

Transportation



- ## Transportation
- Enables all other economic activity
 - Derived demand
 - Important in its own right
 - Accessibility: existence of opportunities
 - Mobility: ability to get there
 - Equity of accessibility and mobility

Transportation

- ❑ In terms of transport modes, the **primary forms** are air, rail, road, and water
- ❑ Each one has its own cost associated with; speed of movement as a result of friction, and the place of origin and destination
- ❑ For moving large amounts of goods (carry more at a cheaper price), maritime shipping is generally utilized

Transportation

- ❑ For moving people who prefer to minimize travel time, and maximize comfort and convenience, air and road are the most common modes in usage
- ❑ Railroads are often utilized to transport goods in areas away from water

Transportation Geography

- ❑ Shrinking distance
- ❑ Changing technology
- ❑ Changing accessibility and mobility
- ❑ Impact on landscape

Modes – Ship Transport



Ship Transport (freight and pleasure)

- ❑ Ship transport is the process of moving people, goods, etc. by barge, boat, ship or sailboat over a sea, ocean, lake, canal or river
- ❑ This is frequently undertaken for purposes of commerce, recreation or military objectives

Ship Transport (freight and pleasure)

- ❑ Ship transport is used for a variety of unpackaged raw materials ranging from chemicals, petroleum products, and bulk cargo such as coal, iron ore, cereals, bauxite, and so forth
- ❑ So called "general cargo" covers goods that are packaged to some extent in boxes, cases, pallets, barrels, and so forth

Ship Transport (freight and pleasure)

- ❑ Since the 1960's containerization has revolutionized ship transport
- ❑ More than 6 billion tons of cargo were delivered by sea in 2005
- ❑ Transport by water is significantly less costly than transport by air for trans-continental shipping

Panama Canal

- ❑ Joins the Atlantic and Pacific oceans at the Isthmus of Panama:
 - ❑ From Cristobal on Limon Bay, an arm of the Caribbean Sea, to Balboa, on the Gulf of Panama
 - ❑ Ranks as one of the greatest engineering works of all time
- ❑ Composed of three main elements:
 - ❑ Gatun Locks (Atlantic side)
 - ❑ Gaillard Cut (continental divide)
 - ❑ Miraflores Locks (Pacific side)



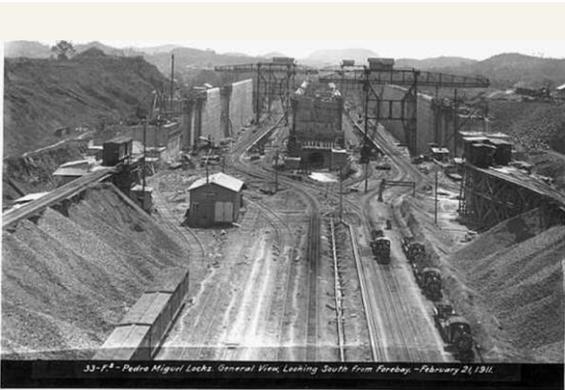
Panama Canal

- Dimensions:
 - Slightly more than 64 km long.
 - Minimum depth of 12.5 m and a minimum width of 91.5 m.
- Prevents a 21,000 km detour around South America
- Handles about 12% of the American international seaborne trade



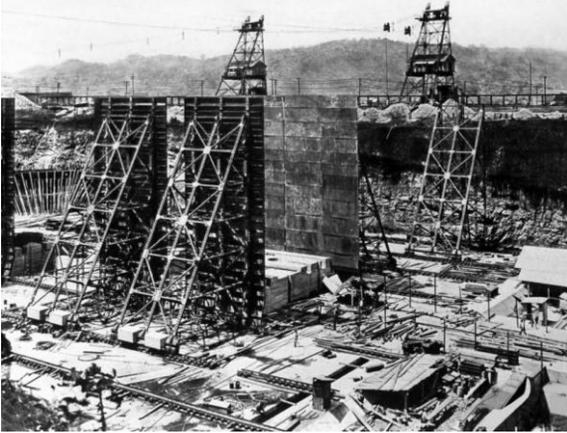
Panama Canal

- Construction
 - Constructed between 1904 and 1916
 - Cost of \$387 million (compensation to Panama and \$40 million to purchase the previous project from the French Canal Company)
 - Under the authority of the U.S. Army Corps of Engineers



Panama Canal

- Construction
 - 70,000 people worked on the project and about 5,600 died in the process
 - Excavation of 143 million cubic meters of earth
 - Sanitation of the entire canal area (mosquitoes; yellow fever and malaria)



Panama Canal

- Operations and traffic
 - Under the jurisdiction of the Panama Canal Authority (1999):
 - Collect tolls on all ships crossing the canal
 - A loaded ship pays about \$2.57 per net ton
 - The average toll is about \$45,000

Panama Canal

- Operations and traffic
 - Traffic:
 - 13,000 ships transit the canal every year, (35 ships per day)
 - Grains (43% of the traffic transited)
 - Containers (11%) and petroleum products (10%)
 - Loss of some of its strategic importance due to super-tankers
 - Panamax standard:
 - Equals to 65,000 tons and a draft of 12 meters



Modes – Rail Transport



Rail Transport

- ❑ Today, most rail transport in the United States is based in freight train shipments
- ❑ Changing U.S. economic needs and the rise of automobile, bus, and air transport led to repeated consolidations in the U.S. passenger-rail industry

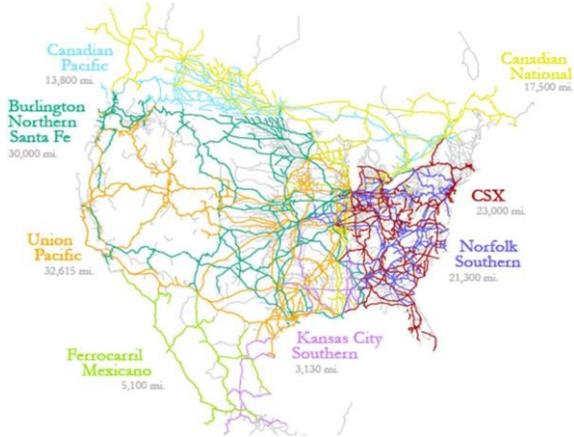
Rail Transport

- ❑ Today, the sole intercity passenger railroad in the continental United States is Amtrak
- ❑ VIA Rail is Canada's equivalent to Amtrak



Rail Transport

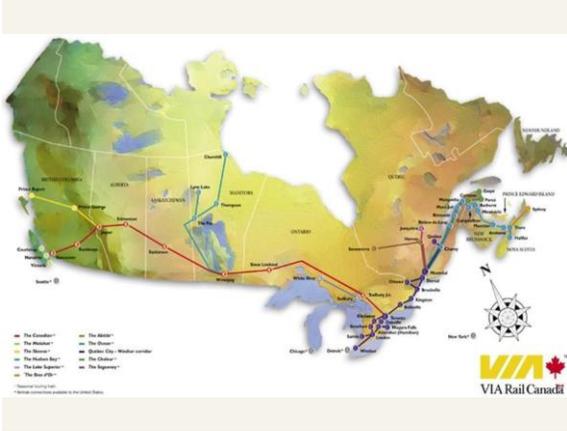
- ❑ In 1939 there were 132 Class I railroads
- ❑ Today, as the result of mergers, bankruptcies, and major changes in the regulatory definition of "Class I," there are only seven railroads operating in the United States that meet the criteria for Class I.



Rail Transport

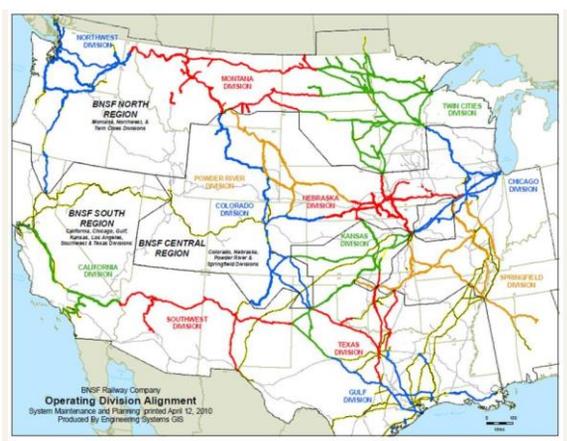
- Although Amtrak qualifies for Class I status under the revenue criteria, it is generally not considered a Class I railroad because it is not a freight railroad
- As of 2006, U.S. freight railroads operated 140,490 route-miles (226,097 km) of standard gauge in the United States





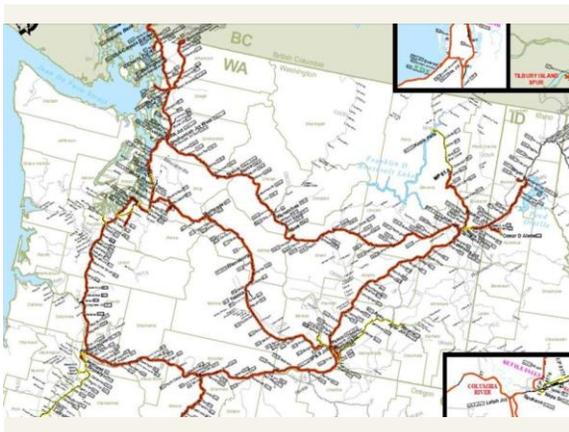
BNSF

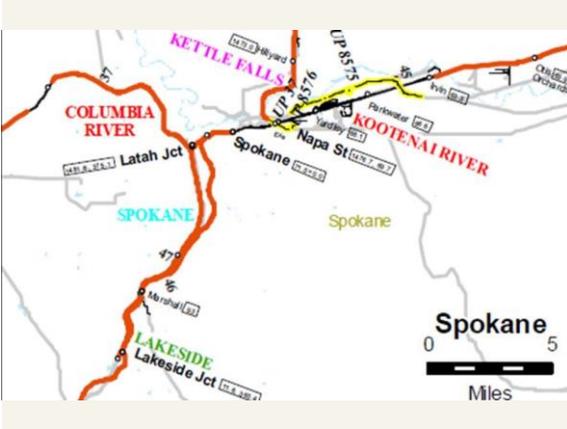
- Primary Commodities
 - Coal
 - Grain
 - Agricultural products
 - Intermodal/container
 - Mixed freight
 - Industrial products











Modes – Highway Transport



Interstate Highway System

- ❑ The Interstate Highway System was authorized by the Federal-Aid Highway Act of 1956, popularly known as the National Interstate and Defense Highways Act of 1956
- ❑ The Interstate Highway System is a separate system within the larger National Highway System

Interstate Highway System

- ❑ The entire system, as of 2004, had a total length of 46,837 miles (75,376 km), making it both the largest highway system in the world and the largest public works project in history

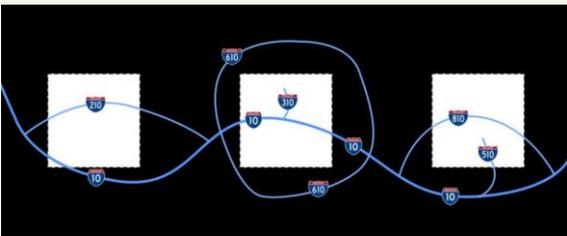


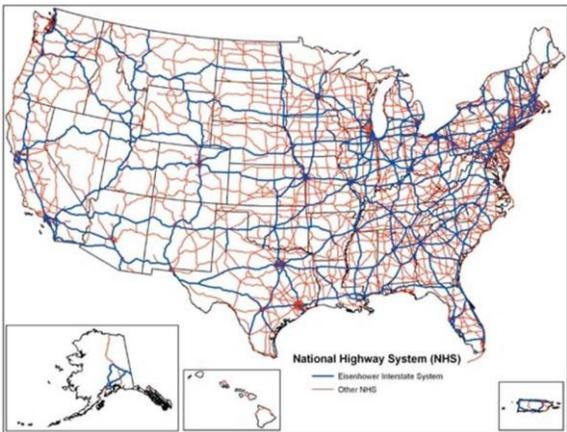
Figure 2.—Estimated status of Improvement of the National System of Interstate Highways as to lane width, in 1965.

Standards

- ❑ **Controlled access** – all access onto and off the roadway is to be controlled with interchanges and grade separations (including railroad crossings)
- ❑ **Minimum design speed** – 75 mph in rural areas
- ❑ **Maximum grade** – is up to 6%

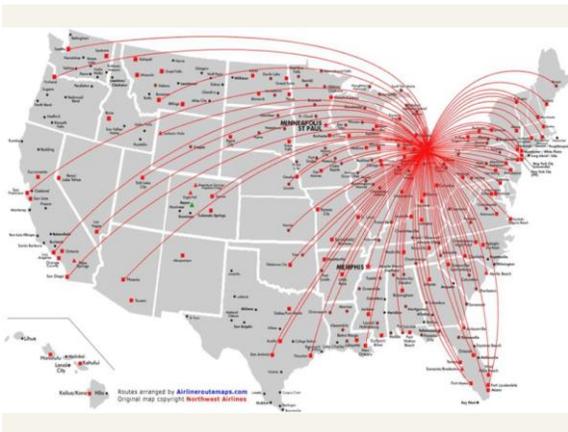
Auxiliary Route Numbering Diagram



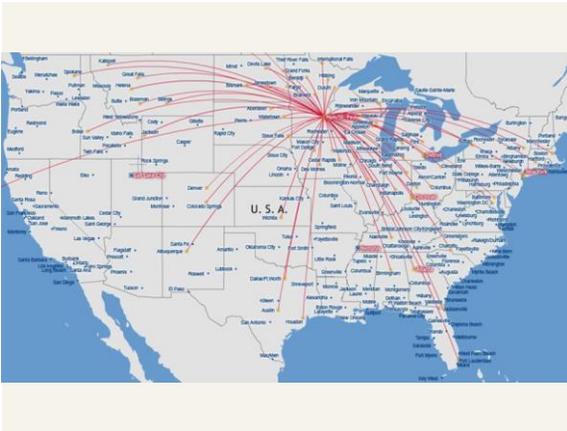


Modes - Aviation







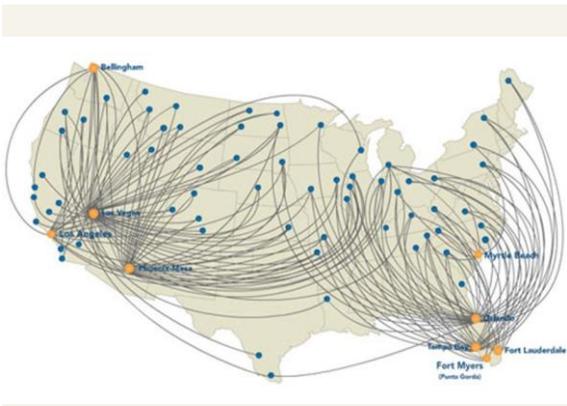




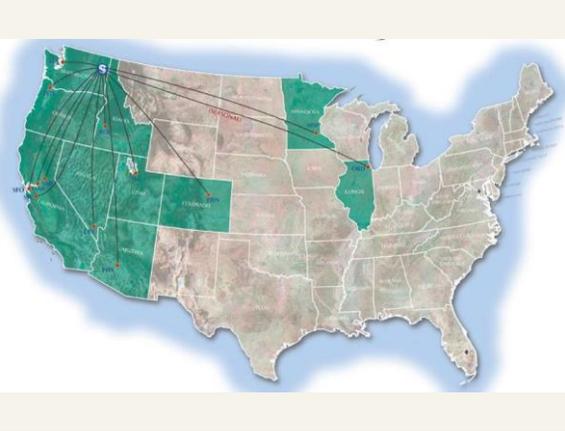
United Airlines







Allegiant Air



Modeling/Future

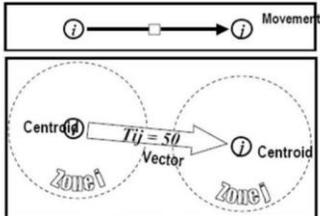
Gravity Model

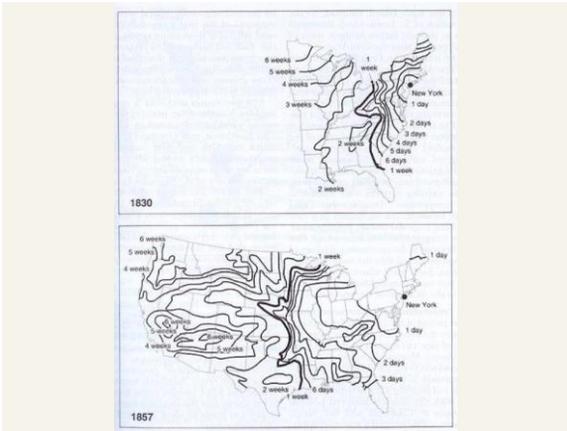
- Loose analogy to Newton's law of gravity
- The attractive force between any two bodies is
 - Directly related to the masses of the bodies and inversely related to the distance between them

$$F_{ij} = G * \frac{M_i * M_j}{D_{ij}}$$

Gravity Model..

- the number of trips between two areas is directly related to activities in the area represented by trip generation and inversely related to the separation between the areas represented as a function of travel time





Future

- New technology: container shipping
- No break-of-bulk
- Less labor needed
- Less "slippage"
- Concentration on a few ports

Rotterdam

