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Chapter 2
Transportation Systems and Organizations

2-1
How would your typical day be changed without availability of your principal mode of transportation? Consider both personal transportation as well as goods and services that you rely on.

A typical day in my life would be significantly different without the airplane. Although I do not use this mode daily, goods and services that I do purchase are transported via this mode. Other modes, such as trucking, trains, and the automobile, could serve as replacements to the airplane; however, the airplane significantly lowers the transit time for shipping goods. For example, I mail a letter to California. Typical transit time for this letter using the airplane is three days. By using another mode other than the airplane, the transit time for the same letter would probably exceed seven days. As for my personal transportation, long distance travel is accomplished by using the airplane. For example, I take a vacation to Europe. If I travel using a cruise ship, it would take me more than seven days to reach Europe. However, if I fly, I can arrive in Europe within nine hours. Having the ability to transport people and goods quickly allows the international trade market to prosper, which in turn provides me with goods in a timely and efficient manner.

2-2
What are the most central problems in your state concerning one of the following: (a) air transportation, (b) railroads, (c) water transportation, (d) highways, or (e) public transportation. (To answer this question, obtain a copy of the governor's plan for transportation in your state or contact a key official in the transportation department.)

(a) A problem in Virginia concerning air transportation is the high cost associated with short haul flights from airports such as Richmond and Norfolk to connection hubs for major airlines. Another problem is that our air transportation system is aging while the demand continues to increase; our air transportation system is approaching capacity and requiring substantial capital investment to provide modern terminals, increase the number of gates and available parking.

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(b) Virginia is experiencing a new dilemma with its railroads. For the first time in nearly 30 years, freight railroads are expanding their operations and growing to serve their market segment. To continue to compete with other railroads in neighboring states, Virginia must investigate the possibility of providing rail clearances to facilitate double-stacking of containers into the Port of Hampton Roads. Another problem associated with the increase in freight rail transportation is the conflict encountered with passenger trains running on freight company-owned tracks. As the demand for passenger rail service increases and the freight market share increases, more conflicts will likely occur and the passenger services may require parallel or additional track mileage to meet demand.

(c) The most central problem concerning water transportation in Virginia is the increased build-up of silt in our channels. In order for Virginia to remain competitive, it will have to continue to dredge our navigable waterways. Another problem is the increased volume of pleasure crafts and cargo vessels. The increased interaction between these types of vessels will likely result in more serious accidents. To mitigate this, more boater safety classes should be provided to ensure all boat operators are responsible on the water.

(d) Virginia's highways are experiencing increased volumes and delays while the overall infrastructure is continuing to age. The volume of trucks on Virginia's highways are significantly increasing annually. As a result, Virginia is experiencing an accelerated deterioration of our highways as well as more serious accidents.

(e) The major problem concerning public transportation is that modern systems such as the ones in Atlanta and San Francisco are not present in Virginia. Only Northern Virginia and the suburbs of Washington, D.C. have rapid rail transit in form of the Metro system that is now facing major renovations. Virginia does not have a sophisticated rural public transportation system that provides all individuals with a means of transportation.

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2-3

A bridge has been constructed between the mainland and an island. The total cost (excluding tolls) to travel across the bridge is expressed as $C = 50 + 0.5V$, where V is the number of veh/hr and C is the cost/vehicle in cents. The demand for travel across the bridge is $V = 2500 - 10C$.

(a) Determine the volume of traffic across the bridge.

(b) If a toll of 25 cents is added, what is the volume across the bridge? What volume would be expected with a 50 cent increase?

(c) A tollbooth is to be added, thus reducing the travel time to cross the bridge. The new cost function is $C = 50 + 0.2V$. Determine the volume of traffic that would cross the bridge.

(d) Determine the toll to yield the highest revenue for demand and supply function in part (a), and the associated demand and revenue.

(a) Determine the volume of traffic across the bridge.

Substitute the total cost function into the demand function and solve for V.

$$V = 2500 - 10(50 + 0.5V)$$
$$V = 2500 - 500 - 5V$$
$$6V = 2000$$
$$V = 333.33 \text{ vehicles/ hour}$$

Therefore, the number of vehicles wanting to cross this bridge is 334 vehicles/hour.

(b) If a 25 cent toll was added, what is the new volume crossing the bridge? What volume would be expected with a 50 cent increase?

1. Add 25 cents to the original cost function.

$$C = 50 + 0.5V + 25$$
$$C = 75 + 0.5V$$

Substitute the above cost function into the demand function and solve for V.

$$V = 2500 - 10(75 + 0.5V)$$
$$V = 2500 - 750 - 5V$$
$$6V = 1750$$
$$V = 291.67$$

Therefore, the new volume crossing the bridge will now be 292 vehicles / hour with a 25 cents toll.

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2. Add 50 cents to the original cost function.

$$C = 50 + 0.5V + 50$$
$$C = 100 + 0.5V$$

Substitute the above cost function into the demand function and solve for V.

$$V = 2500 – 10(100 + 0.5V)$$
$$V = 2500 – 1000 – 5V$$
$$6V = 1500$$
$$V = 250$$

With no toll, the volume would be 334 vehicles/hour; with 50 cents toll, the volume would be 250 vehicles/hour. That means that an increase of toll by 50 cents reduces traffic by 334 – 250 = 84 vehicles/hour.

(c) An additional toll booth changed the cost function to C = 50 + 0.2V. Determine the new volume of vehicles wanting to cross this bridge.
Substitute the new cost function into the demand function and solve for V.

$$V = 2500 –10 (50 + 0.2V)$$
$$V = 2500 – 500 – 2V$$
$$3V = 2000$$
$$V = 666.67 \text{ vehicles/ hour}$$

Therefore, the new number of vehicles wanting to cross this bridge is 667 vehicle/hour.

(d) Determine the toll to yield the highest revenue for part a.
Assume toll rate at T. The new cost function will be C = 50 + 0.5V + T. Since the revenue generated is the toll rate, T, time the volume, V, first solve for V with the new cost function.

$$V = 2500 – 10(50 + 0.5V + T)$$
$$V = 2500 – 500 – 5V – 10T$$
$$V = (2000 – 10T) / 6$$

Since the revenue generated is R = T × V, substitute the above expression into the revenue formula and differentiate with respect to T.

$$R = T \times ((2000 – 10T) / 6)$$
$$R = (2000T – 10T^2) / 6$$
$$dR/dT\ (2000T – 10T^2) / 6 = 0$$
$$(2000 – 20T) / 6 = 0$$

Therefore, the toll which would yield the maximum revenue is T = 100, or T = $1.00.

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$$R = T \times V$$
$$R = (2000T - 10T^2) / 6$$
$$R = (2000(100) - 10(100)^2) / 6$$
$$R = 16{,}666.67$$

Therefore, a toll of \$1.00 will yield a revenue of \$166.67 per hour.

2-4

A toll bridge carries 6,000 veh/day. The current toll is \$3.50/vehicle. Studies have shown that for each increase in toll of 50 cents, the traffic volume will decrease by 500 veh/day. It is desired to increase the toll to a point where revenue will be maximized.

(a) Write the expression for travel demand on the bridge, related to toll increase and current volume.
(b) Determine toll charge to maximize revenues.
(c) Determine traffic in veh/day after toll increase.
(d) Determine total revenue increase with new toll.

(a) Write the expression for travel demand on the bridge. Let V = travel demand.

$V = 6000 - 500(x / 50)$; where x is the increase in toll in cents.

(b) Determine the toll charge to maximize revenues. Let T = toll charge.
Since the original toll was 350 cents per vehicle, the new toll charge will be

$$T = 350 + x$$

The revenue (R) is generated by the equation $R = V \times T$. Substitute the above expressions into the revenue function and differentiate with respect to x, setting the derivative equal to zero.

$$R = (6000 - 500(x / 50)) \times (350 + x)$$
$$R = (6000 - 10x) \times (350 + x)$$
$$R = 2100000 + 6000x - 3500x - 10x^2$$
$$dR/dx\ (2100000 + 2500x - 10x^2) = 0$$
$$2500 - 20x = 0$$
$$x = 125$$

Therefore, an increase in toll of 125 cents will maximize revenues.

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(c) Determine the traffic volume per day after the toll increase.

Now, substitute the new toll, x, into the demand function developed in part a.

$V = 6000 - 500(x / 50)$
$V = 6000 - 500(125/50)$
$V = 6000 - 1250$
$V = 4750$ vehicles per day

The new demand for the bridge will be 4,750 vehicles per day.

(d) Determine the total revenue with the new toll. Therefore, the new revenue will be:

$R = V \times T$
$R = 4750 \times (350 + 125)$
$R = 4750 \times 475$
$R = 2{,}256{,}250$ cents
$R = \$22{,}562.50$

The total revenue to be generated with the new toll will be $22,562.50 per day.

Therefore, the increase in revenue would be:

$$R_{new} - R_{old} = \$22{,}562.50 - \$21{,}000 = \$1{,}562.50$$

2-5

Consideration is being given to increasing the toll on a bridge now carrying 4500 veh/day. The current toll is $1.25/veh. It has been found from past experience that the daily traffic volume will decrease by 400 veh/day for each 25¢ increase in toll. Therefore, if *x* is the increase in toll in cents/veh, the volume equation for veh/day is $V = 4500 - 400\,(x/25)$, and the new toll/veh would be $T = 125 + x$. In order to maximize revenues, what would the new toll charge be per vehicle and what would the traffic in veh/day be after the toll increase?

First, solve for the revenue to be generated by the new toll.

$R = V \times T$
$R = (4500 - 400(x / 25)) \times (125 + x)$
$R = (562{,}500 + 4500x - 2000x - 16x^2$
$dR/dT\ (562{,}500 + 2500x - 16x2) = 0$
$32x = 2500$
$x = 78.125$

Therefore, a toll increase of 78.125 cents per vehicle will maximize revenues for the bridge. For practical purposes and traveler convenience, round the toll increase to 75 cents.

Next, determine the resulting volume after the new toll increase. Simply substitute the new toll into the demand function above.

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V = 4500 – 400(75/25)
V = 4500 – 1200
V = 3,300 vehicles per day

An increase in toll of 75 cents per vehicle will result in a new demand for the bridge of 3,300 vehicles per day.

2-6

A large manufacturer uses two factors to decide whether to use truck or rail for movement of its products to market: cost and total travel time. The manufacturer uses a utility formula that rates each mode. The formula is $U = 6C + 14T$, where C is cost ($/ton) and T is time (hrs). For a given shipment of goods, a trucking firm can deliver in 12 hrs and charges $30/ton, whereas a railroad charges $22/ton and can deliver in 16 hrs.

(a) Which mode should the shipper select?

(b) What other factors should the shipper take into account in making a decision? (Discuss at least two.)

(a) Which mode should the shipper select?

Let U_{truck} be the (dis)utility function for the trucks and U_{rail} the (dis)utility function for the railroad.

$U_{truck} = 6(30) + 14(12)$
$U_{truck} = 348$

Next solve the utility formula for shipping via the railroad.

$U_{rail} = 6(22) + 14(16)$
$U_{rail} = 356$

Based on the results of the above utility formula, the shipper should ship his goods by truck since $U_{truck} < U_{rail}$.

(b) List at least two other factors that shippers should take into consideration when choosing modes to ship products by.

1. *Reliability:* Does the mode consistently operate on schedule?
2. *Convenience:* Which mode can deliver the freight to a serviceable location?
3. *Security:* Which mode reduces the risk of pilfering.
4. *Rideability:* Which mode provides the best ride for the product? In other words, which mode is less likely to cause damage to the product while in transit?

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2-7

An individual is planning to take an 600-mile trip between two large cities. Three possibilities exist: air, rail, or auto. The person is willing to pay $25 for every hour saved in making the trip. The trip by air costs $450 and travel time is 6 hrs, by rail the cost is $400 and travel time is 10 hrs, and by auto the cost is $250 and travel time is 15 hrs.

(a) Which mode is the best choice?

(b) What factors other than cost might influence the decision regarding which mode to use?

Determine the total cost (initial cost plus time cost) for each mode.

$$\text{Total Cost}_{(air)} = 450 + (6 \times 25)$$
$$\text{Total Cost}_{(air)} = \$600$$

$$\text{Total Cost}_{(rail)} = 400 + (10 \times 25)$$
$$\text{Total Cost}_{(rail)} = \$650$$

$$\text{Total Cost}_{(auto)} = 250 + (15 \times 25)$$
$$\text{Total Cost}_{(auto)} = \$625$$

From the above analysis, it appears that the best mode to choose to make this trip is **air**. Other factors to consider, other than costs, when selecting a mode to travel might include the following: personal comfort the modes have to offer, whether additional connections need to be made to reach the final destination, the level of stress that can be anticipated by traveling by that mode, or whether the reason for travel is for business or pleasure.

2-8

Name the two key influences on transit system carrying capacity.

Carrying capacity is influenced by headway (the "spacing" in seconds between each vehicle, and (2) level-of-service (the "comfort factor" experienced by passengers.

2-9

What factors affect the long-term viability of fuel taxes as a stable source of revenue to fund highway system improvements?

The long-term viability of the fuel tax is affected by crude oil shortages, improved automobile efficiency, use of alternative energy sources, and shifts to public transportation. Additionally, the availability of revenue is reduced by diversion of fuel taxes to support transit, ethanol, and government general funds.

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2-10

What emerging concepts for financing highway improvements are currently being explored?

Several financing concepts, including road use metering, electronic toll collection, and value pricing, may help to offset ineffectiveness in the fuel tax as vehicles become more fuel-efficient. Road use metering involves charging highway users according to consumption (vehicle-miles traveled), similar to many utilities. Electronic tolling is a related concept that can be applied on toll roads. Value pricing involves payment for values of service rendered as a function of demand.

2-11

Describe the organization and function of your state highway/transportation department.

Under the Governor, responsibility for the general administration of Virginia's government is distributed among eight cabinet secretaries, one of whom is the Secretary of Transportation. The Secretary of Transportation is empowered to oversee Virginia's transportation program. The secretary is also the chairperson of the Commonwealth Transportation Board, a 16 member policy board that functions as a board of directors to (i) oversee the construction of highways and make regulations governing the use of state highways, (ii) ensure compliance with transportation-related federal laws, (iii) collect transportation statistics, (iv) regulate the location of outdoor advertising, (v) oversee the administration of the Transportation Trust Fund, and (vi) generally oversee the operation of the Virginia Department of Transportation (VDOT). VDOT is headed by a Commissioner, who is also appointed by the Governor. VDOT's core function is to construct and maintain the roadways of Virginia. This includes the daily maintenance and repair, design and engineering of future road projects, and the long range planning based on future demand projections. It is VDOT's responsibility to keep the roadways in good working condition throughout the year. This organization has its central headquarters located in Richmond, Virginia, and nine other District offices strategically located in other areas of the state. These District offices employ individuals to maintain the roads and the right-of-way year round, which includes the mowing of grass in the summer and plowing snow in the winter. In addition to the roadways, VDOT is also responsible for all of the roadway signs, signals, and street lighting.

2-12

What are the major activities performed by the highway/transportation department in your state as described by the organization chart and other information furnished on their website?

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The activities focus around the phase of transportation project development: planning, design, construction, operations, and maintenance. Organizational structure supports these responsibilities.

2-13

Consult with the U.S. Department of Transportation website and identify the name and location of highways in your state that are included as part of the National Highway System.

According to 2011 data, Virginia has approximately 3,430 miles of the NHS. On Rural areas, there are 1,903 miles of highways in the NHS: 656 miles of Interstates, 1,219 miles of other Principal Arterials, 13 miles of Minor Arterials, 6 miles of Major Collectors, and 8 miles of Local roads. In Urban areas, there are 1,527 miles of highways: 463 miles of Interstates, 241 miles of other Freeways and Expressways, 779 miles of other Principal Arterials, 36 miles of Minor Arterials, 6 miles of Major Collectors, and 2 miles of Local roads. This includes Interstates 64, 77, 81, 85, 95, and Principal Arterials and strategic connectors, such as U.S. 29 and 460.

Note: These data are available from the Internet site of FHWA Highway Statistics: "http://www.fhwa.dot.gov/policyinformation/statistics/2011/hm41.cfm"

2-14

List three transportation organizations located in your state. What services do they provide?

Charlottesville Transit Service: Provides local bus service to the residents of Charlottesville.
United Airlines: Provides passenger airline service to several cities outside the state.
Norfolk Southern Corporation: Provides freight rail service throughout the eastern U.S.

2-15

Obtain a copy of a *Transportation Research Record: Journal of the Transportation Research Board* (published by the Transportation Research Board).
(a) Select one article and write a short summary of its contents.
(b) Describe the technical area of transportation covered by this article.

Title: Comparisons of Contractor and State Transportation Agency Quality Assurance Test Results on Mat Density of Hot-Mix Asphalt Concrete: Findings of Multistate Analysis
Authors: Rod E. Turochy and Frazier Parker

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Source: Transportation Research Record: Journal of the Transportation Research Board No. 2040, pp. 41-47 (2007)
Abstract: A typical component of highway construction quality assurance programs is the process by which highway construction elements are sampled and tested to ensure compliance with specifications and other project requirements. The results of contractor-performed tests on in-place properties of hot-mix asphalt are increasingly used in the acceptance decision in many states. Results of tests performed by contractors and state departments of transportation (DOTs) in North Carolina, Florida, and Kansas consistently indicate that differences between contractors and state DOT test results for hot-mix asphalt concrete mat density are statistically significant. Furthermore, these comparisons consistently indicate less variable and more favorable contractor test results, relative to specification limits, that give more favorable acceptance outcomes. Details of quality assurance processes (sampling and testing frequencies, test methods, verification procedures, and acceptance procedures) appear to have little if any effect on these comparisons. These findings provide information for state DOTs to consider in structuring their quality assurance programs, specifically the role of contractor-performed tests in acceptance decisions.

2-16
Write out names of the organizations represented by these acronyms and, for each organization, briefly note the type of organization, its purpose, and its members and constituency.
AAA, AAR, AASHTO, APTA, ARTBA, FHWA, TRB

AAA: American Automobile Association. It is a not-for-profit, fully tax-paying corporation. It is a federation of affiliated motor clubs with more than 1,100 offices in the U.S. and Canada. AAA provides services to its members such as travel, automotive, insurance, financial, and discounts. It has over 53 million members in the United States and Canada. Each AAA club is an independent, not-for-profit organization, chartered and incorporated in its own state and controlled by its own Board of Directors.

AAR: Association of American Railroads. It is an industry trade group representing primarily the major railroads of North America. AAR represents its members' interests to the public at large and to Congress and government regulators in particular. The AAR works to improve the efficiency, safety and service of the railroad industry, such as through its responsibility for the industry's interchange rules and equipment specifications. AAR includes the major freight railroads in the United States, Canada and Mexico, as well as Amtrak. Account for more than 43 percent of intercity freight rail volume and almost 100 percent of intercity passenger service in the U.S. The Association is governed by several committees. AAR has affiliate and associate members; the affiliate members can participate in all activities and are eligible to be part of AAR committees while only some associate members are elected as representatives of associate members at AAR committees. The President of AAR is elected by the members and presides at the

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Washington D.C. Headquarters and is the official spokesperson and authorizing body for policies and plans.

AASHTO: American Association of State Highway and Transportation Officials. It is a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. The primary goal is to foster the development, operation, and maintenance of an integrated national transportation system. AASHTO is composed only of instrumentalities of government. The membership of this Association is by Member Departments, which are those Departments or Agencies of the States of the United States, Puerto Rico, and the District of Columbia in which the official highway responsibility for that State or Territory is lodged, and the United States Department of Transportation, which is an ex-officio member. AASHTO is guided by a Board of Directors made up of the chief transportation officers from the 50 states, the District of Columbia, and Puerto Rico. The 12-member Executive Committee is led by AASHTO's elected officers, and is assisted by its executive director.

APTA: American Public Transportation Association. It is a nonprofit organization which serves as an advocate for the advancement of public transportation programs and initiatives in the United States. APTA serves and leads its diverse membership through advocacy, innovation and information sharing. APTA and its members and staff work to ensure that public transportation is available and accessible for all Americans in communities across the country. APTA consists of public organizations that are engaged in the areas of bus, paratransit, light rail, commuter rail, subways, waterborne passenger services, and high-speed rail. Members also include large and small companies who plan, design, construct, finance, supply, and operate bus and rail services worldwide. All membership classes have the right to vote on Association matters and other such privileges and services as prescribed from time to time by the Board of Directors. The Board of Directors is comprised of the members of the executive committee; the designated committee chair directors, the designated transit system directors, the designated business member directors, the at-large directors, and the APTA president.

ARTBA: American Road and Transportation Builders Association. It is a trade association. ARTBA intends to aggressively grow and protect transportation infrastructure investment to meet the public and business demand for safe and efficient travel. There are more than 5,000 members from the public and private sectors. ARTBA membership divisions include: contractors, planning and design, transportation officials, traffic safety, materials and services, public-private partnerships, research and education, and equipment manufacturers. Members can be elected to serve one-year terms as officers for the Executive Committee. Top executives of industry firms and organizations serve on the ARTBA Board of Directors.

FHWA: Federal Highway Administration. It is an agency of the United States Department of Transportation that specializes in highway transportation. FHWA supports State and local governments in the design, construction, and maintenance of the Nation’s highway system and various federally and tribal owned lands. Through financial and technical assistance to State and local governments, the Federal Highway Administration

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is responsible for ensuring that America's roads and highways continue to be among the safest and most technologically sound in the world. Key Personnel include Administrator Victor M. Mendez, Executive Director Jeffrey F. Paniati, and Deputy Administrator Greg Nadeau. It is overseen by an Administrator appointed by the President of the United States by and with the consent of the United States Senate. The Administrator works under the direction of the Secretary of Transportation and Deputy Secretary of Transportation. The internal organization of FHWA includes several offices.

TRB: Transportation Research Board. It is one of six major divisions of the National Research Council— a private, nonprofit institution that is the principal operating agency of the National Academies in providing services to the government, the public, and the scientific and engineering communities. TRB provides leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. TRB annually engages more than 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest by participating on TRB committees, panels, and task forces. The TRB Executive Committee, whose members are appointed by the chairman of National Research Council, exercises oversight responsibility for the Board's programs and activities. Members include senior transportation industry executives, top officials of public-sector transportation agencies, and distinguished researchers from academia.

2-17
List the seven categories of transportation organizations and cite one example of each.

There are several organizations and associations active in transportation. There are seven categories of these organizations. The categories are listed below along with an example of an organization in each category:

PRIVATE TRANSPORTATION COMPANIES

- United Airlines

REGULATORY AGENCIES

- Federal Motor Carrier Safety Administration

FEDERAL AGENCIES

- U.S. Army Corps of Engineers

STATE AND LOCAL AGENCIES AND AUTHORITIES

- Virginia Department of Rail and Public Transportation

TRADE ASSOCIATIONS

- Association of American Railroads

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PROFESSIONAL SOCIETIES

- Institute of Transportation Engineers

CONSUMER ASSOCIATIONS

- American Automobile Association

2-18

Explain the role of AASHTO with respect to state highway/transportation agencies.

AASHTO represents the common interest of state departments of transportation. AASHTO is an international leader in setting technical standards for all phases of highway system development. Standards and policies are issued for design, construction of highways and bridges, materials, and many other technical areas.

AASHTO serves as a catalyst for excellence in transportation by offering:

- Smart solutions and promising practices;
- Critical information, training and data;
- Direct technical assistance to states; and
- Unchallenged expertise.

2-19

What are the four principal modes for moving freight? Which of these modes carries the largest share of ton-miles? Which carries the lowest?

The four principal modes for carrying freight are highways, railroads, water, and pipeline. Of these four modes, railroads carry the highest share of ton-miles, while water transportation carries the lowest share of ton-miles.

2-20

What are the four principal modes for moving people? Which of these modes accounts for the largest share of passenger-miles? Which mode accounts for the lowest?

Air, automobile, bus, and rail are the four principal modes for moving people. Of these four modes, the automobile accounts for the highest share of passenger-miles. Conversely, the lowest share of passenger-miles is associated with the rail mode.

2-21

(a) List four major factors that will determine the future of public transportation in the United States.

(b) Indicate if the factor is positive, neutral or negative to the success of transit.

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According to the TRB report, *A Look Ahead: Year 2020*, four key trends that will affect the future of public transportation in the United States are (1) increasing suburb-to-suburb commuting, (2) increasing legislation to encourage "livable cities" and "smart growth", (3) increasing emphasis on improving air quality, and (4) increasing use of teleworking. Suburb-to-suburb commuting is difficult for public transit systems to accommodate and therefore will have a negative impact on mass transit. Popularity of "livable cities" and "smart growth" will have a positive impact on mass transit, as will an increasing focus on improving air quality. The reduction in travel associated with teleworking will have a neutral impact on mass transit.

2-22

What are the advantages and disadvantages of using intercity bus transportation?

There are several advantages and disadvantages of using intercity bus transportation. The advantages to using this mode are that it is highly energy efficient. To demonstrate, this mode achieves nearly 300 seat-miles per gallon of fuel consumed. In addition to its energy efficiency, this mode is very safe. It has a relatively low crash rate of 12 fatalities per 100 billion passenger miles.

This mode also has disadvantages to using it. For the most part, it is slow in comparison to other modes. Intercity bus transportation is less convenient, it lacks through ticketing, less comfortable seats, and its terminating points are usually located in downtown locations in less active parts of the city.

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