Appendix C:
Motor Carrier Case Study

Evaluation Report
Volume I - Analysis and Observations

by

Western Highway Institute, ATA Foundation

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C
The
rescent Evaluation

CONTENTS

SUPPLEMENT

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Forward

The Crescent Project element of the HELP Program is a bi-national multi-jurisdictional cooperative research and demonstration initiative involving the public and private sectors in an application of advanced technologies for the creation of an integrated heavy vehicle management system. This initiative is a leading example of the commercial vehicle operations (CVO) aspect of the Intelligent Vehicle Highway Systems (IVHS) concept. Some of the advanced technologies demonstrated in this project include: (1) automatic vehicle identification (AVI); (2) weigh-in-motion (WIM); (3) automatic vehicle classification (AVC); and (4) data communications networks and systems integration.

The HELP program, initiated in the early 1980s, consisted of three phases which included assessing the feasibility of the concept, technical studies involving laboratory and field tests, and lastly, a demonstration phase. Perhaps the most significant activity of this project centered on the subject of institutional arrangements, associated with the integration of emerging technologies with current operational policies and practices, within both government and industry sectors.

The demonstration element of the program, referred to as the Crescent Demonstration Project, began in 1991 and involved six U.S. states and one Canadian province. This project was phased into full scale operation over a three year period.

This document is one of several cited below which comprise the evaluation of the Crescent Project. The complete evaluation is reported in the following list of documents:

The Crescent Project: An Evaluation of an Element of the HELP Program:
Executive Summary

Appendices:
A.   **On-Site Analysis of HELP Technologies and Operations Evaluation Report**
B.   **State Case Study Evaluation Report**
C.   **Motor Carrier Case Study Evaluation Report**
D.   **Crescent Computer System Components Evaluation Report**
E.   **Crescent Demonstration Office Evaluation Report**
F.   **State Line Beacon Project User Case Studies**

The Evaluation team consisted of the following groups:
WHM Transportation Engineering Consultants, Inc. (lead group)
Castle Rock Consultants
Western Highway Institute, ATA Foundation

In addition, the evaluation team was supported in this effort by:
Lockheed Information Management Systems
Booz-Allen & Hamilton Inc.

The team members wish to acknowledge the participation and support of the many individuals and organizations who provided guidance, assistance and encouragement during the evaluation process. While the team members are solely responsible for the content accuracy of these evaluation documents, the process would have been greatly impaired without the recognition of the importance of this effort by all who contributed and their desire to promote efficiency and productivity in future freight systems. To all we are greatly appreciative and indebted.

C. Michael Walton

Chairman, Evaluation Team

CHAPTER 1. INTRODUCTION

PURPOSE OF EVALUATION

The Western Highway Institute was retained to elicit and document the trucking industry's opinions about HELP and the Crescent demonstration project. While respondent's originality was encouraged -- any and all views and opinions were recorded -- the planned line of questioning centered around two areas:

- the usefulness of information in the Crescent database for managing fleets and/or drivers; and,

- the interest in the technology when used to bypass weigh-scales or ports-of-entry.

OVERVIEW OF EVALUATION

When the evaluation work began in June, 1992, there were 62 U.S. carriers participating in the demonstration according to information provided by Lockheed. This reduced to 57 when corporate duplications were eliminated. The actual number of candidate evaluation carriers eventually totaled 60 as several new carriers were recruited during the organizational phase.

Given that motor carrier participation in the HELP/Crescent demonstration was a "no strings attached" arrangement, it was anticipated that there would be a low level of enthusiasm for any large scale or time-consuming involvement in an evaluation. The plan was therefor to identify carriers meeting certain representation criteria and to make a concerted effort to acquire a specific evaluation commitment from them to participate as "case study" carriers. This commitment involved an orientation visit to their office, limited monitoring of HELP/Crescent observation data on their part, and a final review/evaluation visit to document opinions and experiences.

All remaining (non case study) carriers would be asked to complete and return a survey documenting their observations and experience with the HELP/Crescent demonstration. Of those completing the survey, a sample would be visited and interviewed to clarify and elaborate on the written responses.

originally, 18 companies and six drivers were to have been recruited for the case-study evaluations. As the recruitment proceeded, however, it became apparent that the special status of United Parcel Services -- that is, its size and specialized method of operation -- was such that the Phoenix fleet of UPS was added to the case-study group of carriers, bringing the total to 19.

One of the principal criteria for selecting case-study carriers was to find people willing to monitor the use of transponders over a six month period. As it developed, a six-month monitoring period proved impossible because of the delays with the replacement transponders. But, even for a

shorter time period, the idea behind this monitoring was that by undertaking the exercise the case-study carrier would become familiar with the Crescent database and thereby offer a more informed opinion as to potential uses. The actual amount of monitoring performed by the 19 case-study carriers was disappointing -- only one gave it much effort, six others gave it minimal effort, and the balance did little or nothing. The reasons for this lack of monitoring are complex. They range from the simplest -- unwillingness to assist with the evaluation -- to a whole series of factors ranging from the delay in acquiring transponders that worked to difficulty in obtaining information from the Crescent database. Eight of the 19 case-study carriers never did follow through with their original commitment to acquire modem access to the Crescent database. For a number of case-study carriers, the amount of data in the Crescent database -- given the carrier routes, the number of transponders, or the location of Crescent sites -- was so small that monitoring was simply not feasible.

In terms of drivers, all case-study carriers were asked to provide one driver for the weigh-scale bypass evaluation. The hope was that if all carriers were asked for one, the required six who were in a position to evaluate Woodburn SB -- the only scale operating with bypassing at the beginning of the evaluation -- would be found. In total, ten driver evaluation reports were returned from five of the 19 case-study carriers.   Another 11 were completed by drivers from other participating (non case study) carriers. There were also a few driver evaluation forms mailed to WHl offices where it was impossible to determine either a name or an origin. These have not been used.

The 19 case-study carriers were selected from the list of 57 original carriers on the basis of the following criteria:

·   Carriers from all six Crescent states should be included.

·   The distribution of the 19 carriers should approximate the distribution of the total population of motor carriers in the United States

·   The carriers selected for case-study evaluation should have or be willing to obtain modem access to the Crescent database.

It was not possible to meet the conditions of the first criteria as there were no participating carriers in New Mexico. The reason for the second criteria -- to draw a sample representative of the total population of motor carriers -- was to ensure that the carriers studied included all the types represented by the industry as a whole. The actual recruiting of the 19 carriers proved to be difficult: many carriers from the original list of 57 did not have modem access to the Crescent database and others were found to be mis-classified based on the original information obtained through a telephone survey.

The categories for the stratification of carriers were based-on those used by Arthur D. Little in NCHRP Report 303 (1988). This Arthur D. Little distribution -- that is, class 7 and 8 trucks used in inter-city (ie, non local) operations -- is shown in the second column of Table 1.1. For evaluation purposes, Crescent demonstration carriers are classified as hauling general freight if the majority of their trailers are either van (reefer or dry freight) or flat deck. Carriers operating other trailers (dump, possum belly, hopper, tank, etc) are classified as special commodity haulers. Further, for the purposes of this classification, 100 or more class 7 and 8 trucks and/or tractors is considered "large" for for-hire carriers and 25 or more is considered "large" for private carriers.

The main reason for the initial mis-classification -- hence, the difference between columns four and five in Table 1.1 -- was the distinction between "for hire" and "private." Some carriers, responding to a preliminary telephone survey in June, 1992 labelled themselves as "for hire" even though they were predominantly private (ie, hauling their own goods). Many private carriers have now obtained motor carrier authorities and are using these to solicit freight to fill otherwise empty miles. In telephone interviews, a good number of these "primarily" private carriers now label themselves as "for-hire." However, the final column of Table 1.1 classifies carriers according to the major source of their business.

EVALUATION PROCEDURES

The following is a sequential listing of the motor carrier evaluation procedures as implemented:

Preliminary Telephone Interview

The original 57 carriers were telephoned in June 1992 and asked a series of questions (eg, class of carriage, number of trucks, modem availability, etc.)

Develop/Pre-Test Case StudyEarly-Stage Interview Instruments.

Survey instruments -- orientation package, discussion tools, early-stage survey, and a driver input survey -- were developed and pretested with small groups of carriers in July and August of 1992.

TABLE 1.1: Selection of Case-Study Carriers

	Fleet distribution Arthur D. Little	Target Case Study Distribution	Carriers Participation by original Classification	Final Distribution of Case-Study Carriers
for-hire				
general freight				
- large	0.3%	1	1	4
- small & medium	10.5%	2	3	2
special commodity				
- large	0.1%	1	1	0
- small & medium	26.6%	3	4	2
		....	--	....
sub-total	37.5%	7	9	8
private				
general freight				
- large	0.4%	1	4	7
- small & medium	36.4%	6	0	2
special commodity				
- large	0.3%	1	5	1
- small & medium	25.4%	3	1	I
		-----		
sub-total	62.5%	11	10	11
		==	==	- -
Total	100.0%	18	19	19

Orientation Package and Case-Study Solicitation

The 42 carriers indicating modem access or potential modem access to the Crescent database were mailed an orientation package in August, 1992 with a covering letter explaining the planned evaluation procedures. This was followed with telephone calls to solicit case-study participation, starting first with carriers with modems and access already in place.

Driver Case Study Recruitment Letters.

Letters were sent to case-study carriers in August, 1992 asking them to nominate one driver to evaluate bypassing at Woodburn SB.

Develop/Pre-Test All-Carrier Survey

A survey for non-case-study carriers was developed and tested (Tacoma, three carriers) in September, 1992.

Case-Study Early-Stage Visits and Interviews.

From September to November, 1992, visits were made to 19 case-study carrier offices. The interview format included a "discussion tools" package, a Crescent database access manual, a pre-evaluation survey form and duplicate driver recruitment letters.

Case Study Descriptions and Follow-up Letters.

Field notes developed from the first-stage interview were mailed out to 18 case-study carriers in November, 1992 asking for corrections and/or comments. (One of the case-study carriers had already dropped out prior to this point)

All-Carrier Survey

A survey was mailed to non-case-study carriers in February, 1993. A copy of this survey form, which was subsequently also used as a guide to the second interviews with case-study carriers, is contained in Appendix A. Driver monitoring materials were also included in the survey mailings. Telephone follow-up was initiated in March 1993 to encourage survey response.

Case Study Monitoring.

From November 1992 to April 1993, contact was maintained with case-study carriers by periodic telephone calls. The purpose of these calls was to maintain interest in the transponder-monitoring program that had to be delayed while carriers waited for replacement transponders.

Driver Monitoring.

As a result of "pre test" comments from motor carrier managers, drivers from both case-study and non-case-study carriers were asked to record their experience, tune-requirements and opinions related to weigh-scale bypassing. The only scale where this was feasible during the evaluation program was Woodburn southbound. (Woodburn northbound did become operational during the evaluation. However, because it was not open continuously and because it bypasses any legal-weight truck which WTM scales indicate is 80,000 pounds or less, it was not considered representative of a fully implemented weigh-scale bypass application.)

Second-Stage Interviews.

All case-study carriers with continuing participation in the Crescent demonstration were visited a second time during the months of March to May, 1993. The purpose of these visits was to: (1) collect and inspect the monitoring forms; (2) complete a survey (portions of the All-Carrier survey); (3) collect any driver-evaluation forms that had been completed, and (4) record any other opinions/views the case-study carriers offered.

<u>All Carrier Interviews</u>.

Also during the period of March to May 1993, 35 non-case-study carriers were visited. These visits were either to clarify information submitted on the All-Carrier survey or to, in effect, complete the All-Carrier survey during the interview.

<u>Carrier Descriptions and Follow-up Letters</u>.

Descriptions of 57 carriers were prepared. For those classified as "participating," the material was mailed to each individual carrier for review and comment. All 57 "Field Note" descriptions -- 52 participating carriers plus five case-study carriers that dropped out of the Crescent demonstration -- are contained in Appendix C, which, because of its size, is packaged as Volume 2.

<u>Analysis</u>.

From May to June, 1993, all information collected from 57 carriers was entered into a database and analyzed. This report stems from that analysis. A guide to the database developed from the surveys and interviews is contained in Appendix B.

PARTICIPATING CARRIERS

Table 1.2 recaps carrier participation stratified by state of "home base" in six groupings as described below.

TABLE 1.2: Carrier Contact Status Summary

	Case Study, 2 visits	Survey + visit	Survey, no visit	Visit	Sub Total Participating Carriers	Case Study, 1 visit	No survey, no visit	Total
WA	2	1	0	6	9	1	1	11
OR	5	5	0	7	17	2	2	21
CA	3	2	1	7	13	1	0	14
AR	2	1	0	1	4	0	0	4
NM	0	0	0	0	0	0	0	0
TX	2	1	2	4	9	1	0	10
Total	14	10	3	25	52	5	3	60

<u>Group 1</u> consists of 14 case-study carriers for which the evaluation process included an initial orientation visit (autumn '92), a series of telephone conversations (winter of '92/93), and a final evaluation visit (spring '93):

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Albertson's Inc., Portland, Oregon
Chevron, San Ramon, California
Domino's Pizza, Kent' Washington
Frito-Lay, Casa Grande, Arizona
Interstate Distributor, Tacoma'
  Washington
Nickel Plate Express, Eugene, Oregon
PLXPRESS Inc, Wilsonville, Oregon
Tabor Truck Lines, W. Sacramento,
  California

Texas Instruments, Dallas, Texas
Thrifty Corp., Ontario, California
Timber B-Products, Albany, Oregon
Tyler Pipe(Swan Transportation), Tyler,
  Texas
United Parcel Services, Phoenix, Arizona
Wilhelm Trucking Company, Portland,
  Oregon

Group 2 consists of 10 carriers that completed a survey and then agreed to a follow-up meeting to clarify details:

Baxter Health Care, Ontario, California
Bi-Mart Corporation, Eugene, Oregon
Food Express, Inc, Arcadia' California
Frito-Lay, Vancouver, Washington
FTL Inc, Portland, Oregon
Reed's Fuel & Trkng, Springfield, OR

TNT. Bestway Transportation, Phoenix, AZ
United Grocers, Inc, Medford, Oregon
Willamette Industries Inc/Beaverton Bag,
  Beaverton, Oregon
Zero Motor Freight, San Antonio, Texas

Group 3 consists of three carriers that completed a survey but that were not visited:

Frito-Lay, Fontana, California
Merchants Fast Motor Lns, Abilene,
  TX

Oil Transport' Abilene, Texas

Group 4 is made up of the 25 carriers that did not complete a survey but did agree to a visit in the spring of 1993 (during the course of this visit' a survey was completed):

Calzona Tankways, Inc, Phoenix, AZ
Cardmore Trucking, Central Point, OR
Central Freight Lines, Waco, Texas
Condor Freight Lines, Goshen, CA
Domino's, Hayward, California
Domino's, Ontario, California
Frito-Lay Inc, Modesto, California
Gordon Trucking Inc, Sumner, WA
Gresham Transfer Inc, Portland, OR
Husky Crane Inc., Stockton, CA
Inco Express Inc, Seattle, W
KMD, Auburn, WA
Mark Woods Trucking/Wildwood
  Express Inc., Kingsburg, CA

Market Transport, Portland, Oregon
Parkway Transport, San Antonio, Texas
Post Trucking/Post & Sons Transfer,
  Tacoma' WA
Provisioners Express, Auburn, WA
Ralph Wilson Plastics, Temple, Texas
Refrigerated Transport, Texas
Risberg's Truck Lines, Portland, OR
Sessler Inc., Eugene, Oregon
TNT Reddaway Trk Lns, Clackamas, OR
Troutman's Emporium Inc, Eugene, OR
Veneer Chip Transport, Tacoma' WA
Wiegand Button Motor Express, Inc, Dixon,
  CA

The 52 motor carriers in Groups 1 through 4 constitute the "participating carriers" for this report. For evaluation purposes, "non-participating" carriers include those from which evaluation information was unattainable for one reason or another. These include:

Group 5 is made up of the five case-study carriers that dropped out of the evaluation prior to the second-stage interview (one actually dropped out at the start of the first visit):

Haney Truck Line, Inc., Yakima, WA   Leather Center, Carrolton, Texas
KKW Trucking, Pomona' California   United Groceries, Portland, Oregon
L.S. Transport' Prineville, Oregon

Group 6 consists of three carriers that did not complete a survey and could not be visited within timing/schedule limitations

Sherman Bros. Trucking, Eugene, OR   T & K Products, Portland, Oregon
Washington Trucking Inc, Everett' WA

The count of 60 carriers participating in the Crescent demonstration may differ from numbers published elsewhere since:

·   UPS was counted only once and represented in the evaluation by the Arizona fleet even though fleets in WA, OR and CA also participated.

·   Some companies shown on other lists as separate entities have been combined (eg, Mark Woods Trucking and Wildwood Express) as they have common ownership and management.

METHODOLOGICAL CONSIDERATIONS

There are three considerations in using information developed from this evaluation: the weighting of the responses; the extrapolation of the results; and the quality of the information collected and contained in the database.

Weighting: In this report' statistics are presented showing carrier's opinions on aspects of HELP and/or the Crescent demonstration. These are presented either as the "percent of respondents", i.e., "26 out of 52 carriers or 50 percent think . . . ," or as "percent of participating carrier power units." The second measure weighs the responses in terms of the size of a motor carrier as measured by trucks. This "weighted" response is used in many of the following tables to give recognition to the importance of carriers with large fleets. For the very large firms (TNT,

UPS) only the number of trucks at the facility included for-study are used in the weighting. For example, UPS is given a weight of 252 as this is the number of class 7 and 8 power units based in Phoenix. While this weighting gives more recognition to the large carrier's opinions, it is recognized that there is still a potential problem. Specifically, it gives more weight to LTL (less than truckload) carriers than TL (truckload) carriers. LTL carriers also typically have a large number of P&D (pick-up and delivery) trucks in their fleet. Ideally, the weighting should have been constructed so as to weight the responses using only the number of linehaul trucks or tractors -- that is, the equipment actually in "over-the-road" service. Most of the P&D units were screened out but some undoubtedly remain.

Extrapolation: Whatever measure is used to weight (or not weight) the responses, it is not appropriate to extrapolate the figures in this report to the entire motor carrier industry. First' the 60 or so carriers agreeing to participate in the demonstration were not drawn from a random sample. One might logically suspect that carriers agreeing to participate are "biased" one way or another towards the technology. Second, within the group of 60 carriers, a total of eight are eliminated as "non-participating." Some dropped out for reasons having nothing to do with HELP/Crescent (eg, management change). However, in several cases, the decision not to participate was explained on the grounds that HELP was not providing the carrier with what had been expected. Therefore, some negative views about HELP/Crescent are already screened out when percentages are based only on the 52 participating carriers. Because of this inability to extrapolate to the entire trucking industry, the findings in this report should be seen only as "possible indicators" of what the industry as a whole might think.

Quality: The information in the database may not be entirely "clean." Problems occur for a number of reasons. The following illustrate this point:

(1) Changes over time. Information was collected at a given point of time from each carrier, even though things are continuously changing. For example, fleet size is constantly changing and, for some carriers, the recorded number may be for September 1992 whereas for others it may be for May 1993.

(2) Different information from different people. Information collected that depended on views or opinions varied somewhat according to the respondent. An example of this is one carrier where the first interview was with the President who said he needed AVI data for tracking trucks and monitoring the routes his drivers used. At the follow-up meeting, the person designated for the interview worked in the dispatch office. He wanted AVI data to help him check drivers' log books and to estimate the time of arrival of his trucks at the company stores. One company; two different people; two different views on how HELP

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AVI data would be used. (In the database, all four uses for AVI data have been coded for this carrier.)

(3)   The qualitative nature of the responses. In many cases there is a qualitative aspect to the responses that is difficult to capture as a number in a database. A good example is the response "Yeah, we might use it" to the question: "Would you use HELP's AVI data?". It is not clear that this response really indicates much interest in use of the Crescent database for fleet management purposes.

(4)   Missing or "Unknown" Values. In several cases, it was not possible to obtain all the information desired. Some of the visits, particularly those where a survey was completed during the interview, were rushed – either at the request of the respondent or, in some cases, because the respondent was on active duty during the interview (eg, continued to answer the phone, dispatch trucks or weigh trucks). In other cases, the person interviewed was not knowledgable concerning all of the requested information.

In addition there may be an occasional coding or tabulation error in the database and the tables presented here. Care has been taken to prevent this, but given the size of the database and the qualitative nature of many of the responses, it is difficult to guarantee that all such errors have been eliminated.

CHAPTER 2. CHARACTERISTICS OF PARTICIPATING CARRIERS

INDUSTRY COMPONENTS

Several characteristics of the 52 participating carriers are shown in Table 2.1. Carriers are classified by such factors as the primary commodity hauled or by other characteristics describing the majority of their operations. For example, there are 28 carriers operating "primarily" short-haul routes and these carriers have 2,404 trucks. This is not the same as saying there are 2,404 trucks operating on short-haul routes.

In terms of the jurisdictional nature of their operations (intrastate, interstate or international) carriers are classified by the highest order: that is, a carrier operating intrastate, interstate and international routes is classified as "international." "Long haul" means trips of overnight duration (more than one driving shift). Large carriers, which are clearly national or international in scope, are classified as "short haul" if trips are dispatched so that drivers return to their home base every day.

The last column of Table 2.1 shows the average number of power units for each carrier category. Notice that there are significant differences; i.e., for-hire vs. private, LTL vs. TL, intrastate vs. others. These differences will be reflected in and influence the fleet-weighted statistics presented in later sections.

FLEET COMPOSITION

Details on the fleets of these 52 carriers are shown in Table 2.2. How the trucks are equipped and the fleet managed are somewhat related to each carrier's unique operation. Integration of owner-operators seemingly suggests greater equipment diversity and more reliance on driver discretion. Unless otherwise indicated in the text' the term "truck" is used to mean class 7 and 8 straight trucks and road tractors.

TRANSPONDERS INSTALLED

In Table 2.3, the number of transponders is shown. In the March-to-May 1993 time frame (when the information was collected), carriers participating in the Crescent project had installed only 1,071 replacement transponders, about two-thirds of those issued. Some of the 12 carriers that had not installed replacement transponders had lost interest in the Crescent demonstration project. In addition, as far as it was possible to determine, none of the non-participating carriers had installed replacement transponders, bringing the total to 20 carriers out of 60 that had effectively dropped out of the Crescent demonstration.

TABLE 2.1: Classification of Participating Carrier

	Number of Carriers (52)	Number of Class 7 & 8 Power Units (7,182)	Power Units per Carrier
1. Class of Carriage			
- for hire	32	6,363	199
- private	20	819	41
- exclusively private	12	483	40
- private with for-hire authority	8	336	42
2. Commodity			
- general freight, LTL	10	2,033	203
- general freight, TL	25	2,807	112
- general freight, LTL & TL	2	566	283
- temperature controlled	4	815	203
- liquid (tank)	3	375	125
- bulk (hopper, dump, etc.)	6	512	85
- heavy haul	2	74	37
3. Jurisdictions			
- intrastate	5	279	56
- interstate	39	5,404	139
- international	8	1,499	187
4. Length of Haul			
- primarily short haul	28	2,404	86
- primarily long haul	21	4,488	216
- mixture of short & long haul	3	290	97
5. Nature of Routes			
- primarily regular	27	3,281	122
- primarily irregular	21	3,564	170
- mixture of regular & irregular	4	337	84
		Transponder -Equipped Trucks	
6. Crescent Segments Operated			
- Washington	34	637	19
- Oregon	38	706	19
- California	41	899	22
- Arizona	25	729	29
- New Mexico	16	417	26
- Texas	15	464	31

TABLE 2.2: Participating Carrier Fleets

	Carriers with Fleet Information	Power Units				Trailers*
		Total (class 7 & 8)	Company owned	Full service lease	Owner-operator	
WA	9	1,736	966	135	635	3,506
OR	17	1,530	1,187	156	187	3,067
CA	13	599	471	128	0	877
AR	4	711	656	55	0	1,973
NM	0	0	0	0	0	0
TX	9	2,606	1,728	0	878	2,749
Total	52	7,182	5,008	474	1,700	12,122

* Trailer numbers are estimated in 40 cases: the actual number is likely much higher than the figures shown.

TABLE 2.3: Participating Carrier Transponders

	Transponders Issued*	Replacement Transponders Installed*	Carriers Not Installing Replacement Transponders**
WA	438	169	3
OR	361	339	4
CA	179	142	2
AR	195	174	1
NM	0	0	0
TX	266	247	2
Total	1,439	1,071	12

* Information was supplied by respondents; sometimes this differed from Lockheed records.
** At the time of the visit or at the time the information was collected.

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FLEET MANAGEMENT ASPECTS

Fleet management practices are important in understanding a motor carrier's views on potential HELP applications. Details are shown in Table 2.4. Again, carriers and the associated trucks are grouped by categories representing broad characteristics. For example, 22 carriers had some or all trucks equipped with electronic engines. These carriers have 3,827 trucks, which is not the same as saying that there are 3,827 trucks with electronic engines. Notice again the average power units associated with each category. Satellite tracking and driver communication each show some interesting extremes.

Any demonstration use of Crescent data for fleet management purposes requires a modem in most cases. Only 11 of the 52 participating carriers are known to have obtained modem access to the Crescent database and to have used this access. In fact, there are even fewer than 11 carriers that are using a modem on a regular basis to access the Crescent database. (The precise number is unknown but is probably in the range of a half dozen.) Most carriers are relying on Lockheed's bi-weekly "hard copy" report to view information contained in the Crescent database. If Lockheed had not taken the initiative to provide these reports, it is probable that very few carriers would have had any direct contact with the database contents.

TABLE 2.4: Participating Carriers Fleet Management

	Number of Carriers	Number of Class 7 & 8 Power Units	Power Units per Carrier
1. OBCs			
- on some or all trucks	19	2,492	131
- no trucks	29	3,654	126
- no information *	4	1,036	259
2. Electronic engines			
- on some or all trucks	22	3,827	174
- on no trucks	4	113	28
- no information *	26	3,242	125
3. Satellite tracking/communications			
- on some or all trucks	2	830	415
- will possibly acquire	6	925	154
- on no trucks	44	5,427	123
- no information	0	0	0
4. Other monitoring devices			
- on some or all trucks	11	1,408	128
- on no trucks	37	5,510	149
- no information	4	264	66
5. Logs prepared electronically			
- yes (some or all)	11	1,131	102
- no	32	4,031	126
- no information	9	2,020	224
6. Driver communications			
- call-in (most trucks)	31	5,289	171
- cellular phone (most trucks)	5	186	37
- radio phone (most trucks)	7	507	72
- satellite (most trucks)	2	830	415
- mixture of call-in, cellular, radio phone	3	158	53
- no regular procedure	3	142	137
- no information	1	70	70
* This includes two fleets of owner-operators (890 trucks) where the decision as to what equipment and/or engines to use is up to the owner-operator.			

CHAPTER 3. USE OF AVI (ONLY) DATA

INFORMATION REQUESTED

Respondents were asked how they would use information from HELP if all it consisted of were the following:

- truck identification,
- location (e.g., Crescent site), and
- time.

This would be the information in the database if only AVI readers were installed along the highways, at weigh scales or at POEs (ports of entry). The question was asked in an "open format" -- that is, rather than having a list of possible uses to check "yes" or "no," respondents were simply asked to describe any uses they thought would be of interest. The purpose in asking this question was to record what respondents said. No judgment about the feasibility of these uses was made. For example, it is not known if HELP data could be used to dispute charges made by state enforcement officers.

RESPONSES

Table 3.1 provides a summary of the responses. The numbers and percentages under "Interest in the Use of AVI Information" are not additive as one respondent may have indicated several uses. While judgment had to be used in coding the responses, the possible uses mentioned by motor carriers have been classified with one of the following seven broad areas.

Log checking.

Nineteen respondents are interested in using the observations from AVI installations to verify that a driver completes a log book correctly. For example, if a driver records an "off duty" status between midnight and 6:00 am, the truck should not be observed passing through an AVl point during this period if the log is accurate. Generally, respondents who were interested in log checking are not concerned with the manner in which they obtain the data (modem versus periodic hard copy report) or with the polling frequency.

Tracking/locating.

This potential use of AVI data is noted where the respondent indicated it would be useful to be able to find a driver or a truck at a particular time. The 16 respondents who are interested in this tend to be concerned with the manner in which they can access the data (preferring modem) and the polling frequency (generally favoring something shorter than the current two hours).

TABLE 3.1: Potential Uses of AVI Data

	Interest in the Use of AVI Information			
	carriers	%	**trucks**	%
Use for AVI data indicated:	35	67.3	4,241	59.0
1 log checking	19	36.5	2,065	28.8
2 tracking/locating	16	30.8	2,260	31.5
3 ETAs	14	26.9	2,423	33.7
4 checking routes	8	15.4	1,444	20.1
5 speed monitoring	4	7.7	229	3.2
6 accident investigations	3	5.8	238	3.3
7 disputing citations	2	3.9	31	0.4
No use for AVI information:	17	32.7	2,941	41.0

ETAs.

Fourteen respondents are interested in AVI observations for estimating arrival times. In the case of a private carrier, this could be where the central supply depot wants to be able to advise stores when to have a crew ready to unload a truck. In the case of a for-hire TL carrier, this could be where a carrier is supplying a factory on a JIT (just in time) basis. Modem access to the HELP database and a relatively frequent polling of AVI readers are important for this potential use of the information.

Checking Routes.

Eight respondents are interested in AVI data as a means of determining which highways drivers use. In some companies, the choice of routes is entirely up to the driver, but in other companies managers prefer -- and sometimes insist -- that drivers use a particular highway.

Speed Monitoring.

Four respondents are interested in using AVI data for checking driver's speed. To do so, they would have to calculate the elapsed time between two points. This raises an issue brought up by two respondents: are the times noted in the Crescent database sufficiently well synchronized to calculate these speeds accurately? While it is understood that there may be a problem with synchronizing times in the HELP installations, this particular issue was not investigated in this evaluation.

Accidents.

Three carriers suggest they could use AVI data in conducting a post-accident investigation. According to one respondent' any information which allows a company to determine a driver's performance in the hours preceding an accident is valuable. Presumably, AVI data would allow an investigator to determine such things as the hours a driver had been on the road, the speed or changes in speed that occurred and maybe a few other things.

Citations.

Two respondents are interested in AVI data as a means of disputing alleged infractions of regulations. For example, one respondent claimed that a driver had been charged with an infraction on his log book. Both the respondent (the president of the company) and the driver were convinced the enforcement officer was mistaken but' apparently, had no means of proving this. They believe that AVI data could have been used to show when the truck had passed a certain point and, therefore, would have been able to counter the officer's allegations.

ASSESSMENT MODEL

General Observations.

These seven potential uses, plus a number of minor possibilities not coded, interest 35 of the 52 participating carriers. Even so, they account for 59.0 percent of the trucks. The remaining 17 carriers, accounting for 41.0 percent of the fleet' have no interest in AVI-only data for any aspect of their operations. (This does not rule out their interest in AVI data coupled with WIM data.)

TABLE 3.2: Potential Uses of AVI Data By Type of Motor Carrier

	Interest in the Use of AVI Information (% weighted by number of power units)							
	LOGs	TRACKING	ETAs	ROUTES	SPEED	ACCIDENTs	CITATIONs	NO USE
All Carriers (52)	28.8	31.5	33.7	20.1	3.2	3.3	0.4	41.0
For-hire (32)	27.6	32.3	35.2	20.1	1.6	2.7	0.5	40.8
Private (20)	37.5	25.0	22.3	20.4	15.3	8.3	0.0	42.3
Short Haul (28)	16.9	21.0	10.4	29.5	2.3	0.0	1.1	43.6
Long Haul (21)	30.5	35.3	43.1	16.4	1.3	2.7	0.1	42.2
Regular route (27)	7.6	19.5	18.5	22.0	7.6	2.1	0.8	**54.6**
Irregular route (21)	44.0	39.4	44.9	20.2	3.0	4.8	0.1	32.2
Intrastate (5)	0.0	17.2	0.0	0.0	0.0	0.0	11.1	**71.7**
Interstate (47)	29.9	32.0	35.1	20.9	3.3	3.5	0.0	39.7
For-hire, long haul, irregular route, interstate (13)	47.1	41.6	**53.1**	20.7	1.6	5.5	0.0	29.8
With OBCs (19)	20.6	17.8	17.3	34.2	0.0	0.0	1.0	41.4
With Electronic engines (22)	19.7	37.1	29.0	21.4	1.4	0.0	0.0	43.4
With Satellite tracking (8)	30.0	40.2	30.0	30.4	0.0	0.0	0.0	**59.8**
Commodity:								
-gen. freight, LTL (10)	0.5	25.8	20.9	30.2	2.7	0.0	0.0	43.8
-gen. freight, TL (25)	**55.2**	46.9	47.4	20.3	2.4	6.7	1.1	35.1
-gen. freight, LTL & TL (2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**100.0**
-temperature controlled (4)	19.5	10.2	**75.8**	0.0	0.0	0.0	0.0	14.9
-liquid (tank) (3)	0.0	0.0	6.7	6.7	0.0	0.0	0.0	**93.3**
-bulk (hopper, dump, etc.) (6)	**58.0**	**65.8**	0.0	46.1	11.1	0.0	0.0	5.5
-heavy haul (2)	**67.6**	0.0	32.4	0.0	**67.6**	**67.6**	0.0	0.0
Group 1 (2 visits) (14)	29.0	5.2	12.0	18.3	11.7	7.9	0.3	**68.1**
Group 2,3,4 (38)	28.7	38.4	39.4	20.6	1.0	2.1	0.5	33.8

<u>Component Analysis.</u>

To analyze this in more detail, Table 3.2 breaks the responses into a number of categories and, to show this information compactly: (1) the axis has been rotated in comparison to Table 3.1; (2) only the fleet-weighted percentages are shown; and (3) the headings for the seven potential uses have been shortened. (Percentages of 50 or larger are shown in bold face.) This tabular format provides an excellent means of portraying the variability of responses as related to various industry characteristics. As a result, it is used extensively throughout the balance of this report.

The following is an interpretation and explanation of the rows in Table 3.2 -- that is, the various sub-categories of the 52 carriers. This information constitutes the "glossary" for and key to interpreting all subsequent tables similarly presented.

<u>All Carriers</u>. The first row repeats the figures shown in the last column of Table 3.1 for ease of reference and to assist in interpreting the "row data" on Table 3.2.

<u>For-Hire versus Private</u>. The next two lines of Table 3.2 separate for-hire from private motor carriers. (Private carriers with for-hire authority are grouped in with "Private" in this case.) It is not clear that there is much difference between the two rows. A weak observation may be that private carriers appear to be slightly less inclined to use AVI data than for-hire carriers.

<u>Length of Haul</u>. The next two lines of the table divide the 52 carriers according to the length of their hauls. (Three carriers with a mixture of long and short hauls have been omitted.) Carriers with long routes are somewhat more inclined to see uses for AVI data than carriers with shorter routes -- even so the proportions are so close that this observation is also "weak." The one difference that is apparent is that long-haul carriers see more of a use for AVI data for tracking and ETAs than do the short-haul carriers.

<u>Regularity of Routes.</u> The next two lines divide the sample according to how regular their routes are. Four carriers with a mixture of regular and irregular routes have been omitted. As shown, carriers with irregular route structures are more inclined to see uses for AVI data than those carriers with regular routes.

<u>Intra versus Interstate.</u> The next two rows compare intrastate with interstate carriers. (International carriers have been included with interstate.) The figures indicate there may be a tendency for interstate carriers to see more use for AVI data than for intrastate carriers.

<u>For-hire. Long Haul. Irregular Route. Interstate Motor Carriers.</u> In the next line of Table 3.2, all factors indicating a greater chance of using AVI data to this point are pulled together. The group of 13 motor carriers satisfying the criteria – for-hire, long haul, irregular route, interstate -- are, presumably, the ones with the greatest use for AVI data.. This is borne out by the figures shown -- 70.2 percent of the total, as measured by power units, have some use for AVI information (i.e., 100 minus the 29.8 in the last column).

Fleet Management: The next three rows show aspects of fleet management and the related views on the use of AVI information. Where information was not available on a carrier's fleet management, these carriers have been omitted from the percentages shown. The more definitive of the alternate conditions is shown. Carriers that use onboard computers (on most of their fleet) are more inclined to see a use for AVI data than those carriers without OBCs (58.6% versus 49.7% as weighted by the number of trucks). Carriers with electronic engines (or, strictly, with electronic engines on some trucks) are also more inclined to see a use for AVI data than those without. But, carriers who either have satellite tracking/communications services or who are considering acquiring such services are less inclined to see a use for AVI information than those carriers with no satellite tracking/ communications services. The only two carriers that now have satellite service both suggested that C&scent AVI data was not usable for their operations. (In fact, at the completion of the evaluation visits to both of these firms, the respondents inquired as to when they could drop out of the Crescent demonstration.)

Commodity. The next seven rows show how carriers carrying various commodities feel about AVI information. Sweeping conclusions on the basis of this information are not advisable as the number of firms within some categories is small. Further, it may be that factors in the earlier part of the table -- irregular route versus regular, fleet management, etc. -- are more important in determining a carrier's views on AVI than the particular commodity hauled. This caveat aside, the information seems to indicate that truckload carriers see more uses for AVI data than other carriers. (This tends to be the same group of carriers identified above as "for-hire, long-haul, irregular route, interstate.")

Case-Study Carriers: Finally, in the last two rows, the proposition that case-study carriers will have a different view of AVI than other carriers is tested. The figures seem to suggest that familiarity with AVI information in the Crescent database gave carriers a more negative view about potential uses.

CHAPTER 4. USE OF AVI/WIM DATA

INFORMATION REQUESTED

Following directly after the discussion about AVI data, respondents were asked if they could think of any other uses for HELP information if, in addition to AVI readers, all sites included WIM scales. Again, the question was asked in an "open format" framework and it was only after the information was collected that an attempt was made to categorize it.

During many interviews, the subject of the accuracy of WIM scales was raised. This is a genuine concern and must be dealt with. However, in their response to the question, respondents were told to assume that all accuracy issues had been resolved.

GENERAL OBSERVATIONS

Table 4.1 summarizes the responses to the question "Would you use AVI/WIM information from the HELP database?" Thirty-seven (7 1 %) of the respondents indicated they could see a use for AVI/WlM data; 15 (29%) indicated they had no use for it. These figures, however, give a misleading picture. There are a large number of respondents who would be more accurately characterized as "mildly interested" in AVI/WIM information. In the database, there is no distinction between those who said "Yes, we really need that information and would use it on a daily basis" and those who replied "Well, if it was available, we might look at it from time-to-time."

The possible uses mentioned by the respondents fall into three broad areas related to axle loads, speed, and GVW (gross vehicle weight).

<u>Axle Loads</u>.

Twenty-three of the 52 carriers indicated an interest in information on axle loads. Although there may be overlapping in what follows, an attempt has been made to further sub-divide this interest.

<u>Driver Responsible for Loading</u>. Six carriers are interested in axle-load information because drivers are responsible for loading trailers in such a manner as to achieve legal loads on all axles. Sometimes this is for all loads, sometimes it is only on backhauls. Drivers generally have to pay any fines that are levied if overloaded axles are detected. While it is not clear that the six respondents thought the possession of axle-load information through a HELP database would prevent a fine being levied ("once the truck is on the highway and we see an overloaded axle, there isn't a lot we can do."), they did think the information would help in monitoring drivers.

Someone Else Responsible for Loading. Six carriers are also interested in axle-load information because someone other than the driver -- another terminal, a shipper, etc. -- is responsible for loading the trailer.

TABLE 4.1:   Potential Uses of AVI/WIM Data

	Carriers Indicating an Interest in the Use of AVI/WIM Information			
	Carriers	%	Trucks	%
Use of AVI/WIM data indicated:	37	71.2	5,107	71.1
axle weight data	23	44.2	3,203	44.6
a) driver loading	6	11.5	168	2.3
b) others loading	6	11.5	1,846	25.7
c) 5th wheels	3	5.8	337	4.7
d) violation matters	4	3.3	238	3.3
e) analytical	6	11.5	1,129	15.7
speed monitoring	22	42.3	2,784	38.8
gvw data	7	13.5	1,645	22.9
a) weight-distance tax	3	5.8	895	12.5
b) shipper loads	3	5.8	725	10.1
c) other	1	1.9	25	0.4
No use for AVI/WIM	15	28.9	2,075	28.9

Drivers Moving Fifth Wheels. Three respondents raise the issue of drivers moving fifth wheels either after they leave the terminal or after passing through a weigh scale. This can result in overloaded drive axles and the three respondents want a means of spotting the practice. (Changing the location shifts weight to or from the front axle to improve the ride.)

Disputing Overweight Citations and/or Otherwise Using WIM data for Enforcement Purposes. Four carriers want WIM data to show enforcement officers that trucks are legally loaded. The most compelling of these four cases involves a tank operator who occasionally has a problem with an inexperienced weigh-scale official. This carrier would like the WIM data to show the officer that it is the sloshing creating the problem and not a real axle overload.

Analytical. Six carriers want axle-load information on a time-series basis so that they can spot trends and/or the source of problems. For example, one large LTL carrier with only the occasional axle-overload wants to be able to see if there is a pattern in terms of particular terminals or shippers that cause these problems.

Speed

Twenty-two carriers are interested in WIM data as a means of monitoring drivers' speed. Unlike AVI information, which can only be used to calculate speed between two points, AVI/WIM information shows speed, roughly speaking, at a point in time. Several respondents point out, however, that they could only use this information once to monitor speed. As drivers become aware of how speed is detected, they will quickly adjust their behavior as they pass over the HELP installations (which are quite visible to anyone who travels the I-5, I-10 or I-20 on a regular basis).

GVW

Only seven out of 52 carriers are interested in gross vehicle weight information available from WIM scales. The uses for this information have been further sub-divided as follows:

Oregon's Weight-Distance Tax: Three carriers want the information as a check on the calculation of the weight-distance tax in Oregon. They believe the use of such data will show that the tax they are paying is too high.

Shipper's Actual Loads. Three respondents want GVW information to see if shippers are really loading what they say they are loading. One of these is an LTL carrier where trucks are not regularly scaled. On occasion a shipper will load a fairly large shipment (5,000 to 15,000 lbs.) with a declared weight of somewhat less than what the carrier suspects is the true weight. The carrier wants WIM so that "extra heavy" shipments can be detected and so that shippers can be re-invoiced. In another situation, involving a private carrier, management has found itself in the situation of having inconclusive or conflicting information as to whether or not a load has been picked up. With the WIM data, the carrier feels he can quickly confirm whether or not the truck on the highway is loaded.

Other. One other carrier wanted GVW information for an unspecified reason.

COMPONENT ANALYSIS

In Table 4.2, the responses summarized in Table 4.1 are shown by various sub-classifications of motor carriers. Only the "truck-weighted" figures are shown, starting with the "all carrier" response in the first row (this is the same as the last column of Table 4.1).

The first eight rows -- for-hire/private, short/long haul, regular/irregular route, intra/interstate -- suggest that those most likely to be interested in AVI/WIM information are the for-hire, long haul, regular route, intrastate carriers. However, these relationships may be

TABLE 4.2: Potential Uses of AVI/WIM Data By Type of Motor Carrier

	Carriers Indicating an Interest in the Use of AVI/WIM Information (% weighted by number of power units)			
	AXLE WEIGHT	SPEED	GVW	NO USE
All Carriers (52)	44.6	38.8	22.9	28.9
For-hire (32)	47.5	39.3	23.4	27.7
Private (20)	22.2	34.5	19.2	38.1
Short Haul (28)	47.9	**53.4**	28.2	31.7
Long Haul (21)	40.8	26.8	21.6	29.2
Regular route (27)	**62.5**	**53.0**	22.1	27.8
Irregular route (21)	26.3	23.3	24.6	30.5
Intrastate (5)	12.2	**74.6**	14.3	1.8
Interstate (47)	45.9	37.3	23.3	30.0
Commodity:				
-gen. freight, LTL (10)	**90.9**	**74.6**	41.8	2.5
-gen. freight, TL (25)	37.3	21.2	34.5	20.5
-gen. freight, LTL & TL (2)	0.0	0.0	0.0	**100.0**
-temperature controlled (4)	10.2	0.0	0.0	**89.8**
-liquid (tank) (3)	6.7	**53.3**	6.7	40.0
-bulk (hopper, dump, etc.) (6)	24.6	**82.4**	0.0	0.0
-heavy haul (2)	**100.0**	**67.6**	0.0	0.0
Group 1 (2 visits) (14)	10.6	28.4	**53.8**	17.6
Group 2,3,4 (38)	**53.5**	41.5	14.8	31.9

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misleading in that the addition of WIM data to AVI information is probably of more interest to carriers according to the types of loads they haul rather than the nature of their routes.

The next seven rows of Table 4.2 group the carriers by commodities carried. As shown, there is an indication that LTL carriers and heavy-haul carriers are the ones most interested in axle-load information and that general freight carriers (both TL and LTL) have the most interest in gross weight information.

In the last two rows of the table, assuming that the case-study carriers actually did enough monitoring of the data so that their opinions are more informed, the numbers seem to indicate that the use of AVI/WIM data has tended to discourage carriers from thinking they can use axle-load information. On the other hand, the figures seem to indicate that the familiarity of the data has convinced more carriers that there are uses for GVW information.

The potential use of speed information from WIM scales is related to the amount of technology now employed in fleet management as shown in the following, truck-weighted responses:

Carriers	Percent of Group Indicating an Interest
with onboard computers	39.0%
without onboard computers	49.6%
with electronic engines	49.4%
without electronic engines	95.6%
with satellite services	0.0%
thinking of acquiring satellite services	37.9%
no satellite services	44.8%
with other monitoring devices (speed-o-graphs)	24.8%

These categories are not as concise as the above listing make them appear. For example, if a carrier indicated it had some new tractors with electronic engines, it was coded "electronic engines" in the database which is not quite the same as saying that all trucks in the fleet had electronic engines. Nevertheless, the figures suggest that the greater the use of existing sophisticated technologies, the less chance there is a carrier will be interested in speed information from HELP technology.

Another way of characterizing those firms that do or do not have a use for AVI/WIM information is to consider which ones scale their trucks (or otherwise know the weight of their loads) prior to a trip. This can only be done by considering a sub-sample of the carriers as scaling information was only obtained from 43 respondents. To summarize the scaling relationship, and dealing only with the truck-weighted responses:

- 59 percent of the carriers indicating an interest in axle-load information do not scale their trucks prior to a trip and

- 84 percent of the carriers with an interest in GVW information do not scale their trucks prior to a trip.

Carriers that do not generally scale their trucks tend to be LTL carriers or private truckload carriers hauling their own low-density freight on the front haul and a variety of for-hire freight on the backhaul. What these figures suggest' when compared to the percentages in the first row of Table \4.2, is that it is the practice of scaling or not scaling trucks which is probably the most important factor in explaining a carrier's views on the use of AVI/WIM information.

CHAPTER 5. CARRIER EVALUATION OF POTENTIAL APPLICATIONS

INFORMATION REQUESTED

After discussing how they might use AVI or AVI/WlM information, respondents were asked to rank and rate potential HELP applications. Nine potential applications were suggested:

- fleet management (e.g., tracking or scheduling a truck)
- driver management (e.g., checking log books or checking routes)
- reporting/auditing (e.g., data for fuel tax reporting)
- safety management (e.g., monitoring speed)
- check on loading (e.g., to spot axle overloads)
- private use of AVI (e.g., AVI readers at terminals)
- tracking stolen vehicles (e.g., with hidden transponders on trailers)
- regional one-stop-shopping
- bypassing weigh scales/POEs

It is difficult to ask questions that convey the same meaning to everybody. As a result, many respondents covered the same ground under "driver management" and "safety management" so there is probably little distinction between these two potential applications. For example, monitoring a driver's speed or ensuring that a driver is off duty after a certain number of hours could be either "driver management" or "safety management" depending on the respondent. Also, "regional one-stop shopping" means different things to different people and no standard definition was provided. As a simple explanation, respondents were told that "one-stop-shopping" simply meant a reduction in the number of agencies a motor carrier had to deal with because of the adoption of technology allowing vehicles to be identified electronically.

In addition to these nine potential applications, carriers were also asked their opinions on a "call home" capability being considered with one portion of the HELP technology (the express receivers being used in the Santa Nella demonstration). While this application is not included in the next few tables, it is discussed at the end of the chapter.

Ratings.

Carriers were asked to rate the nine potential applications in the survey using the following scores:

> 1 = valuable
> 2 = useful
> 3 = nice to have available
> 4 = questionable value
> 5 = no value

Table 5.1 provides an overview of the ratings assigned. The numbers shown are averages and they disguise much of the information collected (e.g., the dispersion about the mean). This diversity in the opinions of motor carriers is dealt with later as is the characterization of which kinds of motor carriers like or dislike particular applications.

TABLE 5.1: Summary of Carrier Rating of Potential Applications
Average Ratings (1 to 5, 5 = no value) 52 Respondents

	Average of Responses	Implied Rating
fleet management	2.4	Useful-Nice
driver management	2.4	Useful-Nice
reporting/auditing	2.5	Useful-Nice
safety management	2.4	Useful-Nice
check on loading	3.6	Nice-Questionable
private use of AVI	3.5	Nice-Questionable
tracking stolen vehicles	3.3	Nice-Questionable
one-stop shopping	2.6	Useful-Nice
bypassing	1.6	Valuable-Useful

One broad observation may be made on the basis of the averages shown in Table 5.1. It is apparent that -- with the exception of weigh-scale bypassing -- none of the potential HELP applications is highly regarded by the industry as a whole.

Rankings

After rating the potential applications, the respondents were asked to rank the potential applications starting with a "1" for the one they would chose first and ending with a "9" for the last application they would chose. In many cases, respondents did not complete this ranking process. Rather, they chose to rank only those applications they had rated a "1" or a "2" and simply left those they had rated lower blank. For the purpose of analyzing these responses, unranked applications are assigned a score of "10." (One of the surveys mailed to the WHI offices had misconstrued the intent of the ranking question and, therefore, the sample drops to 51 firms.)

Fleet-Weighted Ranking Scores.

The rankings have been converted to an overall percentage-type ranking score based on the size of fleet of each respondent in the following manner:

$$\frac{[(\text{fleet}) \ X \ (10)] - [(\text{fleet}) \ X \ (\text{rank})]}{[(\text{fleet}) \ X \ (10)] - [(\text{fleet}) \ X \ (1)]} \ (100)$$

In other words, with 6,982 trucks operated by the 51 responding carriers, a 100 score would occur if everyone ranked an application "1." Similarly, if everyone had ranked the application a "5," the overall rank would be 55.6.

These fleet-weighted rankings are shown in Table 5.2 along with the carrier-average rankings. In order to ensure the rankings are interpreted properly, consider weigh-scale bypassing. Using the fleet-weighted index, weigh-scale bypassing comes out on top with a score of 80.1 out of a possible 100 points. Giving each respondent an equal weight, the average rank of all 51 respondents is 2.8 on a descending scale from 1 to 10. This is also the highest ranking average of any of the potential applications.

APPLICATION ANALYSIS

To explore these ratings and rankings in more detail, the following sections look at each of these potential applications in turn. The procedure in the following nine sections is to examine the application by subdividing all 52 carriers in much the same manner as that demonstrated earlier. The discussion will be more limited, however since not all of the stratification leads to particularly relevant observations, only the significant portions are reported. The intent is to identify which groups of carriers rate which potential application high or low. In the sections which follow, each of the applications is discussed in descending order of the fleet-weighted rank.

TABLE 5.2: Fleet-Weighted versus Carrier—Average Rankings

Potential Application	Fleet-Weighted Score		Carrier-Average Rank	
	raw score (100 =highest)	relative rank	raw average (1 to 10) (1 =highest)	relative rank
bypassing	80.1	1	2.8	1
one-stop shopping	58.4	2	5.3	4
driver management	51.2	3	5.0	2
fleet management	48.7	4	5.6	6
safety management	47.5	5	5.2	3
reporting/auditing	43.7	6	5.4	5
private use of AVI	32.6	7	7.3	7
tracking stolen vehicles check on loading	32.1	8	7.5	8
	19.2	9	7.9	9

Bypassing Weigh Scales/POEs.

Using HELP technology to bypass weigh scales or ports-of-entry -- either in a scale bypass lane or in a mainline bypass system -- has an overall rank score of 80.1, the top of the list. as shown on Table 5.3, 60 percent of the respondents, representing 40 percent of the fleet, rated this application as "valuable."

TABLE 5.3: BypassingæRating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	31	59.6	2,868	39.9
2 useful	12	23.1	2,587	36.0
3 nice to have available	7	13.5	1,191	16.6
4 questionable value	2	3.9	526	7.3
5 no value	0	0.0	0	0.0

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TABLE 5.4: Bypassing—Rating By Type of Motor Carrier
(fleet-weighted ratings, 1 = valuable)

	Rating 1	2	3	4	5
All Carriers (52)	39.9	36.0	16.6	7.3	0.0
For-hire (32)	37.6	38.4	15.8	8.3	0.0
Private (20)	58.5	17.5	22.8	0.0	0.0
Short Haul (28)	59.7	6.7	11.7	21.8	0.0
Long Haul (21)	25.5	54.3	20.3	0.0	0.0
Regular route (27)	33.4	43.8	8.6	14.2	0.0
Irregular route (21)	41.5	31.3	25.5	1.7	0.0
Intrastate (5)	97.1	0.0	2.9	0.0	0.0
Interstate (47)	37.6	37.5	17.1	7.6	0.0
Commodity:					
-gen. freight, LTL (10)	34.4	60.7	4.9	0.0	0.0
-gen. freight, TL (25)	48.0	23.0	26.9	2.1	0.0
-gen. freight, LTL & TL (2)	0.0	0.0	17.7	82.3	0.0
-temperature controlled (4)	24.2	75.8	0.0	0.0	0.0
-liquid (tank) (3)	60.0	0.0	40.0	0.0	0.0
-bulk (hopper, dump, etc.) (6)	63.5	0.0	36.5	0.0	0.0
-heavy haul (2)	100.0	0.0	0.0	0.0	0.0

In terms of the information shown in Table 5.4, following, listed in descending order of significance, are the groups which see more or less value in this bypassing application:

More Value	Less Value
intrastate	interstate
special commodity	general freight
private	for-hire
short haul	long haul

The differences between other groups shown on Table 5.4 -- for example, regular vs. irregular route carriers -- are not great enough to include them on this list.

The position of the four groups included on the above list is, perhaps, somewhat surprising as it might be expected that the long-haul, interstate carriers would have the most to gain from weigh-scale bypassing. On this point, several qualifications to the above ratings should be noted: Two large for-hire carriers -- both long haul, interstate -- ranked weigh-scale bypassing as number "1" but neither rated the application as "valuable." These two carriers, with over 800 trucks

between them, both use satellite services and both asked to discontinue their involvement in the Crescent demonstration at the completion of the final evaluation visit. Another point is that there are only five intrastate carriers in the group of participating carriers. This is a small sample on which to draw any conclusions about intrastate carriers in general. Further, of these five, the four that rated bypassing as "valuable" are located in California (3) and Texas (1). None of them had demonstration experience with weigh-scale bypassing. This is noted, not because it invalidates the above characterization, but simply because it helps to clarify the apparently surprising finding that intrastate, short-haul carriers find bypassing more attractive than long-haul, interstate carriers.

Is there a difference in how carriers perceive weigh-scale bypassing based on their experience with the weigh-scale bypassing in the Crescent demonstration? Not an easy question to answer but there are at least two ways of approaching it.

First, the 52 carriers were divided into two groups: those operating transponder-equipped trucks through Oregon (the only state with a scale capable of weigh-scale bypassing during the evaluation) and those not operating through Oregon. The following shows the proportion of each group rating weigh-scale bypassing as "valuable:"

	Operating Through Oregon	Not Operating Through Oregon
carriers	57.9%	64.3%
trucks .	37.9%	44.1%

Weak evidence perhaps, but this may indicate that the carriers operating in Oregon with actual experience at Woodburn southbound (and, to a certain extent' northbound) are less enthusiastic about weigh-scale bypassing than those carriers that have only read about it.

Second, the 52 carriers were divided into two groups: those that supplied a driver-evaluation form (described later) and those that did not. The idea here is that those carriers that cooperated to provide driver-evaluation forms are at least more aware of and more familiar with the operation of Woodburn southbound. The following shows the proportions of these two groups which rated weigh-scale bypassing as "valuable:"

	Carriers Providing Driver Evauations	Carriers Not Providing Driver Evaluations
carriers	50.0%	61.4%
trucks	23.1%	42.9%

Somewhat stronger evidence that the carriers with actual experience with bypassing transponder-equipped trucks are less enamoured with the application than those with no experience.

Note that all of the above comments are based on an evaluation completed before Santa Nella – which is mainline bypassing -- became operational. This may be viewed as a significant enhancement and might suggest that the carrier opinions documented about bypassing are somewhat premature.

Regional One-Stop Shopping.

Using HELP technology to achieve one-stop shopping (whatever that meant to each respondent) has an overall rank score of 58.4, second from the top, but considerably lower than bypassing weigh-scales. About one-third of the carriers, measured either as the number of carriers or the number of trucks, rated this application "valuable."

Although it is not clear from Table 5.6 that there is a lot of significance to the differences, these are the carriers that see more or less value in the one-stop shopping application of HELP technology:

More Value	Less Value
gen. freight TL	gen. freight LTL
interstate	intrastate
irregular route	regular route

Since location may also be considered a factor in a carrier's views on one-stop shopping, the following shows the proportion of the fleet in each state where respondents rated this application a " l" or a "2."

TABLE 5.5: **One-Stop Shopping—Rating**

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	17	32.7	2,472	34.4
2 useful	14	26.9	2,336	32.5
3 nice to have available	5	9.6	383	5.3
4 questionable value	10	19.2	1,845	25.7
5 no value	6	11.5	146	2.0

TABLE 5.6: **One-Stop Shopping—Rating By Type of Motor Carrier**

(fleet-weighted ratings, 1= valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	34.4	32.5	5.3	25.7	2.0
For-hire (32)	33.1	34.5	4.8	26.0	1.6
Private (20)	44.3	17.0	9.8	23.6	5.4
Short Haul (28)	22.8	**58.0**	3.7	12.6	2.9
Long Haul (21)	38.0	19.5	6.6	34.4	1.7
Regular route (27)	24.0	41.2	2.7	29.9	2.1
Irregular route (21)	42.4	27.6	7.0	23.0	0.0
Intrastate (5)	0.0	**71.7**	0.0	16.1	12.2
Interstate (47)	35.8	30.9	5.6	26.1	1.6
Commodity:					
-gen. freight, LTL (10)	20.9	32.1	2.7	43.5	0.8
-gen. freight, TL (25)	**51.2**	10.7	5.3	31.2	1.6
-gen. freight, LTL & TL (2)	0.0	**100.0**	0.0	0.0	0.0
-temperature controlled (4)	14.9	**75.8**	0.0	0.0	9.3
-liquid (tank) (3)	46.7	**53.3**	0.0	0.0	0.0
-bulk (hopper, dump, etc) (6)	46.9	0.0	35.0	16.6	1.6
-heavy haul (2)	**100.0**	0.0	0.0	0.0	0.0

	fleet-weighted responses	
	valuable (1)	valuable and/or useful (1 or 2)
Total carriers (52)	34.4	66.9
Washington	40.1	51.0
Oregon	57.0	73.3
California	48.7	48.7
Arizona	8.9	100.0
Texas	21.0	69.0

Oregon carriers, apparently, see the most potential for this application. (Arizona is discounted since represented by only 3 carriers plus UPS.) While the majority of California carriers (as weighted by fleet size) do not see much value in this application, those that do all see it as "valuable."

Driver/Safety Management

Driver management has an overall rank score of 51.2 (third from the top) and safety management has an overall rank score of 47.5 (fifth from the top).

As explained, driver and safety management are combined in this section as respondents did not compartmentalize these two tasks as neatly as the survey form. (This may lead to a bias in the following assessment as the absolute rank score might have been somewhat higher had these two applications been combined in the original question on the survey.)

Table 5.7 shows the ratings for both of these potential applications. About one-third to 40 percent of the carriers, either measured by the number of respondents or the number of trucks, think that driver management and safety management are "valuable" applications.

From an aggregation of the information shown on Table 5.8 and 5.9, these are the motor carriers who see more or less value for driver/safety management applications:

More Value	Less Value
no satellite	with satellite
driver call-in	communications devices
intrastate	**interstate**
for-hire	private
gen. freight LTL	gen. freight TL

TABLE 5.7: Driver/Safety Management—Rating

	Respondents Rating			
	Carriers	%	Trucks	%
Driver Management				
1 valuable	20	38.5	2,876	40.0
2 useful	11	21.2	1,659	23.1
3 nice of have available	9	17.3	850	11.8
4 questionable value	5	9.6	100	1.4
5 no value	7	13.5	1,697	23.6
Safety Management				
1 valuable	18	34.6	2,509	34.9
2 useful	13	25.0	1,870	26.0
3 nice to have available	8	15.4	868	12.1
4 questionable value	7	13.5	799	11.1
5 no value	6	11.5	1,136	15.8

The sharpest division is between those carriers (2) with satellite services versus those without (44). Both carriers with satellite service rate HELP technology of "no value" in driver or safety management. The second clearest division is between 31 carriers that rely on drivers calling in (after delivering a load or at other times) versus the 14 carriers that have some form of communications technology (cellular phones, satellite, radio phones). Carriers without the communications technology see more potential for HELP technology. Finally, intrastate carriers (perhaps surprising, but based on a small number), for-hire carriers and LTL carriers see more potential for this application than do interstate, private and TL carriers.

(The distinction between carriers using onboard computers and those not use them was almost large enough to also be included on the above list. Carriers without onboard computers were slightly more inclined to see some value in driver/safety management applications of the HELP technology. However, using the criteria adopted, this distinction between the two groups of carriers was just not clear enough to warrant their inclusion on the above list.)

TABLE 5.8:   Driver Management—Rating By Type of Motor Carrier

(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	40.0	23.1	11.8	1.4	23.6
For-hire (32)	40.6	23.6	11.4	0.9	23.4
Private (20)	35.5	18.9	14.9	4.9	25.8
Short Haul (28)	38.0	27.2	23.9	4.2	6.7
Long Haul (21)	37.3	22.4	6.1	0.0	34.2
Regular route (27)	39.6	32.1	16.6	2.3	9.5
Irregular route (21)	38.2	14.8	7.4	0.7	38.9
Intrastate (5)	26.5	**71.7**	1.8	0.0	0.0
Interstate (47)	40.6	21.1	12.2	1.5	24.6
With OBCs (19)	48.3	5.4	5.0	2.0	39.3
No OBCs (29)	36.1	39.6	17.9	1.4	5.0
With Satellite (2)	0.0	0.0	0.0	0.0	**100.0**
No Satellite (44)	43.3	26.8	14.4	1.8	13.8
Driver Call-In (31)	46.2	25.7	10.5	1.2	16.4
Some Communications Tech (14)	12.6	19.6	13.3	0.0	**54.5**
Commodity:					
-gen. freight, LTL (10)	**53.2**	44.2	0.0	2.0	0.5
-gen. freight, TL (25)	**55.6**	5.5	9.9	1.3	27.8
-gen. freight, LTL & TL (2)	0.0	0.0	**82.3**	0.0	17.7
-temperature controlled (4)	0.0	9.3	10.2	0.0	**80.5**
-liquid (tank) (3)	0.0	0.0	**53.3**	6.7	40.0
-bulk (hopper, dump, etc.) (6)	35.7	**64.3**	0.0	0.0	0.0
-heavy haul (2)	**67.6**	0.0	32.4	0.0	0.0

TABLE 5.9: Safety Management—Rating By Type of Motor Carrier
(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	34.9	26.0	12.1	11.1	15.8
For-hire (32)	37.0	26.1	11.3	10.3	15.3
Private (20)	19.1	25.8	18.0	17.6	19.7
Short Haul (28)	41.4	13.7	28.1	9.1	7.7
Long Haul (21)	28.8	32.8	4.3	12.9	21.2
Regular route (27)	22.5	43.9	19.8	5.9	8.0
Irregular route (21)	43.6	9.9	6.2	15.7	24.6
Intrastate (5)	**83.9**	1.8	0.0	14.3	0.0
Interstate (47)	33.0	27.0	12.6	11.0	16.5
With OBCs (19)	41.5	12.4	0.0	6.8	39.3
No OBCs (29)	30.6	40.7	21.8	2.6	4.3
With Satellite (2)	0.0	0.0	0.0	0.0	**100.0**
No Satellite (44)	36.5	30.6	14.7	14.7	3.4
Driver Call-In (31)	42.4	30.4	10.1	11.7	5.3
Some Communications Tech (14)	7.5	11.3	14.9	11.8	**54.5**
Commodity:					
-gen. freight, LTL (10)	30.4	**60.7**	1.7	6.6	0.5
-gen. freight, TL (25)	**52.2**	10.4	7.7	3.7	26.0
-gen. freight, LTL & TL (2)	0.0	0.0	**82.3**	0.0	17.7
-temperature controlled (4)	10.2	9.3	0.0	**65.6**	14.9
-liquid (tank) (3)	**53.3**	0.0	0.0	6.7	40.0
-bulk (hopper, dump, etc.) (6)	18.2	**52.5**	29.3	0.0	0.0
-heavy haul (2)	**67.6**	0.0	0.0	0.0	32.4

Fleet Management

Fleet management has an overall rank score of 48.7, making it the fourth highest potential HELP application. In Table 5.2, fleet management is shown as the sixth from the top in terms of the unweighted responses. The difference between these two (fourth or sixth down the list) suggests that larger carriers tend to see somewhat more potential for HELP data in fleet management than do the small carriers.

TABLE 5.10: Fleet Management-Rating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	15	28.9	2,946	41.0
2 useful	18	34.6	2,019	28.1
3 nice to have available	7	13.5	836	11.6
4 questionable value	6	11.5	239	3.3
5 no value	6	11.5	1 142	159

As shown in Table 5.10, there is no clear consensus that fleet management potential is "valuable," but 33 carriers (63.5%) representing 69.1 percent of the total trucks of the participating carriers gave fleet management applications a rating of either "1" or "2" (i.e., valuable or useful).

From the information shown on Table 5.11, motor carriers who see relatively more or less value for fleet management applications are:

More Value	Less Value
no satellite	with satellite
driver call-in	communications devices
gen. freight LTL	gen. freight TL
long haul	short haul
for hire	private
no OBCs	with OBCs

While the difference between regular and irregular route carriers is not great enough for them to be included on the above list, it is noteworthy that irregular-route carriers are sharply divided in their opinions. There is probably a logical explanation for this difference. Irregular route carriers, or at least some of them, are the carriers who have adopted various fleet management/driver management technologies -- OBCs, satellite, cellular phones, etc. These are the carriers who are lumped in the 27.5 percent of the irregular route carriers who think the HELP technology offers nothing for fleet management. A good number of the remaining irregular route carriers, who have not yet adopted sophisticated fleet management technologies, are lumped in at

the other end with the 49.2 percent who do see much potential in HELP technology. They are apparently hoping that HELP technology will offer a cheaper alternative to some of the technologies they might otherwise have to buy if they are to continue to compete.

TABLE 5.11: Fleet Management—Rating By Type of Motor Carrier

(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	41.0	28.1	11.6	3.3	15.9
For-hire (32)	44.1	25.7	12.4	2.5	15.4
Private (20)	17.3	47.3	6.1	9.7	19.7
Short Haul (28)	32.5	24.0	29.8	3.7	10.0
Long Haul (21)	48.3	26.8	2.7	3.3	19.0
Regular route (27)	35.0	36.3	17.3	6.5	4.9
Irregular route (21)	49.2	16.3	6.3	0.7	27.5
Intrastate (5)	12.2	**86.0**	1.8	0.0	0.0
Interstate (47)	42.2	25.8	12.0	3.5	16.5
With OBCs (19)	31.6	22.1	1.8	6.0	38.5
No OBCs (29)	34.7	38.1	19.7	2.5	5.0
With Satellite (2)	0.0	0.0	0.0	12.0	**88.0**
No Satellite (44)	47.7	30.2	14.1	2.6	5.4
Driver Call-In (31)	**50.4**	33.5	8.9	2.0	5.3
Some Communications Tech (14)	10.4	10.5	19.4	6.6	53.2
Commodity:					
-gen. freight, LTL (10)	**51.3**	41.5	4.7	2.0	0.5
-gen. freight, TL (25)	45.6	18.5	4.5	2.6	28.9
-gen. freight, LTL & TL (2)	0.0	0.0	**82.3**	17.7	0.0
-temperature controlled (4)	**65.6**	19.5	0.0	0.0	14.9
-liquid (tank) (3)	0.0	0.0	**53.3**	6.7	40.0
-bulk (hopper, dump, etc.) (6)	12.7	**58.0**	29.3	0.0	0.0
-heavy haul (2)	32.4	0.0	0.0	0.0	**67.6**

This probable explanation is borne out in part by the above listing of the groups which see more or less value in HELP technology for fleet management. Carriers with satellite service, carriers with some form of communications technology (i.e., other than drivers calling in from telephones), and carriers with onboard computers see less value in this potential application than do carriers that have not (yet) acquired satellite service, communications technology or OBCs.

Reporting/Auditing.

The overall rank score for the reporting/auditing application is 43.7, sixth from the top. While this is rather low on the ranking scale, few carriers actually gave this potential application a rating of "no value," as shown on Table 5.12.

TABLE 5.12: Reporting/Auditing-Rating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	17	32.7	1,842	25.7
2 useful	10	19.2	1,276	17.8
3 nice to have available	13	25.0	2,124	29.6
4 questionable value	8	15.4	1,863	25.9
5 no value	4	**7.7**	**77**	**1.1**

From Table 5.13, it is not clear there is much significance to the differences reported but carriers seeing more or less value in this potential application are as follows:

More Value	Less Value
no satellite	with satellite
driver call-in	communications devices
private	for-hire

The two heavy haulers included in the group of participating carriers both see a lot of potential here and, during the interviews with these carriers, they both made much of the reporting burden they now encounter with the trip permit process.

Private Use of AVI Technology.

Overall (Table 5.2) this application received a rank score of only 32.6 out of a potential 100. The private use of AVI, as a means of keeping track of vehicles (tractors, dollies, trailers) entering and leaving a yard or terminal appeals only to a few of the larger carriers -- note on Table 5.14 that 19 percent of the carriers representing 25 percent of the fleet find the application potentially valuable.

TABLE 5.13: Reporting/Auditing—Rating By Type of Motor Carrier

(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	25.7	17.8	29.6	25.9	1.1
For-hire (32)	24.6	16.0	30.3	28.1	1.0
Private (20)	33.6	31.5	23.9	9.0	2.0
Short Haul (28)	10.5	43.9	31.2	11.2	3.2
Long Haul (21)	30.5	3.4	30.6	35.5	0.0
Regular route (27)	21.2	26.6	41.7	8.2	2.4
Irregular route (21)	27.3	11.4	16.6	44.7	0.0
Intrastate (5)	0.0	**71.7**	19.0	0.0	9.3
Interstate (47)	26.7	15.6	30.0	27.0	0.7
With OBCs (19)	21.0	32.0	11.7	43.3	1.0
No OBCs (29)	26.4	11.2	48.1	13.0	1.4
With Satellite (2)	0.0	0.0	0.0	**100.0**	0.0
No Satellite (44)	21.5	22.2	39.1	15.7	1.4
Driver Call-In (31)	27.1	21.7	36.0	14.9	0.3
Some Communications Tech (14)	20.0	2.2	5.6	70.6	1.6
Commodity:					
-gen. freight, LTL (10)	23.8	30.2	38.9	4.7	2.5
-gen. freight, TL (25)	39.4	6.3	24.7	28.6	0.9
-gen. freight, LTL & TL (2)	0.0	0.0	**82.3**	17.7	0.0
-temperature controlled (4)	14.9	10.2	9.3	**65.6**	0.0
-liquid (tank) (3)	6.7	**93.3**	0.0	0.0	0.0
-bulk (hopper, dump, etc.) (6)	11.1	5.5	19.1	**64.3**	0.0
-heavy haul (2)	**67.6**	32.4	0.0	0.0	0.0

TABLE 5.14: Private AVI—Rating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	10	19.2	1,760	24.5
2 useful	5	9.6	924	12.9
3 nice to have available	6	11.5	1,099	15.3
4 questionable value	11	21.2	2,046	28.5
5 no value	20	38.5	1,353	18.8

From Table 5.15, carriers that see more or less value in this potential application are as follows:

More Value	Less Value
long haul	short haul
interstate	intrastate
irregular route	regular route
gen. freight TL	gen. freight LTL

"Temperature controlled" carriers as a subset of the special commodities group expressed considerable interest, but the size of the sample is too small to put much stock in this generalization. One point not shown on either Table 5.14 or 5.15 is that the ten carriers rating this application "valuable" account for 27 percent of the trailers of the 52 participating carriers. In other words, it is the large carriers with large trailer fleets that are interested. (This point does not come out in the fleet information quite as strongly as it should as one of the carriers with a real interest in this rents many of its trailers on a short-term basis and these numbers are not incorporated in the database.)

Tracking Stolen Vehicles.

Using transponders on trailers or dollies as a means of locating stolen equipment has an overall rank score of 32.1, eighth out of nine potential applications. As shown on Table 5.16, only 15 percent of the respondents (and the fleet) rated this application "valuable."

TABLE 5.15: Private AVI—Rating By Type of Motor Carrier

(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	24.4	12.9	15.3	28.5	18.8
For-hire (32)	23.9	11.7	17.2	30.0	17.2
Private (20)	29.2	21.7	0.6	16.7	31.8
Short Haul (28)	6.6	7.4	34.2	16.6	35.3
Long Haul (21)	35.7	16.6	2.3	34.1	11.3
Regular route (27)	19.3	5.4	20.5	29.6	25.2
Irregular route (21)	31.6	20.9	7.2	27.6	12.7
Intrastate (5)	9.3	0.0	0.0	73.5	17.2
Interstate (47)	25.1	13.4	15.9	26.7	18.9
Commodity:					
-gen. freight, LTL (10)	20.9	0.0	33.1	43.3	2.8
-gen. freight, TL (25)	26.5	21.2	9.9	32.6	9.8
-gen. freight, LTL & TL (2)	0.0	0.0	0.0	0.0	**100.0**
-temperature controlled (4)	**65.6**	0.0	0.0	0.0	34.4
-liquid (tank) (3)	0.0	0.0	40.0	**53.3**	6.7
-bulk (hopper, dump, etc.) (6)	11.1	35.0	29.3	0.0	24.6
-heavy haul (2)	0.0	0.0	0.0	**67.6**	32.4

TABLE 5.16: Tracking Stolen Vehicles—Rating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	8	15.4	1,076	15.0
2 useful	8	15.4	2,187	30.5
3 nice to have available	7	13.5	1,306	18.2
4 questionable value	16	30.8	978	13.6
5 no value	13	25.0	1,635	22.8

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From Table 5.17 it can be seen that the 5 Intrastate and 7 of the special commodity carriers (temperature controlled and tank) found this application of interest. Overall the carriers that see more or less value in this potential application are:

More Value	Less Value
intrastate	interstate
long haul	short haul
for-hire	private

TABLE 5.17: Tracking Stolen Vehicles—Rating By Type of Motor Carrier
(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	15.0	30.5	18.2	13.6	22.8
For-hire (32)	14.7	34.4	19.4	11.8	19.7
Private (20)	17.2	0.0	8.8	27.6	46.4
Short Haul (28)	12.8	3.7	32.0	21.1	30.4
Long Haul (21)	17.1	42.9	11.9	9.4	18.7
Regular route (27)	6.7	38.9	20.9	8.4	25.1
Irregular route (21)	24.0	20.8	15.3	17.2	22.8
Intrastate (5)	**81.0**	0.0	0.0	16.1	2.9
Interstate (47)	12.3	31.7	18.9	13.5	23.6
Commodity:					
-gen. freight, LTL (10)	2.7	**57.8**	30.2	6.9	2.5
-gen. freight, TL (25)	10.2	26.3	20.7	11.0	31.3
-gen. freight, LTL & TL (2)	0.0	0.0	17.7	0.0	**82.3**
-temperature controlled (4)	**65.6**	10.2	9.3	14.9	0.0
-liquid (tank) (3)	**53.3**	0.0	6.7	0.0	40.0
-bulk (hopper, dump, etc.) (6)	0.0	0.0	17.6	**69.7**	12.7
-heavy haul (2)	0.0	0.0	0.0	**67.6**	32.4

Check on Loading Practices.

The overall rank score for using HELP technology as a check on loadings is 19.2, the very bottom of the list. How much of this dismissal of the potential application has been caused by the controversy surrounding the accuracy of WIM scales is not known. Clearly, it was a factor that came up in the discussions with carriers (although they were asked to rank the applications on the assumption that all "bugs" in the system had been resolved).

As shown on Table 5.18, only 10 percent of the carriers, representing 10 percent of the fleet, rated this application "valuable." Fully 40 percent of the carriers with 34 percent of the fleet rated this application as having "no value."

TABLE 5.18: Load Checking—Rating

	Respondents Rating			
	Carriers	%	Trucks	%
1 valuable	5	9.6	742	10.3
2 useful	9	17.3	1,207	16.8
3 nice to have available	8	15.4	1,452	20.2
4 questionable value	9	17.3	1,312	18.3
5 no value	21	40.4	2,469	34.4

As mentioned earlier, other grouping factors were examined throughout the analysis and typically dropped due to lack of significance. For this application, however, "scaling" becomes a factor of interest. Here the term "scaled" potentially means a number of things. Included are: trucks are always scaled before a trip; trucks are generally scaled (backhaul, fronthaul, when heavy load is hauled, etc.); or there is some other means to know the weight of the load (onboard weighing device in the case of one of the participating carriers, loads are weighed as they are loaded, etc.).

From Table 5.19, these are the carriers that see more or less value in this potential application:

More Value	Less Value
gen. freight LTL	gen. freight TL
not scaled	scaled
short haul	long haul
regular route	irregular route

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TABLE 5.19: Load Checking—Rating By Type of Motor Carrier

(fleet-weighted ratings, 1 = valuable)

	Rating				
	1	2	3	4	5
All Carriers (52)	10.3	16.8	20.2	18.3	34.4
For-hire (32)	11.7	17.8	19.9	18.8	31.8
Private (20)	0.0	8.9	22.3	14.0	**54.7**
Short Haul (28)	30.9	4.2	4.5	16.2	44.3
Long Haul (21)	0.0	24.6	30.0	16.7	28.7
Regular route (27)	21.1	15.2	27.1	6.4	30.2
Irregular route (21)	1.4	19.9	13.3	26.1	39.3
Intrastate (5)	9.3	19.0	0.0	**71.7**	0.0
Interstate (47)	10.4	16.7	21.0	16.1	35.8
Trucks scaled (25)	1.7	25.6	7.0	33.4	32.4
Trucks not scaled (17)	32.4	23.8	5.2	5.6	32.9
Commodity:					
-gen. freight, LTL (10)	32.8	23.1	36.9	4.9	2.3
-gen. freight, TL (25)	0.9	18.6	25.0	13.8	41.7
-gen. freight, LTL & TL (2)	0.0	0.0	0.0	0.0	**100.0**
-temperature controlled (4)	0.0	0.0	0.0	**65.6**	34.4
-liquid (tank) (3)	6.7	0.0	0.0	**53.3**	40.0
-bulk (hopper, dump, etc.) (6)	0.0	0.0	42.0	17.6	40.4
-heavy haul (2)	32.4	0.0	0.0	0.0	**67.6**

The LTL carriers (quite often the same group as those included under "not scaled," "short-haul, "regular route") are clearly the one group of carriers that see some value in HELP technology for indicating something about the load on a truck. While weight is not often an issue for these carriers, there are occasions when LTL freight can be loaded in a manner so as to overload an axle and there are other occasions when an LTL carrier would like to be able to verify the declared weight provided by a shipper.

POTENTIAL "CALL HOME" APPLICATION

While the Crescent demonstration did not include a "call home" application, the question of potential was raised by a number of carriers and by Lockheed when it began shipping its express receiver for the Santa Nella mainline bypass demonstration. Consequently, carriers were asked if they would be interested in such an application. For other than two carriers (out of 52) where no opinions were given, information gathered was coded on a scale of 1 to 4, ranging from "not interested" to "very interested." These were subjective ratings based on the evaluator's opinion of the response.

A summary -- using the fleet-weighted numbers -- is shown in Table 5.20. The carriers with more or less interest in this application are as follows:

More Interest	Less Interest
no satellite	with satellite
driver call-in	communications device
gen. freight LTL	gen. freight TL
for hire	private
no OBCs	with OBCs

Not surprisingly, it is the first two characteristics (which are somewhat overlapping) -- the presence or absence of some form of communications technology (satellite, cellular or radio phone) -- that are the important ones in determining a carrier's interest in this application.

TABLE 5.20: Interest in "Call Home" Application—By Type of Motor Carrier
(responses weighted by fleet size)

	great interest	some interest	mild interest	no interest
	%	%	%	%
All Carriers (50)	**60.0**	9.5	5.6	24.9
For-hire (30)	**64.8**	9.5	2.8	22.9
Private (20)	23.3	9.5	27.0	40.2
Short Haul (27)	**62.6**	8.9	11.2	17.3
Long Haul (20)	**61.0**	9.3	3.0	26.8
Regular route (27)	**73.2**	4.8	5.0	17.0
Irregular route (19)	**52.1**	13.5	6.8	27.6
Intrastate (5)	**71.7**	11.1	17.2	0.0
Interstate (45)	**59.5**	9.4	5.2	25.9
With OBCs (19)	40.4	3.9	4.6	**51.1**
No OBCs (28)	**74.7**	6.0	7.8	11.5
With Satellite (2)	0.0	0.0	0.0	**100.0**
No Satellite (43)	**75.4**	5.4	7.4	11.9
Driver Call-In (31)	**75.6**	8.3	2.3	13.9
Some Communications Tech (14)	10.7	9.2	14.6	**65.5**
Commodity:				
-gen. freight, LTL (10)	**88.2**	2.7	2.2	6.9
-gen. freight, TL (24)	36.1	20.8	4.1	39.1
-gen. freight, LTL & TL (2)	**82.3**	0.0	0.0	17.7
-temperature controlled (4)	**65.6**	0.0	0.0	34.4
-liquid (tank) (3)	**53.3**	0.0	0.0	46.7
-bulk (hopper, dump, etc.) (6)	**52.5**	47.5	0.0	0.0
-heavy haul (1)	0.0	0.0	**100.0**	0.0

CHAPTER 6. WEIGH-SCALE/POE BYPASSING

EVALUATION POTENTIAL

As the evaluation began, it was unclear whether any Crescent sites were working properly in terms of bypassing transponder-equipped trucks (there was even some question about Woodburn SB). By the completion of the field work, two were confirmed as working. Woodburn SB could bypass transponder-equipped trucks up to 105,500 pounds and trucks without transponders up to 50,000 pounds if a series of conditions (speed, position, height detector, etc.) were met. Woodburn NB worked in a similar manner except that it could bypass any truck without a transponder up to 80,000 pounds. This paucity of working bypass scales constrained both the exposure and the evaluation.

DRIVER'S EVALUATION

Even though geographically constrained, a total of 21 drivers submitted evaluation forms, all for Woodburn SB. A few additional driver evaluation forms mailed directly to the WHI offices were unidentifiable as to their source and lacked enough information to be used. Table 6.1 summarizes the responses from the 21 driver evaluation forms.

The average total elapsed time shown in the third column for those trucks receiving bypass clearance is 2.28 minutes. The average time for the six trucks which did not receive bypass clearance is 3.45 minutes. This suggests that bypassing saves an average of 1.17 minutes, which appears to be at odds with the information shown in column 4, the driver's own estimates of the time saved by receiving bypass clearance. It is suspected that drivers tend to over-estimate the time they actually save when they receive a bypass clearance. It should be noted that none of the 21 trips involved trip-permit loads where a driver would ordinarily be required to park. Several drivers who operate trip-permits loads through Woodburn SB were interviewed and suggested that their total time can often be as much as 30 minutes.

Drivers were also asked to evaluate the physical layout of the scale -- in particular, the placing and operation of signal lights. Only eight of the 21 reports included any comments and most of these were "OK." A couple of drivers thought the traffic control signals were too closely spaced. In other comments, one driver, who completed two of the reports shown on Table 6.1, noted on both reports that "[transponders are] just another tool for management harassment of drivers." Apparently, the advantages of weigh-scale bypassing have yet to sell him on the program.

TABLE 6.1: Bypassing Driver Evaluation

(Woodburn Southbound Port of Entry)

Trip #	Received Bypass Clearance		Total Elapsed Time* (minutes)	Driver's Est. Saved Time (minutes)	RGVW or GVW if known (kips)
1	yes		2.4	5.0	80.0
2	yes		3.0	2.0	?
3	yes		2.0	3.0	?
4	yes		1.25	0.5	?
5		no	1.75	--	5.0
6	yes		2.0	10.0	88.0
7	yes		2.5	5.0	105.5
8		no	6.0	--	96.0
9		no	4.0	--	?
10	yes		1.5	?	80.0
11	yes		2.0	5.0	80.0
12	yes		2.06	?	80.0
13	yes		2.5	1.0	80.0
14	yes		1.5	5.0	80.0
15	yes		1.5	2.0	80.0
16	yes		3.0	10.0	80.0
17		no	3.0	--	98.2
18		no	4.5	--	?
19	yes		2.0	3.0	?
20	yes		5.0	2.0	?
21		no	1.5	--	63.5
====	====	====	====	====	
Average	yes		2.28	4.11	
		no	3.45		

* Elapsed time is measured from the moment the truck started to decelerate on the highway until the moment it regained cruising speed on the highway.

MANAGEMENT EVALUATION

The management of the case-study carriers and the other carriers that were visited were also questioned about weigh-scale bypassing. A few had anecdotal accounts and general impressions as to how many trucks were receiving bypass clearance, but none had any actual numbers. Management typically knows very little about what goes on over-the-road unless problems arise.

In this question on weigh-scale bypassing, respondents were also asked how much they valued the potential time saved. Few thoughtful responses were forthcoming, and the question ultimately came down to how much would they be willing to pay for bypassing. Such information was obtained from 40 carriers and is shown in Tables 6.2 and 6.3. The percentages shown are based on only the 40 carriers that responded (i.e., the 12 "no information" carriers have been excluded). As in earlier tables, the percentages in Table 6.3 are the fleet-weighted figures.

Apparently, time saved bypassing is of little value to approximately 28 percent of the carriers operating 46 percent of the trucks. While there are undeniable operating cost penalties associated with weigh scale stops, these costs are so ingrained in the "system" that few carriers have yet to seriously consider the impact that might be made if "bypass" were to become an area-wide network opportunity. As shown in Table 6.3, Oregon-based demonstration carriers (operating over 60 percent of the Oregon-based trucks) are not yet convinced that the Woodburn SB-type bypass is worth much on a per-trip basis.

The unknown at this point is how the carrier response might change, given eventual operational exposure to the Santa Nella-type mainline bypass. Unfortunately, delays in bringing the latter system on line prohibited evaluation treatment of this facility as anything other than a concept.

Of the carriers responding, those that tend to place more or less value on weigh-scale bypassing are:

More Value	Less Value
gen. freight TL	gen. freight LTL
irregular route	regular route
long haul	short haul

Although the number of carriers is small, it also appears that carriers hauling temperature controlled loads (more time sensitive than others) and the heavy-haul carriers (presumably because of the cumbersome procedures now used to check trip permit loads) put a high value on bypassing.

TABLE 6.2: Willingness to Pay for Bypassing

	Respondents Rating			
	Carriers	%	Trucks	%
would not pay for bypassing	8	20.0	1,426	30.4
would pay less than $1	3	7.5	729	15.5
would pay $1 to $1.99	14	35.0	988	21.0
would pay $2 or more	15	37.5	1,551	33.0

TABLE 6.3: Willingness to Pay for Bypassing By Type of Motor Carrier
(responses weighted by fleet size)

	Nothing to $0.99	$1.00 to $1.99	$2.00 or more
	%	%	%
All Carriers (40)	45.9	21.0	33.0
For Hire (24)	48.5	18.0	33.6
Private (16)	32.4	37.4	30.2
Short Haul (20)	**57.0**	23.9	19.1
Long Haul (17)	44.6	21.6	33.7
Regular route (19)	**73.2**	13.8	13.0
Irregular route (18)	32.3	25.5	42.2
Commodity:			
-gen. freight, LTL (7)	**92.1**	0.0	7.9
-gen. freight, TL (21)	37.4	34.6	28.0
-temperature controlled (4)	0.0	19.5	**80.5**
-liquid (tank) (2)	**85.7**	0.0	14.3
-bulk (hopper, dump, etc.) (4)	37.6	30.9	31.5
-heavy haul (2)	0.0	0.0	**100.0**
State			
-Washington	**55.4**	26.4	18.2
-Oregon	**62.3**	5.2	32.5
-California	28.2	37.9	33.9
-Arizona	**96.3**	0.0	3.7
-Texas	0.0	38.8	61.3

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CHAPTER 7. OTHER MATTERS INVESTIGATED

In addition to the two main areas of questioning during the evaluation (the use of the Crescent data for fleet and/or other aspects of management and weigh-scale bypassing), a number of other related issues were addressed as well.

SITE POLLING FREQUENCY

The vast majority of the mainline HELP facilities are, in essence, state data collection sites with equipment upgraded to include an AVI capability. As a result, much of the Crescent activity data enters the Crescent database on the original data collection basis; i.e., a two-hour site polling frequency. Motor carriers were asked how they felt about this -- that is, whether or not a two-hour gap in "real time" information would affect any of their answers on how they would use AVI or AVI/WIM data.

Most were not too concerned about this subject (in some cases this was because they indicated little use for AVI or AVI/WIM data). The only point to note, then, is that those who were concerned -- and who, consequently, wanted a more frequent polling cycle -- tended to be those who saw a potential use for AVI data in such areas as tracking or estimating time of arrival (ETA). This is demonstrated by the following, where percentages are truck weighted numbers and based only on those carriers providing information (the "don't knows" are excluded):

	percent wanting more frequent polling
all carriers	27.8%
carriers who would use AVI for tracking	37.7%
carriers who would use AVI for ETAs	36.4%

OBSERVATIONS ON CRESCENT ACTIVITY DATA

Case-study carriers were asked to monitor aspects of the information in the Crescent database. One of the original hopes was that it would be possible to compile quantifiable measures about such things as the number of replacement transponders working and the variability of information on a given truck for a given trip. Not enough monitoring was performed to allow this, however some carriers -- both case-study and non case-study -- did express opinions on the Crescent database. The 21 responses were based largely on hard copy reports received from

Lockheed. Each response is unique and often covered multiple subject areas. A tabular summary of the various comments in order of frequency mentioned shows:

Comment Subject	% of Respondents
Weight/length accuracy problems	48
"Ghost"/extra/missing axles	33
Weight/length inconsistency between sites	29
Data appear fairly accurate	18
Trips missed/transponders bad	18
Problems with modem access	14
Duplicate records	14
Transponders don't match trucks	14
Site tune synchronization problems	10

The specific comments are summarized in a chart format over the next few pages. Two points should be noted in interpreting this information. First, the carriers' comments are shown in field interview order; and only those carriers that actually used their modem to access the Crescent database and/or those carriers that have reviewed the Lockheed hard copy reports are included. In other words, no views or opinions are contained in the following based on someone's "uniformed" opinion of Crescent.   These are the carriers that have actually taken the time to look at the information. Second, there is undoubtedly an inherent "bias" in this information in the sense that there was a tendency for respondents to point out what they considered to be the "bad" aspects of the Crescent information. That is, when carriers were asked what they thought of the information in the Crescent database, the tendency was to photocopy the latest hard copy report from Lockheed and circle or otherwise mark the obviously incorrect information. Only a few spent much time on it, and no one bothered to highlight the information that seemed reasonable.

CHART 7.1 Observations on the Crescent Database Information

<u>Group 1</u> (Case Study Carriers)	Comment
Domino's Pizza, Kent	There is a possibility that one transponder is not functioning. A claim was also made that other trips are "not showing up." Neither problem could be confirmed.
Interstate Distributor	The company feels Crescent data are not very accurate. Examples were provided showing where a given truck varies in weight by up to 28,700 lbs. and in overall wheelbase length by up to 4.2' on one trip through four Crescent sites.
Albertson's	Casual inspection of hard copy reports indicates that most information appears reasonable. However, several anomalies, such as extra "ghost" axles, were noted.
Wilhehn Trucking	One "extra" (non-Wilhelm truck) transponder is included in the hard copy reports. Additionally, most trips that were checked show an extra 2' of length being added at the end of a configuration at Woodburn SB. One case of an extra "ghost" axle 32.4' behind the last real axle was noted. One permit truck operating at 160,000-to- 170,000 lbs. is shown at 209,600 lbs.; and another weighing less than 80,000 lbs. is shown at 101,600 lbs..
PLXPPESS	One replacement transponder has never shown up in the database; another appears to have worked for a while and them ceased to operate. During the second visit to the company's office, the password would not access the Crescent database. Three trips were monitored for the evaluation and all three show anomalies in the database: total lengths of "zero;" impossible axle spreads (2' or zero feet); gross weight changes of 6,900 lbs. between one Crescent site and another (although it could not be absolutely verified that the load had not changed between the two readings).

Nickel Plate Express	Truck "class" information in the database appears to be inconsistent. Woodburn SB consistently adds 2' of axle spacing to the end of Nickel Plate's 5-axle tractor semitrailers. While most load information appears reasonable, some anomalies were noted during a check of the hard copy report at the company offices: trucks with weight changes of 10,000 lbs. or more at different Crescent sites; one truck appearing at exactly the same time at two different Crescent sites (Tacoma 56th and Tacoma 84th); one instance of an extra "ghost" axle showing up 41.2' behind the last real axle.
Chevron	Other than a problem with duplicate records, no accuracy problems were noted.
Tabor Truck Lines	On one trip, a truck is shown dropping 10,000 lbs. and one axle between two Crescent sites. The speed at the second site (where the weight and the axle are lost) is shown at 212 mpg.
Texas Instruments	There is a possibility that some replacement transponders are not working. The axle weight and gross weight information on the hard copy reports checked "looked reasonable."
Tyler Pipe Industries	According to the company, three attempts were made to obtain an ID login to the Crescent database. With no success, the company gave up trying to use a modem to access the database. Hard copy reports show for a four-week period a total of seven observations from a total of 50 replacement transponders. This is because of the routes taken by the trucks and the placement of Crescent sites. With this little data, the company has little interest in examining or using the Crescent database.

Group 2 (survey + visit)	Comment
Reed's Fuel & Trucking	The company is not happy with the accuracy of Crescent data. Examples were provided showing many instances of incorrect weights -- one truck is shown at Jefferson NB at a weight of 95,100 lbs. and a wheelbase of 77.9' and, 73 minutes later, at a Portland site with a weight of 165,400 lbs. and a wheelbase of 126.4'. In addition, there are a large number of duplicate records (in one instance, triplicate) and the Woodburn SB site generally adds an extra 2' to a truck's wheelbase.
United Grocers, Medford	There appears to be a major problem with the data in the Crescent database as the company has installed the replacement transponders (at least some of them) on the wrong tractors.
Food Express	There is a concern with the accuracy of some of the weight information.
Baxter Health Care	Because of the location of Crescent sites and the operations of Baxter (L.A. area), there is not enough information in the Crescent database to be of any use to the company.
Zero Motor Freight	Zero Motor Freight does not see much use for the data received to date and has written Lockheed about what appear to be many errors and/or inconsistencies in the data (duplicate records, obviously incorrect weights and axle-spacing measurements). Axle weights on a given truck varying by as much as 6,000 lbs. from one Crescent site to another, and wheel base differences of as much as 5' with one extreme example of a 68'4" total wheelbase showing up at 108 feet.

Group 4 (1 visit)	Comment
Gresham Transfer	Sometime prior to March 25 1993, Gresham's password ceased to work. From the hard copy reports, the company notes that there is a persistent problem with WIM scales measuring the axle spacings on its 9-axle doubles: this occurs in the last tandem axle of a 4-axle pup trailer. Also, the weight on these last tandem axles is always exactly split between the two axles (unlikely)
Troutman's Emporium	Troutman's suggests the information provided is not very accurate: one transponder-equipped truck is not showing up; triple-trailer combinations are often shown with nine axles instead of eight; and at Woodburn SB there is a re-occurring problem with an extra 2' of non-existent axle spacing at the end of the configurations
Husky Crane Inc.	The company considers the information on the hard copy reports to be fairly accurate.
Frito-Lay Inc., Modesto	For unknown reasons, which may have something to do with a mix-up in the credentials information, all information in the Crescent database is incorrect. That is, the wrong truck is showing up at the wrong place.
Mark Woods Trucking	The company noted instances of incorrect weights in the hard copy reports and also claims that some of the times shown for the Newhall scale are incorrect.
Calzona Tankways	Most information in the hard copy reports appears "reasonable."

CASE-STUDY VERSUS NON CASE-STUDY CARRIERS

In this section, the difference in responses of case-study and non case-study carriers are examined. As can be seen from Table 7.1, the percentage of carriers having a use for either AVI or AVI/WIM data is about the same in both groups. The primary point of difference is that some of the large case-study carriers have little use for AVI data. This, in fact, is largely a result of one large case-study carrier that has acquired satellite tracking services and, as a consequence, found no use for HELP information.

The original idea in selecting case-study carriers was to ensure that the views about HELP/Crescent were developed from a reasonably well-informed group of respondents. This was also part of the rationale of asking case-study carriers to monitor aspects of the transponder-related information in the Crescent database. While the amount of monitoring was disappointing, there still is some validity to the suggestion that case-study carriers as a group represent a more "informed" response than non case-study carriers. After all, case-study carriers were visited twice. On the first visit, they were given a complete "discussion tools" presentation and, when agreeable, an actual hands-on demonstration of accessing the Crescent database by modem. Their involvement in HELP/Crescent was also "prompted" more often by a continuing series of telephone calls throughout the winter of 1992/93.

In terms of the rating of potential applications, the only ones where there appears to be a significant difference between the two groups are bypassing, driver management, and reporting/auditing. In each instance, the case-study carriers seem to see a greater potential value.

The difficult question is whether or not the differences between the two groups actually arise because the case-study carriers represent a more "informed" opinion. Since other variables may better explain the differences, i.e., the use or non-use of various communications technologies, it is perhaps safer not to make too much of the information shown on Table 7.1.

TABLE 7.1: Case-Study versus Non Case-Study Carriers

(Percentages)

	Case-Study		Non Case-Study	
	Carriers	Trucks	Carriers	Trucks
Some Use for AVI Information	64.3	31.9	68.4	66.2
Some Use for AVI/WIM Information	71.4	82.4	71.1	68.1
Potential Applications Rated "Valuable"				
bypassing	71.4	35.8	55.3	41.0
one-stop shopping	35.7	25.8	31.6	36.7
driver management	57.1	28.5	31.6	43.1
fleet management	28.6	16.0	29.0	47.6
safety management	42.9	21.5	31.6	38.5
reporting/auditing	50.0	27.0	26.3	25.3
private use of AVI	28.6	16.0	15.8	26.7
tracking stolen vehicles	14.3	7.6	15.8	14.7
check on loading	0.0	0.0	13.2	13.0

CHAPTER 8. SUMMARY OBSERVATIONS

The following observations summarize the analysis:

CARRIER PARTICIPATION

For whatever reason -- underlying weakness in the program, repeated delays, or perhaps just the time it takes to work the "bugs" out of a system – the Crescent demonstration has not met with overwhelming enthusiasm by the carriers originally agreeing to take part At the tune the field work for the evaluation was completed (May, 1993), it appeared that fully one-third of the carriers may have chosen not to install replacement transponders. That is, they had effectively dropped out of the Crescent demonstration. Only 1,071 installed replacement transponders could be accounted for in the evaluation. [1]

Among the 52 carriers participating in the evaluation, many of the attributes typically used to identify industry characteristics were found represented. Even so, those participating could hardly be considered a random sample, and the quality of the information gathered left some to be desired because of the conceptual nature of the demonstration. Therefore, no attempt was made to extrapolate the findings to the entire trucking industry. The finding of the report should be viewed only as "possible indicators" of likely industry acceptance.

USE OF AM (ONLY) INFORMATION

Two points emerge from this analysis:

(1)   First, many carriers -- 33 percent with 41 percent of the fleet -- see no use for data from stations collecting only AVI information. Among the others, log checking was the most frequently mentioned potential use; i.e., 36 percent of the carriers with 29 percent of the fleet.

(2)   Second, those that do see a use tend to have the following characteristics: irregular route, truckload, interstate (or international), for-hire, long haul. Carriers using onboard computers as fleet management devices see significantly more potential for these data than those that have gone on to satellite tracking/communications services.

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[1]   Admittedly, not all the UPS fleet was accounted for in this count.

USE OF AVI/WIM INFORMATION

A large number of carriers -- 71 percent as measured by both number of carriers and fleet size -- indicated an interest in the use of AVI/WIM data. Some of this interest, however, is "soft." That is, carriers are 'mildly interested" as compared to being "much in need of" the information.

- General freight LTL carriers and heavy haul carriers have the most interest in axle-load information; LTL carriers because they do not typically scale their trucks prior to a trip and heavy-haul carriers because of the special attention they have to pay to how they load.

- Gross weight information is of most interest to LTL and TL general freight carriers. However, the number with an actual interest is small and is strongly related to whether or not the carrier scales its trucks (or otherwise knows the weight of the load) prior to a trip.

- Speed information available from the WIM scales is of most interest to those carriers that do not now have a means of governing or monitoring speed (speed-o-graphs, tachographs, satellite tracking, electronic engines). Intrastate and LTL general freight carriers expressed the most interest.

RATING OF POTENTIAL APPLICATIONS

Each application was to be rated on a scale of 1 to 5, where l=valuable, 2=useful, 3=nice to have available, 4=questionable value, and 5=no value. It is apparent that -- with the exception of weigh-scale bypassing -- none of the potential HELP applications is highly regarded by the industry as a whole. Looking just at the averages of the responses, the respondents as a group rated the potential applications:

bypassing weigh-scales/POEs	} }	Industry rates this somewhere between valuable" and "useful" on **average**
fleet management driver management reporting/auditing safety management regional one-stop-shopping	} } } } }	Industry rates these five applications somewhere between "useful" and "nice to have available" **on average**
check on loading private use of AVI tracking stolen vehicles	} } }	Industry rates these three applications somewhere between "nice to have available" and "questionable value" **on average**

RANKING OF POTENTIAL APPLICATIONS

Assignment of a descending order of significant value from 1 to 9 was requested. Results are presented as carrier-based averages and also using an index weighted by on the number of trucks in each fleet. An application not ranked by a respondent was given a "10." The following shows the overall rank score of potential HELP applications:

Application	Fleet Weighted Score Relative	(100 max.)	Carrier Avg.	Relative
bypassing	1	80.1	2.8	1
one-stop shopping	2	58.4	5.3	4
driver management	3	51.2	5.0	2
fleet management	4	48.7	5.6	6
safety management	5	47.5	5.2	3
reporting/auditing	6	43.7	5.4	5
private use of AVI	7	32.6	7.3	7
theft prevention	8	32.1	7.5	8
check on loading	9	19.2	7.9	9

As listed, the applications appear to constitute three groups. Bypassing is clearly in a class by itself. Within the second group, positioning varies by method but all generally fall near mid-range. The third group drops markedly lower. Note that the makeup of the three ranking groups correlates precisely with those of the rating analysis.

Within the second ranking group, the position variability of one-stop shopping (2 vs. 4) and fleet management (4 vs. 6) are apparently affected by fleet size. Companies with larger fleets appear to think more highly of both. Note also that in the interview process respondents had problems dealing with driver management and safety management as separate applications. Had these two been combined in the survey, the composite fleet-weighted score would likely have been somewhat higher.

"CALL HOME" APPLICATION

One potential application which was not actually demonstrated during the evaluation -- the ability to use HELP technology to send a "call home" message -- is highly regarded by a great number of carriers (60% as measured by fleets). The ones most interested are those without a current communications system, that is, without other than the instruction to drivers to call-in periodically.

APPLICATIONS VERSUS TYPES OF MOTOR CARRIERS

The objective of this portion of the analysis was to identify the attributes of the carriers most likely to find interest in a particular application. For the various applications, those characteristics suggesting a high differential rate of acceptance are listed in order of relative significance.

Applications	Most Interest Expressed
bypassing	- special-commodity haulers (tank, bulk, heavy-haul); intrastate
one-stop shopping	- gen. freight TL
driver/safety mgmt.	- no satellite or communications tech.; interstate; for-hire
fleet management	- no satellite or communications tech.
reporting/auditing	- no satellite
private use of AVI	- long haul, interstate; irregular route
theft prevention	- intrastate; long haul
check on loading	- gen. freight LTL; short haul
"call home"	- no satellite or communications tech.; gen freight LTL, for-hire

WEIGH SCALE BYPASSING

As an "operational" application, the survey included additional questioning concerning the amount of and value of time potentially saved. Twenty-one trip reports of driver experiences at Woodburn SB recorded 15 pre-clears and 6 non-clears. Time saved by pre-clear can be inferred as being 1.17 minutes for regular operations using the Woodburn model.

The conceptual "value of time saved" question received few thoughtful responses and quickly degenerated into how much the carrier would be willing to pay for each bypass. Even so, only 40 of the 52 carriers responded. Results were as follows:

	% Carriers	% Trucks
Unwilling to pay	20.0	30.4
Less than $1	7.5	15.5
$1.00-$1.99	35.0	21.0
$2 or more	37.5	33.0

Of the carriers responding, those placing more or less value on weigh-scale bypassing are:

more value	less value
gen. freight TL	gen. freight LTL
Irregular route	regular route
long haul	short haul

OTHER MATTERS INVESTIGATED

- As expected, site polling frequency for mainline stations was of concern primarily to the carriers indicating interest in route tracking and ETA estimation. Of those carriers expressing a concern:

Group	% wanting more frequent polling
All responding	27.8%
Users of AVI for tracking	37.7%
Users of AVI for ETAs	36.4%

- Comments concerning specific data gathered from observations of their trucks were solicited from all carriers that had obtained information from the Crescent Database. Twenty-one carriers responded based largely on the hard copy reports received from Lockheed. Each response is unique and often covered multiple subject areas. A tabular summary of the various comments in order of frequency shows:

Comment Subject	% of Respondents
Weight/length accuracy problems	48
"Ghost"/extra/missing axles	33
Weight/length inconsistency between sites	29
Data appear fairly accurate	18
Trips missed/transponders bad	18
Problems with modem access	14
Duplicate records	14
Transponders don't match trucks	14
Site time synchronization problems	10

- Responses of case-study versus non-case-study carriers were examined to determine if the "more informed" group saw things differently. Recognition is given to the fact that differences identified may indeed be better explained by other variables. However, there is some evidence to suggest that the case study carriers as a group did tend toward the assignment of higher application ratings for **bypassing, driver management, and reporting/auditing** than did the others.

As a concluding observation, motor carriers were generally cooperative but typically unwilling to commit personnel time to the evaluation process in the absence of on-site personal contact

SUPPLEMENT I: "ALL CARRIER" SURVEY

February 5 1993

[]

Dear:

Western Highway Institute has been retained by the HELP/Crescent organization to develop and implement the motor carrier component of the overall HELP evaluation effort. We're not new to this project. WHI has been a participant in the HELP/Crescent IVHS project (some eight years now) as a "volunteer" motor carrier advocate and the technical representative for the state trucking associations. WHI and a handful of others have been representing, projecting, and protecting motor carrier interests on the project since day one. Since we're now wearing a consultant's hat.. it's time for you to speak for the **real trucking** industry as experienced in your operation!

The HELP program' as currently constituted, "sunsets" on September 30, 1993. The consultant evaluation report must be completed well before this deadline. As a result, the evaluation has become time-critical, even though facility implementation is still not what it should be. In about a week, we'll be mailing you your copy of the "All Carrier" evaluation survey form. It's not going to be something you can whip out in five minutes. But it is **critical** that every participating carrier work through and return this survey. Whether the "HELP" brand of IVHS will work for you or not, this is the time to tell "the powers that be" what you think!

In the survey, we'll be asking you to make the transition from "what is" to "what might be." This will require both understanding and vision. The survey **presumes** that you understand the intended capabilities of the system. It will ask you to think through the question of how "widespread" deployment might be useful for your trucking operation. And' if your transponder-equipped trucks travel I-5, we'll be asking for information about (1) the success rate of your trucks in bypassing the involved static enforcement scales and (2) your estimate of the potential for any operational saving that you might realize from such a capability system-wide.

If you attended one of the recent Lockheed "transponder replacement" luncheons, you probably got a good "promotional" briefing on where things are going-that's great! You've undoubtedly also received the latest Lockheed announcement concerning mainline bypass at the Santa Nella (CA) weight enforcement scale-that's significant! To further assist you in understanding the project, I'm enclosing a short paper subtitled "Motor Carrier's Orientation." Hopefully, you'll find that the "orientation" material teams with the recent Lockheed information to give you the necessary perspective for a meaningful evaluation contribution.

Sincerely,

Kenneth L. Heald
Team Leader, Motor Carrier's Evaluation

P . S . If information about weigh scale bypass experience is hard to come by, please consider having two or three of your drivers help out by documenting specific trips using copies of the enclosed "Driver Input" form.

DRIVER INPUT

Driver: _____

Crescent Demonstration Site (Circle the site for this observation):

OR: Woodburn/SB   OR: Woodburn/NB

Please complete as much of the following as possible as you drive through the station when it is operating in by-pass mode for HELP/Crescent trucks. Jot down only the critical information while negotiating the scale site and then complete the form at your next roadside stop.

Date: _____ Time: _____

Weather (Circle appropriate): Clear   Rain   Snow

Elapsed Time: Note time you began to slow down to enter the scale ramp.

How many minutes did it take until:

o   You received the "go-no go" bypass signal? (Minutes)_____

o   You reached the interstate re-entry ramp? (Minutes)_____

o   You resumed your normal cruising speed? (Minutes)_____

Please record your experience for this pass through the scale

(Circle the response where appropriate):

1.   Did you have to come to a complete stop at any time before you crossed the AVI/WIM sorter? Yes or No

    (If yes,) how long was the pre-sorting que?

        Less than 3 trucks,   3-6 trucks,   more than 6

2.   Were you given by-pass clearance? Yes or No (If No - skip to Question 4)

3.   (If you did receive a by-pass signal), roughly how much time did you save?

    (Minutes)_____   (Trip data complete - go to Question 6)

4.   (If not given a by-pass signal) were you "called in" for a safety inspection?

    Yes or No (If yes,) was your CVSA sticker still good?

        Yes_____ expires _____ or   No

(OVER)

5. (If "called in" for other than a safety inspection) what is your understanding of why (e.g., overweight or close to weight limits, credentials not in order or subject to question, etc.)?

_____

_____

_____

o   Did you receive a citation for:

Weight problems?   Yes or No

Credentials problems?   Yes or No

o   (If no citation was issued), were you given procedural suggestions for by-pass on future trips?   Yes or No

(If yes), what suggestions were offered?

_____

_____

_____

o   How long did the "call-in" process take before you were released?   (Minutes)_____

o   Did the "call-in" take more time than normal processing? Yes or No

(If yes), about how much was time increased?   (Minutes)_____

Thank you for helping with this evaluation of the HELP/Crescent technology. Please turn this evaluation report into your supervisor on your return .

February 12, 1993

Dear

Re: Motor Carrier's Evaluation Survey

Yes, I know you didn't make any commitment to the HELP people when you agreed to put transponders on your trucks for the Crescent Demonstration. Yes, I know you'll be shocked by the "weight" of this Motor Carrier's Evaluation Survey form.

In my letter of last week, I tried to do two things:

- impress on you the importance of giving this survey your best shot

- impress on you the significance of your opinions in guiding the future development of IVHS (Intelligent Vehicle Highway Systems) for Commercial Vehicle Operations (CVO).

Make no mistake, IVHS is coming! Since it's still a voluntary participation program, now is the time for you to help build into it those features that will make it useful and usable for you, the private sector end user.

The survey is not as imposing as it looks—there are several pages of explanation relating to the information available in the Crescent database and several pages that may not relate to things that you interface with in your fleet operations. If the questions aren't clear, please call me for clarification.

A stamped return envelope is enclosed for you to send the "thing" back. We do have some time constraints on working up the responses, so please get it back a.s.a.p. (consistent with giving it serious thought). We'll be in touch to see how you're doing.

Thanks in advance for your cooperation!

Kenneth L. Heald
Team Leader, Motor Carrier's Evaluation

KLH/lb
Enclosures

I-4

Crescent Demonstration Motor Carrier's Evaluation
ALL CARRIER SURVEY

Company: _____ Response Date: _____

1. **HELP/CRESCENT INFORMATION** *(Data on file; please modify/amend as appropriate.)*

  Name: _____

  Position: _____

  Address: _____

  _____

  Phone: _____ Fax: _____

  1.1 Please confirm your participation in the Crescent Demonstration:

  (Circle indicated response where appropriate.)

  - *Number* of *replacement* transponders: Issued? _____ Installed? _____

  - Does your firm have a modem & communications software? Yes No

  - Does your firm have a Lockheed Database Login ID & Password? Yes No

  1.2 Please confirm the Crescent route segments which all or some of your transponder-equipped trucks use frequently; i.e., several times a week.

  (Check as appropriate.)

  _____ I-5 Canada to Seattle

  _____ I-5 Seattle to Oregon border

  _____ I-5 Washington border to Salem

  _____ I-5 Salem to California border

  _____ I-5 Oregon border to Jct. I-80

  _____ I-5 Jct. I-80 to Jct. I-10

  _____ I-10 Jct. I-5 to Arizona border

  _____ I-10 California border to Phoenix

  _____ I-10 Phoenix to New Mexico border

  _____ I-10 Arizona border to Texas border

  _____ I-10 Arizona border to San Antonio

  _____ I-10/I-20 Arizona border to Fort Worth

2. **CARRIER DESCRIPTION** *(Circle indicated response where appropriate.)*

  Please reconfirm your company's operations in terms of:

  2.1 For hire, private carriage *(i.e., you carry your own freight)* or both private and for-hire? *(If both, also circle type which predominates.)*

  Both   For-hire   Private

I-5

2.2   Intrastate only   Interstate   U.S.-Canada   U.S.-Mexico

2.3   Is your company/fleet primarily or solely a local-base *(i.e., trucks return to the same terminal each day)* carrier?

       Yes   No

2.4   General Freight?   Solely   Primarily   No

      For other than general freight: Do you use trailers other than vans, "reefers," or flatdecks for your special commodities?

          Yes   No

      Special Commodities carried include:

      _____   _____   _____

      _____   _____   _____

2.5   Nature of routes.   *(Check one)*

      ☐ Regular route *(i.e., fixed and/or regularly scheduled)*
      ☐ Irregular routes *(i.e., many different routes depending on freight)*
      ☐ Regular & irregular routes, but predominantly _____

2.6   Re: Class 7 & 8 trucks/tractors operated *(i.e., units with GVW over 26,000 lbs.)*

      (# of units) Owned:_____, Leased *(Co. Drivers)*: _____, Contracted:_____

3.   FLEET MANAGEMENT

3.1   Please indicate technologies you currently use to help manage your fleet *(e.g., on-board computers, tachs, electronic engines used in some aspect of fleet management)*

      _____

      _____

      _____

3.2   Please describe methods currently used to locate trucks and communicate with drivers *(e.g., phone-in, satellite tracking systems, mobile radios, cellular phones)*.

      _____

      _____

      _____

3.3   Are you receiving the Lockheed bimonthly hard copy "AVI/WIM Vehicle Report"?

          Yes   No   Sometimes

      If yes, how have you found it useful and/or how could it be improved?

      _____

      _____

4. EXPERIENCE WITH TRANSPONDERS *(Circle indicated response where appropriate)*

    4.1 Have you had any problems installing or maintaining the serviceability of the recently upgraded transponders?

        Yes   No

        If yes, please comment: _____

        _____

        _____

    4.2 How many <u>upgraded</u> transponders have been replaced or are in need of replacement?

        (# transponders) _____

    4.3 Considering that installation requires a clear line of sight to the pavement, do you have any comments on the placement or possible future utility of the transponders? *(i.e., Is there a better location to enhance serviceability? Should there be "hidden" tags to help trace stolen equipment? Should dollies and trailers also have tags?)*

        _____

        _____

        _____

        _____

5. EXPERIENCE WITH WEIGH-SCALE/PORT-OF-ENTRY BYPASS

    If the routes of your transponder-equipped trucks include segments of I-5 which have *(mainline or within the scale site)* bypass facilities, please describe your experience to date by answering this series of site-specific questions.

        Please note:

            Responses desired are site-specific. Following are individual response pages for:

                OR-Woodburn/SB POE (pg. 4)
                OR-Woodburn/NB   (pg. 5)
                CA-Santa Nella/NB   (pg. 6)

    If your transponder-equipped trucks do not traverse one or more of these three enforcement scales, skip to item 6, pg. 7.

Experience with POE bypass: OR-Woodburn/SB POE

5.1   What is your estimate of the time it normally takes for one of your trucks *without* a transponder to clear this facility (time from point of initial deceleration to regaining highway speed)?

_____ minutes

5.2   In the most recent week, approximately how many trips did your transponder-equipped trucks make by or through this site?

Week of: _____ (# of trips): _____

5.3   *When the station was open,* how many transponder-equipped trucks actually processed through this site:

(# of trucks) _____ (estimate OK)

5.4   *When the station was open,* how many transponder-equipped trucks were <u>not</u> given a "bypass" signal:

(# of trips) _____

For your transponder-equipped trucks <u>not</u> given a bypass signal, what is your understanding of why they were called in (e.g., safety inspection, overweight, or close to weight limits, credentials not in order or subject to question, etc.)?

_____

_____

_____

5.5   Of the transponder-equipped units called in, how many were safety inspected?

(# of trucks) _____

5.6   Of those "called in" *for other than a safety inspection,* how many were issued a warning and/or citation?

(# of trucks) _____

5.7   For your transponder-equipped trucks that *were given* a "bypass" signal, please provide an estimate of the average time per trip saved at this station.

(# of minutes) _____

5.8   If the time savings from 5.7 became routine at all ports of entry would it translate into a per-bypass cost savings for you, the carrier?

Yes or No

(If yes), how much? _____ ($ per bypass)

(If no), why not?

_____

_____

_____

_____

Experience with weigh scale bypass: OR-Woodburn/NB Weigh Scale

5.1 What is your estimate of the time it normally takes for one of your trucks *without* a transponder to clear this facility (time from point of initial deceleration to regaining highway speed)?

_____ minutes

5.2 In the most recent week, approximately how many trips did your transponder-equipped trucks make by or through this site?

Week of: _____(# of trips): _____

5.3 *When the station was open,* how many transponder-equipped trucks actually processed through this site:

(# *of trucks*) _____ (estimate OK)

5.4 *When the station was open,* how many transponder-equipped trucks were <u>not</u> given a "bypass" signal:

(# of trips) _____

For your transponder-equipped trucks <u>not</u> given a bypass signal, what is your understanding of why they were called in *(e.g., safety inspection, overweight, or close to weight limits, credentials not in order or subject to question, etc.)?* ·

_____
_____
_____

5.5 Of the transponder-equipped units called in, how many were safety inspected?

(# of trucks) _____

5.6 Of those "called in" *for other than a safety inspection,* how many were issued a warning and/or citation?

(# of trucks) _____

5.7 For your transponder-equipped trucks that *were given* a "bypass" signal, please provide an estimate of the average time per trip saved at this station.

(# of minutes) _____

5.8 If the time savings from 5.7 became routine at all weigh stations would it translate into a per-bypass cost savings for you, the carrier?

Yes or No

(If yes), how much? _____ *($ per bypass)*

(If no), why not?

_____
_____
_____
_____

<u>Experience with weight scale bypass: *CA-Santa Nella/NB Weigh Scale</u>
(*Mainline screening -- requires addiitonal hardware obtainable from Lockheed.)

5.1   What is your estimate of the time it normally takes for one of your trucks
without a transponder to clear this facility (time from point of initial deceleration
to regaining highway speed)?

_____ minutes

5.2   In the most recent week, approximately how many trips did your transponder-
equipped trucks make by or through this site?

Week of: _____(# of trips): _____

5.3   *When the station was open,* how many transponder-equipped trucks actually
processed through this site:

(# of trucks) _____ (estimate OK)

5.4   *When the station was open,* how many transponder-equipped trucks were <u>not</u> given
a "bypass" signal:

(# of trips) _____

For your transponder-equipped trucks <u>not</u> given a bypass signal, what is your
understanding of why they were called in *(e.g., safety inspection, overweight, or close
to weight limits, credentials not in order or subject to question, etc.)?*

_____

_____

_____

5.5   Of the transponder-equipped units called in, how many were safety inspected?

(# of trucks) _____

5.6   Of those "called in" *for other than a safety inspection,* how many were issued
a warning and/or citation?

(# of trucks) _____

5.7   For your transponder-equipped trucks that *were given* a "bypass" signal, please
provide an estimate of the average time per trip saved at this station.

(# of minutes) _____

5.8   If the time savings from 5.7 became routine at all weigh stations would it
translate into a per-bypass cost savings for you, the carrier?

Yes or No

(If yes), how much? _____ *($ per bypass)*

(If no), why not?

_____

_____

_____

6. YOUR COMMENTS ON CRESCENT DATABASE AS A POTENTIAL MANAGEMENT TOOL

Background

The Crescent Database includes both credentials and activity data for all partici-
pating motor carriers. Every aspect of the database is security protected so that
each carrier's access is limited to only those records associated with its own
company.

Credentials data for the Company and all vehicles enrolled are "packaged" within the
system, so that it can be readily examined and verified by the carrier. These data
(as currently entered by Lockheed after verification with the appropriate state agencies) serve as the
basis for the weigh-scale credentials check.

Activity data, on the other hand, is dynamic and is updated with each new
observation of a transponder-equipped truck. These "observations" may originate
from mainline *(in the normal traffic lanes)* or weigh station exit ramp installations.
While an AVI reader is currently the minimum site hardware configuration, most of
the stations will also include WIM *(weigh in motion)* machines which record axle and
gross weight data. During the course of the demonstration, activity data in the
Lockheed Database are available to carriers via computer modem and bimonthly hard
copy summaries.

The data available for inspection via computer modem are presented in four
alternative formats for inspection as desired:

- *Daily Vehicle Activity* – All units for a specified day.

- *Weekly Vehicle Activity* – All units for a specified week.

- *Individual Truck Activity* – All observations for one unit.

- *Daily Site Activity* – All units at a specific observation site for a
  specified day.

Following are "screen print" examples of each reporting format using "dummied" I.D.
data developed by Lockheed for illustration purposes.

Daily Vehicle Activity
(Data for all company units for a specified date. Records listed from latest to earliest time.)

Please enter the date of the day to be queried (MM/DD/YY). 020592

Crescent daily activity report: (WARNER TRANSPORTATION, INC.)

Site	Date	Time	Lane	Help I.D.	Equip. No.
NEWHALL MAINLINE	02/05/1992	23:03:38	1	1094	8536
LODI MAINLINE	02/05/1992	21:11:38	6	1038	8537
HILT	02/05/1992	14:53:06	6	1038	8537
HILT	02/05/1992	14:53:06	6	1038	8537
HILT	02/05/1992	13:01:54	1	1038	8537
HILT	02/05/1992	13:01:54	1	1038	8537
LODI MAINLINE	02/05/1992	07:00:32	1	1038	8537
BAKERSFIELD MAINLINE	02/05/1992	04:58:20	1	1025	8535

Press Return to Continue

Weekly Vehicle Activity
(Data for all company units for one week as defined by the date of the last day. Records listed from latest to earliest by date and observation time within each day.)

Please enter the END date of the search range (MM/DD/YY). 020492

Crescent weekly activity report: (WARNER TRANSPORTATION, INC.)

Site	Date	Time	Lane	Help I.D.	Equip. No.
LODI MAINLINE	02/04/1992	23:51:47	6	1025	8535
LODI MAINLINE	02/04/1992	21:00:03	6	1094	8536
REDDING MAINLINE	02/04/1992	18:34:09	2	1025	8535
HILT	02/04/1992	17:49:13	1	1040	8394
HILT	02/04/1992	17:49:13	1	1040	8394
HILT	02/04/1992	16:38:48	5	1025	8535
HILT	02/04/1992	16:38:48	5	1025	8535
REDDING MAINLINE	02/04/1992	16:27:31	1	1094	8536

Press Return to Continue

Individual Truck Activity

(All data on file for a specified unit. Records listed from latest to earliest by date and observation time within each day.)

Would you like to select by HELP I.D. or Equipment No. (H/E)? H

Carrier Name: [   ]
Transponder Number (Help I.D.): [   ]   Equipment No.: [   ]

Total Records Selected 6

Carrier Name: [WARNER TRANSPORTION, INC. ✓   ]
Transponder Number (Help I.D.): [1038]   Equipment No.: [8537   ]

Site	Lane	Date	Time	GR Weight
[HILT]	[0]	[02/05/1992]	[14:53:06]	[0]
[HILT]	[0]	[02/05/1992]	[13:01:54]	[0]
[LODI MAINLINE]	[1]	[02/05/1992]	[5:58:55]	[66400]
→[NEWHALL MAINLINE]	[1]	[02/04/1992]	[22:58:55]	[67400]
[HILT]	[0]	[02/01/1992]	[16:49:55]	[0]
[HILT]	[0]	[02/01/1992]	[14:48:53]	[0]
[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	[ ]
[.]	[ ]	[ ]	[ ]	[ ]

Move Cursor to Desired Row and Press <CTL-P> to Show More Data;
or <CTL-E> to Exit

```
                    +----------------------------------------------+
                    |                                              |
Total Records Sele| |                                              |
                    |-WIM Data for Transponder:         1038 -     |
Carrier Name: [WAR|Site:  NEWHALL MAINL   Lane:          1        |
Transponder Number|Direction:          Speed:          49.10   |8537    ]
                    |Date:  02/04/1992    Time:   22:58:55:38      |
             Site  |Class:  11            Length:        70.20     |
                    |Gross Wght:        67400                      |
[HILT             |Axles:                 5                       |
[HILT             |Axle No.    Space          Weight             |
[LODI MAINLINE    |   1        16.10           9900              |
→[NEWHALL MAINLINE |   2        20.60          17500             |
[HILT             |   3         8.90          18200             |
[HILT             |   4        21.30          11300             |
[                 |   5         0.00          10400             |
[                 |   6         0.00              0             |
[                 |   7         0.00              0             |
[                 |   8         0.00              0             |
                    |   9                           0             |
Move Cursor to Des| Press Return to Continue                     |;
                    |                                              |
                    +----------------------------------------------+
```

Daily Site Activity
(Data on file for a selected site on a specified day. Records listed from latest to earliest time.)

```
+---------------------------------------------+
|                                             |
|                                             |
|   Site #      Site Name             State|  |
|   [    1]    [HILT                ] [CA] |  |
|   [    2]    [MOUNT SHASTA        ] [CA] |  |
|   [    3]    [REDDING MAINLINE    ] [CA] |  |
| ->[    4]    [LODI MAINLINE       ] [CA] |  |
|   [    5]    [SANTA NELLA NB WS   ] [CA] |  |
|   [    6]    [SANTA NELLA MAINLINE] [CA] |  |
|   [    7]    [BAKERSFIELD MAINLINE] [CA] |  |
|   [    8]    [NEWHALL MAINLINE    ] [CA] |  |
|   [    9]    [BANNING WEIGHSTATION] [CA] |  |
|   [   10]    [INDIO MAINLINE      ] [CA] |  |
|                                             |
|   Move the Cursor With the Arrows;          |
|   Press <Esc> To Select a Site.             |
|                                             |
+---------------------------------------------+
```

Please enter the date of the day to be queried (MM/DD/YY). 020592

Crescent site act. rpt.: (WARNER TRANSPORTATION, INC. at LODI MAINLINE)

Date	Time	Lane	Help I.D.	Equip. No.
02/05/1992	21:11:38	6	1038	8537
02/05/1992	07:00:32	1	1038	8537

Press Return to Continue

As you consider the following questions, ASSUME that mainline observation data are available on a 24-hour, 7-days-per-week basis, with all major highway covered. If you had some routine means of accessing the Crescent data base, i.e., computer modem monitoring or periodic hard copy summary reports, please comment on how useful the data as illustrated might be for each of the following conditions:

6.1   HELP/Crescent activity data, at a minimum, provides a record of individual truck passage at a specified time. How might such data be useful to you?
(e.g., from the standpoint of fleet management, driver management, reporting/auditing re fuel tax, registration, permits, safety management, or any other purpose.)

Please provide as much insight regarding potential use as possible in your response.

_____

_____

_____

_____

6.2 The mainline "truck passage" observations referenced above·are currently targeted for transfer to the Crescent database on a two-hour update cycle. *However, more frequent updating is possible should that be desirable.*

Would the possibility of _not_ having some data available until two hours after observation affect your response to question 6.1? *(Please circle)*

Yes   No

If yes, please give us an indication of how current the data would need to be to be more useful? Use the following codes to rate each time block compared to the two-hour cycle:

N = no better, U = minimum usable, D = minimum desirable, M = more than adequate

_____ within 1 hour?   _____ within 10 minutes?

_____ within 30 minutes?   _____ within 5 minutes

_____ within 20 minutes?

6.3 At many HELP/Crescent sites, "observations" include information beyond just the passage of the truck at a specified time. Where WIM machines are installed, other data (the weight of the truck [axles and gross], the speed of the truck, the class of the truck [for example, a "5-axle tractor-semitrailer"] and information on any violations) are also recorded.

How might this information be useful to you? *(Please specify the type of information and the use envisioned (e.g., "truck speed—driver monitoring," "axle loads—driver loading practices," etc.)*

_____

_____

_____

_____

_____

6.4 Activity data from enforcement stations is entered in the Crescent database almost immediately; however, some weigh stations or ports of entry with "observation" equipment installed in the exit ramp may not operate continuously or may occasionally "close down."

Recognizing that there may be "black out" periods at enforcement scales, how might the occasional gaps in the records affect your answer in 6.1 and/or 6.3?

_____

_____

_____

_____

6.5 Traffic signal controls associated with weigh scale bypass capabilities also offer the possibility of using a "red light" to deliver "emergency" messages to individual trucks.

How useful would such a service be in your opinion if:

- limited to true "emergencies"?

_____

_____

- it were expanded to include operational fleet management contact?

_____

_____

6.6 How useful might HELP/Crescent data be to check your truck loading practices *(e.g., by checking the database for "bridge formula" violations)*?

_____

_____

6.7 What are your views concerning the possibility of using HELP AVI technology for proprietary readers installed at terminals *(e.g., for down-loading on-board computers, equipment tracking, etc.)*?

_____

_____

6.8 To what extent might the HELP technology be useful to trace stolen vehicles *(e.g., at say $35 per "hidden" transponder for each trailer and dolly)*?

_____

_____

6.9 How important might the Crescent regional database be to your operations if such a database facilitated the development of regional "one-stop-shopping" *(by serving as the sole point of contact for providing all required vehicle/carrier information)*?

_____

_____

_____

_____

_____

_____

_____

_____

7.   OVERALL EVALUATION

    7.1   Having experienced some use of the HELP technology and examined the various types of data available to you in the HELP/Crescent database, please rate and rank the potential applications as follows:

        (a) RATING — assign the rating to each potential application which reflects the likely value for your operation--select from the following:

                1 = Valuable
                2 = Useful
                3 = Nice to have available
                4 = Questionable value
                5 = No value

        (b) RANK — Assign rank order number to each of the nine listed applications with respect to anticipated usefulness for your organization *(i.e., 1,2, 3 through 9, where 9 is judged least usable)*.

POTENTIAL APPLICATIONS	(a) RATING	(b) RANK
Fleet management		
Driver management		
Reporting/auditing		
Safety management		
Check on loading practices		
Private use of AVI technology at terminals		
Tracking stolen vehicles		
Regional "one-stop shopping"		
Bypass weigh scales/POE		

    7.2   Any other comments you'd like to add with respect to 7.1 or about the program in general?

_____

_____

_____

_____

_____

_____

Thanks for staying involved and working through this! Your views on the various aspects of the HELP/Crescent technology will help answer the questions of who benefits? from what? and how much?
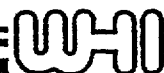
SUPPLEMENT II: DESCRIPTION OF DATABASE

APPENDIX B: DESCRIPTION OF DATABASE

The following describes the fields in the database and some of the interpretations used in completing these fields:

Field #	DESCRIPTION	COMMENT
1	Response #	
2	Carrier name	
3	City	
4	State	
5	Evaluation class	1 = case study, 2 visits 2 = case study, 1 visit 3 = returned survey + visit 4 = returned survey, no visit 5 = visit 6 = no survey, no visit
6	Number of respondents	number of people within the firm giving information and/or sitting in during meetings
7	Management level	1 = senior (president, vice-president, senior manager) 2 = middle (truck/drive supervisor/manager etc) 3 = low (dispatcher, etc)
8	Power units	# of class 7 & 8 power units in fleet
9	Power units - owned	company-owned equipment; if no other information is available, all power units are assumed to be company owned.
10	Power units - leased	full-service lease trucks & tractors
11	Power units - owner-operators	contractors or owner-operators
12	Trailers	# of trailers; default value is the number of class 7 & 8 power units
13	Default value for # of trailers	1 = default value used for number of trailers
14	Transponders issued	# of transponders issued, generally according to respondent's information (sometimes differs from Lockheed records)

15	Replacement transponders installed	# of repIacement transponders installed at **time** information was collected (this may have changed subsequently) 0 = unknown
16	Modem access	respondent has modem access **and is known** to have used modem access to Crescent database
17	Intrastate, Interstate, International	1 = intrastate 2 = intra and interstate 3 = intra, interstate and international
18 19 20 21 22 23	Crescent - WA Crescent - OR Crescent - CA Crescent - AR Crescent - NM Crescent - TX	1 = trucks on Crescent in Washington 1 = ” ” ” ” Oregon 1 = ” " ” ” California 1 = ” ” ” ” Arizona 1 **=** ” ” " ” New Mexico 1 = ” ” ” ” Texas
24	For-hire/private	1 = for-hire 2 = private 3 = private with for-hire authority
25	Commodity	1 = LTL general freight 2 = TL general freight 3 = LTL & TL general freight 4 = temperature controlled 5 = tank (ie, any liquid hauled in tank) 6 = bulk (eg, glass, logs, scrap metal, flour, chips, etc) 7 = heavy haul Note: generally the major or primary **commodity listed by respondent determined the commodity value (eg, a general** freight carrier with some refrigerated trailers was lists as a 1, 2, or 3, but not a 4)
26	Haul distance	1 = primarily short haul 2 = primarily long haul (trips of over-night duration) 3 = local and long haul **Note: carriers such as UPS are classified as "primarily short haul" as the drivers return to the terminal at the end of every shift (even though UPS is an international carrier).**
27	Routes	1 = primarily regular routes 2 = primarily irregular routes 3 = regular & irregular routes

28	OBCs	On-Board commuters used
		0 = don't know
		1 = all (most) trucks
		2 = company-owned trucks only
		3 = some trucks
		4 = no (but has tried them in the past)
		5 = no
		6 = use determined by O/Os
29	Electronic engines	Electronic engines used
		0 = don't know
		1 = all (most) trucks
		2 = company-owned trucks only
		3 = some trucks
		4 = no
		5 = use determined by O/Os
30	Satellite tracking	Use of Satellite services
		0 = don't know
		1 = all (most) trucks
		2 = planning to install; considering purchasing
		3 = no
		4 = no (but has tried service in the past)
31	Other monitoring	Other monitoring devices (tachs, speed-o-graphs etc)
		0 = don't know
		1 = all (most) trucks
		2 = some trucks
		3 = no
32	Logs prepared by OBC	0 = don't know
		1 = yes
		2 = no
33	Communications	Method Used to communicate with driver
		0 = don't know
		1 = call-in (daily, after delivery, etc)
		2 = messages left at delivery points (eg, in a distribution center-to-retail outlet situation)
		3 = cellular phone - some trucks
		4 = cellular phone - all trucks
		5 = satellite - data messaging, etc
		6 = radio phone - some trucks
		7 = radio phone - all trucks
		8 = no regular procedures except telephone in special situations
		9 = pager
		10 = mixture of call-in, cellular, radio phone

Ratings/Rankings - score given to each of the nine
potential applications

34	Rating' 1	#
35	Rating 2	#
36	Rating 3	#
37	Rating 4	#
38	Rating 5	#
39	Rating 6	#
40	Rating 7	#
41	Rating 8	#
42	Rating 9	#
43	Ranking 1	#
44	Ranking 2	#
45	Ranking 3	#
46	Ranking 4	#
47	Ranking 5	#
48	Ranking 6	#
49	Ranking 7	#
50	Ranking 8	#
51	Ranking 9	#

Use of AVI Data From Crescent

52	for log checking	0 = don't know; 1 = yes; 2 = no
53	for tracking/locating	
54	for speed monitoring	"
55	for estimating ETAs	"
56	for post accident analysis	"
57	for checking routings	"
58	for disputing citations	"

59	Polling frequency	blank = don't know or no comment
		# = time in minutes for "minimum desirable"
		120 = current 2-hour polling frequency is satisfactory

Use of AVI/WIM Data from Crescent
 Fields #60 to #68 have the following codes:
0 = don't know; 1 = yes; 2 = no

60	speed monitoring	ie, speed at a point in time
61	axle loads - driver	ie, where driver is responsible for placing load
62	axle loads - someone else	ie, where someone else is responsible for load
63	axle loads - 5th wheel	ie, to monitor drivers moving 5th wheels
64	axle loads - disputes etc	eg, disputing a citation; investigating a citation; preventing a citation
65	axle loads - analytical	eg, where respondent would like the data for undertaking some analysis ("which shippers?" "which terminals?" "where?" etc)
66	gvw - ton-mile tax	ie, where respondent believes AVI/WIM data could be used to calculate Oregon's weight-distance tax ("calculate" can mean to disagree with the Oregon's calculations)

| 67 | gvw - shipper load | ie, did shipper load what he claimed? |
| 68 | gvw - other | ie, some other use of gvw data |

69	trucks scaled?	0 = don't know
		1 = usually or always
		2 = yes on outbound load; inbound load up to driver
		3 = not scaled, but weight of load known
		4 = not scaled, but onboard weighing device
		5 = not scaled or not usually scaled

70	potential blackouts?	(eg, where HELP sites located in scales)
		0 = don't know
		1 = perceived as a problem
		2 = not perceived as a problem
		3 = not perceived as a problem as respondent has no use for AVIMIM data

71	no use for AVI/WIM	0 = don't know
		1 = yes, no use for AVI/WIM
		Note: field **is blank if there are any positive responses to Fields #60 to #68**

72	"Call Home" application	0 = don't know
		1 = not interested
		2 = mildly interested
		3 = interested
		4 = very interested

| 73 | $ for mainline bypassing | # |

74	qualification to Field #73	1 **= response to #73** for **trip permit trucks only**
		2 = response to #73 unknown
		3 = response to #73 conditional on O/O's paying amount indicated

| 75 | **driver** evaluation received | 1 = yes |