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Auditor General
of British Columbia

Trucking Safety

**Ministry of Transportation
and Highways:
Motor Vehicle Branch**

Performance Audit

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The Honourable Dale Lovick
Speaker of the Legislative Assembly
Province of British Columbia
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Sir:

I have the honour to transmit to the Legislative Assembly my 1996/97 Report 4:
Trucking Safety.

This audit was carried out within the Ministry of Transportation and Highways,
Motor Vehicle Branch.

A handwritten signature in cursive script that reads "George L. Morfitt".

George L. Morfitt, FCA
Auditor General

Victoria, British Columbia
December 1996

copy: Mr. E. George MacMinn, Q.C.
Clerk of the Legislative Assembly

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auditor general's comments



This report, my fourth to the Legislative Assembly for the 1996/97 year, contains the results of my office's audit of safety regulation of the trucking industry in British Columbia.

Trucking safety refers to the operation of commercial vehicles in a way that results in the number and seriousness of truck accidents being minimized, lives being saved, injuries being prevented and property damage being reduced.

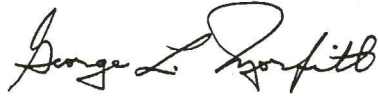
Trucking safety continues to be an important issue in British Columbia. Over the past few years, there have been several notable trucking accidents. These accidents involve a high cost, not only in direct property damage, higher insurance rates, and increased fees and taxes for health care and criminal justice systems, but also in the significant social costs associated with loss of life, injury, and loss of productivity.

The Motor Vehicle Branch, an agency in the Ministry of Transportation and Highways, has the primary responsibility for achieving the government's goals relating to trucking safety. In general, they are pursued through education and enforcement activities.

In this audit we examined the three enforcement programs—fixed weigh scales, portable weigh scales, and carrier safety audits—used by the branch to detect and prevent unsafe commercial vehicles from operating. We concluded that there is reason for concern. The severity of accidents is increasing, and a high rate of vehicles are taken out-of-service for safety reasons when inspected. Because there are certain times of day and areas of the province that are poorly regulated, unsafe trucks and drivers can operate with little chance of being detected.

I am supportive, therefore, of the work of the recently formed Task Force on Commercial Vehicle Safety which involves the branch, industry and other key stakeholders. The Task Force has been asked to develop feasible options to address trucking safety issues, including coroners' jury recommendations, in an effective and cost-efficient manner. The terms of reference are reflective of the significant issues identified by my staff during our audit.

I greatly appreciate the cooperation shown to my audit staff by the branch's executive and staff during the audit.



*George L. Morfitt, FCA
Auditor General*

*Victoria, British Columbia
December 1996*



highlights

trucking safety

An audit of safety regulation of the trucking industry in British Columbia

The Motor Vehicle Branch's contribution to the Ministry of Transportation and Highway's vision for an efficient and effective highway transportation service focuses on traffic safety issues and the need to reduce the number and severity of traffic accidents. The branch supports and contributes to the ministry's vision through a number of trucking safety enforcement programs which regulate commercial vehicles. The branch's vision is that "travel on British Columbia roads will be the safest in North America."

Audit Purpose, Approach, and Scope

The purpose of the audit was two-fold: 1) to assess the extent to which the ministry's three trucking safety enforcement programs—fixed weigh scales, portable weigh scales, and carrier safety audits—are designed and implemented to achieve trucking safety in a cost-effective manner; and 2) to assess the extent to which the ministry has examined whether its three enforcement programs are the most effective alternatives in achieving trucking safety.

In the first part of the audit, we examined the design and implementation of the programs and whether the programs are delivered at reasonable cost. Our conclusions on the design and implementation of the programs were based on our analysis of ministry information, site inspections, and interviews and a survey we conducted with branch staff and other key stakeholders.

In the second part of the audit, we reviewed the extent to which the branch had assessed the relative effect of a range of factors, such as driver training and vehicle design, on trucking safety, and examined whether such an analysis had been used to determine if trucking safety enforcement programs were meeting their objectives in the best way possible. In addition, we carried out research to assess the relative importance of each factor on trucking safety.

Our audit encompassed both "for hire" and private carriers using heavy commercial vehicles, defined as any single or combination truck unit over 5,000 kg gross vehicle weight such as a gravel truck or a tractor semi-trailer unit. Class I drivers—operators of heavy, air brake equipped, and articulated vehicles—were included to the extent that inspections focus on a driver's physical condition and record

of duty. The audit also included overweight and over-dimension vehicles as they relate to safety. Our audit excluded an assessment of driver behavior while the vehicle is in motion. We did not consider buses and taxis, or trucks that are not subject to National Safety Code requirements.

We carried out the audit between January and June 1996. Our examination was performed in accordance with value-for-money auditing standards recommended by the Canadian Institute of Chartered Accountants and accordingly included such tests and other procedures we considered necessary in the circumstances.

Overall Conclusion

We concluded that there are serious issues related to the state of trucking safety in British Columbia. The severity of accidents is increasing and, if inspected, about one in five commercial vehicles would be taken out-of-service for a range of defects, the most significant being faulty brakes. We also concluded that the three trucking safety enforcement programs are neither well designed nor well implemented by management, and that the branch has not determined whether its enforcement programs are the most effective alternatives in achieving trucking safety. This makes it difficult for the Motor Vehicle Branch to provide assurance that these programs are cost-effective and that they are meeting the objective of safer roads.

Key Findings

The state of trucking safety continues to require the attention of government and the trucking industry

We determined that a significant number of commercial vehicles are taken out-of-service at roadside inspections. During the period 1991 to 1996, approximately one in five commercial vehicles inspected were taken out-of-service for defects related to brakes, lights, suspension, steering, and tires. During the same period, there was also an increase in the number of drivers taken out-of-service for violations such as excessive hours of service.

We also noted that the rate of trucking collisions is declining but their severity has increased. The percentage of collisions involving heavy commercial vehicles is small compared to total motor vehicle collisions and has shown a slight decrease in recent years (from 5.37% in 1991 to 4.87% in 1994). In addition, the absolute number of collisions has

declined (from 5,372 in 1991 to 4,727 in 1994). The severity of these collisions, however, is often more significant than their mere numbers. In British Columbia, the rate of injuries as a percentage of heavy commercial vehicle collisions has increased (from 26.1% in 1991 to 30.9% in 1994) and the rate of fatalities has also increased (from 1.23% in 1991 to 1.54% in 1994).

The branch is not evaluating the effectiveness of its enforcement programs

The branch has not developed an evaluation framework nor has it established performance indicators and targets to measure how well its trucking safety enforcement programs are operating and to provide information about program costs. The branch has not clearly defined in measurable terms what it means by "trucking safety" nor has it established a clear relationship between the impact of its enforcement programs and the state of trucking safety, so it is unable to determine whether they are having a positive effect.

There is no assurance that coroners' recommendations are acted upon

There is no assurance that coroner recommendations for improvements in trucking safety are evaluated and properly dealt with by the branch. Although coroners' inquiry reports from 1989 to 1996 indicate several common trucking safety deficiencies, we found no evidence that the branch had an established process to obtain these reports and act upon their recommendations. Our analysis of several major inquiries in the past eight years shows that many key recommendations have not yet been implemented.

The branch has neither profiled the trucking industry nor determined the resources needed to regulate it

The branch has not carried out a comprehensive study to profile the trucking industry. As a result, the branch does not have complete and reliable information on the size, location and operating patterns of the trucking industry which is needed to determine the greatest areas of risk, the appropriate number of commercial vehicle inspections, the staff needed to regulate the industry, and the most effective deployment of its resources.

The three enforcement programs are neither well designed nor well implemented by management

Standards and monitoring

The branch cannot provide assurance that safety standards and sanctions are being applied uniformly and consistently throughout the Province. While the branch has established adequate standards for assessing the safe operation of commercial vehicles, it has not established a centralized monitoring function to check the activities of personnel in the three enforcement programs. For example, it does not regularly observe how uniformly its safety inspections and carrier safety audits are carried out.

Staff training

Overall, enforcement officers are properly trained and meet certification requirements.

Program implementation

Carriers have an opportunity to operate poorly maintained and overweight or over-dimension vehicles with relative impunity during weigh scale "off" hours. Fixed and portable weigh scales are not deployed to maximize their coverage by time of day. In general, fixed and portable weigh scales tend to operate during the same hours leaving significant times of the day without coverage by either. Similarly, in key bottleneck locations through which all commercial vehicles must pass (such as Haig, Hunter Creek, and Laidlaw), scales are not operational 24-hours-a-day, 7-days-a-week even though the trucking industry is a full-time operation. With current fixed and portable weigh scale hours, some trucks are never checked.

We also found that trucks are free to enter and return through some key border locations and to carry out local and regional operations in some areas with little chance of being inspected because fixed and portable weigh scales are not deployed to maximize their coverage by geographic location. Over the past 10-15 years, there has been no change in fixed weigh scale locations and no successful initiatives to construct weigh scales at some key points of entry.

With respect to the Carrier Safety Audit program, our primary concern is with adequate and timely coverage. Given that there are approximately 26,000 carriers Province-wide and only 11 Carrier Safety Inspectors, the branch cannot ensure that all carriers are subject to regular safety audits such as once every three years.

Sanctions

When offenders are identified, sanctions are imposed. However, some fines are not commensurate with the offense and do not act as an effective deterrent. The clearest example is a \$100 fine for brakes out of adjustment, considered to be a major safety issue. Several coroners' inquiries have recommended increasing the fine for faulty brakes to at least \$500 in order to be an effective deterrent. We also noted that there is no provision for progressive fines for chronic and recurring offenses. These repeat offenders consider the penalty to be a "cost of doing business" rather than a deterrent.

Other jurisdictions are moving in new directions to achieve trucking safety

While vehicle safety inspections and the detection of vehicle defects continues to be an important component of trucking safety, a number of jurisdictions have decided that driver behavior should be an increasing focus of enforcement efforts. Since moving violations committed by commercial drivers have the potential to cause accidents of great magnitude, this new approach to trucking safety seems well justified.

Management of the branch is actively considering whether to extend the focus of portable weigh scales to active intervention in heavy truck moving violations, and whether current branch staff should perform this new function. Many jurisdictions believe that such active intervention should continue to be a police function because police are selected and trained for this role and already have the necessary equipment and infrastructure to carry it out.

While technology such as weigh-in-motion sensors is playing an increasing role in the regulation of the trucking industry in other jurisdictions, in our opinion the branch is not taking full advantage of current technology to improve the efficiency and cost-effectiveness of its enforcement programs.



detailed report

trucking safety: the ministry's enforcement programs

What Is Meant by Trucking Safety?

Trucking safety refers to the operation of commercial vehicles in a way that results in the number and seriousness of truck accidents being minimized, lives being saved, injuries being prevented and property damage being reduced. In general, it is pursued through education and enforcement activities.

Importance of Trucking Safety

Trucking safety continues to be an important issue in British Columbia for a number of reasons.

First, there is an increasing number of trucks on provincial highways. Second, heavy commercial vehicle collisions continue to be a source of concern to the industry, regulators, and the general public. Third, the real and estimated social costs associated with truck accidents, injuries and fatalities are significant. These matters are discussed more fully below.

Growth of the Industry

The trucking industry carries more than 75% of all goods transported within the Province and is expected to continue to grow over the next 10-year period at a rate consistent with the expected growth of the provincial economy.



Courtesy: I.H. Aaron

Typical tractor-trailer unit with gross vehicle weight of 39,500 kgs.

British Columbia's trucking industry mirrored the Province's strong economy in 1994, with tonnage shipped increasing 11% over 1993 levels. International movements such as transportation from Vancouver to Portland, Oregon, showed the largest percentage increase, with tonnage shipped rising 16% over 1993 levels. Intra-provincial movements—that is movements from point-to-point within the Province—showed an increase in tonnage shipped of 7% over 1993 levels. The forecast is for continuing growth in the volume of shipments handled by the Province's trucking industry.

After passenger vehicles, commercial vehicles are the second largest population of vehicles traveling on British Columbia's roads (Exhibit 1.1). Over the period 1986 to 1994, growth in the number of licensed commercial vehicles paralleled the growth of passenger vehicles (on average, 2.1% and 2.5% per year, respectively).

Heavy Commercial Vehicle Collisions

Over the past few years, commercial vehicles have been involved in numerous accidents, including notable ones in North Vancouver, Horseshoe Bay, Kamloops, and on the Coquihalla Highway. These were heavily publicized in the media and were the subject of major coroners' inquiries.

Costs of Motor Vehicle Collisions

Commercial vehicle collisions, fatalities, and injuries incur a high cost, not only in direct property damage, higher insurance rates, and increased fees and taxes for health care and criminal justice systems, but also in the significant social costs associated with loss of life, injury, and loss of productivity. The Ministry of Attorney General estimates the social costs of a fatal accident to be \$3,800,000; of an injury accident to be \$100,000; and of a property damage accident to be \$12,000. It also estimates the total

Exhibit 1.1

Number of Licensed Vehicles (1986-1994)

(In Thousands)

	1986	1987	1988	1989	1990	1991	1992	1993	1994
Commercial vehicles	574	586	603	620	638	653	665	675	694
Passenger vehicles	1,571	1,628	1,682	1,740	1,803	1,858	1,904	1,931	1,969

Note: Commercial vehicles include trucks, buses, and other commercial vehicles.

Source: British Columbia 1994 Traffic Collision Statistics

cost to citizens of the Province of all motor vehicle collisions to be more than \$2 billion annually. Thus, effective programs that reduce the incidence and magnitude of trucking accidents have significant economic and social impacts.

Achieving Trucking Safety

The Motor Vehicle Branch, an agency in the Ministry of Transportation and Highways, is the primary means by which the government seeks to achieve its goals relating to trucking safety (Exhibit 1.2). The objective of the branch is to ensure that people and resources are moved safely and efficiently as part of the provincial transportation system. The branch has responsibility for: setting driver licensing standards; operating trucking safety enforcement programs; and regulating and licensing commercial carriers.

The Motor Vehicle Branch spent, net of recoveries, \$58.1 million during the 1994/95 fiscal year: about \$38.7 million on driver/vehicle operations and \$19.4 million on administration. The branch estimates the total cost of the three trucking safety enforcement programs to be \$13.2 million, but it was unable to provide us with a detailed breakdown of the individual program costs.

The branch is currently undergoing a transition in reporting relationships. The first phase of this transition, which took place in November 1996, involved the move of the driver licensing division of the branch to the Insurance Corporation of British Columbia. Safety enforcement functions are scheduled to move to the Insurance Corporation of British Columbia in March 1997.

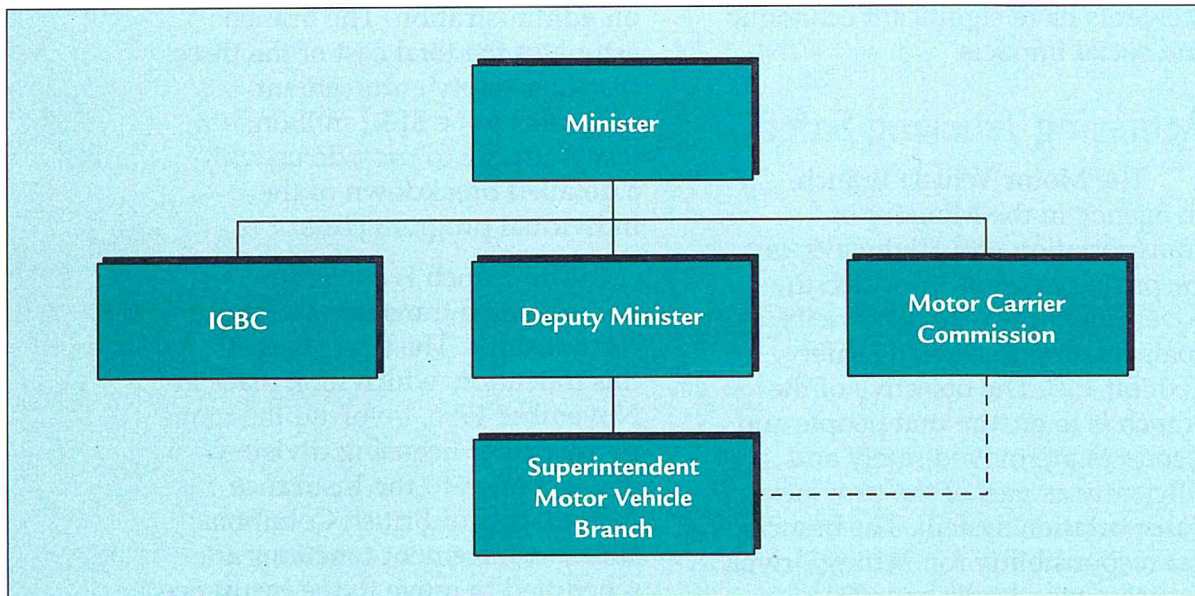


Courtesy: Office of the Chief Coroner

Fatal heavy commercial vehicle collision in Kamloops, British Columbia

Exhibit 1.2

Partial Organizational Structure of the Ministry of Transportation and Highways, March 31, 1996



Source: Ministry of Transportation and Highways

Key Legislation and Safety Codes

The Motor Vehicle Branch enforces the provisions of the *Motor Vehicle Act*, the *Commercial Transport Act*, and the *Motor Carrier Act* which make reference to trucking safety. The notion of trucking safety is also contained in the ministry's mandate, "to provide for the safe and efficient movement of people and resources on a multi-modal provincial transportation network" (Ministry of Transportation and Highways Annual Report, 1993-94). In addition, the branch applies the National Safety Code, and the out-of-service criteria of the Commercial Vehicle Safety Alliance in its regulation of the trucking industry.

Trucking Safety Enforcement Programs

We focused our audit on the branch's trucking safety enforcement programs, examining specifically three principal components:

- fixed weigh scales;
- portable weigh scales; and
- carrier safety audits.

Fixed Weigh Scales

There are 36 fixed weigh scales operating in the Province. The purpose of these is to perform both service and regulatory functions. The service function entails activities such as issuing permits and

responding to trucking industry inquiries about weights, dimensions, truck configurations, and so on. Regulatory functions include enforcing weight limits established for commercial vehicles, and examining commercial vehicles to ensure they comply with the licensing provisions of the *Motor Carrier Act*. Another major responsibility of fixed weigh scales is the conduct of commercial vehicle safety inspections using the out-of-service criteria of the Commercial Vehicle Safety Alliance. This involves three inspection levels:

- A level 1 inspection consists of a mechanical inspection of the truck, including the cab controls and vehicle underside (brakes and other components). It also includes a visual scrutiny of the driver for signs of fatigue or impairment, and an examination of the driver's record of duty and shipment documentation.
- A level 2 inspection is a visual walk-around check of the vehicle and the driver.
- A level 3 inspection is an examination of the driver and shipment documentation only.

Any driver and/or vehicle found to be in violation of safety requirements may be fined and/or taken out-of-service until the conditions are corrected.

Portable Weigh Scales

There are 24 portable weigh scale vehicles operating in the Province. The purpose of these vehicles is to patrol provincial highways, identify suspect vehicles, and conduct roadside inspections of

commercial trucks to determine whether the driver and vehicle comply with various safety codes, acts, and regulations. Portable weigh scales act as a deterrent in that they are deployed in a random manner in order to check for overweight and over-dimension trucks, and general vehicle and driver condition. Portables also redirect trucks that have attempted to bypass fixed weigh scales, and provide coverage in those areas not served by fixed weigh scales. Portables also participate in random roadside inspections at pre-selected sites throughout the Province in conjunction with the RCMP and municipal police.

As with fixed weigh scales, any driver and/or vehicle found to be in violation of safety regulations is subject to fines and/or being taken out-of-service until the conditions are corrected.

Carrier Safety Audits

Carrier safety audits are carried out by 11 Carrier Safety Inspectors to ascertain if commercial carriers meet the requirements of the various acts and safety codes. Carriers are selected for audit from the branch's "worst 500 list" or based on other selection criteria. Guided by the legislation and codes, an inspector enters the business premises of motor carriers to review driver and truck safety programs as indicated by driver records, vehicle maintenance records, safety certificates, and so on. Audits can result in significant fines being levied against the carrier and, in serious situations, a carrier's operating authority being removed.

Our Expectations

To maximize the effect of the enforcement programs on trucking safety, we expected the branch to have:

- evaluated the degree to which program objectives were being achieved;
- established clear objectives and safety standards for each program, and instituted an effective monitoring mechanism to ensure system-wide uniformity and consistency in the application of safety standards;
- staffed its programs with properly trained and certified inspectors;
- delivered the programs in a manner designed to achieve their objectives; and
- conducted research to determine whether more cost-effective strategies exist to achieve trucking safety.

These criteria are based on the requirements of the *Motor Vehicle Act*, *Commercial Transport Act*, and *Motor Carrier Act*, the safety codes and standards related to those, the standards of the branch and ministry, and good management practices.

In the following sections of the report, we present our audit findings and conclusions with respect to the extent to which the branch meets these criteria. In the first section, we discuss program evaluation, and provide an analysis of output levels achieved in each enforcement program. In addition, we analyze some outcome measurement information to provide insights into the state of trucking safety in the Province. In the final section of our report, we review the extent to which the branch has assessed the relative effect of a range of factors to determine whether more efficient and cost-effective strategies exist to achieve trucking safety.



measuring and evaluating program results

We expected management to know whether the programs are achieving their intended results or whether adjustments to the programs are needed.

Conclusion

The branch has not developed an evaluation framework to measure how well its enforcement programs are operating. Consequently, the branch neither has adequate information about the costs of the programs nor is it able to determine whether the number of administrative and enforcement activities per inspector are declining, improving, or remaining the same. We concluded from our analysis that the branch is not achieving the same output levels as were achieved in previous years.

The branch has not defined what it means by “trucking safety” nor has it established a clear relationship between the impact of its trucking safety enforcement programs and the state of trucking safety. Further, the branch has not developed performance indicators and realistic targets to achieve trucking safety. We concluded that there are serious issues related to the state of trucking safety in British Columbia in that a significant number of commercial vehicles and drivers continue to be taken out-of-service and, while the absolute number of trucking accidents has decreased, their severity has increased.

Findings

Measuring and Evaluating Program Outputs

General

In our audit, we identified key program activities that managers control and are accountable for. The results of these activities, called program outputs, should be measured by managers using a range of indicators, and be compared to established targets in order to determine whether performance is meeting expectations and reasons for variance from targets if any. Such insights into the performance of enforcement programs is the only way managers can objectively assess whether the programs are being delivered efficiently and cost-effectively.

We found that regional managers compile a monthly summary of program activities including the number of Commercial Vehicle Safety Alliance inspections performed, the number of violation tickets issued, and the number of carrier safety audits conducted. This information, however, is not consolidated at the corporate level and, accordingly, the branch does not determine the overall output of each of these three enforcement programs. Nor does the branch attempt to determine the cost of each program for the current and prior years. It therefore does not know whether program outputs are declining, improving, or remaining the same and cannot answer some

basic questions. For example: Is the cost of each program changing over time? Are more or fewer inspections being conducted? Are available resources being used efficiently? Does output vary significantly between regions and, if so, why? What is the level of enforcement and cost that impresses upon potential offenders that they have a high probability of being detected, prosecuted, and convicted?

As the branch had not evaluated the output of its three enforcement programs, we set out to make our own assessments. This was a difficult task in that the

information we needed was stored in a number of databases and the branch lacked computer programs with which to produce comprehensive performance reports. In the end, we were not able to obtain significant pieces of information that we originally requested such as annual costs for each of the three enforcement programs. One of our key objectives had been to determine whether the programs were being delivered at reasonable cost. Because of information limitations, we were not able to answer this important question.

Exhibit 1.3

Enforcement Program Staffing Levels (1992-1996)

	1991/92	1992/93	1993/94	1994/95	1995/96
Technical Enforcement Officers	144	144	145	149	141
Carrier Safety Inspectors	19	9	12	11	11

Source: Motor Vehicle Branch

Exhibit 1.4

Fixed and Portable Weigh Scale Activity (1992-1996)

Fiscal year	Permit count	Permit revenue (\$)	Fines count	Fines revenue (\$)	Notice & orders count	Vehicles checked count
1995/96	152,650	7,202,192	29,128	4,915,676	25,447	2,622,003
1994/95	181,861	8,324,552	34,607	5,385,734	31,918	2,629,052
1993/94	171,362	7,365,735	45,220	5,283,796	39,081	3,353,013
1992/93	157,541	est. 6,284,490	38,851	est. 4,550,838	33,603	3,143,876
1991/92	N/A	N/A	41,952	3,707,541	35,167	2,813,269

Note: Revenues for 1992/93 were estimated from total 1992/93 permits plus fines revenue and the permit and fine ratios from 1993/94

Source: Motor Vehicle Branch

Staffing and Output Activities

At our request, the branch provided enforcement program staffing levels and some output data for a five-year period.

Technical Enforcement Officers

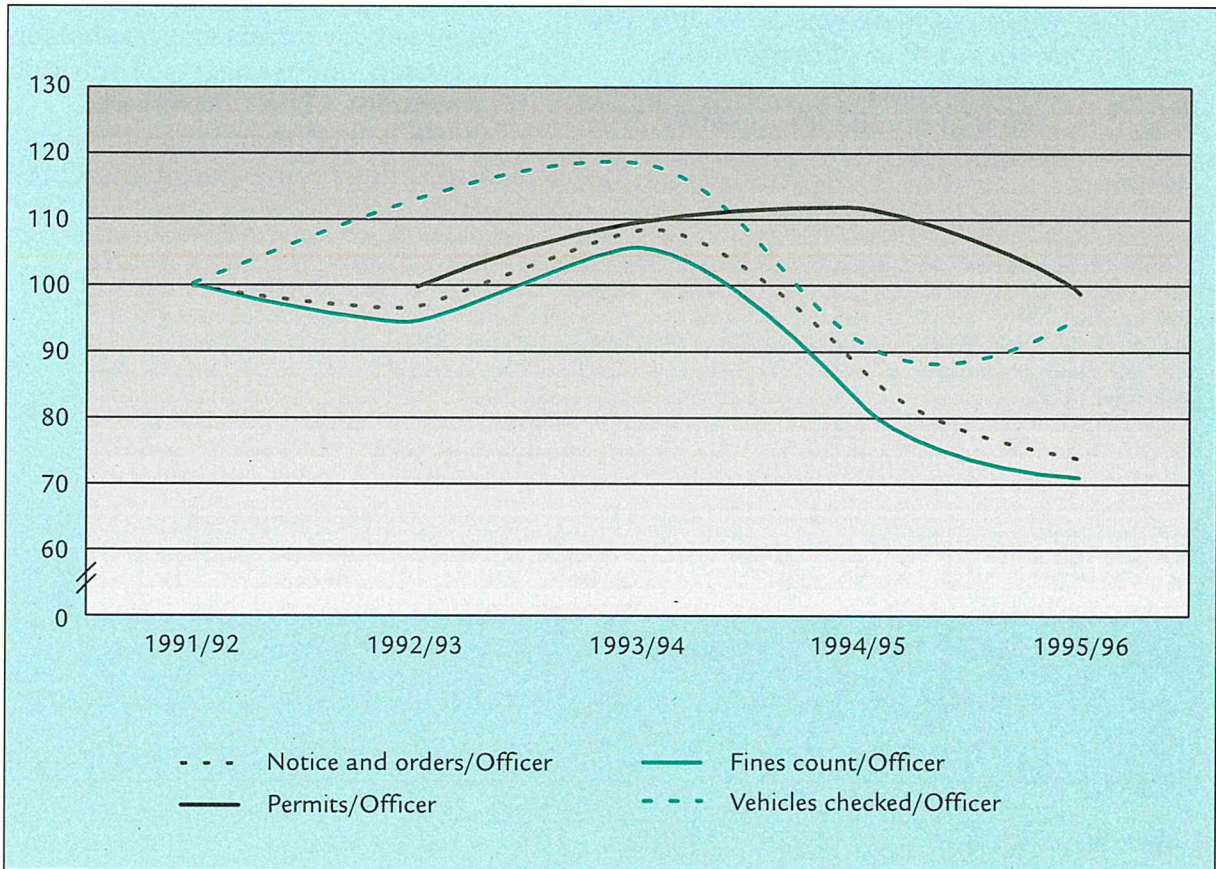
Exhibit 1.3 shows that the number of Technical Enforcement Officers, the people primarily engaged in fixed and portable weigh scale programs, remained relatively constant during the period 1991/92 to 1995/96.

Using data provided by the branch, we also reviewed fixed and portable weigh scale enforcement activities during the same period, including permits issued, permit revenue, fines levied, fines revenue, notices and orders, and vehicles checked (Exhibit 1.4). We found that enforcement activities per inspector showed an increase between 1991/92 and 1993/94, and a decline between 1994/95 and 1995/96.

Exhibit 1.5

Fixed and Portable Weigh Scale Activity per Officer (1992-1996)

Output per Officer



Source: Motor Vehicle Branch

Our observation, in comparing staffing levels with output levels at fixed and portable weigh scales, is that while staffing levels have remained constant, the output of the weigh scale programs has decreased. This suggests that the branch is not achieving the same level of output per inspector as in previous years (Exhibit 1.5). We were not able to determine the reason for this trend.

Carrier Safety Inspectors

As noted earlier, carrier safety audits are conducted by Carrier Safety Inspectors at the premises of motor carriers. According to branch records, the number of Carrier Safety Inspectors has decreased from 19 to 11 over the four-year period beginning in 1992.

During the period 1992 to 1994, we found there was a 34% increase in the number of carrier safety audits per inspector. However, in 1995 that number dropped by 29%. (Exhibit 1.6).

We sought an explanation for these figures. Since the program began in 1992, there has been a shift in philosophy. Previously the focus was on educating carriers through compliance audits which serve to raise the level of carrier awareness of safety requirements. More recently, there has been greater use of verification audits which check carrier records to determine whether safety requirements have been met and use sanctions to achieve change. We believe this shift partly explains the decline in the number of audits per inspector due to the fact that verification audits are more complex than compliance audits and, therefore, require more time.

Attitudes and the relationship to safety

We set out to determine whether the branch's programs were seen by significant stakeholders—owners and managers of trucking companies, Class I drivers and Motor Vehicle Branch employees—as meeting their expectations. Our

Exhibit 1.6

Audits and Contraventions per Inspector (1992-1995)

Year	Audits	Audits per inspector
1995	617	56
1994	874	79
1993	913	76
1992	533	59

Source: Motor Vehicle Branch

results show a significant discontent on the part of trucking company owners and managers as well as Class I drivers with the way they are being treated by some branch personnel at fixed and portable weigh scales. For example, while some applauded the demeanor, competency, and attitudes of the majority of Technical Enforcement Officers, others were concerned about the attitudes of some officers who were described as inflexible, rude, and confrontational.

We believe an antagonistic relationship exists between the enforcement community and the trucking industry which does not promote the interests of trucking safety in British Columbia. The depth of concern expressed by the industry leads one to question whether there are more fundamental issues at stake, such as the recruitment, selection, and training of enforcement officers with appropriate motivation, attitudes, and skills for the functions they perform.

Use of Survey To Collect Audit Evidence

In the conduct of our audit we surveyed a random selection of stakeholders both within and outside the branch. The survey was based, in part, on the standards as set down in the National Safety Code and the Commercial Vehicle Safety Alliance, as well as relevant sections of the *Motor Vehicle Act* and *Motor Carrier Act*. The survey was designed to seek a range of information concerning design, implementation, and cost-effectiveness of the enforcement programs. It also sought information about the impact of the enforcement programs on trucking safety relative to other factors.

We were struck by the high level of interest in trucking safety as evidenced by the response to our survey. The following table identifies the number of surveys issued, the response rate, and the rate of surveys returned in which the respondent took the extra effort to provide additional comments that were very useful. Response rates of 50% in this type of survey are generally considered exceptional.

Survey Recipient	Sent	Returned	Response Rate	"Comments" Rate
Branch employees	126	109	87%	52%
Owners/managers of B.C. based trucking companies	695	229	33%	47%
Active B.C. Class 1 truck drivers	1,125	693	62%	48%

Several significant themes arose from the additional comments supplied by our survey respondents. The most significant of these were as follows:

- Need for graduated licensing / apprenticeship program / driver training
- Inequitable enforcement (i.e. unlevel playing field)
- Inappropriate fines / sanctions
- Driver logbooks not effective
- Inadequate enforcement program coverage (hours and location)
- Negative branch employee attitudes / inadequate training

We found that the branch has conducted a number of meetings with the trucking industry. While there has been good attendance and participation at some meetings, other attempts to meet with industry to identify their concerns and ways to improve programs have been unsuccessful.

Coroners' Inquiries

We reviewed a number of coroner inquiry reports related to major trucking accidents in British Columbia for the period 1989 to 1996. We found that each inquiry report contained recommendations common to those contained in previous inquiry reports relating, for example, to issues around air braking systems, the need for proper training of commercial drivers, and implementation of a graduated licensing system. However, since the branch does not have an established process to obtain coroners' reports and to act upon the recommendations, there is no assurance that these issues are being properly dealt with. Our analysis of the present status of recommendations from coroners' inquiries into four major commercial vehicle crashes involving fatalities shows that several important recommendations have not been acted upon (Exhibit 1.7).

Measuring Outcomes *General*

Branch enforcement programs have been developed to contribute to the ministry's goal of the safest roads in North America and the goal of trucking safety. Therefore, in addition to evaluating how well the programs are operating, we expected that the branch would

have defined the term "trucking safety" and established the relationship between its enforcement programs and the state of trucking safety. We also expected the branch to have identified a number of outcome indicators such as fatalities and injuries, and to have set performance targets. Finally, we expected the branch to have developed systems to provide such information on a regular basis. This would then allow the branch to periodically evaluate the impact of its enforcement programs on trucking safety.

Because the branch does not have a comprehensive evaluation framework, we used data from the branch and other sources in an attempt to provide information about the state of trucking safety in British Columbia.

Results of Driver and Vehicle Inspections

Out-of-service rates

The Commercial Vehicle Safety Alliance annually stages a North America-wide roadcheck in which all commercial vehicles are stopped and checked at key locations in all Provinces and states. During this 72-hour blitz, Alliance-trained-and-certified inspectors randomly select commercial vehicles and carry out a full Commercial Vehicle Safety Alliance inspection. The results of this annual roadcheck provide some insight into the state of trucking safety and how it has changed over time. The purpose of the Annual Roadcheck is to provide regulators, the trucking industry, and the general public with a snapshot of the state of trucking safety in each jurisdiction. Results for the years 1991 to 1996 show a steady decline

Exhibit 1.7

Status of Coroner's Recommendations From 4 Major Accidents Between 1989 and 1996

Recommendation	Year(s) of Recommendation	Present Status
Promote driver education re: air brake systems	1989 (Coquihalla) 1996 (the "Cut")	No change
Intensify "Brake Check" enforcement	1989 (Coquihalla)	No change
Fine registered owner of vehicle with unserviceable brakes	1989 (Kamloops) 1996 (the "Cut")	No change
Require all air brakes to have push rod indicators	1996 (the "Cut")	Limited number handed out at RoadCheck '96
Require automatic brake adjusters on all air brake equipped vehicles	1996 (the "Cut")	Currently optional on tractor brakes; mandatory on new vehicles beginning Jan. 1, 1997
Install brake inspection pits	1989 (Kamloops)	No change
Require greater use of computerized brake testing equipment	1996 (the "Cut")	No change
Train/qualify Eagle Ridge inspectors at Horseshoe Bay to carry out brake inspections and require drivers to adjust brakes	1990 (Horseshoe Bay)	No change
Provide sufficient funding to hire adequate inspectors to monitor commercial vehicle safety	1989 (Kamloops) 1996 (the "Cut")	Minister announces "flying squad" to enforce "Brake Check" Regulation (Sept. 1996)
Institute regular Class 1 licence reexamination	1989 (Coquihalla)	No change
Institute joint training/apprenticeship program between industry and government for new drivers	1989 (Kamloops) 1996 (the "Cut")	No change
Implement graduated licencing system	1996 (the "Cut")	No change
Operate all major weigh scales 24-hours-per-day	1989 (Kamloops)	No change
Institute escalating penalties for repeat offenses	1996 (the "Cut")	No change
Note: Coroner's Inquiry recommendations for the "Cut" were published in September 1996		

Coroners' Inquest Recommendations

The jury at a recent coroner's inquest into two deaths caused by a runaway tractor-trailer on the Trans-Canada Highway north of the Second Narrows Bridge in North Vancouver has made 19 recommendations to improve truck safety. The coroner found that the accident was a result of five of eight brakes being out of adjustment. The following recommendations are taken from the Coroner's report:

- That the Ministry of Transportation install an "800" number that can be used by people in the commercial vehicle industry to report unsafe practices.
- When making commercial vehicle repairs, wherever possible, self-inspection should be discouraged. When work is performed on critical systems on commercial vehicles (i.e., braking systems) an inspection should be required by another, different qualified mechanic/inspector. Where a second such mechanic/inspector is not available, the operator is required to carry out a function check.
- An organized auditing and reporting structure, based either on volume of vehicles inspected or a fixed time frame, should be established for monitoring inspection and repair/maintenance facilities. Such a system already exists under the ISO 9000 umbrella.
- That a protocol be developed between the Ministry of Transportation and Highways, the B.C. Coroners Service and the police that would allow for a cooperative investigation of commercial vehicle fatalities. This protocol should stress cooperative effort amongst all interested parties. This suggestion should be addressed to the Chief Coroner of the Province.
- Steps should be taken to secure sufficient funding from the B.C. Government to provide enough inspectors to adequately monitor commercial vehicle safety. Clearly, 24 inspectors cannot be expected to enforce or monitor the various regulations dealing with truck safety.
- That legislation be enacted to provide a law with respect to fining the operator of a motor vehicle who is doing so with maladjusted brakes. The suggested fine is \$500.00. In addition, we recommend escalating penalties be levied for repeat offenses (i.e., suspension of air brake license). Signs should be erected throughout the Province warning of this legislation.
- That legislation be enacted to provide a law with respect to fining the owner of a commercial vehicle that is found to have unserviceable or maladjusted brakes. While the operator is responsible for checking the brakes, somehow the owner must be responsible for the condition of his vehicles. Clearly, properly completed and archived pre-trip inspection reports would be of great assistance to the owner in determining unsafe conditions. The fine for either offense should be \$500.00.
- That the trucking industry and the B.C. Government enter into a joint training program for new drivers and new B.C. license applicants. The program would be akin to an apprenticeship and cover a minimum period of 6 months. This program could be combined with a multi-step license that would ensure that the driver was completely trained and conversant in all areas of the operation of a commercial vehicle.
- That trucks utilizing air brakes be required to be equipped with self-adjusting slack adjusters. This issue falls within the mandate of the federal government and as such the recommendation should be forwarded to the Minister of Transport as well as the provincial Minister of Transportation and Highways. The Minister of Transportation and Highways should attempt to get a consensus on this issue with her provincial counterparts. It should be noted that self-adjusting slack adjusters does not remove the responsibility on the part of the driver and owner to ensure that the brakes are in safe operating condition.
- Conduct focused "brake" inspections with the use of computerized dynamometer type brake testers.
- Phase in computerized dynamometer braking performance testing of heavy trucks and trailers on a regular basis (either semi-annually or by kilometers traveled).
- Develop meaningful performance standards for certified CVIP facilities to either comply or lose the privilege of conducting CVIP inspection on heavy trucks/trailers.
- Heighten the awareness of professional drivers and mechanics (through existing training programs)-about the significance (and importance of) maintaining maximum reserve pushrod stroke.

- Revise the existing mandatory air brake course for professional drivers to focus more attention on conditions that could result in a loss of braking performance as opposed to the design of pneumatic brake systems.
- Provide heavy truck operators traveling on the Upper Levels Highways with additional information (at the top of the "Cut") regarding the severity of the grade that descends toward the Second Narrows Bridge. Specifically, we recommend an overhead flashing "davit" sign indicating an 8% grade of 1 km; trucks gear down.
- Require that steps be taken (at each CVIP inspection) to confirm and record that there is the maximum required reserve pushrod stroke at each brake chamber.
- Develop a standard approach to inspect brake systems and determine the braking performance force of heavy trucks involved in any brake-related crashes.
- We recommend the installation of concrete pier barriers through the Mountain Highway overpass in both the eastbound and westbound direction of Highway #1.
- We recommend the duration of the temporary inspection approvals be reduced from 14 days to 7 days.

Exhibit 1.8

Commercial Vehicle Safety Alliance 72 Hour Roadcheck Out-of-Service Statistics for British Columbia (1991 - 1996)

Year	Units out-of-service rate (%)	Violations per unit	Drivers out-of-service
1991	43	0.5	4
1992	31	0.7	10
1993	23	0.6	1
1994	24	0.5	13
1995	21	1.1	48
1996	19	0.9	49

DEFINITIONS:

Units out-of-service
Percentage of units inspected having conditions serious enough (such as defective brakes) to require that they not be permitted to continue until the conditions are corrected.

Violations per unit
Frequency of any defects/violations

Drivers out-of-service
Number of drivers having conditions serious enough (such as having driven beyond the allowable time limits or not recording logs properly) to require that they not be permitted to continue until the conditions are corrected.

Source: Motor Vehicle Branch

in British Columbia out-of-service rates from 43% to 19% (Exhibit 1.8). In addition, the number of drivers placed out-of-service by commercial vehicle inspectors has increased

significantly in the same period because of an increased focus on drivers. The results of the branch's own inspections carried out at fixed and portable weigh scales during



Technical enforcement officer performing inspection during Roadcheck '96

Courtesy: W.J. (Bill) Brown

the same period show consistent vehicle out-of-service rates between 19% and 26% (Exhibit 1.9).

Clearly these results are unacceptable as they indicate that approximately one in five commercial vehicles traveling in British Columbia would, if subjected to a Level 1 inspection, be taken out-of-service immediately until appropriate repairs or adjustments had been made. The seriousness of the situation is evident from results of branch roadside inspections for the period February 1995 to February 1996 which show that

about 57% of those vehicles taken out-of-service are because of brake-related problems, and about 31% for lights, suspension, steering, and tire problems (Exhibit 1.10). The significance of these vehicle defect rates are further corroborated by evidence from a number of coroner inquiries which attest to the fact that brake-related problems played a significant role in all of the 4 major commercial vehicle crashes noted previously (Exhibit 1.7). Thus we believe the branch needs to achieve lower out-of-service rates in order to meet its vision of "the safest roads in North America."

Comparison with other Canadian jurisdictions shows that British Columbia is better than the national average in terms of out-of-service trucks, but worse than the national average when it comes to out-of-service drivers (Exhibit 1.11).

Collision, injury, and fatality rates

In addition to out-of-service rates, the incidence of heavy commercial vehicle collisions in British Columbia also provides insight into the state of trucking safety and how it has changed over time (Exhibit 1.12). As shown in the table, the number of heavy commercial vehicle collisions declined significantly by 18.8% from 1991 to 1993 but then increased again sharply in 1994, by 8.4%. (Because figures for 1995 were not available, we were unable to determine whether the increase in 1994 was an anomaly.) Compared to all collisions, the number of heavy commercial vehicle collisions declined from 5.37% to 4.87% in the three years 1991 to 1994.

While these percentages show that the incidence of heavy commercial vehicle collisions is

Exhibit 1.9

Motor Vehicle Branch Yearly Out-of-Service Statistics for British Columbia (1991 - 1995)

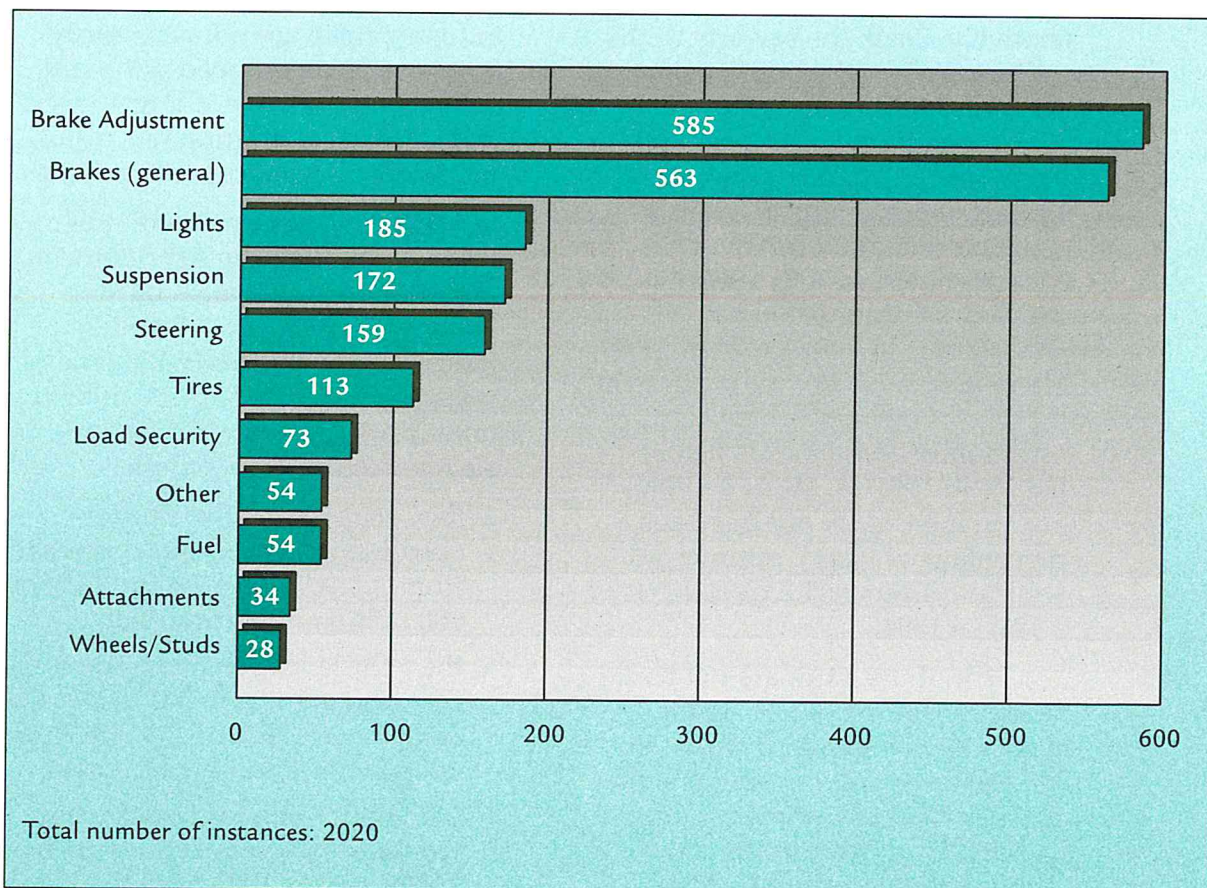
Year	Units checked	Units out-of-service	Units out-of-service rate (%)
1991	16,091	3,067	19
1992	20,713	4,742	23
1993	19,385	4,956	26
1994	13,107	3,274	25
1995	12,824	2,912	23

Source: Motor Vehicle Branch

Exhibit 1.10

Main Reasons for B.C. Vehicles Being Taken Out-of-Service in B.C.

Results of roadside inspections for B.C. plated vehicles from February 1995 through February 1996



Source: Motor Vehicle Branch

Exhibit 1.11

Commercial Vehicle Safety Alliance Roadcheck – 1995

Jurisdiction	Total units inspected	Units out-of-service	Drivers out-of-service	Units out-of-service (%)	Drivers out-of-service (%)
B.C.	1,085	279	48	25.7	4.4
Alta.	789	254	50	32.2	6.3
Sask.	405	101	3	24.9	0.7
Man.	161	59	5	36.6	3.1
Ont.	2,436	1,045	8	42.9	0.3
Que.	853	113	16	13.2	1.9
NB	215	88	9	40.9	4.2
PEI	44	9	0	20.5	0.0
NS	306	93	0	30.4	0.0
Nfld.	251	46	1	18.3	0.4
Yukon	47	12	2	25.5	4.3
NWT	68	23	0	33.8	0.0
Nationally	6,660	2,122	142	31.9	2.1

Source: Canadian Council of Motor Transport Administrators

relatively small, the severity of the collisions when they do happen is often greater than for other motor vehicle collisions. From 1991 to 1994, the number of persons injured as a result of a commercial vehicle collision remained relatively constant (1,401 in 1991 vs. 1,460 in 1994), as did the number of fatalities (66 in 1991 vs. 73 in 1994). There was, however, an increase in the rate of injuries as a percentage of commercial vehicle collisions (26.1% in 1991 vs. 30.9% in 1994) and an increase in fatalities as a percentage of heavy commercial vehicle collisions (1.23% in 1991 vs. 1.54% in 1994).

The above rates are not based upon a common denominator which allows standardization in measurement. As a result, it is not clear to what extent these rates are affected by growth in the industry. Though there is growth in the volume of business for the trucking

industry, there are not necessarily more trucks on the road nor more distances traveled (e.g. larger trucks and different configurations result in greater carrying capacity per trip).

The U.S. has dealt with this problem through the development of a common outcome indicator known as "rates per 100 million miles." Using this indicator, fatality rates by truck type per 100 million miles traveled in the U.S. show a steady decline. For example:

- the occupant fatality rate for combination trucks has decreased from 1.3 in 1980 to 0.4 in 1992 per 100 million miles traveled;
- the vehicle involvement rate for combination trucks has decreased from 5.8 in 1980 to 3.1 in 1992 per 100 million miles traveled; and
- the fatality rate for combination trucks has decreased from 1.4 in 1980 to 0.5 in 1992 per 100 million miles traveled.

Exhibit 1.12

Motor Vehicle Collisions and Related Injuries and Fatalities (1991 - 1994)

	1991	1992	1993	1994
Motor vehicle collisions	100,023	96,082	93,819	97,157
Heavy commercial vehicle collisions	5,372	4,920	4,360	4,727
Heavy commercial vs. all collisions (%)	5.37	5.12	4.65	4.87
Persons injured (all vehicles)	47,375	48,438	46,952	48,299
Commercial vehicle drivers injured	1,401	1,371	1,434	1,460
Injured vs. heavy commercial vehicle collisions (%)	26.1	27.9	32.9	30.9
Fatalities (all collisions)	537	473	512	534
Fatalities vs. all collisions (%)	.54	.49	.55	.55
Commercial driver fatalities	66	54	68	73
Fatalities vs. heavy commercial vehicle collisions (%)	1.23	1.10	1.56	1.54

Note: The above data may be under-reported because the source documents do not always specify "commercial vehicle" involvement in the fatality. Users of these statistics are also advised that, in a live database environment, occurrence data are constantly being updated, thus changing the statistics over time. For instance, some individuals who may have been severely injured as a result of a commercial vehicle collision may subsequently become fatalities.

Source: British Columbia 1994 Traffic Collision Statistics

Indicators from Transport Canada's national traffic collision data file suggest that, overall, a fairly stable road safety situation exists involving commercial vehicles. As a percentage, commercial vehicle involvement in fatal and property damage crashes nationally over the past several years has remained virtually unchanged at about 1.2%, and has even decreased for injury-producing collisions.

Thus, overall, it appears that while trends involving heavy commercial vehicle collisions in British Columbia are consistent with those involving other motor

vehicles, the severity of the collisions is increasing and British Columbia appears to be moving contrary to the national average and U.S. trends.

Stakeholder Views

In addition to our own analysis, we sought the views of branch employees and trucking company owners and managers with respect to the impact of the three enforcement programs on trucking safety (Exhibit 1.13). This analysis provides the branch with insights into areas where it is perceived as being effective and areas where improvements are needed.



Courtesy: Office of the Chief Coroner

Fatal heavy commercial vehicle collision in North Vancouver, B.C. (the "Cut")

Recommendations:

The branch should:

- *define "trucking safety," develop performance measures and set targets with respect to the desired level of safety;*
- *institute a program evaluation framework to provide managers with regular and accurate performance reports on its enforcement programs and, in the longer term, determine the relationship between its enforcement programs and trucking safety;*
- *address the hostility that exists between itself and the trucking community; and*

- *establish a process to obtain and act upon recommendations arising from coroners' inquiries.*

In this section we have given our assessment of the results achieved by the three enforcement programs. Because improvements are required, the following sections discuss the design and implementation of the three enforcement programs and provide our assessments as to where changes could be made to improve efficiency, cost-effectiveness, and results.

Exhibit 1.13

Stakeholder Views About the Effectiveness of Enforcement Programs

	Branch employees	Owners/managers of B.C. based trucking companies
<p>Fixed Weigh Scales Scales are effective in reducing the number of overweight or over-dimension trucks. Scales are effective in detecting unsafe drivers. Scales are effective in detecting unsafe trucks.</p>	<p>Strong Agreement Little Agreement Strong Agreement</p>	<p>Strong Agreement Little Agreement No Agreement</p>
<p>Portable Weigh Scales Scales are effective in reducing the number of unsafe trucks. Scales are effective in detecting unsafe drivers. Scales are effective in detecting unsafe trucks.</p>	<p>Strong Agreement Strong Agreement Strong Agreement</p>	<p>Strong Agreement No Agreement Strong Agreement</p>
<p>Carrier Safety Audits Audits are effective in improving carrier safety management practices. Audits are effective in reducing the number of unsafe drivers. Audits are effective in reducing the number of unsafe trucks.</p>	<p>Strong Agreement Some Agreement No Agreement</p>	<p>Strong Agreement No Agreement Some Agreement</p>



establishing trucking safety standards

We expected the branch to have clear objectives that establish direction for its enforcement programs. We also expected the objectives to be consistent with overall ministry and branch goals, and to reflect the ideals of prevention of loss of life, personal injury, and loss or damage to vehicles and property. Standards are the rules that are used to assess whether a truck can be operated safely. We looked to see whether the standards were consistent with legislation and commercial vehicle safety standards. Finally, we looked to see whether the branch was monitoring to ensure the safety standards were being applied consistently and uniformly.

Conclusion

We concluded that the objectives and standards for the three enforcement programs are consistent with relevant legislation and commercial vehicle safety standards. However, the lack of clear communication of program priorities leads to inconsistent regulation of the industry in our view. Furthermore, the branch cannot provide assurance that safety standards are applied consistently and uniformly throughout the Province in that there is no system-wide monitoring of the standards.

Findings

Objectives

We found that the branch has established written objectives for the weigh scale and carrier safety audit programs. The objectives of the weigh scale program are: to

inspect and monitor commercial vehicles and drivers to ensure road safety; to educate industry; and to enable the safe movement of extraordinary loads and vehicles. The objectives of the carrier safety audit program are to reduce accidents by examining motor carrier operations and to promote compliance with safety requirements and laws concerning the highway transportation of people and goods across British Columbia.

Notwithstanding the existence of program objectives, the relative emphasis that inspectors should place on educating the trucking industry versus strict enforcement of the regulations does not appear to have been clearly communicated. This leads to inconsistent regulation of the industry in that an inspector who believes that education is the way to change carrier behavior and practices is likely to use moral suasion; an inspector who believes that enforcement is the best approach is likely to use fines and penalties.

Standards

Commercial vehicles are regulated primarily by the following provincial legislation: *Commercial Transport Act*, *Motor Vehicle Act*, and *Motor Carrier Act*. In addition to provincial legislation, there are two other sets of standards that the branch applies to help achieve trucking safety in the Province.

The first, the National Safety Code, is a comprehensive set of 14 carrier safety standards. These standards apply to all persons responsible for the operation of commercial vehicles exceeding a

National Safety Code

In 1987, the federal, provincial, and territorial governments developed a comprehensive set of standards for the safe operation of commercial vehicles. Known as the National Safety Code, it includes the following:

1. **Single Driver's License** – Prohibits the holding of more than one driver's license.
2. **Knowledge and Performance Test** – Principles for written and on-road driving tests.
3. **Driver Examiner Training Program** – A standard course for driver examiners and a minimum course for drivers.
4. **Classified Driver License System** – Seven classes of license, from Class 7 (learner) to Class 1 (heavy truck).
5. **Self-Certification Standards and Procedures for Drivers** – Criteria for carriers and schools to train and test drivers.
6. **Medical Standards for Drivers** – Initial medical requirements for each class of license and requirements for periodic re-examination.
7. **Driver and Carrier Profiles** – Contain records of infractions, accidents, on-road inspections, and facility audits.
8. **Hours of Service** – Limits on driving time and total on-duty time.
9. **Load Security** – Minimum standards for securing cargo.
10. **Commercial Vehicle Maintenance** – Minimum standards for the periodic inspection, maintenance, and repair of vehicles.
11. **On-Road Inspections** – Minimum standards for roadside inspection of vehicles, and for out-of-service criteria.
12. **Daily Trip Inspection Reports** – Requires drivers to prepare pre-trip and post-trip vehicle inspection reports.
13. **Compliance Review of Safety Fitness** – Currently under re-development. When complete, it will provide a comprehensive system for establishing carrier safety fitness ratings and for imposing sanctions where necessary.
14. **Facility Audits** – Requirements for the maintenance of records at a carrier's terminal, to be available for on-site review by government auditors of the carrier's safety performance and overall compliance with the National Safety Code.

registered gross vehicle weight of 5,000 kg. Every carrier, its officers, and employees must be familiar with these safety standards and comply with all applicable provincial safety regulations developed from the standards.

The penalties for non-compliance with the regulations can be severe. Warnings, fines, and out-of-service notices can be imposed by branch enforcement officers.

The Commercial Vehicle Safety Alliance, on the other hand, is a specific set of criteria used by regulators to evaluate whether a vehicle and/or a driver are in satisfactory condition to operate on the Province's highways. If a driver or vehicle is found to be in violation of certain criteria, that driver or vehicle is deemed out-of-service and cannot operate until the condition is remedied. If the vehicle is deemed to be in compliance,

Commercial Vehicle Safety Alliance Out-of-Service Criteria

While on the highway, drivers and their vehicles are subject to being inspected under the Commercial Vehicle Safety Alliance criteria. These criteria, applied across Canada, the United States, and Mexico are used to determine when a driver or vehicle should be required to stay off the road because of being unsafe.

Driver Out-of-Service Criteria

A driver may be found to be ineligible to operate a vehicle if he or she is:

- not the minimum age required;
- not licensed to operate the class and type of vehicle being operated;
- physically disqualified from driving and does not possess a waiver;
- so impaired with sickness or fatigue that it is unsafe to continue the trip;
- in possession or under the influence of drugs or other substances;
- in possession or under the influence of an intoxicating beverage;
- in violation of the hours of service regulations; or
- unable to produce the appropriate record of duty status or has a fraudulent record.

Vehicle Out-of-Service Criteria

Vehicle out-of-service conditions involve a defect in one or more of the following:

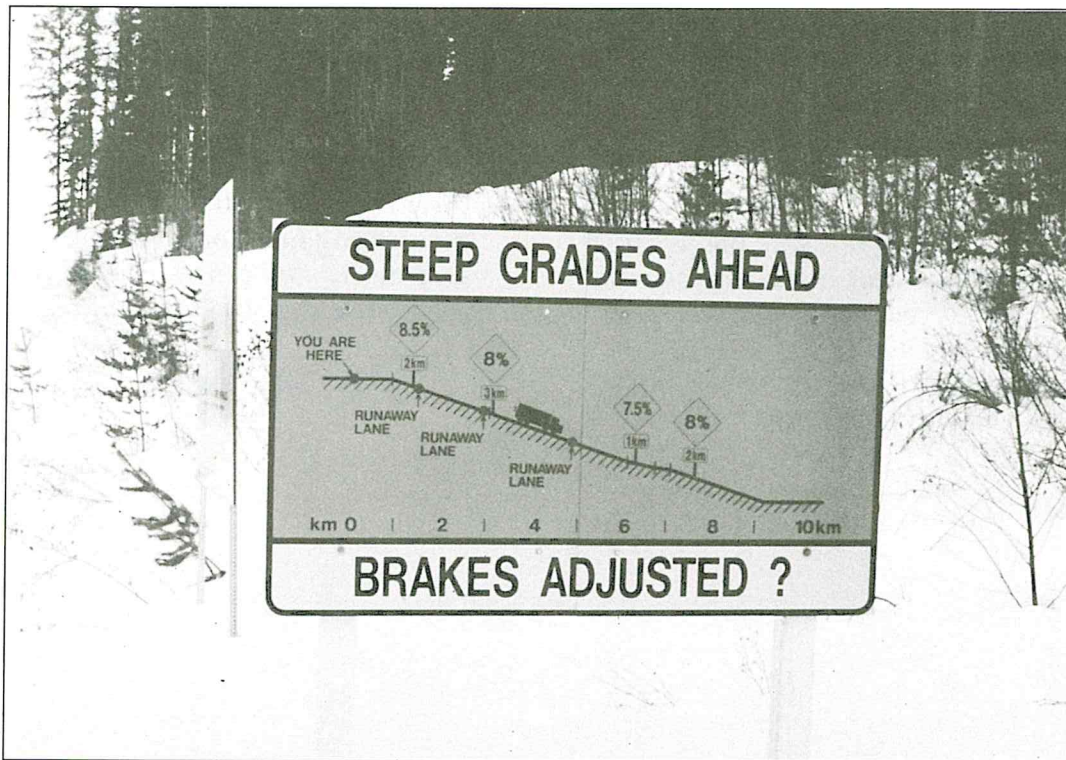
- braking system;
- coupling devices;
- exhaust system;
- fuel system;
- lighting devices;
- loading of the vehicle;
- steering mechanism;
- suspension;
- frame;
- tires;
- wheels and rims;
- windshield glazing; or
- windshield wipers.

inspectors will award a Commercial Vehicle Safety Alliance sticker, valid for three months.

We found that the policies and procedures manuals of the branch, revised in January 1996, reflect current legislative standards. Weigh scale inspection procedures are based on legislative requirements, which include National Safety Code

standards, as well as on Commercial Vehicle Safety Alliance standards. Carrier safety audits are also carried out in accordance with National Safety Code requirements.

We noted that the Commercial Vehicle Safety Alliance has clear and strict guidelines for determining when a driver or vehicle should be placed out-of-service. We noted also



Courtesy: Office of the Chief Coroner

Province-wide advisory sign alerting commercial drivers to adjust brakes

that the standards of the National Safety Code have been published and are readily available to the trucking industry from the branch. What is less precise, however, is what steps should be taken by the branch when violations of National Safety Code standards have been identified and the threshold at which such action should be taken. For example, with carrier safety audits, there are no clear guidelines as to when an interview should occur between management of a carrier with a poor safety record and the Regional Manager, Compliance; or, depending on the severity of the offenses, when a "show cause" hearing should take place to determine whether a carrier should continue to operate.

Monitoring

The branch has a responsibility for public safety by ensuring that its programs are delivered in a consistent and uniform manner throughout the Province. In order to accomplish this, we expected the branch to have in place a centralized monitoring function to review the application of all relevant safety standards.

We found, however, that the branch has not established such a function. As a result, the conduct of Commercial Vehicle Safety Alliance inspections and carrier safety audits are not monitored to ensure they are carried out uniformly and consistently throughout the Province. During our audit, several members of the trucking industry raised

concerns about the lack of uniform and standardized enforcement coverage by the branch.

Recommendations:

The branch should:

- *clearly communicate the relative emphasis that inspectors should place on educating the trucking industry about its responsibilities for safety versus strict enforcement of the regulations;*

- *develop clear guidelines as to when and how specific National Safety Code sanctions relating to carriers with poor safety records are to be applied; and*
- *institute a centralized monitoring function to ensure uniformity and consistency in the application of safety standards.*



training staff to identify unsafe trucks and drivers

Properly trained and qualified employees are an integral part of an efficient and effective organization. As trucking safety is an important social issue, we expected the branch to have commercial vehicle inspectors who are carefully selected, trained, and certified to carry out their responsibilities in a professional manner. We also expected them to be capable of using good judgment in the application of various acts, regulations, and codes. In addition, we considered knowledge of vehicle mechanics and prior experience with commercial vehicles and the trucking industry to be beneficial.

Conclusion

Overall, enforcement officers are properly trained and meet certification requirements. Nevertheless, some improvements could be made.

Findings

Training

Technical Enforcement Officers

We found that entry-level inspectors (Technical Enforcement Officer 1) are provided with basic training at the Justice Institute. This consists of three courses over 17 days: a prosecution course; a dangerous goods course; and a permits, licensing, enforcement, and National Safety Code course. Entry-level inspectors are also offered four courses over seven days, held in four regions of the Province. These are courses on: computers, first aid, dealing with angry clients, and

client service. This training is augmented by one year on the job, with a requirement to pass a proficiency exam after one year.

For Technical Enforcement Officer 2 positions, the next highest level, a number of courses are provided at each of four regions over six days: a prosecution refresher course, dangerous goods refresher, and National Safety Code refresher. One of the responsibilities of a Technical Enforcement Officer is applying Commercial Vehicle Safety Alliance out-of-service safety criteria to the inspection and certification of heavy commercial vehicles and drivers. To qualify, a Technical Enforcement Officer 2 must complete a number of modules (18 days in all), consisting of classroom instruction and on-the-job training. This is completed by a written and practical examination to test skills and knowledge. Following this training, a formal one-day Commercial Vehicle Safety Alliance refresher course is provided annually. One region has also initiated a one-week training course for operators of portable weigh scales.

Technical Enforcement Officers, levels 3 to 7, undertake a number of courses totaling 10 days. These include a supervisory management course and a "total control" driving course directed specifically to operators of portable weigh scales. A weights and dimensions refresher course is under development; it will be two days long and administered at each of four regions.

We found a significant level of concern about the degree of training provided to Technical Enforcement Officers. Comments from branch personnel suggest that more appropriate training is needed to meet the changing needs of the job. Industry representatives indicated that some weigh scale operators fail to use good judgment in exercising their duties and are poorly trained in understanding and interpreting the regulations, leading to delays for truckers while operators seek clarification from higher authorities.

Carrier Safety Inspectors

Carrier Safety Inspectors who undertake on-site safety audits of trucking companies are selected from a range of backgrounds including bank auditing, law enforcement, and inspections. When the program began in 1992, all Carrier Safety Inspectors were offered a course of instruction at each of four regions, consisting of seven modules over three days. These included an orientation, followed by modules on dangerous goods, driver profile and staff training, vehicle maintenance, provincial and federal hours of service, motor carriers, and legislation as it applies to audit and sanctions. Inspectors also completed the five-day court prosecution course at the Justice Institute. In 1993, new audit software programs were introduced in conjunction with laptop computers, aimed at standardizing the audit process and reducing the time taken in compiling information and producing reports. In that year, a three-day meeting was held, with a major portion of the discussion focused on audit methodology and procedures.

Branch staff expressed some concerns about the training provided

to Carrier Safety Inspectors. For some staff, the concern is whether training is sufficient to ensure that carrier safety audits are carried out in a uniform and standardized way. In that many Carrier Safety Inspectors come from non-audit backgrounds, it was suggested that greater audit rigor would ensue from basic, formalized audit training. Similarly, many staff felt that a one-week course in case preparation and court prosecution was insufficient to bring about the successful prosecution of complex cases arising from carrier safety audits. We noted that Carrier Safety Inspectors have received no additional training since their initial 3-day orientation in 1993.

Certification

Fixed and portable weigh scale inspectors are required to attain and maintain Commercial Vehicle Safety Alliance certification. This requires each inspector, on an annual basis, to complete a minimum of 32 inspections. At the time of the audit there were 102 fixed and 21 portable weigh scale inspectors with Commercial Vehicle Safety Alliance certification. Twenty others (14%) have not met the certification requirement. Sixteen of these individuals, all at the Technical Enforcement Officer level 2 or higher, are awaiting training; the other four have been decertified for medical reasons. All 20, being sworn peace officers, have the authority to inspect commercial vehicles but cannot issue the Commercial Vehicle Safety Alliance decal.

There are several reasons that not all Technical Enforcement Officers are certified. Some inspectors work at remote, single-person scales, which makes it



Courtesy: W.J. (Bill) Brown

Trained and certified Technical Enforcement Officers performing vehicle safety inspection

difficult for them to inspect commercial vehicles as well as attending to other scale duties. Some scale sites have inadequate space to safely conduct Commercial Vehicle Safety Alliance inspections. Other scales are high volume and lack adequate staff to conduct the required number of safety inspections. Finally, there are some inspectors who choose not to meet the minimum certification, in that they see their job as primarily vehicle weighing rather than the safety certification of commercial vehicles. With the introduction of new job descriptions, recently-hired inspectors will be required to conduct Commercial Vehicle Safety Alliance inspections as part of their ongoing duties.

Recommendations:

The branch should:

- *move expeditiously to train and certify the 16 inspectors currently not certified under the Commercial Vehicle Safety Alliance; and*
- *review its present curriculum to ensure it reflects current and future position requirements including a clear understanding and interpretation of regulations, case preparation, court prosecution, and interpersonal relations with trucking industry personnel.*



removing unsafe trucks and drivers from the road

The branch has limited resources that it must use wisely in order to maximize the impact of its enforcement programs on the trucking industry. In this regard, we expected the branch to have conducted an assessment of what physical and human resources were needed and how they might be deployed cost-effectively. Included in this analysis would be a profile of the industry being regulated. We also expected the sanctions imposed in the event of non-compliance with safety standards to be seen as a deterrent and to be closely related to safety.

Conclusion

We found that the branch has not undertaken a comprehensive needs assessment so it cannot be assured that it is adequately regulating the trucking industry. Fixed and portable weigh scales are not deployed to maximize their coverage by time and geographic location, and therefore the branch cannot provide assurance that safety in the industry is being regulated in a uniform and consistent manner throughout the Province. Similarly, the branch cannot provide assurance that, with current carrier audit resources, all carriers will be audited for adherence to safety standards within an acceptable time period. In addition, some sanctions do not appear to “suit the offense” or provide an effective deterrent.

Findings

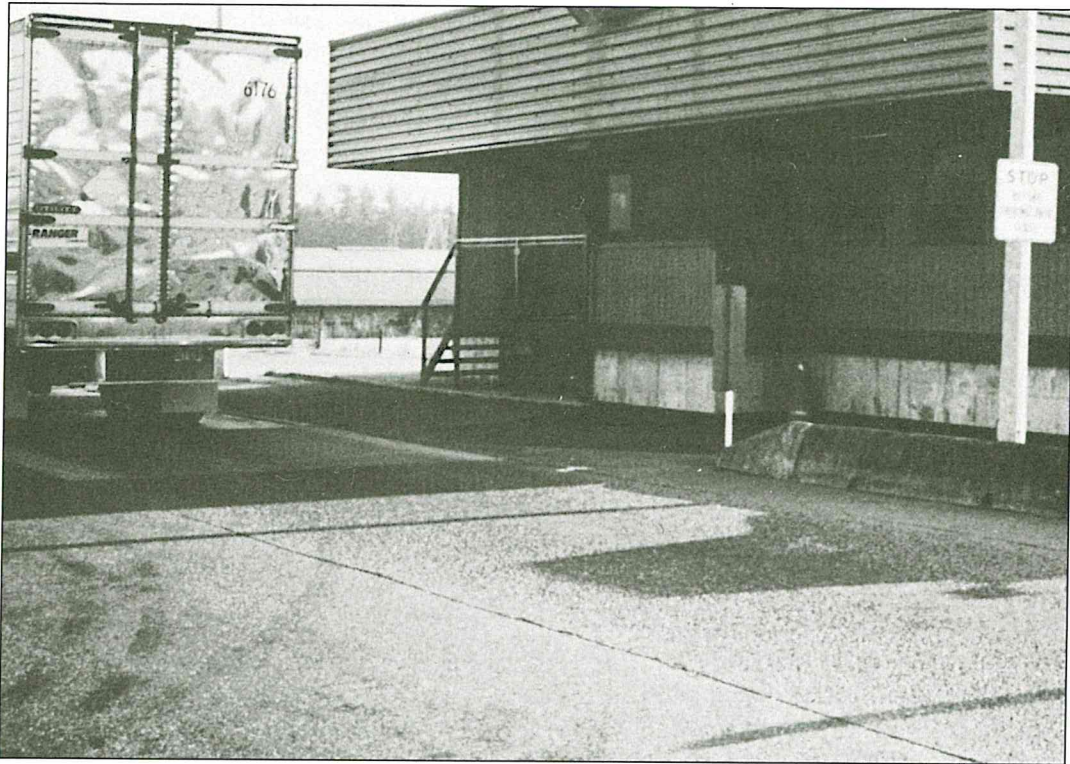
Needs Assessment

We found that the branch has not undertaken a comprehensive study to profile the trucking industry in order to determine what resources are needed and how they might best be deployed. As a result, the branch does not have complete and reliable information on the size of the industry, names of carriers, their locations, and their operating patterns and practices. In addition, the branch does not have a comprehensive human resource plan with which it can determine the number, type, and location of staff needed in future to provide services, and ensure that existing and new staff have the knowledge, skills, and abilities to meet ministry expectations. We believe this lack of information makes it difficult for the branch to know whether it is doing an adequate job of regulating the trucking industry in a cost-effective manner or properly allocating its resources.

Fixed Weigh Scales

Locations

Given that the trucking industry extends to every corner of the Province, fixed weigh scales are needed at strategic locations and key border entry points to monitor truck traffic. Over the past 10 years, the branch has carried out several studies to determine the proper location of fixed weigh scales.



Courtesy: Motor Vehicle Branch

Truck being weighed at a fixed weigh scale

Nevertheless, there has been virtually no change in fixed weigh scale locations nor construction of weigh scales at key border entry points such as Sumas, Osoyoos, and the Yukon/British Columbia border. Consequently, trucks traveling between Canada and the U.S. or Yukon are free to enter and return through these locations with little chance of being inspected. We were advised of instances where American carriers have entered the Province through an unregulated point of entry, delivered a load in the Interior, and returned to the U.S. without any intervention by the branch. Similarly, some local and regional fixed weigh scales such as Nordel and Patullo Bridge can be readily by-passed by heavy commercial vehicles. This increases the probability of unsafe trucks and drivers traveling British Columbia highways.

Less than complete coverage by location creates a situation whereby carriers not in compliance are able to circumvent fixed weigh scales without penalty. Clearly, the ability to bypass open weigh scales detracts from effective safety regulation. Furthermore, weigh scale evasion studies show that a significant percentage of carriers are prepared to bypass fixed weigh scales to avoid regulation. For example, a Wisconsin study found that 15-18% of all trucks bypass scales. A Montana study found that in cases where there were inadequate bypass routes, waiting until the scales closed was the primary mode of avoidance. In our study, about half of Class I drivers, operators of heavy commercial vehicles, indicated they could avoid being checked by using routes around present weigh scale locations.

Hours of operation

Because the trucking industry is a 24-hours-a-day, 7-days-a-week operation, one would expect fixed weigh scales to operate in a pattern consistent with the patterns of the industry. Accordingly, full-time operation at key border crossings and strategic "bottleneck" locations are needed to ensure an adequate level of coverage. At less strategic locations, regular business hours with random "off-hour" openings so that the trucking industry would recognize the scale is likely to be in operation during non-regular hours would be adequate. In fact, we found that, even in key bottleneck locations through which all commercial vehicles must pass (such as Haig, Hunter Creek, and Laidlaw), scales were not operational 24-hours-a-day, 7-days-a-week.

Information provided to us by a large number of trucking company owners and managers suggests that, with current hours of certain fixed weigh scales, some trucks are never checked. We also noted reported instances of carriers departing Prince George in the late afternoon and traveling to the lower mainland without passing through any fixed weigh scale that was open. As well, more than 50% of Class I drivers told us they could avoid being checked simply because some weigh scales are not open full-time.

A study by the US Comptroller General concluded that a permanent scale is effective only if it is open for prolonged times (such as three to four consecutive 24-hour periods) and cannot be easily bypassed. A 1989 study by the Ontario Ministry of Transportation concluded similarly that a desirable

characteristic of fixed weigh scales is that the hours of operation be either unpredictable or a continuous 7-days-a-week, 24-hours-a-day effort.

Staffing numbers

We found that, while the trucking industry has continued to grow at a steady pace, the percentage increase in staff at fixed weigh scales has not. In our survey of branch staff, more than half believe that the branch is not committed to allocating sufficient resources to ensure trucking safety. Management also expressed the view that current resources are insufficient to meet the branch's objective of trucking safety.

Number of inspections

The conduct of Commercial Vehicle Safety Alliance inspections is an integral part of the branch's enforcement programs and an important responsibility for Technical Enforcement Officers. Accordingly, one would expect the branch to have analyzed and determined how many Commercial Vehicle Safety Alliance inspections would be needed to cope with current volumes of truck traffic. We found, however, that this has not happened. Thus, the branch cannot be sure that an appropriate number of commercial vehicles are being inspected.

One person weigh scale operations

There are seven one-person scales in operation throughout the Province. Although the inspectors at these scales provide a service function, they are generally too busy to conduct safety inspections as well. We found that the branch had not assessed the usefulness of these weigh scales nor had it



Courtesy: I.H. Aaron

Commercial vehicle passing closed weigh scale

determined whether it would be more beneficial to allocate the inspectors to major weigh scales where they could extend hours of service or conduct Commercial Vehicle Safety Alliance inspections.

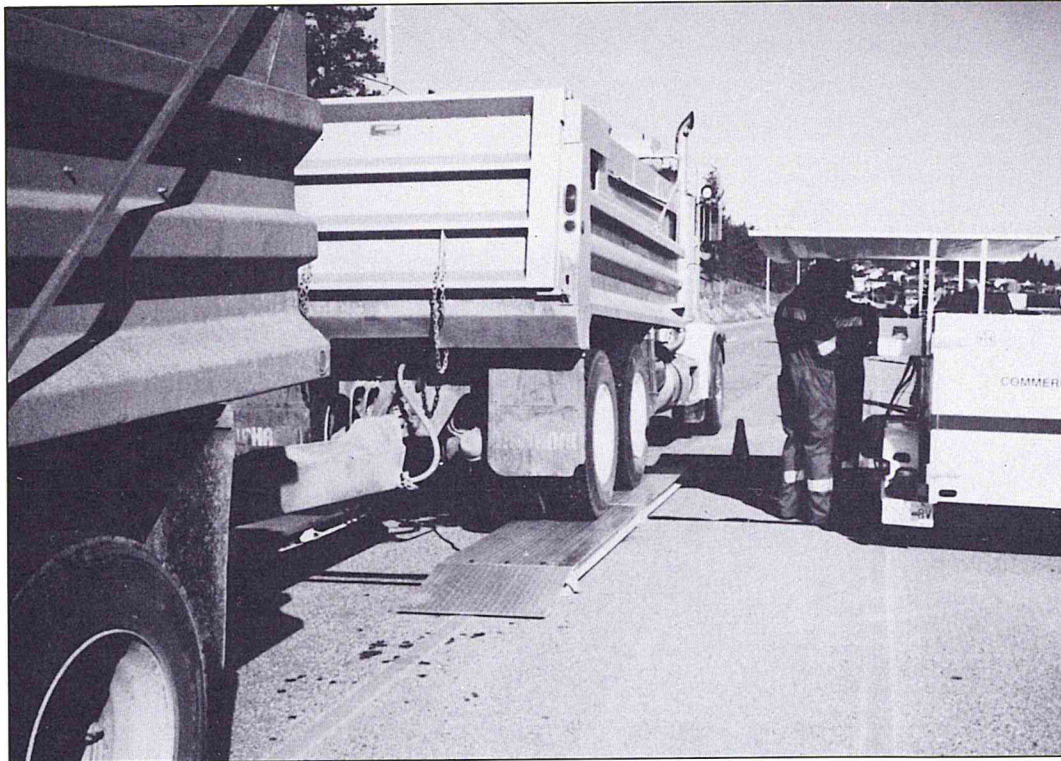
Adequacy of weigh scale infrastructure

During the past 10 years, the branch has commissioned a number of studies to review the adequacy of its weigh scale infrastructure. These have looked at a range of issues including whether the current numbers of scales are adequate, and whether the general state of existing facilities is acceptable. We found comprehensive and detailed reports listing the general state and condition of each fixed weigh scale's buildings, scale decks, and yards in the Province, as well as recommendations for improvements

and associated costs. We could find no evidence, however, that steps were being taken or planned to address the deficiencies noted in these studies. We also found that many fixed weigh scale locations have inadequate yard facilities to allow the safe conduct of Commercial Vehicle Safety Alliance inspections or to allow drivers to reduce overweight loads.

Conduct of routine regulatory procedures

During the audit, we found fully trained and certified Technical Enforcement Officers at fixed weigh scales involved in clerical tasks such as issuing permits. The Lower Mainland Region recognized that, as important as these services are, staffing and hours of operation at its fixed weigh scales are too limited to allow the opportunity for Technical



Courtesy: Motor Vehicle Branch

Innovative portable weigh scale and trailer monitoring heavy commercial vehicle traffic

Enforcement Officers to conduct both these routine tasks and Level I Commercial Vehicle Safety Alliance safety inspections. To offset this, the region has introduced two clerical positions to perform a number of routine regulatory procedures. Since the positions pay at a rate which is 22% less than that for Technical Enforcement Officers, this change is also a cost reduction strategy. We found no evidence, however, of an analysis by the branch to determine whether this is an adequate number of clerical positions, how this strategy might be applied elsewhere, and to what extent the strategy is cost-effective. Lack of further development in this area may explain, in part, why about a third of branch staff informed us that they believe the branch does not deliver its enforcement programs efficiently.

Portable Weigh Scales

Vehicle Selection

Commercial vehicles selected for roadside inspections are identified by an inspector based on an assessment of the vehicle's condition or the inspector's knowledge of carriers and their track records. Often a Level 1 Commercial Vehicle Safety Alliance inspection will be carried out (including mechanical inspection of the truck, a visual scrutiny of the driver for signs of fatigue or impairment, and an examination of logbooks and shipment documentation).

Number required

Given the important role that portables play in regulating the trucking industry, one would expect the branch to have made an assessment of the number of

portable weigh scales needed to properly regulate the industry. Such an analysis would take into account the number of commercial vehicles operating and the number of kilometers of provincial highway. In fact, we found that while the branch has 24 portable weigh scale inspectors, it has not carried out a needs assessment to determine whether this number is sufficient to provide adequate service and enforcement coverage for approximately 22,000 kilometers of primary roads, 20,000 kilometers of

secondary roads, 26,000 carriers, and about 21,000 active Class 1 drivers.

Hours of operation

In order to be effective, the hours of operation of portable weigh scales would be coordinated with those of the nearest fixed weigh scale to maximize coverage over a 24-hour period. We found, however, that fixed and portable weigh scales tend to operate during the same hours, leaving significant times of the day without coverage by either (Exhibit 1.14).

Exhibit 1.14

Hours of Operation of Fixed and Portable Weigh Scales

Northern Region – November 29, 1996

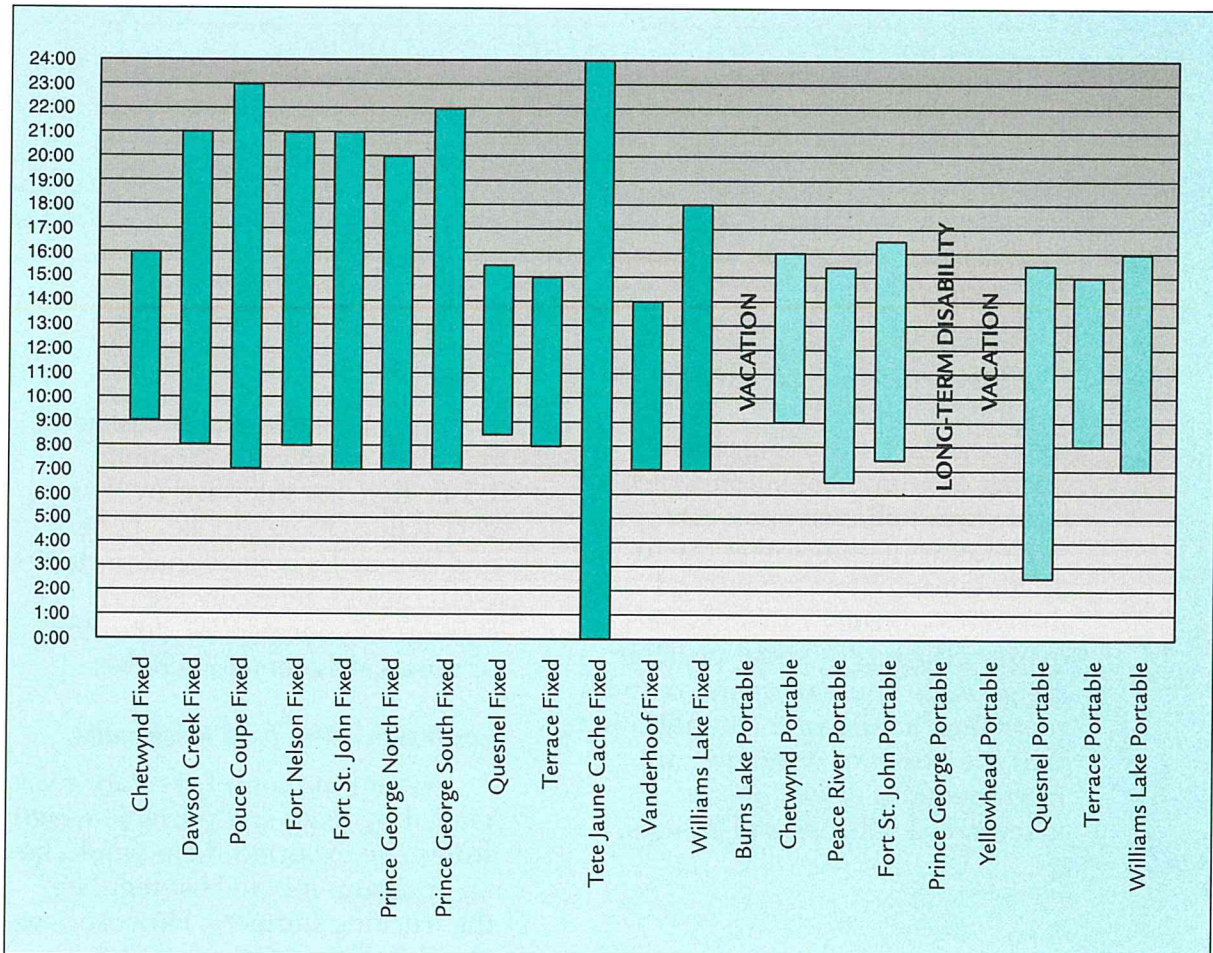
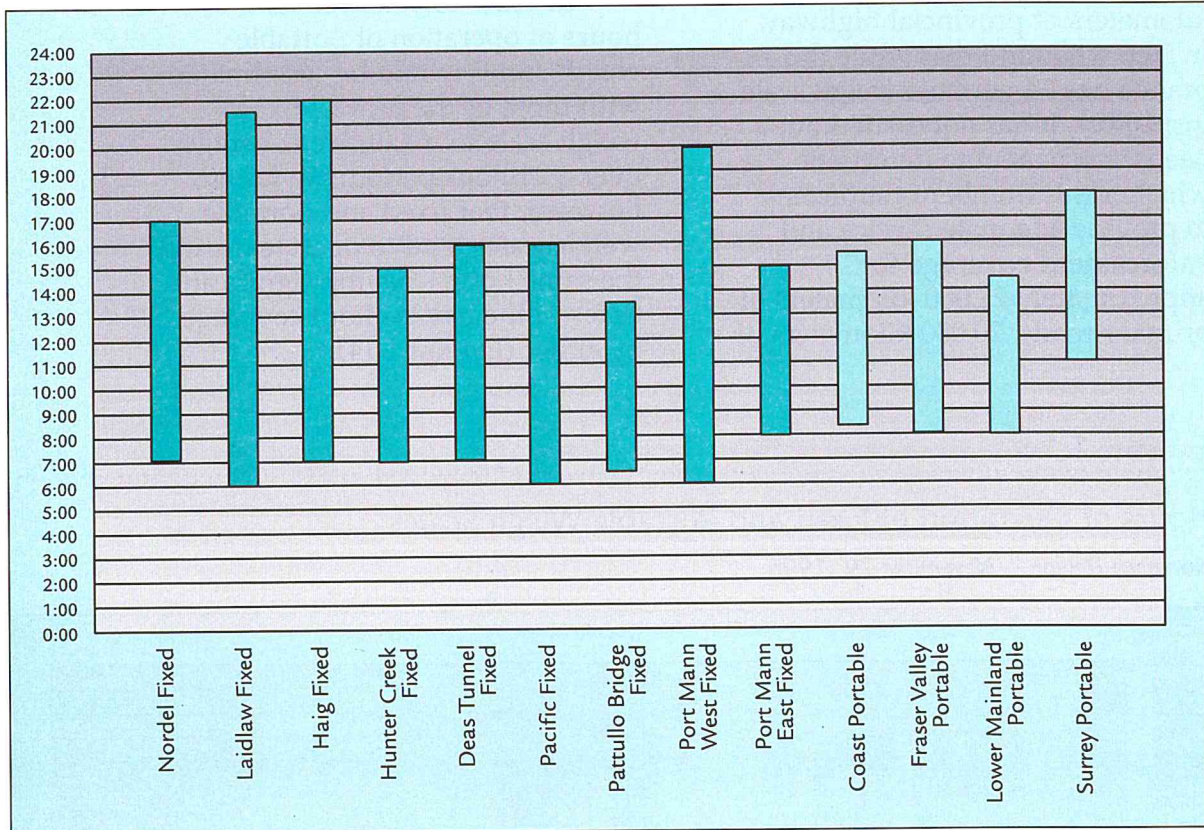


Exhibit 1.14 (continued)

Hours of Operation of Fixed and Portable Weigh Scales

Lower Mainland/Fraser Valley Region – November 29, 1995



We found that, as with fixed weigh scales, hours of service for the portable scales fell primarily during the day, a situation which, in our view, allows many carriers to circumvent enforcement with relative impunity. Owners and managers of trucking companies expressed concern about portable weigh scale hours of operation with more than a third of them indicating that the hours of operation are inadequate to detect unsafe commercial vehicles and drivers.

Location

We also looked at the issue of portable weigh scale locations. While they are intended by their very nature to be mobile, owners and managers believe that portable weigh scales generally are not strategically located for detection of unsafe drivers and vehicles.

Combination with fixed weigh scales

Given the complimentary roles played by fixed and portable weigh scales, we expected there would be an optimum mix to best regulate the trucking industry. However, we could find no evidence that the

branch has conducted a review to determine the best combination of weigh scales, although our survey showed that more than two-thirds of branch staff believe that 50% fixed and 50% portable would be the most effective.

Full-time operation of portable weigh scales

It is practice that when a portable weigh scale operator is on vacation, the vehicle is not assigned to another inspector. Since the branch spends approximately \$530 per month to lease these vehicles, and given the important role they play in regulating the trucking industry, we feel that this practice is wasteful. Instead, the possibility of keeping these vehicles operating continuously should be investigated. A high percentage of branch staff and trucking company owners and managers indicated to us that portables are effective in detecting and reducing the number of unsafe trucks on the road.

Deployment of portables

Another issue has to do with the current deployment of portables. It is unclear whether the present practice of patrolling the highways and selecting vehicles for inspection is the most effective. Research by the U.S. Government Accounting Office suggests that portables are particularly effective when used at truck concentration points such as construction sites where large numbers of overweight and over-dimension trucks may operate. In addition, the agency indicates that when sufficient information about shippers and receivers of overweight and over-dimension shipments exists, targeting them with portable scale teams is more effective than

trying to find overweight and over-dimension trucks on the open road.

Carrier Safety Audits

The branch has 11 Carrier Safety Inspectors in the Province. Given that there are approximately 26,000 carriers Province-wide, the branch cannot ensure that the majority of carriers are audited on a regular basis. Branch staff indicated that, with current resources, only a select number of carriers from the "worst 500" profile receive regular attention. However, some unsafe carriers never become part of the "worst 500" profile in that they avoid fixed and portable weigh scales. As a result, there is a bias towards auditing carriers with high exposure to routine weigh scale enforcement.

This situation has a detrimental impact on trucking safety. Research indicates that ongoing safety audits ensure that a higher percentage of carriers will maintain a satisfactory rating and that carriers with satisfactory audit ratings tend to be involved in fewer accidents. However, when safety audits are not carried out at regular intervals, carriers become less attentive to safety requirements.

Sanctions

The branch's main method for encouraging compliance with safety standards is the use of fines and penalties. We noted a clear delineation of fines for a range of infractions in the *Commercial Transport Act* and the *Motor Carrier Act*. While many of these are seen as being valid from many years of use, there are some notable exceptions that cause branch inspectors as well as representatives of the trucking

industry to question how these infractions are related to safety. Several individuals told us that some fines do not suit the seriousness of the offense. The clearest example is a \$100 fine for brakes out of adjustment, considered to be a major safety issue, and a \$250 fine for a relatively minor offense such as failing to complete an administrative portion of a driver's logbook.

Several coroner inquiries have recommended increasing the fine for faulty brakes to at least \$500 in order that it may be an effective deterrent.

We also noted that there are not progressive fines for chronic and recurring offenses. Branch staff told us that they encounter repeat offenders who consider the penalty a "cost of doing business" rather than a deterrent. The problem is heightened in that fines often do not reach the offender. A special report by the US Transportation Research Board in 1990 concluded that this situation will not be corrected if the penalties do not reach those persons who are controlling and profiting from the illegal operation, often the owner or shipper but seldom the driver. We found that, while drivers feel they are accountable for driving violations such as speeding, many also believe they are often put under pressure by their employers to operate poorly maintained vehicles, avoid weigh scales, and meet unreasonable shipper demands. Fines for violations are issued against the driver.

In the case of carrier safety audits, we observed audits which had identified carriers with a pattern of flagrant violation of National Safety Code standards over lengthy periods of time, yet

little or no follow-up action was taken to restrict or terminate the carriers' operations. We noted that only five administrative hearings, one fleet limitation, and three canceled certificates have occurred since inception of the program in 1992—a relatively small number given the "worst 500" list and the large number of carriers in the Province. This has the potential to discourage Carrier Safety Inspectors who see little or no results coming from extensive and recurring audits of individual carriers consistently in violation of National Safety Code standards.

Recommendations:

The branch should:

- ***identify the trucking universe it has responsibility to regulate in order to determine an optimal level of resources to achieve the desired level of trucking safety and, at an operational level, to maximize its use of current resources;***
- ***develop a comprehensive human resource plan to: determine the number, type, and location of staff needed in the future to provide services; and ensure that existing and new staff have the knowledge, skills, and abilities to meet ministry expectations;***
- ***undertake a comprehensive review of previous facilities studies, and implement relevant and cost-effective recommendations;***
- ***find ways to monitor key border entry points such as by constructing fixed facilities or introducing regular random deployment of portable weigh scales to increase the probability of intercepting a larger number of unsafe trucks and drivers;***

- *find ways to operate key fixed weigh scales on a 24-hour, 7-day-a-week basis or, barring this, have regular random openings of key scales during off-hours to increase the probability of intercepting a larger number of unsafe trucks and drivers;*
- *develop greater flexibility in the hours of operation of portable weigh scales, thereby reducing the present pattern of mostly concurrent hours of service with fixed weigh scales;*
- *ensure that all carriers are subject to regular safety audits, such as once every three years;*
- *implement coroner recommendations to increase significantly fines to drivers and owners for brakes out of adjustment, and to impose a progressive fine system for chronic and recurring violators of safety regulations; and*

- *consider whether fines for significant safety violations should be extended to the shipper or trucking company.*

In the three previous sections we have discussed the design and implementation of the enforcement programs and provided our assessments as to where improvements could be made to improve their efficiency, cost-effectiveness, and the results they achieve. In the following section, we review the extent to which the branch has assessed the relative effect of a range of factors to determine whether more efficient and cost effective strategies exist to achieve trucking safety.



looking for better ways to achieve trucking safety

We expected that the branch would have identified the factors that contribute to trucking safety and determined the extent to which current programs achieve trucking safety relative to these factors. A prudent manager, we believe, having carried out such a comparison, would then modify existing programs or develop new programs and reallocate program resources to maximize the return on investment.

Conclusion

We concluded that the branch has not given adequate thought to factors, besides its own enforcement programs, that might contribute significantly to trucking safety. Similarly, it has not modified existing programs or designed new programs consistent with more cost-effective alternatives, or reallocated program budgets to these alternatives. It has, however, begun to consider the redesign and reallocation of resources in two program areas; enforcement of moving violations and using third parties to conduct carrier safety audits. Finally, the branch is not taking full advantage of technological innovations aimed at improving efficiency and effectiveness.

Findings

Impact of External Factors

General

We found no evidence that the branch had identified, evaluated, and reviewed the relative effect of external factors on trucking safety.

Therefore, we conducted a review of some of these factors to raise awareness of this issue.

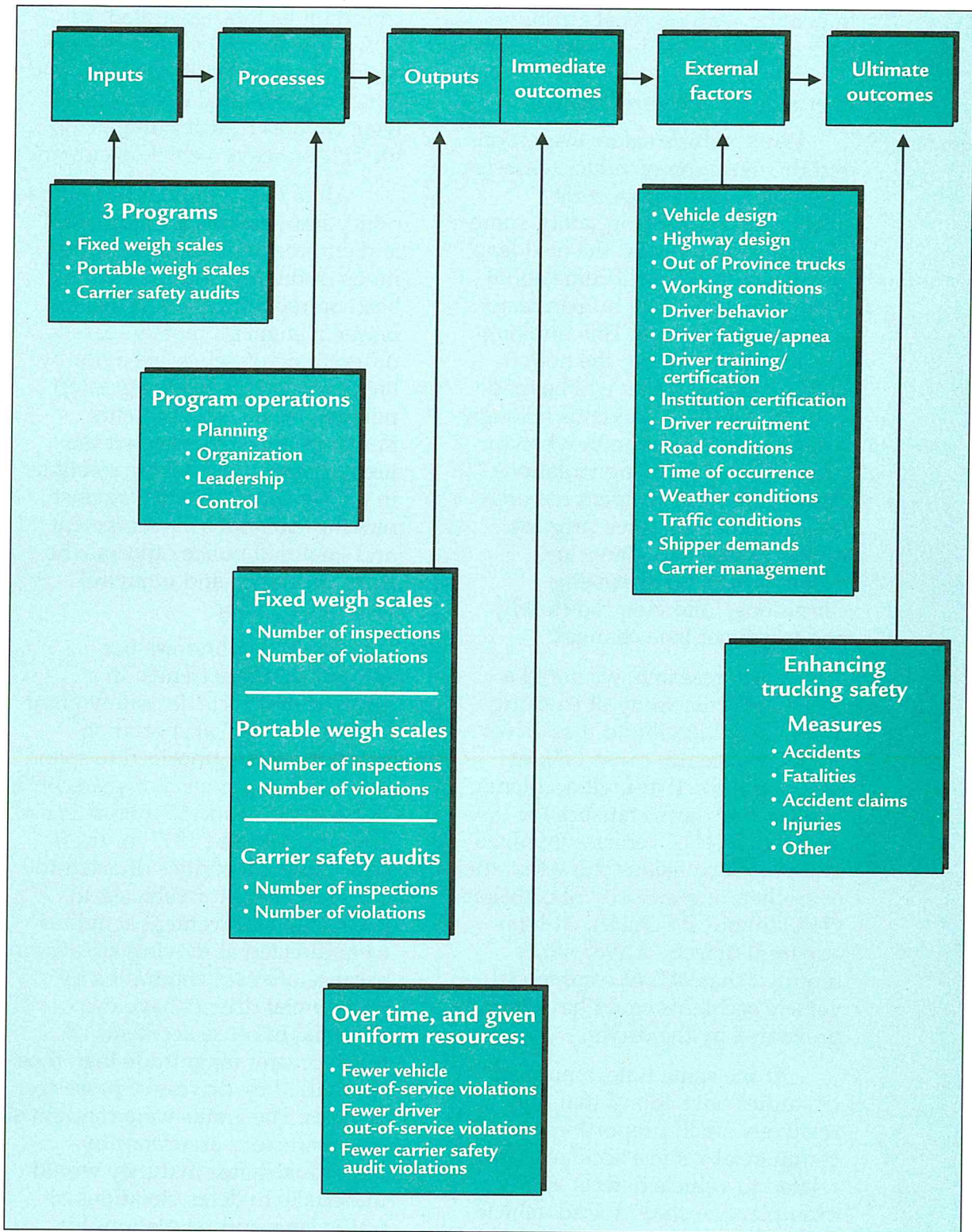
There are several theoretical frameworks for understanding how these key factors contribute to trucking safety. For example, some research recognizes that the immediate causes of accidents involving commercial vehicles can be grouped into driver, vehicle, and environmental factors. Similarly, other research identifies the factors as driver-related, vehicle-related, and highway/environmental factors. The framework we used, the Program Logic Model (Exhibit 1.15), describes a number of important factors that, in varying degrees, contribute to or reduce the probability of a commercial vehicle accident. Two of these factors are vehicle design and highway design, both of which have undergone improvements that have significantly reduced the incidence of collisions.

Highway and vehicle design

Designers of highways, for example, have been able to reduce motor vehicle accidents through the design and construction of highways and bridges that reduce or eliminate many of the infrastructure difficulties that contribute to accidents. Similarly, designers of vehicles have introduced dramatic improvements to vehicles and ancillary equipment which have significantly reduced collisions that at one time were attributed to defective vehicle design. Based on our assessment of

Exhibit 1.15

Program Logic Model



current literature and the comments of branch personnel and owners and managers, we concluded that significant strides have been made in dealing with physical attributes such as vehicle and highway design.

Human factors and driver behavior

While vehicle safety inspections and the detection of vehicle defects continue to be an important component of trucking safety, some research suggests that the next leap in trucking safety will come about with an emphasis on human factors and driver behavior. This thinking has, as a basic tenant, the notion that substantial gains will be made in reducing truck accidents through the direct intervention in what are referred to as "moving violations." North American accident research indicates that the three primary causes of truck accidents are excessive speed for existing conditions, following too closely, and improper lane changes.

In our research, we noted a 1987 California study of trucking accidents which found that driver error consistently caused about 94% of the truck-at-fault accidents. Similarly, Ontario statistics for 1993 on the defects of vehicles involved in reported collisions show that the overwhelming majority of collisions (94%) involved vehicles with no apparent defects. A 1985 study reported that 94% of commercial vehicle accidents could have been prevented by the driver.

At the same time, a number of studies have found that only a relatively small proportion of commercial vehicle accidents are related to vehicle defects. For example, one study found vehicle failure is the primary cause of less than 10% of truck accidents. Another

study concluded that vehicle related factors accounted for only 6-10% of truck accidents. A Saskatchewan study concluded that vehicle condition factors accounted for 17% of the Province's heavy truck accidents. A Manitoba study found that vehicle-related abnormalities were cited as contributing factors for 11% of heavy vehicle accidents.

All of these findings have broad policy implications for regulators and enforcement agencies. While much of the focus until now has been on reducing vehicle defects, research suggests that increased observation of driver behavior by highway patrols has the greatest potential to reduce accidents. Research also suggests that the greatest gains in trucking safety lie in the strict enforcement against moving violations by competent and qualified police officers who focus on erratic and unlawful driving behavior.

The U.S. Congress has recognized these trends. In a series of motor carrier safety grant programs, the Transportation Secretary was authorized to spend \$4.25 million for each of years 1993, 1994, and 1995 and \$5 million in each of years 1996 and 1997 for traffic enforcement activities directed to commercial motor vehicles. In particular, enforcement activities were directed at moving violations because offenses committed by commercial drivers have the potential to cause accidents of much greater magnitude than those committed by drivers of passenger vehicles. The grants were conditional on satisfactory assurance by individual states that they would undertake to deter violations of traffic laws and regulations by commercial motor vehicles.

We also found in our review of the literature that targeting of commercial vehicles for inspection increases the probability of apprehending violator vehicles. From our survey, we concluded that there were certain common driver characteristics that, with some reliability, were often linked to a number of potential violations. For example, one-third of Class 1 drivers reported not wearing their seat belts. These drivers, we found, were significantly more likely to intentionally avoid weigh scales, not receive a Commercial Vehicle Safety Alliance inspection during the previous 12 months, not possess a current and valid driver's license, tend to drive more than the allowed hours, not perform pre-trip inspections and brake checks, and not visually check the position of the fifth-wheel locking jaws. This suggests that focusing inspections and enforcement efforts on those not wearing seat belts could yield positive results beyond just increasing compliance with seat belt statutes.

Our research identified that approximately one in five active truck drivers intentionally avoids weigh scales on a semi-frequent or frequent basis because their vehicles are overweight. Many of these drivers are "high risk" with approximately 25% of them operating when they are 'out of hours' and with logbooks that are not up-to-date. These drivers are more aware of when scale operations are closed and can be avoided, and are more likely to have compromised trucking safety in order to meet shipper demands. In addition, drivers in this group are more likely not to have a current and valid driver's license, not to wear their

seat belt, to drive beyond their allotted hours, to use alcohol or illegal or prohibited drugs while on duty and before going on duty, and not to complete pre-trip and brake inspections. We concluded that adjusting weigh scale hours (fixed and random) and strategically placing portable scales would help reduce intentional scale avoidance and yield greater detection of additional safety violations.

Driver training and education

Our research findings also show that driver training and education, the introduction of a driver apprenticeship program, and a graduated licensing system can all contribute to trucking safety. Branch personnel indicated that random roadside inspections and driver training were the most important factors in trucking safety. Class 1 drivers identified the three most important factors as driver training, licensing standards (license appropriate for class of vehicle being operated), and portable weigh scales. According to owners and managers of trucking companies, the single most significant factor by far was driver training, with licensing standards being a distant second.

We recognize that trucking safety is not the driver's responsibility alone. The quality and behavior of truck drivers can be largely influenced by the attitudes of the companies themselves and by management that sets proper safety objectives and institutes appropriate operating practices.

Redesign and Reallocation of Resources

One would expect that having assessed the relative effect of all external factors on trucking safety, the branch would have reviewed its programs and made a determination to redesign them and reallocate resources accordingly. We noted two examples in which the branch was actively considering this.

Carrier safety audits

We noted that the branch is actively considering third-party audits as a means to provide audit coverage of approximately 26,000 carriers in the Province. Third-party audits, as defined in the National Safety Code, involve private sector agencies undertaking a compliance audit for each carrier in the Province on a tri-annual basis with the cost borne by the carrier. If such audits were to happen, current branch audit resources could be reassigned to engage in verification audits and an oversight role to ensure quality control of audit work undertaken by the private sector. This change would necessitate advanced training of Carrier Safety Inspectors to fulfill this new role.

The branch sees several advantages to this option. It transfers the cost from government to the carrier; it provides for coverage of the industry on a more regular basis; and it provides an incentive for carriers to remain in compliance.

Intervention in moving violations

Among branch management there is considerable discussion about whether the focus of portable weigh scales should shift from non-moving violations to moving

violations. In this case, portable weigh scales would focus on improper driving behaviors. Such an initiative would be a major change in deployment strategy that should be approached with caution. One issue, for instance, is that intervention in heavy truck moving violations requires the recruitment and selection of individuals with the appropriate skills, aptitudes, and attitudes for the job. Many regional staff believe that such an initiative could not occur with the existing staff who were not recruited, selected and trained with this enforcement strategy in mind. Another consideration, in our view, is that if operators of portable weigh scales are allowed to shift their focus to heavy truck moving violations, the number of Commercial Vehicle Safety Alliance inspections they carry out could be dramatically reduced, and so too the number of non-moving violations cited.

Our research indicates that the authority to intervene in heavy truck moving violations should remain with police agencies who are highly trained and skilled in these matters. A recent study by the Minnesota Office of the Legislative Auditor, for example, undertook to examine the reasons for poor coordination and conflict between the Minnesota State Patrol and the Department of Transportation. That study concluded that while the inspector job requires skill, including some training and aptitude for dealing with the public, it does not require the level of skill and judgment required of state troopers. It is clear that having police officers carry out this function reduces the potential for conflict arising in these situations. It is also



Courtesy: Radlinski & Associates, Inc.

Computerized roller dynamometer brake testing equipment

the most cost-effective alternative because police members are trained and equipped, and have direct access to appropriate resources (jails, secure vehicles, etc.) to deal with these situations.

Innovative technology

Technology is playing an increasing role in the regulation of the trucking industry. We found, however, that the branch was not making as much use of it as some other jurisdictions. Some years ago the branch installed weigh-in-motion sensors (for determining accurate weights of commercial vehicles) at four locations in the Province but found the technology to be inaccurate and unreliable. Other jurisdictions such as Oregon, however, have used successfully this technology since 1986 as a screening device to reduce the

number of commercial vehicles required to pass over a fixed scale. Due to its success, Oregon is currently looking to substantially expand the weigh-in-motion program. Oregon sees several benefits including a reduction in commercial vehicle delays and fewer additional fixed weigh scales. We believe that the branch should re-consider weigh-in-motion sensors as an initial screening device.

There are several other technological innovations aimed at improving efficiency and effectiveness which the branch is currently not using. For example, the most common problem identified by the inspection of commercial vehicles is defective brakes. Coroner and accident investigation reports both have called for more routine and systematic testing of commercial

vehicle braking systems. The U.S. Federal Highway Administration, we found, has examined a number of advanced brake testing technologies, and has provided federal funding to Colorado and Minnesota to test such devices as computerized roller dynamometers and flat plate testers as methods for determining the adequacy of braking systems on commercial vehicles. Tentative conclusions from these studies suggest that both devices accurately measure brake performance and thus allow for attention to be focused on vehicles suspected of having inadequate and deficient braking systems. We believe that the branch should consider introducing advanced brake testing technologies as a means to reduce the incidence of defective brakes in the Province.

We noted other types of technology as well for delivering enforcement programs and reducing the indirect costs to the industry of safety regulation. These technologies are currently under development and testing, and should be monitored by the branch for possible use in the future. For example, the research in this area discusses the use of standard on-board electronic diagnostic devices which would improve the efficiency of heavy truck roadside inspections by providing faster and more accurate information about the operations of individual vehicles (information such as speeding, monitoring of steering activity to measure fatigue levels, and recording of trip information through computerized logbooks that cannot be altered). Another example is the Intelligent Vehicle/Highway System which would automate safety and weight regulation by checking trucks at

highway speeds. It would also allow carriers to achieve compliance with all regulations and receive all authorizations through electronic data exchange at the carrier's place of business. Precleared commercial vehicles would be fitted with transponders which, when the vehicles approached fixed weigh scales, would be signaled thereby allowing the vehicle to bypass the enforcement point.

We found that there was research into Automatic Vehicle Identification (AVI) equipment carried out in Kentucky in 1992/93. The equipment was installed and tested for reliability at a selected site. The conclusion drawn was that electronic equipment can be used to collect information consistently and more accurately than can manual methods. Ontario is also considering the "smart station" in which sensors perform road data collection on all vehicles. This enables inspectors to determine immediately whether a carrier's history requires that the vehicle be inspected, whether the vehicle was recently inspected and passed, and so on. A similar concept is the "smart card" for individual drivers. It provides regulatory authorities with current and accurate information about a driver, such as whether he or she has a valid commercial driver's license or any outstanding violations.

Recommendations:

The branch should:

- *identify the most significant factors affecting trucking safety with a view to ensuring its enforcement resources are deployed in the most effective manner;*

- *make fixed and portable weigh scale personnel aware of the probability of detecting additional safety violations through innovative targeting of work sites, and truckers who are not wearing seat belts or who are operating overweight vehicles;*
- *determine the feasibility of third party audits as a means to increase coverage of the trucking industry;*
- *as part of a deployment review, consider the issue of how best to shift the focus of enforcement to moving violations. It is further recommended that serious attention be paid to the U.S. model in which this function and responsibility resides with law enforcement and police agencies; and*
- *conduct a cost-benefit analysis of various brake testing and weigh-in-motion technologies as a means to screen commercial vehicles at selected sites throughout the Province.*



ministry response

The Auditor General's report contains results of the most formal and detailed review of Motor Vehicle Branch truck safety enforcement programs undertaken in recent years. The Ministry of Transportation and Highways thanks the Auditor General and his staff for the diligence with which they conducted their review and for the professionalism and thoroughness of that report. We view it as an important tool that will add significantly to the Ministry's ongoing efforts to improve truck safety in British Columbia.

The Ministry also thanks the many members of the trucking industry who cooperated with the Auditor General in the development of his report. Their comments will contribute immeasurably to improvement in the Ministry's truck safety enforcement programs.

On September 12, 1996 the Minister announced the creation of a joint government-industry task force to examine ways of improving truck safety in British Columbia, including enforcement of regulations governing the mechanical fitness of commercial vehicles, as well as improving driver licensing standards and auditing processes for designated inspection facilities. Moreover, its mandate includes an examination of administrative sanctions, adherence by BC motor carrier companies to the National Safety Code, and rewards for carriers with exceptional safety records. The Task Force is also examining the twelve remaining Coroner's recommendations as they relate directly to its Terms of Reference.

Task Force participants are expected to complete their work by March 31, 1997 and more recently have been asked to make the Auditor General's recommendations for improved truck safety enforcement a cornerstone of their work. The Ministry's full response to the Auditor General's recommendations will not be determined until after Task Force deliberations have concluded. The Minister of Transportation and Highways will then apprise the Auditor General of further actions to be taken in light of his recommendations.

The Ministry notes that heavy commercial vehicle accidents as a percentage of total vehicle collisions in British Columbia declined from 5.37% in 1991 to 4.87% in 1994, despite an annual growth in the heavy commercial vehicle fleet. This remained unchanged in 1995. More recent statistics also reveal a 22% decline in the number of fatalities from 1994 to 1995. These trends coincide with British Columbia's implementation of the National Safety Code and with our efforts to educate drivers about the importance of truck safety. Nevertheless, the Auditor General highlights enforcement limitations and inefficiencies within the Motor Vehicle Branch, the agency whose principle mandate is road safety, at the very moment when concern is rising among British Columbians over the safety of heavy commercial vehicles.

The Ministry recently responded to nineteen recommendations by the Coroner's office for improved commercial vehicle safety. Seven of those recommendations are now being

implemented: The number of mobile inspectors in the Lower Mainland was increased October 15, 1996, with plans to add more staff as added resources become available. A 1-800 number will be established early in the new year to enable the public and members of the trucking industry to alert authorities about possible truck safety violations. Standards for commercial vehicle inspection facilities are being reviewed, including an examination of maintenance facilities which install and inspect truck brake chambers and other equipment.

The ministry is also proposing significantly higher fines for commercial vehicle drivers and vehicle owners who fail to ensure the brakes on their vehicles are fully adjusted and regularly maintained. Moreover, direct communications are being established with trucking associations to ensure out-of-province truckers are kept abreast of the latest measures to improve truck safety in British Columbia.

As we make improvements to truck safety in British Columbia, it is important to anticipate the impact which national economic regulatory change will have on BC's trucking industry. Regulatory reform must be compatible with government's commitment to improved road safety. To that end, the Parliamentary Secretary to the Minister of Transportation and Highways is conducting public hearings on regulatory reform, with express instructions to develop strategies that will ensure road safety remains at the forefront of those discussions.

With the merger of Motor Vehicle Branch and the Insurance Corporation of British Columbia, we look forward to a consolidation of complementary safety programs under a single umbrella that will enhance road safety in general, and truck safety in particular. We expect improved coordination of the licensing, insurance and enforcement of commercial vehicles. Moreover, while responsibility for commercial vehicle safety will remain primarily with the Ministry of Transportation and Highways until Phase Two of the merger in 1997, coordination of these important programs with ICBC has already begun.

British Columbians need and demand safer roadways. For this reason, road safety is the Minister's top priority. More must be done to improve the planning and delivery of MVB safety programs. The Auditor General's recommendations are most timely and useful in this regard. It helps to sharpen our focus on core truck safety issues and we believe will make a significant contribution to a reduction in truck crash related fatalities, injuries and collisions on British Columbia roads.



appendices

appendix a

1996/97 Audit Reports Issued to Date

Report 1

Performance Audit
Management of
Child Care Grants

Report 2

Crown Corporations
Governance Study

Report 3

Performance Audit
Vancouver Island
Highway Project:
Planning and Design

Report 4

Performance Audit
Trucking Safety



appendix b

Office of the Auditor General: Audit Objectives and Methodology

Audit work performed by the Office of the Auditor General falls into three broad categories:

- Financial auditing;
- Performance auditing; and
- Compliance auditing.

Each of these categories has certain objectives that are expected to be achieved, and each employs a particular methodology to reach those objectives. The following is a brief outline of the objectives and methodology applied by the Office for performance auditing.

Performance Auditing

Purpose of Performance Audits

Performance audits look at how organizations have given attention to economy, efficiency and effectiveness.

The concept of performance auditing, also known as value-for-money auditing, is based on two principles. The first is that public business should be conducted in a way that makes the best possible use of public funds. The second is that people who conduct public business should be held accountable for the prudent and effective management of the resources entrusted to them.

The Nature of Performance Audits

An audit has been defined as:

... the independent, objective assessment of the fairness of

management's representations on performance, or the assessment of management systems and practices, against criteria, reported to a governing body or others with similar responsibilities.

This definition recognizes that there are two primary forms of reporting used in performance auditing. The first—referred to as attestation reporting—is the provision of audit opinions on reports that contain representations by management on matters of economy, efficiency and effectiveness.

The second—referred to as direct reporting—is the provision of more than just auditor's opinions. In the absence of representations by management on matters of economy, efficiency and effectiveness, auditors, to fulfill their mandates, gather essential information with respect to management's regard for value for money and include it in their own reports along with their opinions. In effect, the audit report becomes a partial substitute for information that might otherwise be provided by management on how they have discharged their essential value-for-money responsibilities.

The attestation reporting approach to performance auditing has not been used yet in British Columbia because the organizations we audit have not been providing comprehensive management representations on their performance. Indeed, until recently, the management representations approach to value for money was not practicable. The need to

account for the prudent use of taxpayers' money had not been recognized as a significant issue and, consequently, there was neither legislation nor established tradition that required public sector managers to report on a systematic basis as to whether they had spent taxpayers' money wisely. In addition, there was no generally accepted way of reporting on the value-for-money aspects of performance.

Recently, however, considerable effort has been devoted to developing acceptable frameworks to underlie management reports on value-for-money performance, and public sector organizations have begun to explore ways of reporting on value-for-money performance through management representations. We believe that management representations and attestation reporting are the preferred way of meeting accountability responsibilities and are actively encouraging the use of this model in the British Columbia public sector.

Presently, though, all of our performance audits are conducted using the direct reporting model, therefore, the description that follows explains that model.

Our performance audits are not designed to question government policies. Nor do they assess program effectiveness. The *Auditor General Act* directs the Auditor General to assess whether the programs implemented to achieve government policies are being administered economically and efficiently. Our performance audits also evaluate whether members of the Legislative Assembly and the public are provided with appropriate

accountability information about government programs.

When undertaking performance audits, auditors can look either at results, to determine whether value for money is actually achieved, or at managements' processes, to determine whether those processes should ensure that value is received for money spent.

Neither approach alone can answer all the legitimate questions of legislators and the public, particularly if problems are found during the audit. If the auditor assesses results and finds value for money has not been achieved, the natural questions are "Why did this happen?" and "How can we prevent it from happening in future?" These are questions that can only be answered by looking at the process. On the other hand, if the auditor looks at the process and finds weaknesses, the question that arises is "Do these weaknesses result in less than best value being achieved?" This can only be answered by looking at results.

We try, therefore, to combine both approaches wherever we can. However, as acceptable results information and criteria are often not available, our performance audit work frequently concentrates on managements' processes for achieving value for money.

We seek to provide fair, independent assessments of the quality of government administration. We conduct our audits in a way that enables us to provide positive assessments where they are warranted. Where we cannot provide such assessments, we report the reasons for our reservations. Throughout our audits, we look for opportunities

to improve government administration.

Audit Selection

We select for audit either programs or functions administered by a specific ministry or public body, or cross-government programs or functions that apply to many government entities. There are a large number of such programs and functions throughout government. We examine the larger and more significant ones on a cyclical basis.

We believe that performance audits conducted using the direct reporting approach should be undertaken on a five- to six-year cycle so that members of the Legislative Assembly and the public receive assessments of all significant government operations over a reasonable time period. Because of limited resources, we have not been able to achieve this schedule.

Our Audit Process

We carry out these audits in accordance with the value-for-money auditing standards established by the Canadian Institute of Chartered Accountants.

One of these standards requires that the "person or persons carrying out the examination possess the knowledge and competence necessary to fulfill the requirements of the particular audit." In order to

meet this standard, we employ professionals with training and experience in a variety of fields. These professionals are engaged full-time in the conduct of performance audits. In addition, we often supplement the knowledge and competence of our own staff by engaging one or more consultants, who have expertise in the subject of that particular audit, to be part of the audit team.

As performance audits, like all audits, involve a comparison of actual performance against a standard of performance, the CICA prescribes standards as to the setting of appropriate performance standards or audit criteria. In establishing the criteria, we do not demand theoretical perfection from public sector managers. Rather, we seek to reflect what we believe to be the reasonable expectations of legislators and the public. The CICA standards also cover the nature and extent of evidence that should be obtained to support the content of the auditor's report, and, as well, address the reporting of the results of the audit.



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