



# Center for Transportation Analysis Research Capabilities Brief Oak Ridge National Laboratory

## Transportation Decision Support Systems

**O**RNL has a staff with extensive experience in the development and implementation of automated transportation decision support models for the scheduling and routing of cargo and passenger movements both within the United States and internationally. The decision support models can be used for planning operations or scheduling actual movements.

The scheduling process includes a number of steps. The first involves pulling movement requirements, transportation assets, and transportation infrastructure characteristics from a database. Second, once the network and asset resources have been defined, the scheduling goals can be set based on the volume of requirements, desired departure schedule, and desired arrival schedule. Third, the schedules and routes are generated based on the scheduling algorithm. Different types of delivery parameters may require different scheduling and routing algorithms. Fourth, the systems allow the display of the routing and scheduling information and provide the user with the ability to modify it. As the schedule is being developed, we provide the flexibility to modify it and interactively show the impacts on resources and any scheduling conflicts.

### ORNL's Capabilities

- Database design and management of movement requirements, transportation assets, and transportation infrastructure.
- Development of system interfaces to related software systems and databases for data needs and schedule distribution.

- Algorithm development for scheduling, routing, and resource use.
- Development of analysis capabilities, including schedule feasibility, resource scheduling and acquisition, alternative schedules, and
- Development of user interface to modify and replicate schedules.

### Questions ORNL Can Help Answer

- What will be the delivery schedule for a specified volume of requirements and a set number of transportation assets?
- What will be the cost of a deployment or shipping campaign?
- What will be the use rate for transportation assets and infrastructure for a deployment or shipping campaign?
- What will be the impact on the schedule and transportation asset usage if there is a change in the operational schedule?
- What impact will the addition or subtraction of transportation assets have on the schedule?

### ORNL's Comparative Advantage

- Experienced staff focused on solving the customer's problems.
- Use of state of the art optimization software tools.
- Use of the appropriate combination of available technologies (e.g. Client- or Web-based applications, Service Oriented Architecture (SOA) interfaces, etc.) that best meet the customer's needs.
- Leverage our previous experience to provide increased value to the customer.

Center for Transportation Analysis  
(CTA) Research Capabilities

Asset Management  
Economic Modeling  
Geographic Information Systems  
Program Performance Metrics  
Remote Sensing  
Simulation Analysis  
Statistical Analysis  
Supply Chain Analysis  
Transportation Decision Support Systems  
Transportation Network Routing Models

Patricia S. Hu, Director  
Center for Transportation Analysis  
Oak Ridge National Laboratory  
2360 Cherahala Boulevard  
Knoxville, TN 37932  
865.946.1349  
(Fax) 865.946.1314

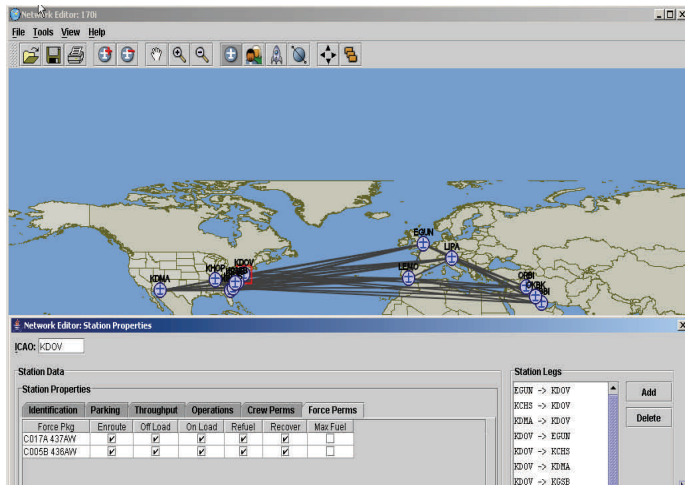
Website: [cta.ornl.gov](http://cta.ornl.gov)

Oak Ridge National Laboratory is managed  
by UT-Battelle, LLC, for the U.S.  
Department of Energy under Contract  
number DE-AC05-00OR22725

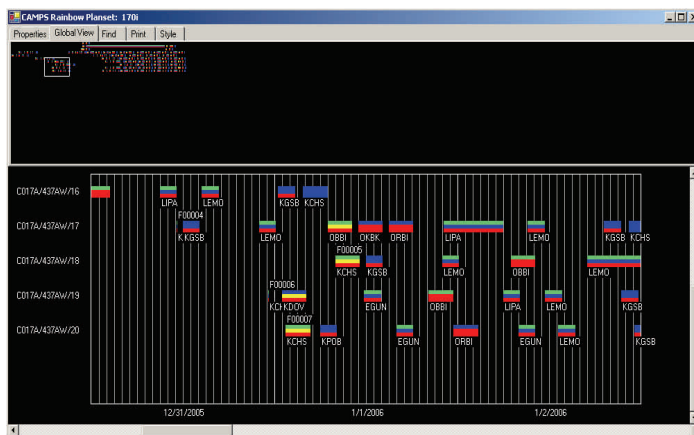


## Experience

ORNL staff has developed a number of Transportation Decision Support systems for government customers. The Consolidated Air Mobility Planning System (CAMPS) was developed for the US Air Force's Air Mobility Command (AMC) to schedule cargo and passenger airlift missions and air refueling missions. This system is used 24/7 to schedule AMC's airlift missions for contingencies, exercises, regularly scheduled, and special airlift missions.



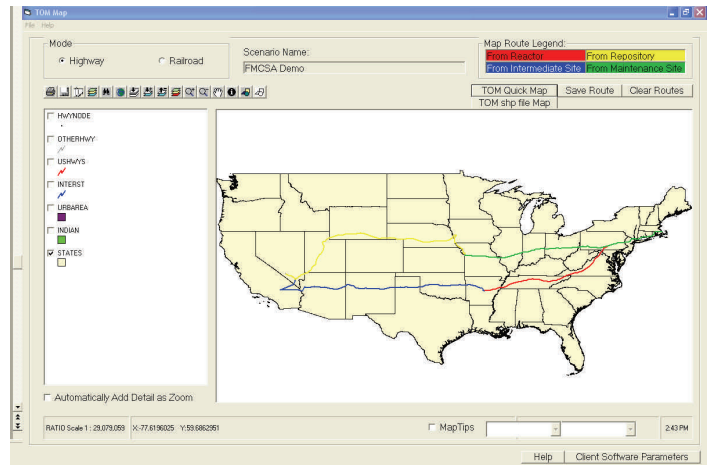
Airlift Network Design



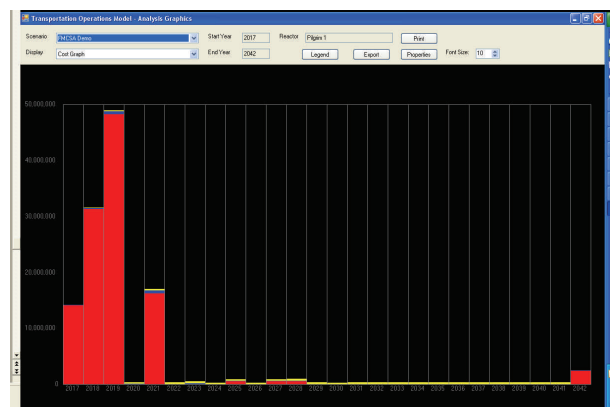
Airlift Schedules With Activities at Each Airfield

The Transportation Operations Model was developed for the Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM). The purpose of the system is to assist OCRWM in planning for the campaign shipments of spent nuclear fuel and high level waste from the commercial utility nuclear power plants to a repository. The system provides a simulation analysis for cask loading operations at the reactor

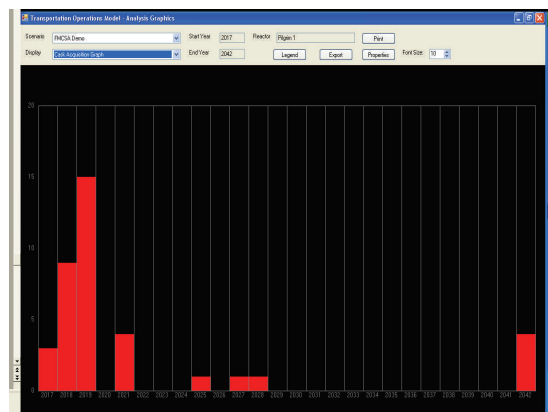
site, routing and scheduling models for the shipments, a capital equipment module that schedules the purchase of casks and transportation equipment, and a transportation services module that schedules the required transportation associated services that are required. This would include heavy haul, rail carriers, rail yards, cranes, and barges.



Projected Route Between Pilgrim Nuclear Reactor and Yucca Mountain Repository Site



Estimated Operation, Capital and Maintenance Expenses



Schedule of Cask Purchases

For more information regarding this research contact Glen Harrison, Center for Transportation Analysis, Oak Ridge National Laboratory, phone (865) 946-1312 or email [harrisonig@ornl.gov](mailto:harrisonig@ornl.gov).