Report on the Status of Work on HPR Project 0760

"A Forecast of the Effects of Containerization on the Transportation
System in the State of Virginia"

by

Daniel D. McGeehan
Highway Research Analyst

(The opinions, findings, and conclusions expressed in this report are those of the
author and not necessarily those of the sponsoring agencies.)

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INTRODUCTION

This study was proposed in May of 1971 with a request for an allocation of $17,000 to cover the study period of one year. On June 18, 1971, the study was approved with a commencement date of July 1, 1971 and a completion date of June 30, 1972.

Data were to be collected by the researchers from a review of various documents that hopefully could be obtained through the cooperation of the Virginia Port Authority. However, after the study was under way, it was discovered that much of the needed data were being collected by the ports and would be made available only when the collection was completed. The completion date for the collection was not certain, but it was thought to be within 6 to 9 months. Rather than duplicate the efforts of the ports, an extension of the study period to March 28, 1972 was requested. On March 30, 1972 approval was given to extend the completion date to June 30, 1973. No additional funds were requested.

This report details the status of work towards the three study objectives.

FIRST OBJECTIVE

To predict the increase in traffic flow directly relatable to containerization and its possible effects on the highway system in Virginia.

Work Accomplished

To attain this objective, a model was to be developed which would predict the origins and destinations of container traffic.

At this point in the research, various models developed by others to accomplish this task have been studied. Since all these models are based on commodity flow, they do not appear to be valid predictive methods for the purposes of this study. With this type of model it would be rather difficult to predict the movement of different size containers; and since the 20-foot container is treated differently than the 40- and 35-foot containers under government regulations and general transportation policy, it is important to know the breakdown.

In light of the above facts, an attempt is being made to attain the first objective through the use of a modified gravity model. * The basic concept upon which this model rests seems to be applicable to the movement of containers, i.e., modified — the further the distance the origin is from the destination the less the tendency for traffic to move by highway between these two points and the greater the tendency to move by rail.

Originally the model was to give a comprehensive view of container movement; however, numerous variables have been identified which would seem very difficult to account for in such a model. Consequently, the analysis will incorporate various warnings and assumptions concerning the abilities and inabilities of the model.

The data for the model will reflect actual container movements. The containers can also be broken down by size because the ports from which the data are collected normally handle either 20 and 40 foot containers in a known ratio, rail traffic (ratio not needed), or 35 foot containers. The ports in the Hampton Roads area will be used as a common origin/destination point.

One large problem in the prediction of container movement is the difficulty of gaining data on overseas markets. As can be seen in Table 1 much of the container traffic originates in the overseas market. However, due to problems such as communications reliability, language barriers, and the traditional problem of market secrecy, not to mention various intergovernmental relations problems, the chances of collecting valid data outside the U. S. seem, at best, to be poor.

Table 1

Import—Export Movements (Container)

Types	1968	1969	1970	1971
Loaded Export	11,346	20,286	40,384	46,012
Empty Export	457	724	2,789	2,784
Loaded Import	5,801	11,588	24,437	26,799
Empty Import	5,881	9,192	19,397	20,685
Totals	23,485	41,790	87,016	96,280

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* A model formed from Newton's Law of Gravity $F = G\,(M_1\,M_2/d^2)$, where F is the attractive force between two bodies with masses of M_1 and M_2, d is the distance separating them, and G is the gravitational constant.

Work Remaining in This Phase

1. Complete data collection.

   The data for the study are being collected through the cooperation of the Virginia Port Authority and, as mentioned earlier, their own collection is not expected to be completed for six months.

2. Regression analysis.

   Once the origin-destination data are complete a regression analysis will be run to determine the relationship of:

   1. Import to rail/highway.

   2. Export to rail/highway.

3. Determination of the factors that can be predicted in terms of the model and those that cannot.

4. Completion of the model selection and analysis of the data which will affect the prediction but cannot, in the opinion of the researcher, be adapted to the model.

SECOND OBJECTIVE

To determine the modes of transportation most affected by container traffic and the extent to which the mode is split.

Work Accomplished

From an examination of the data collected to date, it appears that the routes that will carry the bulk of the traffic will be I-81, I-85, I-64, U. S. 460, U. S. 58, and U. S. 60. The extent to which these routes will be affected cannot be definitely stated at this time. However, the indications are that I-81, U. S. 460 and I-64 will carry 28% of all container traffic, which is 50% of the container traffic which would travel by highway rather than rail; and U. S. 58, U. S. 60 and I-85 will carry 26% of the total container traffic, which is also about 50% of the highway container movement.

The extent to which the modes will be split, rail vs. highway, will be about 71% highway and 29% rail.

The extent to which the rail mode will differ from the highway mode will be determined from the actual data. The expected trend lines can be seen in Figures 1 and 2, which were derived from the data in Tables 2 and 3; however, the actual movements do not appear to follow this trend — which could be due to the paucity of data on hand at this time.
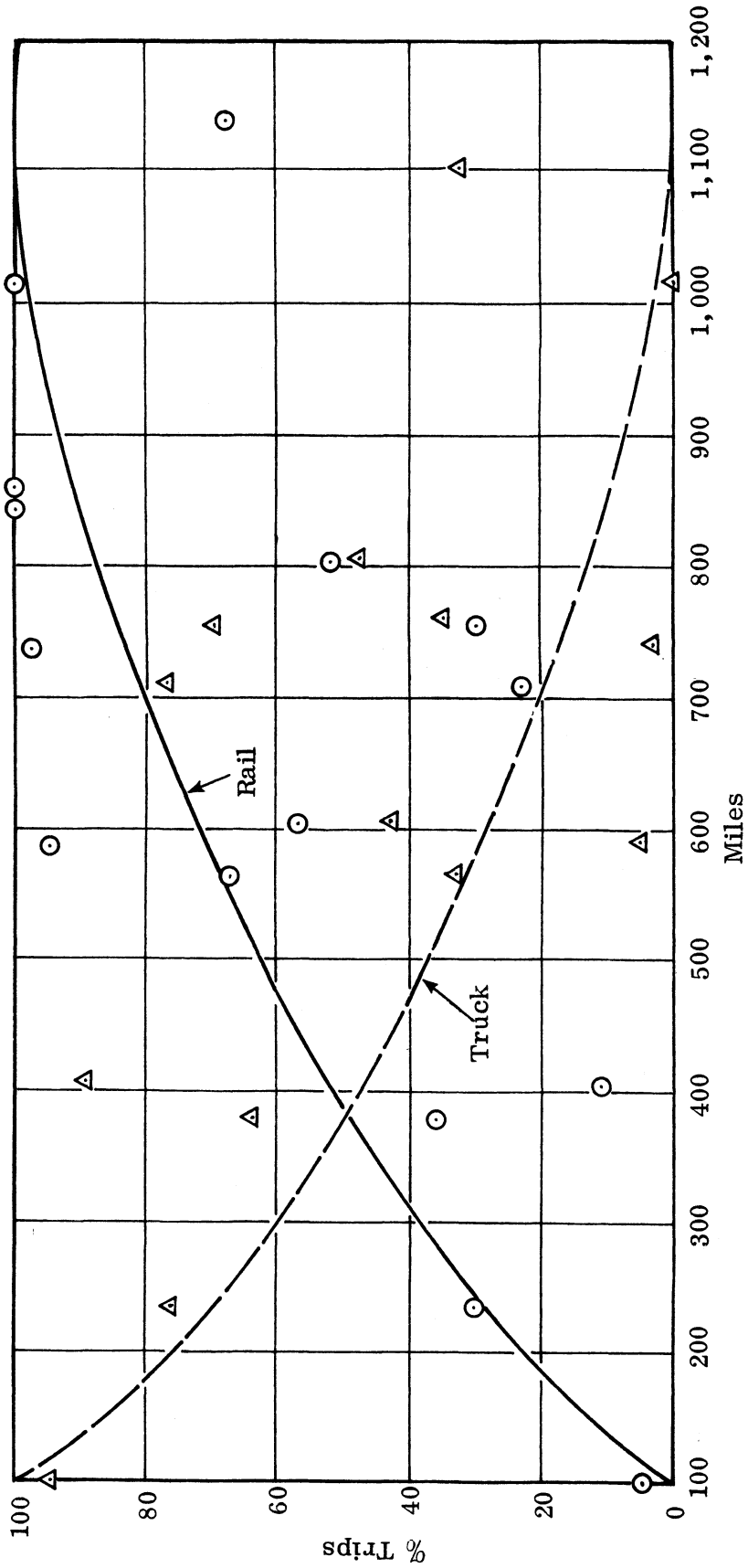
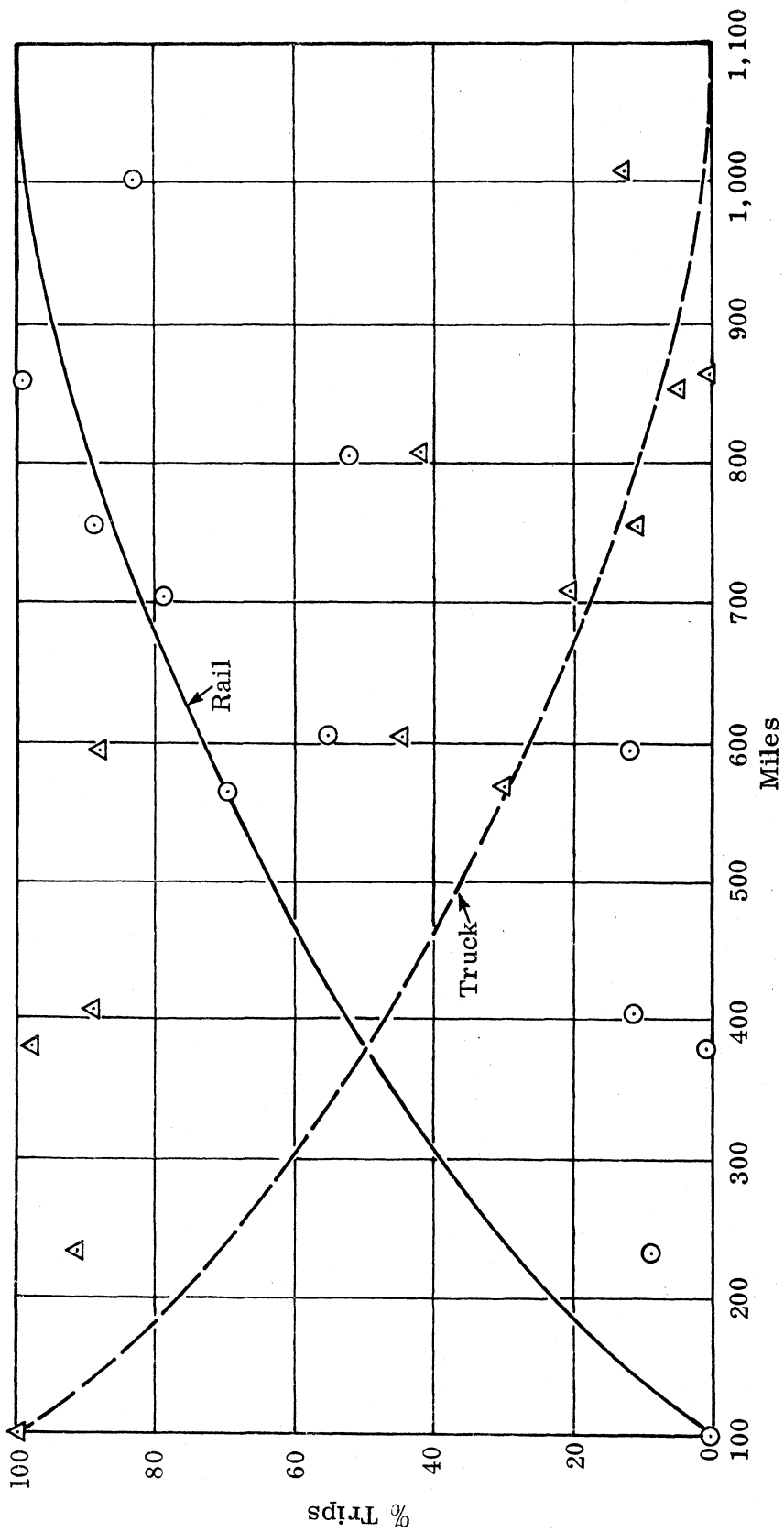Figure 1. Expected vs. actual movement of containers - exports.

Figure 2. Expected vs. actual movememt of containers-imports.

Table 2

Container Movements by Rail/Truck from Destination to Port

EXPORTS

Mileage	From	Truck	%	Rail	%	Total
233	Greensboro, N. C.	232	75	79	25	311
379	Columbia, S. C.	29	64	16	36	45
711	Nashville, Tenn.	170	77	52	23	222
589	Atlanta, Ga.	1	5	18	95	19
1,013	Jackson, Miss.	0	0	1	100	1
804	Orlando, Fla.	11	48	12	52	23
406	Charleston, W. Va.	8	89	1	11	9
565	Rochester, N. Y.	3	33	6	67	9
90	Richmond, Va.	471	95	23	5	494
753	Bowling Green, Ky.	128	70	55	30	183
604	Columbus, Ohio	6	43	8	57	14
862	Bloomington, Ill.	0	0	26	100	26
851	Lansing, Mich.	0	0	6	100	6
759	Birmingham, Ala.	8	35	15	65	23
739	Indianapolis, Ind.	3	3	96	97	99
1,233	Des Moines, Iowa	10	32	21	68	31

1,080 ⎯⎯ 1,515 ⎯⎯ 435

67% of total

Table 3

Container Movements by Rail/Truck from Destination to Port

IMPORTS

Mileage	To	Truck	%	Rail	%	Total
233	Greensboro, N. C.	252	91	26	9	278
379	Columbia, S. C.	43	98	1	2	44
711	Nashville, Tenn.	9	21	33	79	42
589	Atlanta, Ga.	30	88	4	12	34
1,013	Jackson, Miss.	13	17	63	83	76
804	Orlando, Fla.	11	48	12	52	23
565	Rochester, N. Y.	3	33	6	67	9
406	Charleston, W. Va.	8	89	1	11	9
90	Richmond, Va.	168	99	1	1	169
753	Bowling Green, Ky.	4	11	34	89	38
604	Columbus, Ohio	5	45	6	55	11
862	Bloomington, Ill.	1	10	9	90	10
851	Lansing, Mich.	5	100	0	0	5
759	Birmingham, Ala.	0	0	0	0	0
739	Indianapolis, Ind.	1	100	0	0	1
1,233	Des Moines, Iowa	0	0	0	0	0

533 ⎯⎯ 749 ⎯⎯ 196

33% of total

Work Remaining in This Phase

Additional data must be collected and analyzed.

THIRD OBJECTIVE

To define inhibitors to container traffic into and through the state.

Work Accomplished

A list of inhibiting factors to container traffic growth has been compiled, but the extent to which these factors will directly or indirectly affect the predictions of objectives one and two has not been determined. The completion of this part of the study will be delayed until the data collection is complete.

Work Remaining in This Phase

The inhibitors will be separated into categories on the basis of the effect they will have on the state of Virginia or on industry in general. Once this categorization has been made, an attempt will be made to establish patterns between each category. Also, the effects of these inhibitors on the model will be determined.

There are regulations and studies relating to this part of the study which have not been available to date. They should be available within the next few months and a general update of this portion will then be made.