LECTURES 2, 3, & 4

DISPLAYS

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Part I
WHY TRANSPORTATION IS A CLIOS SYSTEM

- The “Details”
  - Context
  - Internal Components
  - External Components
TRANSPORTATION AND THE SOCIAL-POLITICAL-ECONOMIC CONTEXT

- Public-Policy Lever
- Private-Sector Investment
- Industrial Base (e.g., auto and shipbuilding industries)
- Economic Development

- Employer
- Large-Scale Infrastructure with long-term Impact
- Environmental Impact - Sustainable Systems
- Energy Issues
- Equity Issues
TRANSPORTATION SYSTEM – INTERNAL COMPONENTS

- Physical system
- Management
- Labor
TRANSPORTATION PHYSICAL SYSTEM COMPONENTS

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

✦ 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
- Hybrid Engines
- Fuel Cells
- 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
- Hydrogen
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
MANAGEMENT (I)

- Marketing: what do customers want?
  - Intramodal
  - Intermodal
  - Intersectoral (e.g., transportation vs. communication)

- Planning
  - Strategic planning (e.g., building the network, buying the vehicles)
  - Operations planning (e.g., creating an operations plan)

- Operations
  - NB: Distinct from operations planning (e.g., actually running the system)
MANAGEMENT (II)

- Maintenance Management
- Information Management
- Operations Research
- Administration
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 people are cost-oriented.

Operations people are typically worried about minimizing cost.

Operations people want to run an efficient and cost-effective operation.
OPERATING PLANS

- Schedule
- Crew Assignments
- Vehicle Distribution
- Connections
  - Intermodal
  - Intramodal
CONNECTION PATTERNS -- HUB-AND-SPOKE

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?
LABOR

- Drivers
- Dispatchers
- Fare collectors
- Mechanics

DIFFERENCE BETWEEN UNION AND NON-UNION