system. As a result of technological advances, mechanics spend an increasing amount of time repairing electronic systems, such as computerized controls. They also may be required to analyze and develop solutions to complex electronic problems.

How many people are aircraft mechanics?

Aircraft mechanics held about 119,000 jobs in 1994. Job prospects for aircraft mechanics are expected to vary among types of employers. Opportunities are likely to be best at the smaller commuter and regional airlines, at FAA repair stations, and in general aviation. Some jobs will become available as experienced mechanics leave for higher paying jobs with airlines or transfer to another occupations. Prospects will be best for applicants who have significant experience.

Employment of aircraft mechanics is expected to increase about as fast as the average for all occupations through the year 2005. A growing population and rising incomes are expected to stimulate the demand for airline transportation, and the number of aircraft is expected to grow.

What's it like to be an aircraft mechanic?

Mechanics usually work in hangars or in other indoor areas, although they may work outdoors—sometimes in unpleasant weather—when the hangars are full or when repairs must be made quickly. Following a schedule that is based on the number of hours the aircraft has flown, calendar days, cycles of operation, or a combination of these factors, mechanics inspect and perform maintenance on the engines, landing gear, instruments, pressurized sections, accessories (such as brakes, valves, pumps, and air-conditioning systems), and other parts of the aircraft.

Mechanics specializing in repair work rely on the pilot's description of a problem to find and fix faulty equipment. For example, during a preflight check, a pilot may discover that the aircraft's fuel gauge does not work. To solve the problem, mechanics may check the electrical connections, replace the gauge, or use electrical test equipment to make sure no wires are broken or shorted out. While ensuring safety, they work as fast as they can so that the aircraft can be put back into service quickly.

Frequently, mechanics must lift or pull objects weighing as much as 70 pounds. They often stand, lie, or kneel in awkward positions and occasionally must work in precarious positions on scaffolds or ladders. Noise and vibration are common when testing engines.

In 1994, the median annual salary for aircraft mechanics was about $36,858. Mechanics who worked on jets generally earned more than those working on other aircraft. Almost half of all aircraft mechanics, including those employed by some major airlines, are covered by union agreements.

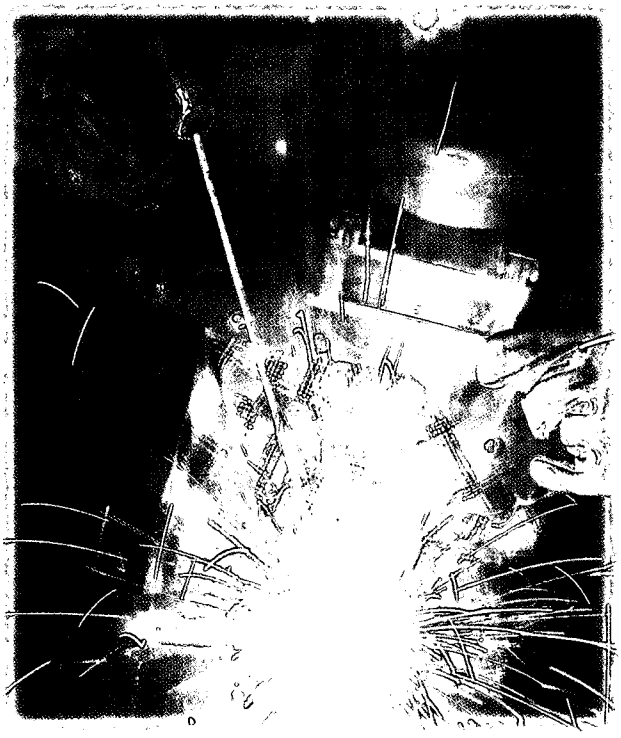
How can I become an aircraft mechanic?

The majority of mechanics who work on civilian aircraft are certified by the FAA as airframe mechanic, power-plant mechanic, or repairer. The FAA requires at least 18 months of work experience for each of these certificates. For a combined airframe and power-plant certificate, at least 30 months of experience working with both engines and airframes is required. Most airlines require that mechanics have a high school diploma and an airframe and power-plant certificate.

Although a few people become mechanics through on-the-job training, most learn their jobs in one of the 192 trade schools certified by the FAA. FAA standards established by law require that certificate mechanic schools offer students a minimum of 1,900 actual class hours. Courses in these trade schools generally last from 2 years to 30 months and provide training with the tools and equipment used on the job.

SHIPBUILDERS

Building a ship is a huge, complex, and fascinating job. It's like building a city that can float on the water and operate safely while moving enormous loads of cargo from one place to another. Ships can be extremely large, exceeding 1,000 feet in length and weighing more than 300,000 tons.



How many people are shipbuilders?

There are about 95,000 shipyard employees in the United States working at 17 major shipyards and more than 550 medium and smaller yards or repair facilities along our coasts. The larger facilities produce large oceangoing vessels built primarily of steel. Some yards specialize in inland barges and tow boats or floating marine equipment.

What are the jobs like?

Shipbuilding takes place mostly at shipyards or ship repair facilities, which are typically built on large parcels of land near the water. Usually, many buildings are nearby, and that's where many types of specialty work is performed. For example, in the pipe shop or sheet metal shop, piping or sheet metal pieces for the vessel are crafted and assembled into larger portions and readied for installation in sections of the vessel under construction. These large sections are later assembled on land before the vessel is transferred to the water for final outfitting with the rest of the equipment that's needed.

There are many types of jobs available in a shipyard or a ship repair facility. Some of the titles of positions are welder, insulator, power electrician, safety inspector, shipfitter, painter, crane operator, drafter, accuracy control engineer, naval architect, fire equipment operator, sandblaster, pipefitter, sheet metal mechanic, and many others.

How do I become a shipbuilder?

There are many ways to begin a career in shipbuilding or ship repair. Many of them require little formal training, but an appreciation for geometric relationships and an ability with numbers is helpful. Shipyards often have apprentice programs or relationships with nearby vocational or regular high schools to provide specialized education and training. College programs provide the engineering skills useful for a number of jobs, including naval architecture (ship design), production planning, and other fields of engineering. Business and marketing programs are also key career areas that can be pursued. The main function of the shipyard is to design and build or repair marine vehicles with a minimum of time and cost. Production planning is a critical area that helps keep costs down and speeds up delivery of the product to the buyer. To get started, visit a shipyard or a port, find out what ships are like, and talk with someone who works in the field.

Shipbuilders at a Glance	
How many people are shipbuilders:	95,000 shipyard employees
Types of jobs available:	Job titles include welder, insulator, power electrician, safety inspector, shipfitter, painter, crane operator, drafter, accuracy control engineer, naval architect, fire equipment operator, sandblaster, pipefitter, and sheet metal mechanic.
Training needed:	Little formalized training is necessary, but knowledge of engineering and business concepts is helpful. Apprentice programs are sometimes available.
Expected salary range:	Salaries vary depending on experience and education.

IV. PLANNING, ENGINEERING, AND CONSTRUCTION:
The Designers, Developers, Testers, and Builders

URBAN AND REGIONAL PLANNERS

Urban and regional planners promote the best use of a community's land and resources; every transportation project to be built has an element of this kind of planning. The larger the system and the more complex its interactions with other systems, the more important planning becomes. Many issues need to be addressed before work on a new system begins, including traffic congestion, air pollution, and the potential effects of population growth and change. Planners are essential to integrate transportation systems with each other, incorporate the systems into the environments where they are being built, and help communities prepare for their current and future transportation requirements.

How many people are urban and regional planners?

Urban and regional planners in all fields held about 29,000 jobs in 1994. Two out of three were employed by local governments, but an increasing proportion works in the private sector for real estate and transportation companies. Others work for State agencies that deal with housing, transportation, or environmental protection, and a small number work for the Federal Government. Many planners do consulting work, either part-time as a supplement to their regular jobs or full-time. Employment of planners is expected to grow faster than the average for all occupations through the year 2005. Most new jobs will be in rapidly growing urban areas. Increased transportation planning is a factor in the expected job growth.

What's it like to be a planner?

In small organizations, planners are usually generalists—that is, they work on all kinds of planning projects. In large organizations, planners may specialize in such fields as social services, resource development, environmental protection, or transportation.

If you like variety in your work and interaction with people, a position as a planner may interest you. Planners are involved in all kinds of activities, from projecting costs to drafting legislation. They develop and examine long- and short-term plans that provide for growth and revitalization of urban, suburban, and rural communities, and they help local officials make decisions on social, economic, and environmental problems. Planners often confer with land developers and ensure that builders and developers follow zoning codes, building codes, and environmental regulations. Planners prepare materials for community relations programs, speak at civic meetings, and appear before legislative committees and elected officials to explain and defend their proposals. If you become a planner, your work could include a combination of these or similar activities.

Most planners have a 40-hour work schedule, but they frequently attend evening or weekend meetings or public hearings with citizen groups. Urban and regional planners work in offices; however, indoor work is usually combined with time spent outdoors at project sites. Some local government planners spend most of their time in the field.

As a planner, your salary will be determined by your education level, the type of employer you work for, your experience, and the size and geographic location of the community where you work. As of 1994, median annual earnings of all full-time, salaried urban and regional planners were about $45,000. This includes salaries from as low as $30,000 for those who have less than 5 years' experience to as high as $63,000 for those who have more than 10 years' experience. At the same time, the Federal Government was hiring planners with master's degrees at starting salaries of $28,300 a year. In some cases, the Federal Government hired people with less than 2 years of graduate work as interns at a lower rate of pay. As of 1995, the average salary for a Federal Government planner was $55,500.

How do I become a planner?

The variety of work and the earnings that go along with being a planner call for a wide range of well-developed skills and abilities. As a planner, you must be able to think in terms of space, shapes, sizes, and relationships and visualize the effects of your plans and designs. You will need to be flexible and able to reconcile different viewpoints and make policy recommendations. Computer skills are a must, and the ability to communicate effectively, both orally and in writing, is essential for anyone interested in becoming a planner.

All these skills and abilities must be accompanied by appropriate education. For most entry-level jobs in Federal, State, and local government you will need a master's degree in urban or regional planning or urban design or the equivalent in work experience. A master's degree from an accredited planning program provides the best training for most planning fields. Although there are a limited number of accredited bachelor's degree programs in planning that may qualify you for an entry-level position, you may not advance as far or as quickly as you would with a master's degree. An alternative path to some entry-level transportation planning positions is to earn a bachelor's degree in planning coupled with a master's degree in civil engineering or another relevant field.

As part of your studies, you will need to take additional courses in disciplines related to planning and specialty areas. For transportation planning, examples might include economics, earth sciences, or management. You must also be familiar with computer models and statistical techniques. Graduate programs, which typically take 2 years to complete, frequently require part-time or summer work in a planning office.

Planners at a Glance	
How many people are planners:	29,000
Types of jobs available:	Positions for planners are available in Federal, State, and local government and in private-sector real estate and transportation companies.
Training needed:	Master's degree in urban or regional planning is usually required. Bachelor's degree in planning may be acceptable for entry-level jobs.
Expected salary range:	Median annual earnings for urban and regional planners were about $45,000 in 1994. In 1995, Federal Government planners earned an average of $55,500.

Sources of education for planners include about 80 colleges and universities that offer master's degree programs and about 10 that offer bachelor's degree programs in urban or regional planning and are accredited by the Planning Accreditation Board. Transportation is one of the more popular specialties offered by planning schools.

The American Institute of Certified Planners, a professional institute within the American Planning Association, grants certification to individuals who have the appropriate combination of education and professional experience and who pass an examination. Certification may be helpful for promotion.

ENGINEERS

Engineers use the theories and principles of science and mathematics to solve practical technical problems. If you are a good student and are especially strong in the sciences and math, you may want to consider a career as an engineer. The type of engineer you become will depend on the kinds of problems you want to solve. Engineering in general, and some of the main engineering jobs that relate to transportation, are described below.

How many people are engineers?

In 1994, there were 1,327,000 engineers. They work in every State, in small and large cities, and in rural areas and in different branches of engineering. The engineers who support the field of transportation usually specialize in one of the following branches: aerospace; chemical; civil, electrical, and electronic; industrial; and general. About 181,000 engineers worked for Federal, State, and local governments in 1994. Most of these worked for the Federal Government in the Departments of Defense, Transportation, Agriculture, Interior, and Energy and at NASA. Most engineers in State and local government agencies worked in highway and public works departments. Job opportunities are expected to be good through the year 2005. More engineers will be needed to improve deteriorating roads, bridges, water and pollution control systems, and other public facilities.

What's it like to be an engineer?

Engineers design machinery, products, systems, and processes for efficient and economical performance. Many engineers work at laboratories, industrial plants, or construction sites, where they inspect, supervise, or solve on-site problems. Most engineers work a standard 40-hour week. Engineers should be able to work as part of a team and should be creative, analytical, and detail-oriented. They should also be able to communicate well both orally and in writing.

Aerospace engineers

Aerospace engineers design, develop, test, and help manufacture commercial and military aircraft, missiles, and spacecraft. Employment of aerospace engineers is expected to grow slower than the average through the year 2005. Future growth of employment in this field could also be limited, because a higher proportion of engineers in aerospace manufacturing may come from the materials, mechanical, or electrical engineering fields.

Chemical engineers

Chemical engineers use the principles of chemistry and engineering to solve problems involving the production or use of chemicals. Employment of chemical engineers should increase about as fast as the average for all occupations through the year 2005, because chemical companies continually research and develop new chemicals and more efficient processes to increase output.

Civil engineers

Civil engineers work in the oldest branch of engineering. They design and supervise the construction of roads, airports, railroad tracks, tunnels, bridges, water supply and sewage systems, and buildings. The job outlook for civil engineers is favorable through 2005.

Electrical and electronic engineers

Electrical and electronic engineers design, develop, test, and supervise the manufacture

Engineers at a Glance	
How many people are engineers:	Over 1 million
Types of jobs available:	Positions vary depending on what branch of engineering is chosen. Branches include aerospace; chemical; civil, electrical, and electronic; industrial; and general engineering.
Training needed:	Bachelor's degree required.
Expected salary range:	In 1994, salaries ranged from $34,100 a year for engineers who had bachelor's degrees to $55,300 for those who held Ph.D.'s.

of electrical and electronic equipment. Electrical and electronic engineers held about 349,000 jobs in 1994, making it the largest branch of engineering. Employment opportunities are expected to increase through the year 2005.

Industrial engineers

Industrial engineers determine the most effective ways for an organization to use the basic factors of production—people, machines, materials, information, and energy—to make or process a product.

In general

Starting salaries for engineers with bachelor's degrees are significantly higher than they are for those holding similar bachelor's degrees in other fields. Engineering graduates with bachelor's degrees averaged about $34,100 a year in private industry in 1994; those with master's degrees and no experience averaged $40,200; and those with Ph.D.'s averaged $55,300.

How do I become an engineer?

A bachelor's degree in engineering from an accredited engineering program is usually required for beginning engineering jobs. Most engineering degrees are granted in specific branches, such as electrical or civil, but engineers trained in one branch may work in another. This allows engineers to shift to fields that offer better employment prospects, or to ones that match their interests more closely. Graduates of 4-year technology programs may get jobs similar to those obtained by graduates who have bachelor's degrees in engineering.

ENGINEERING TECHNICIANS

Engineering technicians assist engineers in their work. They are involved in technical problem solving, and they can be specialized in a particular area, just like engineers. They do not have the full responsibilities of engineers, and the educational requirements for the job are less demanding than they are for engineers.

How many people are engineering technicians?

Engineering technicians held about 685,000 jobs in 1994. Well-qualified engineering technicians should experience good employment opportunities through the year 2005.

What's it like to be an engineering technician?

Engineering technicians work to solve technical problems in research and development, manufacturing, sales, construction, and customer service. Many engineering technicians assist engineers and scientists, especially in research and development. They work regular hours in laboratories, offices, electronics and industrial plants, or construction sites.

Just like engineers, technicians work in particular branches of engineering. Civil engineering technicians help civil engineers plan and build highways, buildings, bridges, and other structures. Electronics engineering technicians help design, develop, and manufacture electronic equipment such as radios, radar, television, and computers. Industrial engineering technicians study the efficient use of personnel, materials, and machines in factories, stores, repair shops, and offices. Chemical engineering technicians are usually employed in industries producing pharmaceuticals, chemicals, and petroleum products.

Engineering Technicians at a Glance	
How many people are engineering technicians:	685,000
Types of jobs available:	Positions vary depending on what branch of engineering is chosen. Branches include civil, electronic, industrial, and chemical engineering.
Training needed:	Training from a technical institute, junior or community college, vocational-technical school, or military training program is desirable.
Expected salary range:	Junior technicians earned about $28,000 a year in 1994; technicians with more experience earned from $34,530 to $51,060 a year.

In 1994, engineering technicians at the most junior level had median earnings of about $28,000 a year. Technicians who had more experience earned about $34,530, and supervisors earned about $51,060.

How do I become an engineering technician?

Although it is possible to qualify for some engineering technician jobs with no formal training, most employers prefer to hire someone who has had some technical training and will require less on-the-job training and supervision. Training is available at technical institutes, junior and community colleges, vocational-technical schools, and through some technical training programs in the armed services. People who have had college courses in science, engineering, and mathematics may also qualify for some positions but may need additional specialized training and experience.

LOGISTICS MANAGERS

The term "logistics" may not be familiar to you, but the function is something that you benefit from every day. All the activities involved in moving an item—from the place where its raw materials are located, to the place where it was made or grown, to the place where it is used or consumed—can be described under the broad terms "logistics" or "distribution." People in a variety of logistics careers are responsible for getting the right products to the right places at the right time in good condition and at a reasonable cost. The act of supervising or managing this far-reaching activity is generally known as "logistics management" or "distribution management," and the people who work in this industry are generally referred to as "logistics managers" or "distribution managers."

Because of the logistics process, there is fresh food in your local grocery store, regardless of the season. Next fall's fashions are available in the summer—in time for you to do your back-to-school shopping. When you have a flat tire, you can replace it almost immediately, regardless of size requirements, and you will be able to buy it for a reasonable price. In fact, Americans can usually find most products they need when they need them without being overcharged because of the successful efforts of the many people in logistics careers.

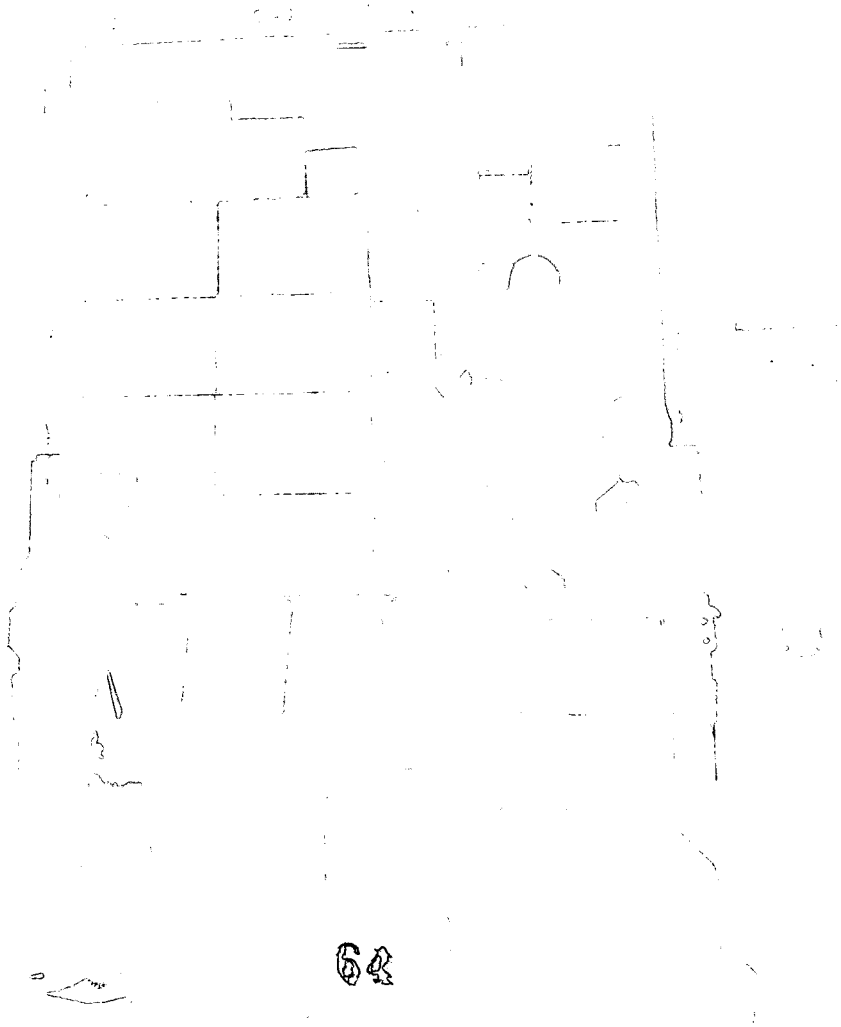
The individual components of a typical logistics system include customer service, demand forecasting, distribution, communications, inventory control, materials handling, order processing,

Logistics Managers at a Glance	
What is the outlook for logistics managers:	Logistics management is a rapidly growing career field that can be expected to provide many new jobs.
Types of jobs available:	Jobs vary considerably; logistics managers are involved in all phases of product distribution, from manufacturing to packaging, shipping, and sales to the end customer.
Training needed:	A bachelor's degree is required; graduate work is becoming increasingly important. Work experience in entry-level logistics jobs may be highly desirable.
Expected salary range:	Salaries vary. Median annual income for members of a major professional organization is estimated at $150,000.

parts and service support, plant and warehouse site selection (location analysis), purchasing, packaging, handling of returned goods, salvage and scrap disposal, traffic and transportation, warehousing and storage, and the information technology needed to support all these operations. A position in a small company may include all of these functions, while one in a large corporation may involve only one or a few of these areas. In some organizations, a logistics manager may have responsibilities that go beyond this list.

How many people are in logistics careers?

Altogether, logistics careers are one of the largest sources of employment in America. Logistics is a rapidly growing, leading-edge field that is expected to continue growing even more in the future. Now, when corporations plan their business strategies, logistics is a major part of that planning process. Many organizations even have a vice president for logistics, which is a top-level position. The ability to sell is only as good as the ability to buy raw materials and deliver finished products. That ensures a continuing source of logistics careers at the executive level, in middle management, and at the entry level.



What's it like to be a logistics manager?

Perhaps the following example will help you visualize why logistics offers so many career opportunities. A logistics "pipeline" begins with the supplier and ends with the customer. In between, there are materials to be managed, inventory to be controlled, customers to be served, and products to be transported. What's more, each logistics pipeline is connected to other pipelines to form a "network." That's because almost every supplier is also a customer, and many customers are also suppliers. For instance, a computer manufacturer is both a customer for parts and a supplier to a computer retail store. The computer retail store, in turn, is both a customer to the manufacturer and a supplier to its shoppers. Some of these networks, or chains, can go on and on. That's a lot of logistics work that has to be done by a lot of people!

If you think of transportation in the larger sense, all logistics careers relate to transportation, because they all relate to moving goods. A typical career path in logistics management may be a "zig-zag" of cross-training and experience in several of these fields, rather than a straight line progressing in any one direction. Following is a list of job titles for logistics careers you might want to pursue permanently or on the way to one career in particular:

- **Inventory control manager**
- **Warehousing/operations manager**
- **Administrative manager**
- **Administrative analyst/planner**
- **Customer service manager**
- **Consultant**
- **Transportation manager**

As you can see, there are different types of jobs that need to be done by many people who have varying interests and skills. Because we are looking specifically at transportation careers, let's take a closer look at the last career on the list, transportation manager.

Transportation or traffic managers

Logistics careers all require adaptability and a wide range of capabilities. That is certainly true for transportation managers. A typical transportation manager for a corporation might be involved in all these different activities: supervising various functions and personnel; managing distribution; consulting with professionals in various fields; negotiating rates with warehousing and transportation companies; planning, monitoring, and implementing the distribution department's budget; establishing the most beneficial routing of company shipments for satisfactory customer service; determining pricing levels; and forecasting on a quarterly, yearly, or 5-year horizon.

Transportation management is a dynamic, constantly changing line of work. If you were a transportation manager, you could count on each day's work to be exciting and new. Can you deal well with changing demands? That's obviously an important skill. You would work with people throughout the company and with people in other companies, too. A typical day might include negotiating with companies, checking the status of a damage claim, implementing a plant distribution survey, training personnel about customs forms, deciding between truck and rail for a large customer, working on production schedules and budgets, and possibly even attending a luncheon held by a transportation association.

A transportation manager has crucial responsibility and authority for staff, material resources, and budgets. To do the job, a basic understanding of the different types of transportation is, of course, essential. Beyond that, a transportation manager has to understand how transportation affects all the other areas of the corporation. Knowledge of the computer, electronic data processing, customer service, inventory control, and production scheduling is also important. The ability to communicate is most important, including listening, speaking, writing, and other forms of communication, as well. Information flow is key to the whole logistics process. Good communication skills, including the ability to use information technology, are necessary for all logistics careers. Other common attributes include the abilities to plan, control, influence, motivate, lead, organize, select the proper employees, and act as an administrator.

How do I become a transportation manager?

To reach the management level in any area of logistics, a college degree is an absolute must. The days of on-the-job training for these careers are over. As far back as 1991, a survey showed that 85 percent of logistics managers held at least a bachelor's degree. Graduate work is not as important, but it does offer a competitive edge. As this field grows and becomes more complex technologically and in other ways, the importance of graduate work may increase. It is certainly valued and rewarded.

People with all kinds of undergraduate academic majors are now in logistics management careers, but to progress, they have all acquired good business backgrounds. You should consider a major in logistics or physical distribution when you are making college choices. Increasing numbers of colleges and universities now offer these choices. Other useful majors include management, marketing, operations, computer science, and statistics/quantitative theory.

To become a transportation manager, or any type of logistics manager, you will need to supplement your education with work experience. Begin by getting as broad a background in transportation as possible, in addition to taking traditional transportation courses. Then, try to get entry-level experience in transportation, perhaps as a summer intern or in a part-time job, before graduating from college. Even though on-the-job training is not enough to move you up the logistics ladder, you will benefit by "paying your dues" at the bottom rung. Examples of good places to get started include working at loading docks, in customer service, or carrier sales. To be effective at the top, you'll need to know your work from the ground up.

If you do succeed as a transportation manager in a large corporation, the president of a transportation services provider, or as a vice president for logistics, the potential rewards will make your time in school and on the job worthwhile. Logistics jobs vary in complexity, and your pay will depend on where you are employed and at what level. However, the Council for Logistics Management, a professional association for people in logistics management careers, estimates that the median income for its members is $150,000 per year. Maybe you should think about it!

CONSTRUCTION TRADES

Construction work is a major component of all transportation systems and facilities. Roads and runways have to be cut and paved, bridges must be built, and tracks must be laid. Plus, construction doesn't end when the building work is done—transportation systems also have to be maintained. All this activity creates a variety of jobs in the construction trades.

How many people work in construction trades?

In 1994, there were 167,000 people involved in highway maintenance alone. There were also 73,000 paving, surfacing, and tamping equipment operators; 57,000 pipelayers and pipelaying fitters; 18,000 people in mining, quarrying, and tunneling occupations; and 28,000 roustabouts.

There are large numbers of jobs in the construction trades, but this is not a major job growth area. The numbers of jobs for mining, quarrying, and tunneling workers and roustabouts are expected to decline. Because the work is physical, there is, however, turnover as workers age. Pipelayers and pipelaying fitter jobs will increase about as fast as average for all occupations. The only area that projects above-average job growth is paving, surfacing, and tamping equipment operation.

What's it like to be in the construction trades?

Construction jobs require physical labor and the use of tools and equipment. Workers are typically paid by the hour. Because many of these workers are union employees, their specific pay rates, overtime arrangements, and benefits are negotiated by their unions. The work performed in some of the construction trades and the training requirements are described in the following paragraphs:

Median weekly earnings for handlers, equipment cleaners, helpers, and laborers in 1994 were about $311. Construction craft laborers generally have higher weekly earnings than other workers in this group.

Paving, surfacing, and tamping equipment operators

This area is projected to be the fastest growing in the construction trades. These operators run the equipment used for applying concrete, asphalt, or other materials to roadbeds, parking lots, or airport runways and taxiways. They also operate equipment used for tamping gravel, dirt, or other materials. The jobs require 1 to 12 months of on-the-job training.

Pipelayers and pipelaying fitters

Growing at an average rate, pipelayer jobs involve laying pipes for storm or sanitation sewers, drains, water mains, and oil or gas lines. Some workers grade trenches or culverts, position pipe, or seal joints. Pipelayer fitters are responsible for aligning pipeline sections so they can be welded together. These jobs require 1 to 12 months of on-the-job training.

Highway maintenance workers

Highway maintenance workers make repairs to highways, city and country roads, airport runways, and rights-of-way to keep them in safe condition. They also build and repair guardrails, highway markers, and snow fences. Sometimes these workers clear brush or plant trees along roads or other rights-of-way. These jobs require only about a month of on-the-job training.

Mining, quarrying, and tunneling workers

These occupations include rock splitters, roof bolters, mining machine operators, and mine cutting and channeling machine operators. All these occupations relate to removing stone, minerals, or sand from the earth. Roof bolters install roof support bolts in underground mines and tunnels. These occupations may be involved in building transportation systems. For example, it is often necessary to tunnel through rock to build a road, and, bridge pilings must be sunk into the sand at the bottoms of rivers and bays. The people who do these jobs frequently operate powerful, self-propelled equipment, and they require at least 12 months of on-the-job training.

How do I get a job in the construction trades?

As you can see by the job descriptions above, there are no formal education requirements for the construction trades. These workers get their training on the job. You should keep in mind, however, that a high school diploma or GED is required by many employers. Furthermore, without a high school education you will always be at a disadvantage when it comes to seeking employment, getting pay raises, and advancing in your work or changing jobs.

Construction Trades at a Glance

How many people work in construction trades:	167,000 in highway maintenance alone
Types of jobs available:	A variety of work in the construction trades is available, including jobs for paving, surfacing, and tamping equipment operators; pipelayers and pipelaying fitters; highway maintenance workers; and mining, quarrying, and tunneling workers.
Training needed:	Varies depending on the type of construction trade; generally 1 to 12 months of on-the-job training is required. A high school diploma or equivalency is desirable.
Expected salary range:	Median earnings for handlers, equipment cleaners, helpers, and laborers were about $311 a week in 1994. Construction craft laborers usually earn more.

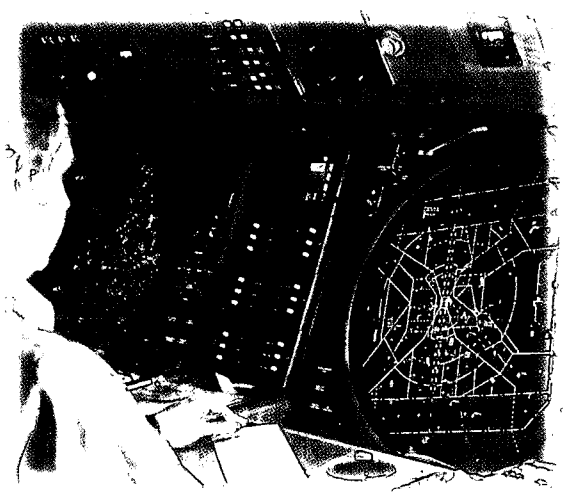
V. SAFETY AND THE ENVIRONMENT:
The Monitors and Enforcers

AIR TRAFFIC CONTROLLERS

One of the most serious problems in aviation today is the constant increase in the number of airplanes. The large number of airplanes occupying the airways at any one time makes it necessary to have a system for preventing collisions. The air traffic control system is a vast network of people and equipment that ensures the safe operation of commercial and private aircraft—both in the air and on the ground. In the United States, the job of air traffic control is handled by the Federal Aviation Administration (FAA), a Federal agency in the Department of Transportation. Air traffic controllers coordinate the movement of air traffic to make certain that planes stay a safe distance apart. Their immediate concern is safety, but controllers must also direct planes efficiently to reduce delays.

How many people are air traffic controllers?

Of the 29,000 air traffic controllers, the Federal Government employs 23,000 at the FAA; the rest work for the U.S. Department of Defense or in private industry. Employment of air traffic controllers is expected to show some gains through the year 2000 but little or no change through the year 2005. The reason is that a new air traffic control system will be installed over the next 10 years. This computerized system will assist the controller by making automatically many routine decisions. There is little turnover in this profession. Although the job is stressful, air traffic controllers enjoy their profession. The pay is good and liberal retirement benefits are offered.



What's it like to be an air traffic controller?

In the current system, air traffic controllers sit at consoles with green-glowing screens that display radar images generated by a computer. Although *airport tower* or *terminal controllers* watch over all planes traveling through the airport's airspace, their main responsibility is to control the flow of aircraft in and out of the airport. Before the pilot can take off, he or she must get permission from the airport control tower. Relying on radar and visual observation, air traffic controllers closely watch each airplane to ensure that a safe distance is maintained between all aircraft and to guide pilots between the hangar or ramp and the end of the airport's airspace. During arrival or departure, several controllers handle each plane. As a plane approaches an airport, the pilot radios ahead to inform the terminal of its presence. The controller in the radar room just beneath the control tower has a copy of the plane's flight plan and has already observed the plane on radar. If the way is clear, the controller directs the pilot to a runway; if the airport is busy, the plane if fitted into a traffic pattern with other aircraft waiting to land. Once the plane has landed, a ground controller in the tower directs it along the taxiways to its assigned gate.

Air Traffic Controllers at a Glance	
How many people are air traffic controllers:	29,000
Types of jobs available:	Air traffic controllers can be tower or terminal controllers or en route controllers.
Training needed:	7 months of formal training at the FAA Academy, followed by on-the-job training.
Expected salary range:	Average salaries were $59,800 a year in 1995.

The ground controller usually works entirely by sight but may use radar if visibility is very poor. The procedure is reversed for departures.

After each plane takes off, airport tower controllers notify *en route controllers*, who will take charge next. There are 22 en route control centers located around the country. Airplanes generally fly along designated routes; each center is assigned a certain airspace containing many different routes. As a plane approaches a team's airspace, the radar controllers accept responsibility for the plane from the previous controlling unit until the plane moves into the next airspace group.

Air traffic controllers who started with the FAA in 1995 earned about $22,700 a year. A controller's pay is determined by both the worker's job responsibilities and the complexity of the particular facility. Earnings are higher at facilities where traffic patterns are more complex. In 1995, controllers averaged about $59,800 a year.

How do I become an air traffic controller?

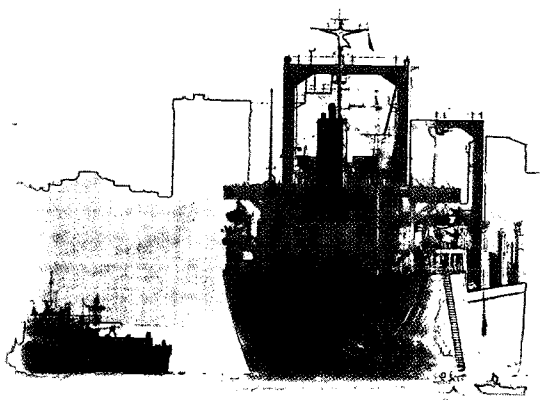
Because most air traffic controllers are employed by the FAA, air traffic controller trainees are selected through the competitive Federal Civil Service system. Applicants must pass a written test that measures their ability to learn the controller's duties. In addition, applicants generally must have 3 years of general work experience or 4 years of college, or a combination of both. Applicants must also undergo a 1-week screening at the FAA Academy in Oklahoma City.

Trainees learn their craft through a combination of formal and on-the-job training. They receive 7 months of intensive training at the FAA Academy, where they learn the fundamentals of the airway system, FAA regulations, controller equipment, and aircraft performance characteristics, as well as more specialized tasks. To receive a job offer, trainees must successfully complete the training and pass a series of examinations, including a controller skills test that measures speed and accuracy in recognizing and correctly solving air traffic control problems. Based on aptitude and test scores, trainees are selected to work at either an en route center or a tower.

VESSEL TRAFFIC CONTROL SPECIALISTS

How many people are vessel traffic control specialists?

The U.S. Department of Transportation employs approximately 74 vessel traffic control specialists. They work primarily at the St. Lawrence Seaway Development Corporation in the U.S. Coast Guard, and at the Maritime Administration in the Department of Transportation.



What's it like to be a vessel traffic control specialist?

Vessel traffic control specialists assist and oversee the maritime industry, maritime stakeholders, and interested parties in establishing and operating waterway management systems. They work in the ports and monitor vessel operations. Vessel traffic control specialists can earn an average of $18,000 a year at entry level to more than $52,000 a year at the journeyman level, depending on education and experience.

How do I become a vessel traffic control specialist?

Educational requirements for vessel traffic management specialists include a combination of college-level courses, a bachelor's degree, and/or experience.

Vessel Traffic Control Specialists at a Glance	
How many people are vessel traffic control specialists:	74 within the U.S. Department of Transportation
Types of jobs available:	Work involves establishing and operating waterway management systems and monitoring vessel operations.
Training needed:	College-level courses, a bachelor's degree, and/or work experience are required.
Expected salary range:	Entry-level specialists earn an average of $18,000 a year; more experienced journeyman specialists earn an average of $52,000.

SAFETY INSPECTORS

Safety inspectors enforce a wide range of laws, regulations, policies, or procedures and advise on standards that protect the public. They inspect and enforce rules on matters relating to the quality and safety of aircraft equipment, verify compliance of railroad systems and equipment, ensure the safe operation of commercial motor vehicles, and enforce rules regarding the transportation of hazardous materials, including pipeline safety.

How many people are safety inspectors?

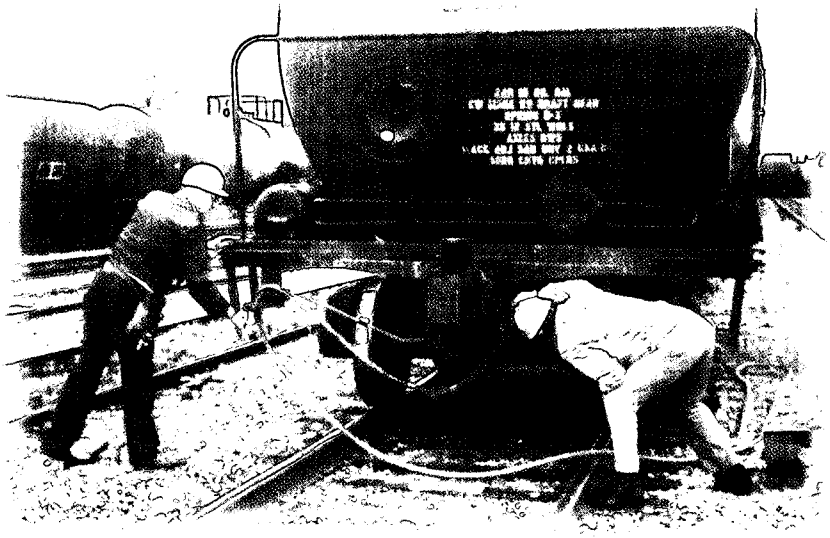
The Department of Transportation employs about 4,000 safety inspectors who inspect railroads, motor carriers, and aircraft. Employment of inspectors is expected to grow about as fast as the average for all occupations through the year 2005, reflecting the growing public demand for a safe environment. Job openings will also arise from the need to replace those who transfer to other occupations, retire, or leave the labor force for other reasons.

What's it like to be a safety inspector?

Safety inspectors meet all kinds of people and work in a variety of environments. Their jobs often involve considerable field work, and some inspectors travel frequently.

Through the enforcement of Federal laws, standards, and regulations, transportation safety inspectors may inspect aircraft and equipment
manufacturing, maintenance and repair, or flight procedures. They may work in flight operations, maintenance, or avionics and usually specialize in either commercial or general aviation aircraft. They also examine and certify aircraft pilots, pilot examiners, flight instructors, repair stations, schools, and instruction materials. Other safety inspectors inspect truck cargo to ensure compliance with legal limitations on gross weight and hazardous cargo, including enforcing regulations related to the safe operation of commercial motor vehicles on the public highways. Other inspectors investigate accidents (for example, railroad or aircraft accidents) and review various transportation industry operating procedures.

The 1995 average salaries published by the Bureau of Labor Statistics showed that aviation safety inspectors averaged $63,000 annually; railroad safety inspectors around $53,000; and motor vehicle safety inspectors close to $60,000.



How do I become a safety inspector?

Because safety inspectors perform a number of different functions, qualifications for inspector jobs vary greatly. The minimum eligibility requirement for all Federal aviation safety positions is a high school diploma or equivalency. Varying specialized experience is also required for the specific types of inspector positions. A college education will, in some cases, substitute for the experience. Requirements include a combination of education, experience, and often a passing grade on a written examination. Employers may require college training, including courses related to the job. Aviation safety inspectors working in operations must be pilots who have certain certificates, ratings, and numbers of flight hours to their credit. To become a railroad safety inspector, individuals must have actual railroad experience. Without railroad experience an individual can move into one of these positions if he or she has a bachelor's degree in general engineering.

Safety Inspectors at a Glance	
How many people are safety inspectors:	4,000
Types of jobs available:	A variety of positions is available in such fields as aviation, railroad, and motor vehicle safety.
Training needed:	A combination of college courses and work experience is required.
Expected salary range:	Average salaries ranged from $53,000 to $63,000 a year in 1995, depending on the specialty of the inspector.

ENVIRONMENTALISTS

Transportation opens opportunities to see and enjoy our surroundings, but at the same time, the operation of vehicles produces pollution, generates noise and congestion, uses energy and other resources, and poses the threat of accidents that can disrupt communities and endanger the environment. Transportation cannot avoid affecting the environment, but a major goal of transportation systems must be to protect the environment as much as possible.

Americans want fast, efficient, and convenient transportation systems, but not at the cost of our air, water, and other natural resources. We have become concerned about preventing oil spills and other catastrophic accidents, preserving the environment, and reducing pollution. It hasn't always been that way, but in the last 30 years or so, we have become more aware of the long-term effects our actions have on the environment. Your generation is more environmentally conscious than any generation that has come before. From an early age, you have been taught to reuse, recycle, and reduce waste. You have probably planted a tree on Earth Day, picked up trash along a roadway, or taken cans to a recycling center. If saving the environment is a goal for you, then a career in transportation as an environmentalist offers a challenging and rewarding way to pursue your goal.

How many people are environmentalists?

Although it's safe to say that there will be a growing need for environmentalists, it is difficult to count or even estimate how many people are in the field. That's because environmentalism is a specialty area in a diverse range of careers. Biologists, chemists, engineers, lawyers, planners, regulators, educators, communication professionals, forest rangers, and others may all qualify as environmentalists. What sets them apart from others in their lines of work is that their main focus is environmental protection.

What's it like to be an environmentalist?

You can apply your environmental interests to a broad range of careers. As an environmentalist, you could be working in waste management and reduction, environmental law, land use and preservation, housing and community development, fish and wildlife management, water- and air-related issues, fund-raising and foundation work, and environmental education. You could write for a newspaper or magazine or work as an investigator or analyst in a government agency. One way of looking at environmental careers is to divide them into these areas:

- **Pollution prevention and control**
- **Disease prevention**
- **Environmental planning**

Transportation careers are primarily in pollution prevention and control and environmental planning. There is a role in transportation for almost all types of environmental careers. How much you earn and your benefits will depend on the type of career you choose (researcher, lawyer, engineer, etc.), your employer, and your level of education.

How do I become an environmentalist?
What does it take to have a career in an environmental field? First of all, you will need a degree that relates to the type of job you choose. For example, if you are an environmental lawyer, you will need a law degree. If you are a newspaper columnist, a communication degree will be helpful. You will most likely also need a graduate degree in a specialty area, such as biology, geology, civil engineering, or chemistry. As your specialization increases, so will the amount of technical education you will need. Regardless of the job you choose, you will need to be well-grounded in both science and math, and you must be able to reason and solve problems. To work in an area related to transportation, you will need to acquire knowledge about transportation systems, either through formal study or work experience.

Environmentalists at a Glance	
How many people are environmentalists:	Difficult to estimate, but expected to be a growing field.
Types of jobs available:	Wide variety, depending on how you wish to pursue environmental action.
Training needed:	A bachelor's or graduate degree is usually required for most professions with an environmental focus.
Expected salary range:	Varies widely, depending on the profession you choose.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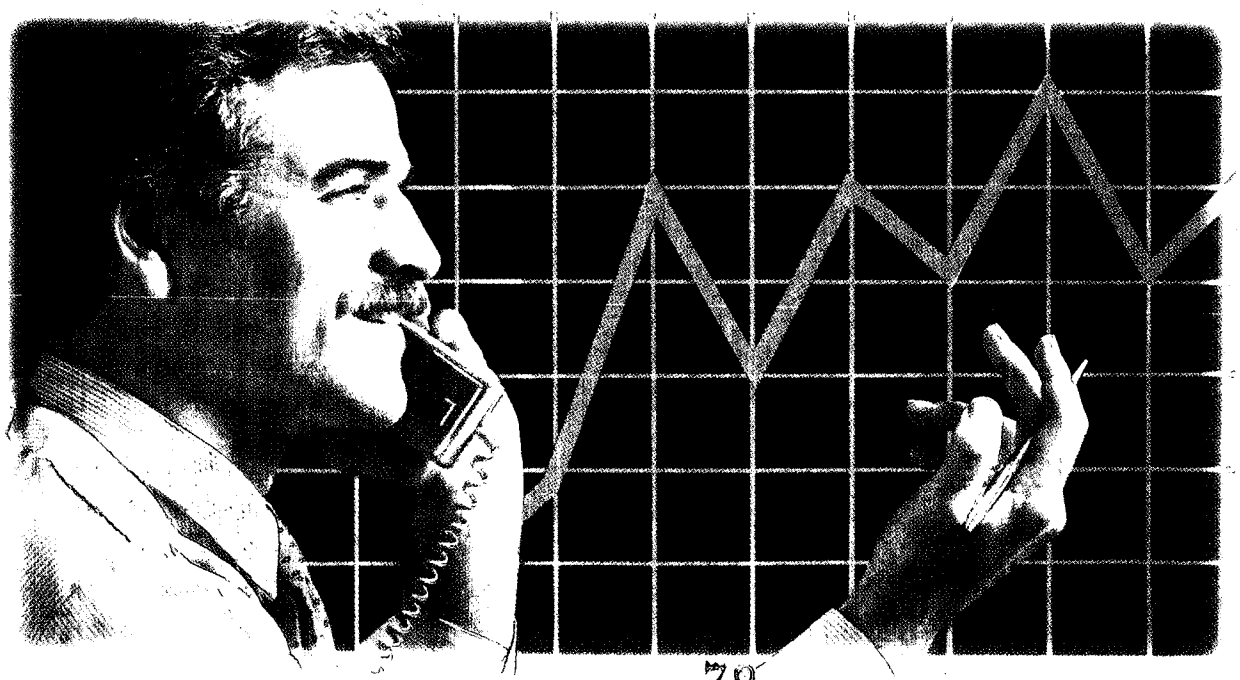
BEHIND THE SCENES
The Supporting Cast

Organizations that deal with transportation, just like all other organizations, require "behind-the-scenes" employees. Although these people are not always visible or readily identifiable as transportation workers, they play a role in the safety and efficiency of the Nation's transportation systems. There are many types of jobs that fall into this category. These workers are employed by Federal, State, and local government agencies, as well as private-sector businesses, unions, professional and trade associations, and transportation facilities. The basic educational qualifications for these jobs are the same as they are for people working in any area. Specialization is achieved by taking courses or earning transportation-related degrees and/or through actual job experience. Except for technician jobs and some jobs in management and administration, these jobs require college degrees and, in some cases, advanced degrees. Scientists, mathematicians, economists, lawyers, administrators, and managers all play critical parts in the transportation system, in both the private and public sectors.

If you have an interest in the field of transportation, but are not suited to one of the more technical jobs described in other sections of this handbook, you can still play a role. By working for various segments of the transportation industry—the airlines, airports, railroads, shipping companies, or Federal, State, or local, transportation agencies, in any capacity—you can make a contribution toward our transportation system.



VII. SPECIAL OPPORTUNITIES IN TRANSPORTATION

UNITED STATES COAST GUARD: An Opportunity To Serve

What is the U. S. Coast Guard?

The U.S. Coast Guard is one of the five branches of the U.S. armed services and is a part of the U.S. Department of Transportation. In the event of war, the Coast Guard becomes a part of the U.S. Navy.

The Coast Guard patrols America's coasts to rescue people in distress, enforces regulations to prevent pollution, clears waterways, and safeguards the flow of commerce along America's shores and major waterways, and works to keep drugs from coming into our country.

How many people are in the Coast Guard military?

The Coast Guard has about 35,000 military personnel. The U.S. Coast Guard has more than 7,000 military personnel who serve as either warrant officers or commissioned officers. In addition, there are more than 28,000 enlisted personnel that support the Coast Guard in carrying out its mission. Besides the 35,000 active-duty men and women, there are 8,000 reservists and 35,000 auxiliarists serving in a variety of job fields ranging from communication specialists, to small-boat operators and maintenance specialists, to electronic technicians and aviation mechanics.

How do I become a part of the Coast Guard military?

You must have a high school diploma and be between the ages of 17 and 27 to join the Coast Guard. You will also have to pass a physical examination and a vocational aptitude test. If you have a 4-year college degree from an

U.S. Coast Guard at a Glance	
How many people are in the Coast Guard military:	35,000
Types of jobs available:	A variety of jobs to support the Coast Guard's mission, which is to rescue people in distress, enforce pollution regulations, safeguard commerce on the waterways, and keep drugs from coming into the country.
Training needed:	A college degree may qualify you for Officer Candidate School or a Coast Guard Direct Commission. Training is also offered at the Coast Guard Academy.
Expected salary range:	Varies depending on your rank.

accredited college and meet the age, physical, and moral requirements, you may apply for Officer Candidate School. This is a 17-week training program in Yorktown, Virginia, that offers studies in nautical science, law enforcement, seamanship, and leadership.

As a professional lawyer, engineer, maritime graduate, or environmental manager, you may also qualify for a Coast Guard Direct Commission. Successful applicants attend a 4-week indoctrination school and receive a reserve commission as an ensign, lieutenant junior-grade, or lieutenant, depending on their education and experience. The Coast Guard is also seeking qualified health professionals, such as nurses, doctors, and dentists.

You can also enter the Coast Guard by attending the Coast Guard Academy in New London, Connecticut. The Academy trains cadets in engineering, science, or mathematics and, after graduation, cadets become officers in the Coast Guard. Acceptance at the Academy is based on SAT scores, high school rank, and leadership potential, as demonstrated by participation in high school extracurricular activities, community affairs, or part-time employment. Unlike other service academies, there are no Congressional nominations for admittance to the Coast Guard Academy. After graduation, you will be commissioned as an ensign in the Coast Guard and have a minimum service obligation of 5 years active duty.

What's it like to be in the Coast Guard military?

There are many basic and advanced military occupational specialties for both enlisted personnel and officers. Military personnel hold managerial and administrative; professional, technical, and clerical; construction; electrical and electronics; mechanical and repair; and many other jobs. The military provides job training and work experience based on your aptitude, physical abilities, and motivation. All specialties in the Coast Guard are open to women, including combat roles. In the Coast Guard, you can attend any school you want as long as you qualify for it. To become a pilot in the Coast Guard, you must first become an officer; then you can apply for flight school. Flight school is in Pensacola, Florida, and lasts up to 13 months.

Military life is much more regimented than civilian life. There are strict dress and grooming requirements. You will usually work 8 hours a day, 5 days a week. Some assignments involve night and weekend work or require that you be on call at all hours. All may require substantial travel. Military personnel enjoy more job security than their civilian counterparts. You will receive paid vacation and health care benefits.

INTELLIGENT TRANSPORTATION SYSTEMS

As long as the automobile has been a common feature of American life, we have fantasized about a car so "smart" it could drive itself. While most of us have been dreaming, technology has been advancing, and researchers, designers, engineers, programmers, and others have been working to make our dreams come true. They have been developing intelligent transportation systems (ITS).

ITS combine telecommunication, information, and computer technologies with existing transportation systems. They have the potential to provide 21st-century answers for the 21st-century problems of increases in population, traffic congestion, and pollution and decreases in land available for new roads. These systems can help us travel more safely and can be used to serve the needs of elderly people and people with disabilities.

What exactly do these systems do? Now, ITS are largely concerned with traffic management. They provide instant information on traffic flow, weather, and travel conditions to traffic managers and travelers. Up-to-the-minute information enables traffic managers to adjust traffic flow and provide traveler information using roadside signs, radio broadcasts, and other means.

Some examples might be helpful for visualizing just what this means. The city of Houston, Texas, and surrounding Harris County have reduced traffic congestion with a fiber optic network of computerized traffic signals, roadway sensors, video cameras, changeable message signs, and other incident detection systems to monitor traffic movement. In Minneapolis, Minnesota, transit buses have automatic vehicle location devices that monitor where they are and allow transit operators to adjust their schedules if the

ITS Specialists at a Glance	
What is the outlook for ITS specialists:	This occupation is projected to increase dramatically in the next 20 years.
Types of jobs available:	A wide variety of professionals will be needed, including aerospace engineers, environmentalists, systems engineers, computer scientists, and communication engineers.
Training needed:	A bachelor's degree and graduate work may be required.
Expected salary range:	Varies widely.

buses are running late. In nearby St. Paul, emergency vehicles can change traffic signals as they approach intersections to help them get to people who are hurt, ill, or in trouble more quickly. ITS were also used to monitor traffic, direct buses, and provide information to transportation users at the Atlanta Olympics in 1996. Perhaps you use an electronic pass to enter a toll road rather than dropping quarters into a basket. If you do, then your travel is already being accelerated by ITS.

Safety is primary in ITS, and avoiding human error is the key to safer transportation. Systems are on the way that will provide vehicles with crash warnings and collision-avoidance capabilities. The "smart" vehicles of the not-so-distant future will sense objects, avoid collisions, monitor driver alertness, and provide route guidance information. What's more, once you breeze past the toll booth and onto the toll road using your electronic pass, the road will be equipped with sensors and other devices that let you sit back and read a book or talk on your cell phone—safely. It looks like it won't be long before cars really are driving themselves.

How many people are ITS specialists?

The market for ITS products and services has grown and matured rapidly over the last 5 years. Technology is also advancing more rapidly than ever before, and the need for better, faster, safer, and more transportation is growing just as fast. This trend is expected to continue and even accelerate over the next 10 years. ITS occupations are expected to grow dramatically over the next two decades, as public- and private-sector investment in research increase and vehicle and highway technologies advance. It is projected that almost 600,000 new jobs will be created along with the growth in investments in transportation technologies and systems.

What's it like to be an ITS specialist?

Jobs in ITS require skills in engineering, electronics, communications, and systems integration. Professionals who have these skills will be able to perform a variety of high-tech jobs to improve the safety and responsiveness of the Nation's transportation systems. Most of the jobs will be found in the following areas:

Traffic Signal Control and Highway-Rail Crossing Protection, which includes regulating traffic flow and making adjustments by controlling signal timing within a transportation network. Traffic signal systems can be coordinated to traffic flow by time of day or in response to specific events.

Freeway Management, which includes collecting up-to-the-minute information about traffic flow and environmental conditions that affect freeways and major roads to better manage freeway flow. Information is collected from such sources as police, maintenance personnel, cellular phone users, and private-sector traffic reporters. Magnetic-loop speed detectors, video, microwave, radar, and ultrasonic speed monitors are some of the current technologies used to monitor traffic.

Incident Management and Emergency Management Services, which involves detecting crashes, disabled vehicles, spilled debris, and other traffic incidents as quickly as possible. Every minute a problem remains on the roadway causes an additional 5 minutes of delay after the incident is cleared. Of particular importance is coordinating information between the various

agencies that respond to problems, such as police, fire, emergency medical, highway maintenance, and traveler assistance services.

Traveler Information, which means providing real-time information, such as traffic flow, weather, and travel conditions, and transit service information to the urban or rural traveler. Information is obtained from a number of sources such as freeway detectors, local street signals, and video cameras. Travelers receive the information via in-vehicle display, highway message sign, radio advisory, on-line computer service, hand-held computer, cable TV, or telephone.

Transit Management, which involves implementing a system to increase ridership, raise operating efficiencies, and lower costs on mass transit. System components include computer-aided dispatching, automatic passenger counting, automatic vehicle location, and advanced voice and data communication.

Electronic Payment, which means using a single card to pay bus, rail, parking, and toll fares, just as one credit card is used by different merchants. A rider can use any type of transit without having to use different forms of payment. In the future, some ATM cards may even be accepted on transit.

Electronic Toll Collection, which uses electronic systems to allow vehicles to continue through toll stations without stopping.

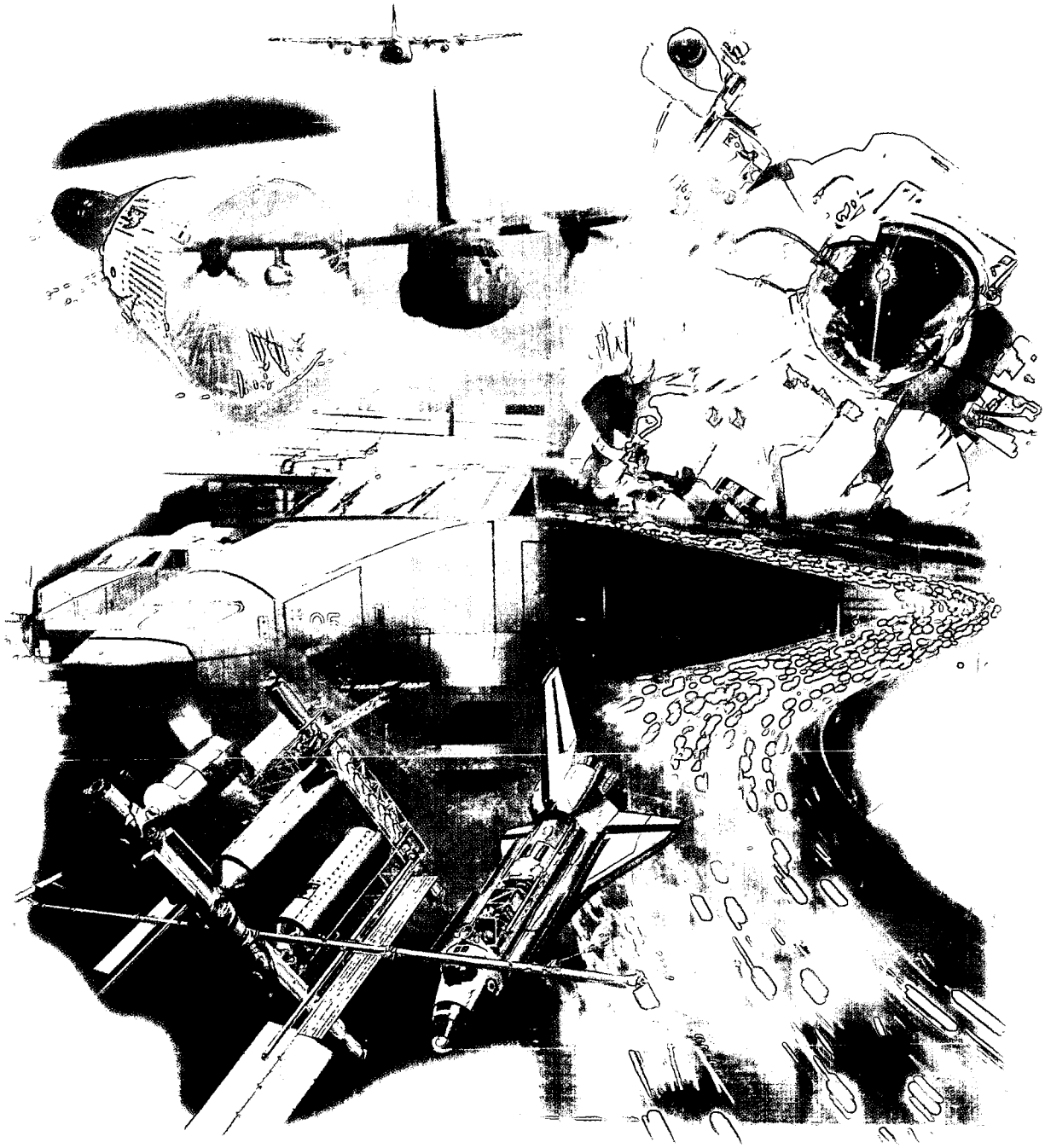
How do I become an ITS specialist?

A number of disciplines and educational paths can prepare you for work in this field. Typically, these disciplines include a college degree and graduate work. Because this is a new field, some people believe there is a mismatch between the skills ITS personnel have and the ITS field itself. Frequently, people who are hired to work in ITS have specialties, such as electrical engineering, that are useful, but they come from fields other than transportation. When many of these ITS personnel began their studies and their careers, they did not visualize working in ITS.

If you pursue a career in ITS, you will be on a true 21st-century career path. As you choose a field of study that appeals to you, you would do well to include courses and job experiences that will give you a mix of general transportation and specialized knowledge. These are some of the specialists that will be needed in this area:

- **Aerospace engineers**
- **Environmentalists**
- **Systems engineers**
- **Computer scientists**
- **Communication engineers**

Other good fields of study for careers in ITS include economics, political science, modeling and simulation, logistics, statistics, anthropomorphics, cognition, and marketing.



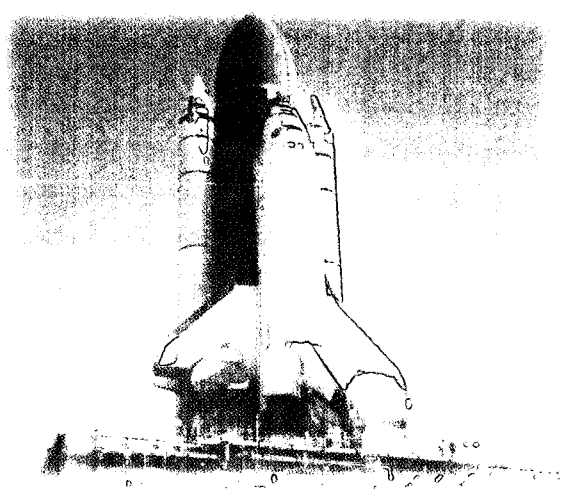
MOVING INTO THE 21ST CENTURY

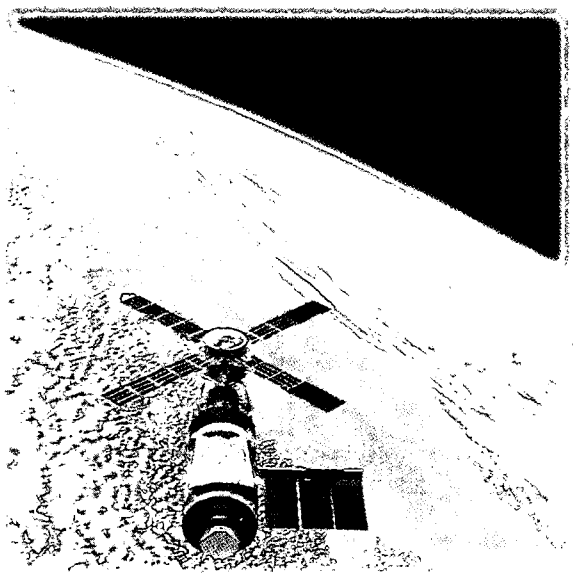
Chances are, you've seen at least one movie recently that shows people traveling to and from space in ultra-modern spaceships. People who watched the same kind of futuristic movies 30 years ago thought the same thing, but look what's happened since then: in 1969, we put a man on the moon, and today we shuttle astronauts and scientists back and forth between Earth and a working space station.

When Jules Verne wrote the book *20,000 Leagues Under the Sea*, his underwater craft, the *Nautilus*, was the future—the impossible. It was a transportation fantasy. Eighty-five years later, however, America launched its first nuclear-powered submarine, also named *Nautilus*.

Nineteenth-century steam locomotives chugged their way along the transcontinental railroad uniting this country's east and west coasts and changing the way Americans lived, worked, and traveled forever.

Almost a hundred years ago, the Wright brothers managed to make a ramshackle little plane fly 120 feet in Kitty Hawk, North Carolina.





As we enter the 21st century, American travelers look forward to commuting to work and crossing the country on electrically powered, high-speed rail, or magnetically levitated trains, such as those in operation or being developed in Europe and Japan.

Technology in transportation has evolved quickly, more quickly than most of us imagined was possible. Is it too far-fetched to think, then, that you or someone you know will travel to space someday?

The future holds endless possibilities for advancements in transportation. In the 1930's, a radio in a car was unheard of. In the early 1980's, telephoning from a car was almost as unlikely as teleporting to a starship. Now, not only can you call, you can reach almost anyone, anywhere, from a plane, a ship, or a train. Take along a fax machine and a laptop, and you have a portable office. In a few years, parents may be able to turn off the "Are we there yet?" coming from the back seat by turning on computerized video games for the kids. The same computer and telecom-

munication technologies that are making traveling more fun and more productive are also changing how we move everyone and everything—everywhere.

Think about this, for example. Suppose you are on your way to a party. Your friend told you how to get there, but somewhere you've made a wrong turn. You don't know where you are or how to get where you want to be and, to make matters worse, you have a flat tire.

What are you going to do? If you're lucky, your car uses global positioning systems (GPS). These satellite and computer technologies are used to check the position of vehicles on the sea, railroads, and highways and in the air. The U.S. Coast Guard uses GPS in its search and rescue missions to locate ships and boats that are in trouble. This extraordinary technology, until now used only by government and military agencies, is becoming a part of our ordinary lives. Now, GPS can help perform a "search and rescue" for you—and get you to the party on time. GPS can determine where you are, show you how to get to the party, get help for the flat tire, and even find the nearest automatic teller machine. What's more, if you've locked yourself out of your car, a telephone call to an adviser could get you back in with a remote signal. If you watch TV commercials, you know that some of today's luxury cars have GPS and are already "smart" enough to help you out. You can bet that it's only a matter of time before every car has similar equipment. *You* may not be finding your way to the prom using GPS technology, but it may come in handy for your little brother or sister.

Pretty amazing, isn't it? But remember, GPS technology in automobiles is not the future. It's where we are now. And it's just one of many examples of the transportation transformation that has begun and will continue and intensify in the 21st century.

Now, let your imagination run free. Technology is advancing and changing our lives faster than it ever has before—certainly much faster than it did between Jules Verne's era and the time your parents, or even you, were born. In your lifetime, transportation reality will exceed any of the fantasies held by generations before yours. All of us, young and old, will use and benefit from high-tech transportation systems. And your generation will build them! If you have the education, creativity, desire, and determination to pursue a career in 21st-century transportation, you can help create the best, most sophisticated transportation system, either in or out of this world!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AVIATION

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Aircraft Pilot/Flight Engineers	91	X	X		7%		
Aircraft Mechanics	119		X		13%		
Air Traffic Controller/Airplane Dispatcher	29		X	X		X	

- Aviation is strongly influenced by economic conditions; employment numbers reflect airline passenger demands.
- Historically, the military has been a hiring source for commercial aviation; major carriers relied on the military for about 75 percent of their pilots.
- Because of military downsizing, airlines will have to depend on civilian sources for training their specialized workforce.
- Aviation occupations do not mirror the diversity of the American workforce. In 1990, less than 2 percent of pilots were black and less than 3 percent were of Hispanic origin; in both cases, these were mostly men.
- The majority of air traffic controllers is employed by the Federal Government.
- The number of air traffic controllers is projected to gradually increase through the year 2000 and then remain at a steady level.

Source: BLS as of FY94

HIGHWAY

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth–Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Automotive Mechanics	736		X		17%		
Material-Moving Equipment Operators	1,061		X		6%		
Taxi Drivers and Chauffeurs	129	X			22%		
Truck Drivers	2,900	X			10%		
Bus and Truck Mechanics	250		X		17%		
Highway Maintenance Workers	167		X		9%		

- Local and intercity travel is expected to increase as the population and labor force grow and income rises.
- Material-moving equipment occupations include crane-and-tower, grader, dozer, scraper, hoist, and winch operators.
- Despite the projected slow growth, the material-moving equipment occupation is large and offers many opportunities arising from the need to replace experienced workers who transfer to other occupations or leave the labor force.
- Taxi driver and chauffeur opportunities will be best for people who have good driving records and are able to be flexible in their work schedules.
- The truck-driving occupation has among the largest number of job openings each year.

Source: BLS as of FY94

TRANSIT

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Bus Drivers	568	X			17%		
Subway/Streetcar Operators	12	X	X		15%		

- Most bus drivers operate school buses.
- School bus driving jobs should be easiest to get, because most of these positions are part-time and have a high turnover rate.
- Subway and streetcar operator employment is expected to grow as cities build new rail systems and add new lines to existing systems.
- Subway/streetcar operators receive classroom and on-the-job training from transit systems.
- Many subway operators are members of the Amalgamated Transit Union or the Transport Workers Union of North America.

Source: BLS as of FY94

WATER TRANSPORTATION

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Unlicensed Seamen	12.4		X			X	
Ship Engineers	3.6	X	X			X	
Mates	2.5	X	X	X		X	
Captains and Pilots	2.5	X	X	X			
Shipbuilders	95.0		X			X	

- Maritime personnel, for the most part, must be certified by the U.S. Coast Guard, which offers many different types of certification, depending on the position and type of craft. Positions listed above are on large commercial ships, and all require certification.
- Deck and engineering officers may have graduated from the U.S. Merchant Marine Academy or one of the six State academies to qualify for a license.
- Merchant marine officers and unlicensed seamen are hired for voyages through union hiring halls or directly by shipping companies.
- Harbor pilot training is usually an apprenticeship with a shipping company or a pilot employee's association. Entrants may be able seaman or licensed officers.
- Training is strongly recommended to become an unlicensed seaman on vessels operating in harbors or on rivers or other waterways to foster safety. Newly hired workers will have opportunities to learn skills on the job.

Source: BLS as of FY94

RAIL TRANSPORTATION

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth–Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Locomotive Engineers	35	X	X			X	
Railroad Conductors & Yardmasters	26					X	
Brake Operators	19		X			X	

- Competition is expected to be keen.
- Many people qualify, because education beyond high school is generally not required.
- Opportunities for railroad operating workers will be limited because of technological improvements in the efficiency of railroad operations and low turnover.
- Conductor jobs are generally filled from the ranks of experienced brake operators who have passed tests covering signals, timetables, operating rules, and related subjects.
- Most railroad transportation workers begin as trainees for either engineer or brake operator jobs.
- Most rail operating employees are members of unions such as the Brotherhood of Locomotive Engineers or United Transportation Union.
- Brake operators include brake, signal, and switch operators.

Source: BLS as of FY94

ENGINEERING

	Number of Jobs Held (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Aerospace	56			X	5%		
Chemical	50			X	13%		
Civil, Including Traffic	184			X	18%		
General	292			X	25%		
Electrical and Electronics	349			X	20%		
Industrial	115			X	13%		
Electrical and Electronics Technicians	314			X	11%		

- California, Washington, Texas, and Florida are the States that employ the highest numbers of aerospace engineers.
- More civil engineers will be needed to design and construct higher capacity transportation, water supply, and pollution control systems.
- Increased demand by businesses and Government for computers and communication equipment are expected to account for much of the projected growth in electrical and electronics engineering.

Source: BLS as of FY94

OTHER, PASSENGER ASSISTANCE

	Number of Jobs Held* (X 1000)	Requirements and Recommended Education			Job Growth–Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Travel Agents	122		X		15%		
Reservation & Transportation Ticket Agents & Travel Clerks	139		X				5%
Flight Attendants	105		X		28%		

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Source: BLS as of FY94

MISCELLANEOUS TRANSPORTATION-RELATED

	Number of Jobs Held* (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Construction Trades	2,624		X		9%		
Lawyers	658			X	28%		
Urban Planners	29			X	24%		
Economists	48			X	24%		
Precision Assemblers	324		X				3%

- There are large numbers of jobs in the construction trades and, because the work is physical, there is turnover as workers age.
- Urban planning and logistics management are two of the fastest growing transportation-related occupations. Some logistics managers earn as much as $150,000 a year.

* The number of jobs for precision assemblers is expected to decrease, because automation is increasing and more companies are having their products assembled in other countries.

DEPARTMENT OF TRANSPORTATION

	Number of Jobs Held* (X 1000)	Requirements and Recommended Education			Job Growth-Year 2005		
		Licenses	Technical Training	College	Increase	Same	Decrease
Aviation Safety Inspectors	3,338	Some	X	X		X	
Motor Carrier Safety Specialists	256		X	X		X	
Railroad Safety Inspectors	378		X	X		X	
Vessel Traffic Control Specialists	74		X	X		X	

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- Additional opportunities are available in the transportation field through State and local governments.

Source: U.S. DOT

U.S. COAST GUARD MILITARY

	Number of Jobs Held* (X 1000)	Requirements and Recommended Education	Job Growth-Year 2005		
		Minimum Educational Requirements	Increase	Same	Decrease
Warrant/Commissioned Officers	7	High School/College USCG Academy		X	
Enlisted Personnel	28	High School		X	
Reservists	8	High School		X	
Auxiliarists	35	High School		X	

- You must be a U.S. citizen or nationalized to be a Coast Guard officer.
- To enlist, you must be a U.S. citizen or a resident alien.
- You must be between the ages of 17 and 27 and have no more than two dependents.
- You must take and pass the Armed Services Vocational Aptitude Battery Test.
- DOT has two officer training sites: New London, Connecticut, and Yorktown, Virginia.
- As a professional lawyer, engineer, maritime graduate, or environmental manager, you may also qualify for a Coast Guard Direct Commission.
- A number of specific requirements and restrictions apply for becoming a reservist.
- Auxiliarists are volunteers who serve in a variety of job fields ranging from communication specialists, to small-boat operators and maintenance specialists, to electronic technicians and aviation mechanics.

Source: U.S. DOT

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