Introduction to Transportation Systems
PART I:
CONTEXT, CONCEPTS AND CHARACTERIZATION
Chapter 2:
Transportation Systems Components: An Internal Perspective
Guideways: Special Purpose vs. General Purpose Guideway -- some examples
- Highway
- Railroad
- Pipeline
- Air Corridors

Terminals/Stations -- some examples
- Rail Freight Yards
- Container Port
- Airports
- Bus Stations
- Transit Stations
- Street Corner Bus Stops/Taxi Stands
Vehicles

- Automobiles
- Rail Locomotives
- Airplanes
- Tractor Trailer
- Truck Trailers
- Railroad Cars
- Containers
Vehicle Characteristics

- Crashworthiness
- Degree of Automation
- Energy Source: internal vs. external
- Weight
- Material
- Aerodynamics
- Emissions
Equipment -- some examples

- Loading Crane at Container Port
- Railroad Track Maintenance Equipment
- Airport Baggage Handling
- Snow Removal Vehicles
Power Systems

- Internal Combustion Engine
- Diesel Engine
- Electric Motors
- Humans
- Animals
- Gravity
- Windmill
- Solar Panels
- Tidal Baffles
Fuel

- Gasoline
- Natural Gas
- Diesel
- Coal
- Electricity (e.g., as generated from coal)
- Electricity (as in an onboard battery)
- Solar Energy
- Tides/Currents
- Wind
Control, Communications and Location Systems

- Humans
  - Driver
  - Controllers (as in air traffic)
  - Dispatcher

- Technology
  - Traffic Lights
  - Sensors -- e.g., Loop Detectors
  - Fleet Management Systems
  - Automated Vehicles
  - Block Control (railroad)
  - Global Positioning Systems (GPS)
  - Intelligent Transportation Systems (ITS)
Summary -- Transportation Physical System Components

- Infrastructure
  - Guideway
  - Terminals
  - Stations
- Vehicles
- Power Systems
- Fuel
- Control, Communications & Location Systems

Figure 2.1
“Operators”

- Labor
- Management
  - Marketing
    - Intramodal
    - Intermodal
    - Intersectoral, e.g., Transportation vs. Communication
- Strategic Planning
- Operations
Operations/Marketing “Tension”

- Marketing people like to provide high-quality service. To a first approximation, they want to maximize revenues.
- Marketing people like to provide universal, direct, frequent, and high-quality service to transportation customers.
- Marketing people are basically concerned with maximizing the revenues that flow to the company.
Operations/Marketing

“Tension”

- Operations people are cost-oriented.
- Operations people are typically worried about minimizing cost.
- Operations people want to run an efficient and cost-effective operation.
“Operators”, continued

- Maintenance Management
- Information Management
- Operations Research
- Administration
Operating Plans

- Schedule
- Crew Assignments
- Vehicle Distribution
Connection Patterns -- Hub-and-Spoke

![Diagram of Hub-and-Spoke Pattern]

Figure 2.2
Cost/Level-of-Service Trade-off

Two Connection Patterns

Figure 2.3
Do we provide direct, high-quality service from A to C as shown in the lower figure, or do we consolidate passengers at Node B with other passengers from Node D, into a single flight from B to C? Here we have some fundamental cost/level-of-service trade-offs. Which pattern does the VP-Marketing like? How about the VP-Operations?
Contingency Planning

What do we do when things go wrong? How do we decide how to alter our operating plan to reflect changes in weather, demand for service and accidents -- such as a derailment?