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Long Beach, California
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Hazardous Materials Transportation: Issues and Trends

*Session Organizer and Moderator:
John C. Allen, Battelle, Massachusetts*

- *Hazardous Materials Transportation - An Overview*
by John C. Allen,
Battelle, Massachusetts
- *Federal Haz Mat Transportation Legislative and Regulatory Activities*
by Richard Hannon,
U.S. Dept. of Transportation
- *California Haz Mat Routing Program*
by Robert Rengstorff,
California Highway Patrol
- *California Haz Mat Transportation - Emergency Preparedness*
by Dr. Fred LeCari,
California Office of
Emergency Services
- *California Haz Mat Transportation - Information Systems*
by Lt. Michael Ayala,
California Highway Patrol

Ship Design and Operation

*Session Moderator: LeLand S. Case,
City College of New York*

- *Fuel Savings from Current Routing on U.S. Transoceanic Trades*
by Hong Kam Lo,
Mark R. McCord and
Cori K. Wall,
The Ohio State University

With the technological progress being made in systems devoted to measuring ocean circulation, the modelling developments allowing prediction of the circulation, and the scientific and military motivation for sponsoring programs to collect and process the necessary data, near real-time estimates of ocean currents could soon be feasible. We provide a "first order" estimate of the potential fuel savings which would be generated from exploiting ocean currents for strategic routing. We use monthly pilot chart data as estimates of current fields and, for each month, simulate routings through these data,

comparing routes chosen without considering the effect of currents (shortest distance routes) to those chosen to exploit the knowledge of current patterns (shortest time routes). We perform this analysis for each of the thirty origin-destination port pairs (fifteen U.S.-based trades, each in the eastbound and westbound directions) on the North Atlantic and North Pacific.

The results show a large amount of spatial and temporal variability. In some month, fuel savings of over 4% are obtained on certain routes. Other months and routes show no savings. Of the Atlantic trades, the Gulf of Mexico to the Mediterranean Sea route showed the greatest yearly savings of the eastbound routes - 2.4% for a 16-knot ship - and the English Channel to Charleston route showed the greatest yearly savings of the westbound routes - 3.5% for a 16-knot ship. The New York-Mediterranean trade showed no savings from current routing in the eastbound direction, but did exhibit a 1.5% savings in the westbound direction. On

the Pacific trades, the Philippines to Seattle route had a 2.2% annual fuel savings, the largest of the eastbound routes, while the Long Beach to Philippines route had the largest annual average savings in the west-bound direction - 2.5% for the 16-knot ship. The smallest annual savings in the east-bound and westbound directions, respectively, were the 0.3% on the Philippines to Long Beach route and 0.4% on the Seattle to Japan route.

After weighting for distance, quantity shipped, and type of vessel, we determine an overall fuel savings of over 1%, translating into a \$10 million annual savings to the U.S. industry and a \$60 to \$70 million savings to the global industry, where the values are based on 1986 dollars. Since the pilot chart data used is of a poorer spatial and temporal resolution than that which would be obtained from the improving technology, and since only marginal investments would be required, we believe that implementation of a current detection system should be pursued.

- **Temporal Variability in Ocean Currents**

by Mark R. McCord and
Hong Kam Lo,
The Ohio State University

It has been estimated that timely knowledge of ocean currents could save the U.S. commercial fleet approximately ten million dollars per year in decreased fuel consumption. Satellite altimetry offers distinct advantages for measuring current patterns because of its synoptic coverage, its ability to obtain measurements in cloudy areas, and the ability of the measurements to be transformed into estimates of current velocities in the water layer which would effect the vessel. The large scale synoptic coverage of the present and proposed altimeter missions is obtained only with a certain temporal resolution, however. The recently completed GEOSAT altimeter mission, for example, covered the oceans every 17 days. The upcoming TOPEX will reduce the time of coverage to 10 days.

We test the importance of the temporal resolution of a single altimeter satellite system by using one year's worth of GEOSAT data and the collinear pass method to determine changes in current velocities as a function of time. We calculate that current variability between successive GEOSAT observations is about 80% of that occurring in a six month period. The reduced TOPEX repeat period decreases this percentage, but only to about 55%. Given the accepted large

temporal variability in current patterns over a six-month period, these percentages seem important for any system designed to obtain timely estimates of current patterns for vessel routing. Potential ways of overcoming the temporal resolution difficulty are discussed.

- **The Impact of MARPOL in Reducing Oil Pollution From Maritime Transportation Activities**

by Marc B. Wilson,
George Washington University

A comparison of oil discharges into the oceans from maritime transportation activities between 1981 and 1988 indicates a reduction in oil pollution. However, this can only be estimated since there is no known information center that maintains the actual amounts of oil discharged to the sea from maritime transportation activities. This paper intends to update previous estimates of oil discharge into the oceans originating from marine transportation activities.

This paper is intended to update the 1981 International Maritime Organization (IMO) study of oil pollution in the marine environment. For continuity and ease of comparison, the same references and assumptions from the IMO study will be used.

Nations have long recognized the need to eliminate oil pollution in the marine environment. Prior to 1973, the International Convention for the Prevention of Pollution of the Sea by Oil, (OILPOL/1954) provided uniform guidance to meet this need. In 1973, the International Convention for the Prevention of Pollution from Ships was adopted by the Intergovernmental Maritime Consultative Organization (IMCO). This was later modified by the Protocol of 1978 and became the convention known as MARPOL 73/78. The Intergovernmental Maritime Consultative Organization has since been renamed the International Maritime Organization (IMO).

Since 1981, no subsequent study has been done on the discharges of petroleum hydrocarbons (PHC) into the oceans due to maritime transportation activities. IMO published a study which predicts estimates of discharges of PHC into the oceans. In 1986, the National Research Council (NRC) published a report which discussed the role that maritime transportation activities contributed to ocean pollution.

This paper is as up-to-date as possible. Unfortunately, all information lags a year or two behind.

- ***Human Factors Engineering for Tomorrow's Ship***
by Marc B. Wilson,
George Washington University

The ship of the future is a micro organization expected to develop in the next 50 years. Designing such an organization with futuristic insight has no limits. Human Factor Engineering (HFE) is designing the machine around the human being. This paper envisions vessels which must be operated and maintained by people.

The Economics of Heavier Axle Loads For Rail Freight Traffic

Session Organizer and Moderator: ***Randolph R. Ressor, ZETA-TECH Associates, Inc.***

Panelists:

- Michael E. Smith, Manager,
Technical Analysis
Burlington Northern Railroad
- Harold Cerveney, Director,
Business and Market Planning,
Trailer Train
- Michael B. Hargrove, Director,
Engineering Economics Division,
Association of American Railroads
- Samuel T. Adenbaum, Director,
Cost Information Systems,
CONRAIL

Book Reviews on Truck and Rail Deregulation

Session Organizer and Moderator: Jack Ventura, ***Interstate Commerce Commission***

Summary by Session Moderator

Curtis Grimm

The first comment posed to Grimm concerned the apparent exclusion of coal and grain shippers from the welfare impact calculations, because of the limitations of the methodology followed. Grimm responded that welfare impacts were calculated for those shippers, but separately. In further discussion of the book, Grimm noted the particular difficulty experienced by the authors in getting the necessary data for the study. With respect to rail rate data, for example, the authors faced the problem that the ICC's waybill sample does not show true

revenues from contract movements. To deal with this problem, the authors obtained actual contract rail rates from individual railroads. Moreover, for service quality rail data, the authors sought and gained access to confidential AAR data. Responding to whether welfare impacts were not unevenly distributed between small and large shippers, Grimm said they undertook no such breakdown. To a question concerning service quality benefits computed for LTL traffic, Grimm responded that the primary service quality benefits came from rail deregulation, and that the benefits for motor carrier deregulation came mostly from the rate side. Grimm noted that the study did take account of financial losses to LTL carriers, 60 percent