TRANSPORT SAFETY

Proceedings of a Conference

John Heads (Editor)

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TRANSPORT SAFETY

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FOREWORD

Capitalizing on the experience of Dr. John Heads in rail safety and the success of an attached unit, the Road Traffic Safety Unit, under Dr. Bill Mulligan, the Transport Institute has increasingly moved to emphasize safety in transportation as one of its priority fields of endeavour. It was most appropriate then, in keeping with the Institute's mission of enhancing discussion and understanding of major issues in the industry generally, to host a Transport Safety Conference. Under the very able leadership of John Heads, we were able to assemble a distinguished group of experts in the field and in the three modes of air, rail and road. It was fascinating to see the number of issues arise in the different modes with a fairly similar impact and context. We at the Institute did regret a little bit that we observed a small drop-off of attendance of particular persons when their own mode was not under discussion. The papers now presented here to a wider audience will help to convince readers of the desirability of more interplay between persons in different modes on this important and emotionally sensitive issue of safety.

Otto Lang
Chairman
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WELCOME AND INTRODUCTORY REMARKS

Hon. Otto Lang *

I have very simple duties today, as I have had little involvement in the conference, which has taken the time and energies of my colleague, Dr. John Heads, quite significantly, over this past time.

Over the years, we have all been involved in safety in different ways. I always recall seeing Carol Burnett describing how she was extremely fearful of flying. Eventually, she was persuaded to go to a hypnotist because flying was an important part of her occupation, and he treated her, by having her repeat over and over again, "Flying is safe; safe, safe. Flying is safe, safe, safe." She got to the point where she kept saying, "Flying is safe, safe, safe. And, landing is dangerous, dangerous, dangerous."

Safety is an extremely important subject in each of the modes of transportation. Those involved in the industry know the problem of trying to explain or justify the measures that have been taken when something has gone wrong. When an accident happens, there is, of course, an investigation. There seems, too easily, to be a public attitude that nothing should go wrong. We are all of two minds on the subject, because we know we would like to take further steps to prevent accidents from happening. On the other hand, we know the problem of fully and completely removing risks and dangers.

I ran into the worries of the people involved in controlling safety when I was once involved in a new law building at the University of Saskatchewan, the centre of which was a library. When we talked, at an early stage, to the Fire Commissioners, they would have had the whole building consisting of sets of doors for easy and absolute egress should anything go wrong. The security problems that we might have faced from such an arrangement were a matter that was not foremost in their minds. Some people involved in the official regulation of safety have as their major concern that they will not be accused of having been less careful and less effective, if an accident should take place.

We all know that the problem is balancing expenditures in order to make things reasonably safe with the alternative uses of those funds. Politicians find this very difficult to handle. It is very difficult to say to people that more safety measures should not have been taken. Oh, yes, it's true, a life was lost, but enough really was done in terms of building a system to give an adequate level of safety! At that point, you appear to be saying that there was a price tag that was put on the life that was involved, and it was not worth more.

As a practical statement, I used to say, only less than half seriously, that when I was out of politics, I would eventually write a book that would be called, 'What This Country Needs is a Higher Death Rate'. I was going to say in the book things that I believed, but dared not say while I was in politics. Sometimes we get carried away by the emotion of a cause. We might perhaps spend money on medical research which should be better suited for higher quality education. There

*Chairman, University of Manitoba Transport Institute
comes a time when the continued extending of life may not be as important as the quality of the life that is lived by those who are living. Education has a harder time making its case for funds than medical research. It may be that we are spending more on one than we should.

It is the constant dilemma in the world of safety that not everything is done that could be done. Yet, we all want to work hard at doing what is reasonable and doing it most effectively. The transport industry has a very good record in that regard. Notwithstanding increases in volumes of travel, accident rates have tended constantly to improve. It’s true that in passenger travel, the public transport modes show records that are far safer than the automobile. Yet, nobody makes a case about that in terms of the choice of mode of travel. It may, in fact, be in passenger mile terms anywhere from ten to thirty times safer if you use public transportation rather than the automobile.

On that note, I am going to turn over to the panel this morning. I welcome our chairman of the rail safety session, Don McCarthy, who is Executive Secretary of the Transport Industry Development Advisory Committee. This afternoon, we will have Jim Wallace in the chair of our highway safety session. Jim is Executive Director of the Transportation Division, Manitoba Department of Highways and Transportation. In the air safety session, tomorrow, I will be with you again as chairman.
RAILWAY SAFETY IS NO ACCIDENT

John P. Kelsall

We in the railway industry welcome the opportunity to participate in this conference, along with so many other groups involved in transportation safety. We believe that a co-operative approach is essential if practical solutions are to be achieved.

I am pleased to note this conference is looking at the safety of all major modes of transportation. It is important that responsibility for safety be borne equally by all carriers in terms of regulation and cost. Only in this way can we have fair competition and transportation safety that fully protects the public.

The Canadian railway industry has accomplished a great deal in safety over the past decade or so. We are planning to take further steps to enhance this performance through the introduction of new technology and improved operating practices.

Safety is not only a matter of responsibility to the community. Safety is also a barometer of management effectiveness. A railway's safety record is a reliable indicator of the quality of its leadership, supervision, work habits and environment, and a good record is usually accompanied by high productivity and good employee morale.

Since a single accident can cost a railway many millions of dollars in terms of loss, damage, increased operating costs, and traffic diversion, there is a clear financial return on investment in safety. This is of particular concern in an industry with a high operating ratio, where a dollar lost on an accident means $20 dollars must be earned to cover the loss.

But, most important of all, safety is a very personal issue of life and death.

As an operating officer, I have been at the scene of too many accidents. I have helped recover from the wreckage the bodies of people I worked with. So to railroaders, safety is never just a matter of statistics and bottom line performance. We see it in terms of the lives and health of our friends and colleagues.

Safety records of Canada's major railways have been regularly among the best in North America. In 1988, CN and CP were the top safety performers in North America in terms of train accidents and personal injuries. Canada should be justly proud of this tremendous achievement. Credit is due to railway employees, because it takes their full support and co-operation to make safety a reality.

This performance culminates a 10-year trend that has seen a steady reduction in the ratio of accidents and injuries. At CN, for example, the number of injuries per 200,000 work-hours has

*Senior Vice-President, Operations
declined from 3.42 in 1979 to 3.12 in 1988. For U.S. Class I Railways, the equivalent figure in 1988 was 6.75.

In the case of train accidents per million locomotive miles, the figure for CN in 1979 was 6.86. In 1988, it was 2.48. The equivalent figure for U.S. Class 1 Railways in 1988 was 4.61.

Over the past decade, Canadian railways have invested many millions of dollars to improve the safety of their track, equipment and operations. This massive program literally begins from the ground up -- with an increased ballast base, concrete ties and heavier continuously welded rail on main lines. Highly mechanized track maintenance has achieved standards of precision and productivity impossible for the old track gangs using nothing but ballast rakes and mauls.

Rolling stock has also been extensively improved and modified to enhance safety. Roller bearings are being installed on more freight cars to prevent hot box problems. Our plan is to have all cars equipped with roller bearings by 1993. More than $200 million has been spent on increasing the safety of Canada's tank car fleet by installing double shelf couplers, headshields, and better thermal protection. Canadian railways are continuing the installation of trackside detectors that alert dispatchers and train crews to overheated journal bearings and dragging equipment before they can cause an accident. To date CN has 329 in service.

Automated centralized traffic control systems have brought new levels of safety to the control of switches and signals. Computers have been introduced to improve the safety of manual block systems by eliminating the possibility of conflicting orders being issued. We use radio communications extensively on trains and at wayside points to speed the flow of information needed for safe operations. By year-end 1989, 97 per cent of CN's lines will be covered with point-to-point train radio contact.

Advanced train control systems, which feature on-board microprocessors linked to a central control office by means of mobile data radio systems, are being developed and introduced to increase the safety and efficiency of train movements. CN is currently engaged with railway suppliers and the government of Canada in a two-year, $14-million project to install ATCS on 300 kilometres of track between Harvey and Prince George in northern British Columbia. This program will have significant benefits in productivity and safety on a line that is essential in moving western Canadian exports to tidewater and the Pacific Rim.

Canadian railways have taken a leading role in the industry to ensure that their employees are properly prepared for the challenges of 21st century railroading. For example, CN has a training centre for operations employees at Gimli, not too far from here, which employs the kind of technology used to train aircraft pilots. Trainees experience the sights, sounds and motions of driving a locomotive, and confront crisis situations, all by simulation.

When accidents do happen, we initiate a thorough investigation process. The major thrust of the process is to determine causes and prevent recurrences rather than to apportion blame. But the rail industry does have a disciplinary system to ensure that rules for safe operations can be effectively enforced. However, this does not mean that safety is an issue of conflict between railway management and employees. Employees contribute suggestions towards greater safety in operations, and we welcome and implement these suggestions.
Substance abuse by operating employees is a matter of concern to both railway management and unions. Our concern, previously surrounding the abuse of alcohol, has grown as the abuse of drugs has become a feature of contemporary life. Canada's railways have led the way in the Canadian transportation scene by introducing pre-employment drug screening for applicants for operating positions. Over the past three years, some 13 per cent of applicants have been kept out of safety-related jobs at CN because of identified drug use. These applicants were informed in advance that they would be required to take a drug test.

We are encouraged that, as a result of the work of a joint industry-labor-government task force, we are seeing progress toward legislation that will permit on-the-job testing in certain prescribed circumstances. In this area, American railways are ahead of us. Since introduction of on-the-job testing, there have been dramatic reductions in human error-related accidents on U.S. railways and we need a similar capability to enhance Canada's rail safety record.

We know that alcohol and drug abuse is a major social problem and that railway employees are not exempt from the possibility of addiction. Discipline and dismissal alone will not solve the problem, either for the individual or for the company. That is why we offer assistance programs to support and rehabilitate employees who may become victims. This massive investment in people and equipment demonstrates our conviction that railway safety is no accident. Maximum safety comes only as a result of large scale investment and concentrated effort on the part of railway employees at all levels in the organization.

Unfortunately, the public's perception of our performance is distorted, because the extraordinary accident draws more media attention in a few hours than the weeks and months of safe operation.

For example, I doubt that many Canadians are aware that the transportation of dangerous commodities by rail has never caused a fatality in Canada. It is relevant that a recent study showed that, per ton-mile carried, the probability of an accident was six times higher for inter-city movement by truck than by rail.

As the first form of mechanized transportation, the railways carry with them a longer history of government legislation and regulation than other modes. Traditionally, railways in Canada have been governed by statute, regulation, and specific orders by a regulatory body.

It was partly to get away from processes that were no longer relevant that governments in both Canada and the United States began to deregulate transportation. This was seen as the best approach to providing the public with efficient and effective transportation services, while at the same time reducing the amount of public funds needed to subsidize or provide facilities for the various transportation modes. At the same time, however, the prospect of vigorous and unregulated competition among carriers generated some concerns about safety.

Consequently, the Canadian government introduced the Railway Safety Act to provide a new statutory foundation for railway safety in a changing environment. We in the railway industry were pleased to have an input when the bill was being drafted. We believe that this resulted in legislation that is more related to operational and business realities, while at the same time achieving the objectives of the legislators.
In appearing before the House of Commons Committee examining the bill a year ago, CN argued that one of the most positive aspects of the bill is that, within the framework of the regulatory process, railways will be able to make rules as the need arises and those rules can be separate from regulations. Moreover, when a regulation does exist, that regulation may incorporate by reference a standard or procedure which may be amended as needed without having to amend the parent regulation itself.

Our position is clear. More than any other group, we have a vested interest in railway safety. We recognize that regulation is required to provide the same rules for all players, and to represent the public interest. But we must not be subjected to a degree of regulation that imposes unwarranted costs and delays on our operations -- costs and delays that are eventually borne by our customers.

It would be unfair for railways to be put in an uncompetitive position vis-a-vis other modes that may be subject to much less onerous regulation.

It would be unfair for railways to be subjected to regulatory lag -- to see changes that are vital for the improvement of railway operations delayed for years in a process that does nothing to improve the original submission.

It would be unfair if railways had to bear unnecessary and unwarranted costs that reduce our ability to invest in new equipment, plant, and technology needed to sustain and create future improvements in service, efficiency, and safety.

It would be unfair if the process could be abused by those who have a vested interest in delaying and preventing changes that have a beneficial effect on operations -- including increased safety.

Above all, we should have the same freedom as other carriers and businesses to operate responsibly and effectively as an industry that has a well-deserved record for safety. We should not be subjected to regulations that ignore the fact that railways have the same bottom lines as other businesses and that they operate with diminishing margins in an increasingly competitive environment.

To explain our perspective, let me outline some of our past experience with regulation.

Take, for example, the case of the air flow method for brake testing. This innovation was pioneered by Canadian railways to improve operations in cold weather, allowing them to operate trains on average 20 per cent larger during winter months.

Initially approved by the Railway Transport Committee, the new method was opposed by railway labour. As a result, its implementation was delayed for further testing and public hearings for a full five years. This delay produced no significant changes in the original railway proposal as amended by the RTC staff. We expected the new method would save $10 million a year, but that estimate proved to be conservative. The cost of regulatory lag in this single case was well in excess of $50 million -- as well as the delay in introduction of a more effective and safer brake testing method.

Another case is Rule 99. This rule on rear-end flagging dates back to the early days of railroading.
When a train stopped, a rear-end trainman was expected to walk out a certain distance with a flag or light to stop oncoming trains. Railway signalling systems that automatically detected the presence of a train and changed the following two signals to red and yellow respectively rendered the trainman and his flag largely redundant.

In 1969, the railways sought to make similar changes in automatic block signalling territory to eliminate rear flagging, as had already been done in centralized traffic control areas. However, the railway unions opposed the move. It took nearly ten years to get the required permission to modify Rule 99 in automatic block signalling territory. The major issue at stake was not safety, but the size of train crews. Once this was resolved with the unions, they no longer opposed the changes in rear-end flagging, and regulatory approval was received.

There are many other changes required in operating rules if Canadian railways are to take full advantage of new technology, and introduce methods already well-established and proven form the point of view of safety in the United States.

Any form of transportation regulation that has safety as its main objective must not be used as a means of preserving jobs and practices that new technology has rendered redundant. Job security is a legitimate concern of railway unions, but the place to settle those issues is around the bargaining table.

Before ending my remarks today, I would like to discuss the transportation of dangerous commodities, and specifically the recommendations of a recent task force that looked at the issue in the Toronto area.

These commodities are an integral part of our economy, and transporting them is required to support Canadian industry and our modern way of life. Many of them can be found in any home or business. One railway executive used to point out to journalists that printer's ink is classified as a dangerous commodity -- and that's even before it appears in the form of newspaper editorials.

We believe that it is in part because of our reputation for safety that the manufacturers and users of dangerous commodities so often look to the railways for their transportation needs. As I mentioned earlier, there has never been a fatality associated with the movement of dangerous goods on Canada's railways. As this aspect of our traffic has grown, and the commodities have become more complex, we have voluntarily instituted rigorous rules for their safe movement.

Nevertheless, in spite of the facts and findings, some people want to impose costly restrictions on railways -- such as speed limits in the 25 mile an hour range -- restrictions that do not apply to the same degree to other modes competing for the same business in the same geographic area. I fail to see that public safety would be improved by a transfer of dangerous commodities from trains to trucks rumbling down the 401 and through the heart of Toronto. These trucks are not expected to maintain a 25 mph limit.

The Toronto task force found that speed is not the primary cause of railway accidents and that no conclusive evidence was uncovered to warrant changes in regulations governing train speeds. Yet a minority wanted to impose lower train speeds because there was a perceived deep public concern on the issue. In fact, a public perception study conducted in Toronto in conjunction with the task
force's inquiry found that while there was some public concern over transportation of dangerous goods, knowledge of actual risk levels was quite low, and the impact of dangerous goods accidents was exaggerated.

But there was also general acceptance of the existing transportation of dangerous goods by rail. People tended to see the system as reasonably safe and acknowledged that technological improvements had taken place. The public saw some risk as inevitable and were prepared to tolerate it, if they were confident about the vigilance of government and industry.

The best way for us to meet the public's legitimate concern over safety is to demonstrate that we can work out solutions in a co-operative and constructive manner, as was the case in the development of the new Railway Safety Act. The plea I would make as a railroader is that we be allowed to get on with the job of providing safe transportation without an inequitable regulatory burden that interferes with our efficiency, our competitiveness with other modes, and our ability to survive as a viable business. The intent of the new Railway Safety Act is to do just that. Hopefully, this intent will be carried through.

Don't tell us how to do our job. Judge us by the results. We have a bigger stake than anybody in safe railway operations. Avoiding a costly derailment is a bigger spur to our safety efforts than any fine.

The issues at stake here extend beyond the transportation industry. Canada has a relatively small population distributed across the second largest nation in the world in terms of land mass. Distribution costs have always been a challenge to Canadian industry as it seeks to compete on an international basis. Canada cannot afford the burden of a transportation infrastructure that is significantly more expensive than those of our international competitors because of unwarranted handicaps placed on efficient operation.

Railways played a key role in the founding and development of our country. I am convinced they have a key role to play in taking Canada into the 21st century. But we must be allowed to change -- and to change quickly -- to adapt to the new environment we are facing. We must do so for the benefit of Canada, our shippers, our employees and the Canadian railway industry.
A FURTHER CARRIER PERSPECTIVE

THE BUSINESS OF SAFETY

J. A. Linn*
Reaction Panelist

I have been asked today to give a further carrier perspective on railway safety.

In doing that, I want to share with you some thoughts on just a few of the issues:

- One is to look more closely at some of the misconceptions about safety in the context of competition.

- A second is the management of safe operations -- and the potential for more positive and constructive regulation.

- Finally, where we go from here -- including public perceptions in relation to what is feasible, practical and effective.

Although both major railways operate in the same environment, we in CP Rail have come to see our world somewhat differently. That view recognizes that, within one railway, we have in fact two different kinds of business. Both are under extreme competitive pressure.

Heavy Haul Systems in the west deals mostly with large movements from a small number of shippers -- mostly bulk, who compete in world markets and are particularly dependent on rail transportation.

In the east, there is Intermodal Freight Systems. It is under strong pressure from other carriers -- trucks as well as CN. It's predominantly manufactured and processed goods.

Although each of these businesses requires a different kind of response to competition, that does NOT mean two different railways. There is only one standard for safety, operations, maintenance and construction -- CP Rail's.

Safety-related standards are one common denominator between the business units. The other is that consistent and reliable service is crucial. That is not new, but its importance has been underlined from our taking a fresh look at the competition. This examination began some five years ago, before the new National Transportation Act. It confirmed that without dependable, economical rail delivery, the export bulk commodities would lose their markets -- and so would we.

*Vice-President, System Operations, CP Rail
When it came to carrier competition, we could foresee trucks becoming an even bigger threat. The traditional long-haul/short-haul split between rail and trucks was fast disappearing. More efficient highway rigs were picking off more and more of the traffic once considered securely in the rail domain.

The NTA doesn't even deal with rail-truck competition. Yet the inroads of trucking -- aided by publicly-financed highways -- are perhaps a far greater force for change than rail-to-rail competition. To respond, we have to build a solid record of reliability and consistency -- on-time, dock-to-dock service that is equal to or better than truckers, or CN, can provide.

Despite the premium on dependability, many people think competition, deregulation and threats of revenue loss are an invitation to cut corners on safe operations. The reality is quite the opposite and the record demonstrates it.

The safety record has steadily improved and in 1988 it was better than ever. For the last five years, we have been the safest Class I railway in North America. In 1988, our accident rate was 1.79 per million train miles, compared with a rate in 1984 of 2.76. CN has experienced a similar rate of improvement.

Significantly, U.S. railroads have also improved, and their environment has been just as competitive as ours -- maybe more so. The U.S. industry has been in a turmoil of commercial readjustment -- and yet safety is steadily getting better.

The economics of our business just don't support a sloppy approach. The notion that letting accidents happen is cheaper than paying the cost of preventing them just does not stand up to scrutiny.

It might be true if the railroad business attracted operators looking for a fast, short-term profit. But, it's simply not a here-today, gone-tomorrow kind of business. An attitude of 'safety-second' -- neglect of the human and financial assets -- takes you very quickly to a point of diminishing returns on any short-term saving. Quite apart from our fundamental responsibility to our work force, and the human and financial cost of accidents, our business simply does not permit unreliable operation -- of which poor safety performance is the leading indicator.

Where, then, are the risks that stem from an uncertain competitive outlook?

Two years ago, we tried to explain to the House of Commons Transport Committee what we saw as the impact if regulatory reform lowered revenues and reduced investment. If revenues fall, there would be only one option -- operations would have to become increasingly restricted, because we could not knowingly operate at reduced safety levels. The most obvious effect would be lower speed and lower permissible train speeds. Loss of traffic to other modes would be the result.

The penalty of revenue starvation would be poorer performance and lost business -- not reduced safety. We would over time become a less viable competitor and a diminishing transportation presence. That kind of shrinkage has serious implications for the railway as a business. But more important is what it implies for Canada meeting export commitments and having a balanced transportation system.
The marketplace is not the issue. The real difficulty lies with government policies that make for unequal competition and discourage necessary railway investment. Some lie within the NTA, such as the potential ease with which U.S. rail carriers can pick off Canadian traffic. But others are outside it -- and outside the direct influence of federal transport policy.

There are, in particular, wide policy differences in how rail and trucking are treated. For example, property taxes apply to railway rights-of-way at the provincial level, but they are not levied on the highways use by the railway's truck competitors. Fuel taxes are another concern. While truckers can argue that fuel taxes they pay partly offset the cost of the highway they use, no such "roadway benefit" is realized by the railway. We pay fuel taxes AND construct and maintain our own right-of-way.

Tied to those issues is the unanswered question of whether the costs of trucking fully reflect the costs of commercial use of the publicly-financed road systems. This is not the forum to deal with these concerns at any length. I raise them only to underline one point: the people who worry about the effects of deregulation and competition on railway safety are flagging the wrong issue.

The railway issue today is viability and equality of competition -- and whether Canada will have the balanced mix of competing transportation modes that our National Transportation Policy envisions.

There is another contributor to competitive disadvantage that most people don't think of -- and that lies with the approach to grade-separation funding. The new Railway Safety Act defines railway safety very broadly. Under its provisions, the National Transportation Agency can compel a railway to contribute to construction of new grade separations -- and to reconstruction of old ones most of which were built largely with federal funding.

The process could leave the railway exposed to major new financial burdens. The concept of contributing is not the problem -- we only hope that the railway's share is fairly based on the extent to which there is a railway safety benefit. After all, the principal benefit of grade separations is in terms of public convenience through improved highway traffic flows. That mostly serves the needs of the provincial or municipal road authority -- not to mention the trucks with which we must compete.

Overall, however, the Railway Safety Act can be the basis for a more positive and constructive approach to the regulation of railway operations and safety. We supported the principles of the legislation when it was introduced and we support them today. Shifting the emphasis from construction and engineering to safety of operations is an overdue recognition that railways are no longer an immature industry.

In addition, allowing the railways more room to manage, by providing for the filing of operating rules for approval rather than automatically imposing regulation, can enable faster responses to change through new technology and methods.

Railway safety regulation historically has been basically reactive. The Railway Safety Act can be a means of being more proactive. For example, it contains provisions for safety-related research, which can usefully complement our own technical R & D activities. Its consultation process for rule changes can promote railway and union dialogue rather than confrontation.
The opportunities for consultation and collaboration are a recognition that railway safety should be a co-operative effort -- in much the same way as the Canadian chemical industry's TRANSACÆR program involves producers, carriers and end-users in the care and custody of hazardous chemicals.

However, the Act also has the potential to be more restrictive.

Much depends on how it is interpreted in the drafting of regulations -- for example, whether engineering matters will in fact be left largely in the railways' hands. Or whether detailed "how-to" regulations creep back in to complicate a regulatory regime that could depend more on performance standards. There is also the question of how the Minister of Transport and Ministry officials interpret their mandate -- because the Act has abundant opportunities for Ministerial discretion.

We will, of course, be interested participants in the evolution of the companion legislation to create the Transportation Accident Investigation Board. This is a further stage in the government's intended separation of regulatory functions.

As we cast an eye to the future, it is clear that a great deal will depend on the railways themselves. We have said: give us the opportunity to demonstrate that we are competent to set our own rules. That places the burden squarely on us to prove that competence.

Looking at the facts of the Canadian railways' safety performance, we may well be tempted to consider the case amply proven. We can point to the record of investment and the fact it is either directly safety-related or has a significant safety spinoff. All of this should be sufficient to demonstrate that railway safety is in fact in capable, competent hands.

But we must also deal with the public perceptions of railway safety -- especially where dangerous goods transportation is concerned -- and the pressures those perceptions may bring to bear. The Toronto area dangerous goods task force which reported last year dealt exhaustively with public perceptions. Its findings are instructive.

While people expressed high levels of concern about dangerous goods accidents, they showed a willingness to tolerate the existing system and accept a degree of risk -- provided they could be confident that all was being done to minimize that risk. The more people were familiar with the system, the greater their tolerance. As for how people perceive our record, it is encouraging that almost two thirds felt the railways had done a good job in developing safe methods. But it still leaves more than a quarter who don't think so.

Clearly, tolerance is closely linked to knowledge. And, there are major gaps in knowledge. Few people knew, for example, that less than 10 per cent of rail traffic is dangerous goods. Most thought it was a lot more -- and that has an obvious influence on how they perceive existing risks. Couple that with the fact that a very large majority felt risks of rail accidents should be reduced regardless of cost. Now we get into the complex territory of our perception of risk and what we want done to reduce it further.
How, for example, can most people -- myself included -- really relate to improving odds against a specific eventuality from one in 10 to the 28th power, to one in 10 to the 29th power? And how do we make the cost-benefit judgment when we are only fractionally improving the odds against a very long-shot occurrence -- not guaranteeing it will never happen?

Against those perceptions and the difficulty of making safety decisions entirely on a cost-benefit basis, what is the intelligent course to follow?

Obviously we must deal better with the perceptions and improve public understanding that railways are a vital industry run by people who know their business. We must also continue to deal with the substance of railway safety as well as the image. We have made great strides but are not about to be complacent. Much more can and will be done. We will improve incrementally by working across the full range of the railway's operations -- not by going overboard for any single solution to the neglect of others. There is no miracle fix.

We have high hopes for the Advanced Train Control System that both CP Rail and CN Rail are moving into the prototype stage. It is a new system that has yet to be fully proven in our harsh operating conditions. It has to be thoroughly tested both technically and economically before its potential efficiency and safety features can be fully exploited.

In ATCS, as in most other safety-related improvements we make, I am reminded of the Canadian Transport Commission's words in a 1981 report on railway safety:

> What can be done are the great multitude of sensible actions which will uniformly improve . . . safety generally; things which may be small individually and not headline-catching, but nonetheless are the very foundation of safety.

To sum up, the Canadian railways are moving into a new environment. Competition is telling us we must be more innovative than ever. In this environment, our resolve to be safe is absolute. It is fundamental to our ability to compete.
January 1, 1989, marked a significant date in the history of railway regulation in Canada because this was the day the Railway Safety Act was implemented. This is the first piece of legislation that focuses exclusively on railway safety in Canada.

Prior to 1989, railway safety was regulated through the Railway Act. This was a multi-purpose piece of legislation covering not only safety, but also corporate provisions and economic regulation. It originated in the last century and just grew like topsy - bits and pieces were added on as conditions changed. The previous legislative framework had worked well in that we have been able to maintain an extremely safe railway system, but there were a number of areas where improvements were desirable.

Railway regulation, that is economic regulation, safety regulation and accident investigation was carried out by the former Canadian Transport Commission. This could lead to a conflict of interest where all three of these functions were carried out by the same body. As an example, accident investigation could reveal inadequacies in the way that safety regulation had been carried out, yet both of these functions were the responsibility of the one agency. In a similar manner, an accident investigation might conclude that certain improvements be carried out, but the railways might have difficulty in providing the funds. The regulator would thus be placed in a conflict between the need to ensure a financially viable system and the need to maintain an acceptably safe system. There was never any indication that a conflict had ever occurred, but this issue is so important that it was felt essential to separate the functions.

It was for this reason that the policy decision was taken to split out the three functions. Economic regulation was to be the responsibility of the National Transportation Agency, safety regulation would come to the Minister of Transport, as is the case with marine and aviation, while accident investigation would be carried out by a multi-modal accident investigation board. The first two were put into place through the National Transportation Act, 1987, and the Railway Safety Act, respectively. The Transportation Accident Investigation Board Bill was introduced in the last parliament, but died on the order paper.

There were a number of other reasons for passing the Railway Safety Act. In the past, the emphasis was placed upon new construction and opening railways for traffic. We are now faced with a different set of priorities including heavy and fast trains and the movement of dangerous commodities through densely populated urban areas. The new legislation will allow us to concentrate our resources where they will have the most effect—inspection for compliance. It is now very clear that the railway is responsible for the management of its own safety.

*Director General, Railway Safety, Transport Canada
The Railway Safety Act gives us a number of other benefits. The approval process has been streamlined. Also, the Criminal Code has been amended so that it is now an offence to be impaired by drugs or alcohol while in charge of a train or to operate a train in an unsafe manner. As well, there is now the power to initiate security measures should they ever be required. Penalties have also been increased to realistic levels and we have eliminated hard labour as a penalty - this anachronism was previously found in the Railway Act.

I thought I would now turn to an examination of some of the concepts developed in the Railway Safety Act which illustrate the changes in regulation that have come about.

In the past, the railways had to apply every time they wished to build or rebuild a bridge. Permission was eventually given to the railway which then carried out the work after which application had then to be made again to open the bridge to normal speeds. This was a very cumbersome process which expended a great deal of time and effort on the part of both the railways and the regulator. Occasionally, a contractor would be held up on the site to inspect the finished product. The process was cumbersome and costly. To the best of my knowledge there have been no plans to build an unsafe bridge and, perhaps most important of all, who would have been responsible if the bridge had turned out to be unsafe?

Under the Railway Safety Act, permission is only needed from the Minister if the proposed structure comes outside standards which have been established and/or if there are objections from people, such as adjacent landowners, who feel their safety may be jeopardized. When the work has been completed the engineer in charge makes an affidavit to the effect that the structure has been built according to standards and is safe for railway operations.

The net effect is that there is less red tape and the work can be carried out quickly by the railway. It is now very clear that the railway is responsible for the management of its own safety. At the same time, the regulator has not given up any power because it is still possible to maintain control over these structures. I will have more to say about this later on.

Another area in which concern has been expressed in recent years relates to changes in operating rules. The Foisy Inquiry, which was set up to investigate the Hinton accident, recommended that a way be found to speed up rule changes so that they may be kept current. In the past, the Uniform Code of Operating Rules (UCOR) has been a regulation made under the Railway Act. It can take a great deal of time to make changes to such a regulation. There is a new procedure in the Railway Safety Act. The Minister orders the railway to file its proposed rule within a specified period of time. Before doing so, the railway must have consulted with labour. Upon filing, the Minister has sixty days to make a decision whether to approve, reject or require modifications. If the rule is rejected, the Minister must give reasons. The railway will have the option to refile if modifications are required, but the Minister has the ultimate power to write the rule should this be found necessary.

The sixty day time period will certainly keep us on our toes! An important point to note is that now the railway has a realistic idea as to how long it will take to receive a decision. In this way, we will be able to keep operating rules in line with changes in railway operating procedures and technology.
I mentioned earlier that we wanted to place more emphasis upon inspection for compliance. We have done this by creating Railway Safety Inspectors. These are appointed by the Minister and may be experts in any relevant discipline. They have the power to enter and inspect any railway property or operation. If the Inspector finds a condition which poses a threat to safe railway operation, he must issue a notice to the railway. If he considers the threat to be immediate, he may issue an order. He must not tell the railway how to resolve the problem he has identified, as this is a railway management responsibility. For example, if an Inspector finds a defective car, the railway may decide to repair the car or to scrap it. Either case would be satisfactory because the key element is that the car must not be used until the defect has been remedied.

The Railway Safety Inspector is the eyes and ears of the regulator. He has greater powers than was the case in the past, but there are restrictions on the use of these powers. An order can only be issued when there is an immediate threat to safe railway operation and it must be served on the person directly responsible for the work or operation. The railway may request an immediate review and the Minister has the power to revoke or alter a decision of the Inspector. Finally, the order may not tell the railway how to resolve the problem because this is a management prerogative.

The order should only be used as a last resort. Railway Safety Inspectors have been instructed to discuss problems on site and, in most cases, an agreement can be reached. Voluntary compliance is to be preferred over issuing an order.

What has been the effect of the new legislation? It is still too early to tell. Both regulator and regulated are still feeling their way with the different legislative techniques that have been in place only since the beginning of this year. It is already evident that we have reduced considerably the paper burden while the number of orders issued has been drastically lowered as we try to resolve our differences by communicating with the railways.

Before closing, I cannot leave this subject without making some comments about drug use or abuse. Transport Canada carried out a study in conjunction with the railways and railway labour. We found that some five percent of employees in safety sensitive positions (i.e., 1,750 people in total) were using drugs, mostly marijuana, but also a significant number used cocaine. This joint government - management - labour group went on to recommend that legislative sanction be obtained that would allow drug testing in the following cases:

- pre-employment;
- following an accident in which drugs could reasonably have been believed to have been a contributory factor;
- where the railway has reasonable cause to believe that an employee had been working while under the influence of a drug;
- at regular medical check-ups;

In publishing the report, the Minister indicated general acceptance of the findings, although he expressed reservations about pre-employment testing and testing at regular medical check-ups.
I should stress that the current legislation does not allow the railways to test for drugs. There was strong indication during the second reading committee stage while the Bill was in the House that members would be sympathetic to drug testing legislation. However, because of the human rights issues and the need to ensure consistency between modes of transport, decisions on drug testing have yet to be taken.

What does the future hold for railway safety? The railways are facing increasing competitive pressures and are being forced to seek new techniques and take advantage of technology. The new Railway Safety Act will allow the regulator to move with these changes and, at the same time, will ensure that Canada's railways maintain their enviable safety record within North America.
A LABOUR UNION PERSPECTIVE

E. G. Abbot*  
Reaction Panelist

I have heard the Canadian railways' general philosophy on rail safety so often, that I almost accept it on a par with the Old Testament. I will begin with a few comments on the usefulness of accident statistics as an indicator of rail safety. Next, I will consider the effects of deregulation and political priorities on rail safety; and then, I will discuss the relationship between bottom-line economics and rail safety.

Accident Statistics

The Canadian railways have a good safety record and they need not fear any comparison with the safety records of the railways in the United States, which are the best comparison geographically, culturally and technologically.

A good safety record, however, is no assurance that the railways are operating at an acceptable level of safety. A safety record is a relative figure based on no more than a statistical compilation of accidents that have already taken place.

On November 9, 1979, the day before the Mississauga, Ontario, near disaster on CP Rail, CP Rail had one of the best safety records, if not the best, of all Class I railways in North America. The same claim could be made by CN Rail the day before the head-on collision with a VIA Rail passenger train at Hinton, Alberta, in 1986, which took the lives of twenty-three people.

Accident statistics and comparative safety records, based on accident statistics, reveal very little as to the level of safety at which a railway is operating or if the threshold of safe operation will rise or fall over time.

Deregulation

The United States, Great Britain and now Canada have resorted to the concept of deregulation as an economic wonder drug to revitalize their ailing economics. How will this cure-all affect rail safety in Canada.

On January 1, 1988, the regulation of Canadian railways underwent a drastic turnabout. A different National Transportation Act introduced a completely new approach to competition between railway companies and other transportation modes. A year later, the Railway Safety Act completely changed the rules of the game governing the regulation of rail safety.

The impact of economic deregulation and the new approach to safety regulation in Canada cannot yet be evaluated, since the legislative changes have not yet worked their way into railway

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operations. Only time will provide the necessary data to permit an evaluation of the impact of deregulation on rail safety.

One approach to safety is that if there are no accidents for a period of time, for example, six months, then it is assumed that the railways must be operating safely. This is what I call the "status-quo" approach.

Another approach is to permit the railways to self-regulate and, when a major accident occurs, launch an in-depth public inquiry into the cause of the accident. Then, based on the findings of the inquiry, the railways are ordered to take the necessary corrective measures to avert a similar accident occurring in the future. I call this the "after-the-fact" approach.

The role of the Government, through the regulatory body, in these two approaches, is to impose minimal general broad guidelines and permit the railways to introduce their own specific safety rules after consultation and approval by the regulatory agency. The regulatory system in the United States has generally followed this method.

The Railway Safety Act introduces to Canada a regulatory process which is closer to the United States model than was the regulation of rail safety by the former Railway Transport Committee of the Canadian Transport Commission, pursuant to the old Railway Act. The Railway Safety Act, as a regulatory legislative framework, in my opinion, has a number of bad aspects. Even if properly enforced and policed by Transport Canada, the Act will not ensure that rail safety is maintained at an acceptable level.

The Railway Safety Act is the direct responsibility of the Minister of Transport. The Minister of Transport, regardless of political party, will always be first a politician, concerned much more with political priorities than rail safety priorities.

Political Priorities

Political priorities will, unfortunately, contribute to the eventual reduction of the level of rail safety. The Railway Safety Act calls for Inspectors, employed by Transport Canada, to police and enforce the Act. If there are insufficient positions created to do the job adequately, there will ultimately be a reduction in the level of rail safety.

The public will not know that the provisions of the Railway Safety Act are not being strictly policed or enforced. This will not necessarily result in an immediate increase of rail accidents, but will increase the statistical probability of a major accident. The level of public safety will be slowly but surely reduced.

The Railway Safety Act was a political priority when it was introduced by Government, but the ongoing staffing and efficiency of operation of the Act is not.

The deregulation of airlines in Canada, some years ago, resulted in more small and medium sized airline companies and increased air travel; this was predictable. A sufficient number of Inspectors and Air Traffic Controllers should have been hired and trained; this was not done. The deregulation of airlines had political priority; the safety of air travel did not.
The political answer to any transportation safety problem that catches the public’s attention is predictable. With great fanfare in the media, appoint a Commission of Inquiry. This takes the matter out of question period in the House of Commons and the Government appears to be doing its job. After public hearings, many months later, the Commission will table a report with recommendations, some of which will eventually be implemented, others will not. However, by that time, the safety issue will have lost its political priority.

The Railway Safety Act, aided and abetted by deregulation, encourages the railways - to do their own thing. Rail safety is now dependent solely on the belief that the railways will have the right stuff; that the railways will ignore their bottom-line and ensure that capital investment is ready, when required, to introduce new technology to maintain and improve the level of safety of the railways and voluntarily to serve the public interest.

Economic Pressure

As the railways strive to increase their bottom line, in a north-south deregulated market place, slowly but insidiously the level of rail safety will decline, as capital is directed to areas of operation that will produce the best return on investment.

On the labour and cost side of the equation, railways will become, to use the new cliche, “lean and mean.” Rail safety will be controlled by the economics of the bottom-line, the same as any other corporate considerations.

Mr. Kelsall today advises us as follows:

Over the past decade Canadian railways have invested many millions of dollars to improve the safety of their track, equipment and operations.

The impression is created that the railways made this investment exclusively to improve safety. This is incorrect. Most of this investment was motivated by economics, seeking increased productivity. There were definite improvements to the safety of railway operation; however they came as a fringe benefit to the investment. Mr. Kelsall gives the following examples:

- concrete ties, increased ballast base, heavier continuous welded rail;
- mechanized track maintenance etc;
- radio communication;
- advanced train control systems.

All of these initiatives were introduced by the railways for economic reasons, not for safety reasons; safety is a side benefit.
Mr. Kelsall lists the following measures, taken by the railways, to improve safety:

- roller bearings (all cars equipped by 1993)
- the installation of double shelf couplers, head shields, and better thermal protection;
- hot box detectors, dragging equipment detectors.

All of these items were recommendations of Justice Grange in his report on the cause of the Mississauga accident, dated December 1980. Hot box detectors, roller bearings, shelf couplers etc., were existing technologies long before the Mississauga accident. Yet, it took a major railway accident and regulations to force the railways to introduce these safety measures.

The aforementioned measures all have two things in common:

(1) no relationship to increased productivity (no direct economic return on investment to the railways); and

(2) they were all imposed on the railways by a regulatory body after the investigation into a major railway accident on November 10, 1979, at Mississauga, Ontario.

The report of the Inquiry Commission into the Hinton train collision by Justice Foisy, dated December, 1986, contained some interesting comments concerning Canadian National Railways' overall approach to rail safety.

One of the recommendations made by Judge Foisy was that all Canadian National Railways' locomotives should have the antiquated "deadman's pedal" replaced by safer tamper-proof reset control devices, a safety device used in Europe and in other countries for over a decade. The Canadian railways did not install these devices, on a priority basis, because they are purely safety devices yielding no direct identifiable bottom-line economic return.

Commenting on the "deadman's pedal" Judge Foisy, in his report, at page 133 stated as follows:

It is disturbing that a problem of such significance could be allowed to persist for so long. CN began to install reset safety controls in locomotives in 1978. The Commission was advised that up to 1985 CN had managed to install reset safety controls in 459 of their approximately 1,800 locomotives. The Commission is not impressed with the priority CN has given to this program of conversion and considers the slow progress to be evidence of a less than acceptable attitude toward the safe operation of trains.

These examples reinforce my comments on bottom-line economics determining the level of safety the railways will operate at, when left to their own economic agenda. The railways' formula is clear: investments will be made if they ensure identifiable economic returns. If safety is improved by the investment, it is a welcome by-product. Capital investment will, however, be slow in coming for purely safety reasons which produce no clearly identifiable return on investment.
In my opinion, three factors will eventually undermine rail safety - deregulation; politics; and the economics of the bottom-line in a deregulated, free-trade North American market place.

Rail safety is a complex and important matter. As the diversity of material moved by rail increases, so will the potential danger to the public and the railway employees. Railway accidents now and into the future will have the potential to take on the dimensions of social and environmental disasters and must be prevented before they happen and not after the fact. I am not prepared to leave the matter of rail safety exclusively to the discretion of the railways.
AN ACADEMIC PERSPECTIVE

John Heads

Reaction Panelist

This comment consists of four assertions, together with the supporting evidence.

1. Railway safety in Canada is already impressive.

The following table summarizes accident statistics for Canadian railways.

<table>
<thead>
<tr>
<th>CANADIAN RAILWAY ACCIDENTS</th>
<th>1988-Preliminary</th>
<th>1987-Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td>Deaths</td>
<td>Injuries</td>
</tr>
<tr>
<td>Derailments</td>
<td>244</td>
<td>0</td>
</tr>
<tr>
<td>Collisions</td>
<td>83</td>
<td>2</td>
</tr>
<tr>
<td>Other*</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
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<td>4</td>
</tr>
<tr>
<td>Crossings</td>
<td>490</td>
<td>57</td>
</tr>
<tr>
<td>Trespassers</td>
<td>110</td>
<td>46</td>
</tr>
</tbody>
</table>

*Other consists of accidents involving track motor cars and maintenance of way equipment, and employees struck by rolling stock.

Previous speakers have already described action taken by the railways in recent years to reduce accidents. Data for 1988 show a total of 356 accidents a year on the Canadian railways, with the bulk of these caused by derailments. It is true that there is an accident almost every day the railways operate. However, most of these accidents are of a very minor nature comparable to the "fender benders" in the highway mode.

Only four employees were killed in railway operations in 1988 and in 1987 there were eight fatalities. These low rates have been typical of railway operations. In respect of passenger trains, there was a major collision at Hinton, Alberta in 1986 with 23 fatalities of crew and passengers. There was also a serious railway accident at Red Deer, Alberta, in 1983, when five passengers and crew members were killed. These are the only cases of railway passenger deaths in the 1980's.

*Director, University of Manitoba Transport Institute

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The major cause of death in railway operations is crossing accidents, where the victims are motorists or other road users. In roughly 60% of these cases the train hit the highway vehicle and in the other 40% of cases the highway vehicle ran into the train. In the past, the railways tended to have a fatalistic attitude towards crossing accidents, regarding these as the fault of the highway driver. While there may be justification in this view, in the last decade the railways have taken a more active role in the prevention of crossing accidents through the sponsorship of a public awareness campaign known as Operation Lifesaver.

The number of crossing accidents is falling and the current number of fatalities, which averaged 51 per annum over the last three years, compares with a figure of over 80 at the beginning of the decade. In addition to Operation Lifesaver, crossing accidents have also been reduced by increasing expenditure on crossing protection and by the general reduction in accidents across the whole highway system. This last subject is for discussion this afternoon in the highway session and relates primarily to lower speed limits, seat belt legislation and increased action to reduce drinking and driving.

After crossing accidents, the major cause of fatalities associated with the railways arises from trespassing. Formerly, these trespassing statistics were broken into two categories - suicides and the remainder assumed to be non-deliberate deaths from trespassing. This distinction has now been abandoned in the official figures, but a number of trespassing deaths must still be suicides. The railways have always argued that the trespassing deaths are none of their causation or responsibility and there is some justification in this view.

Taking the total numbers of transport accidents in Canada, there are currently over 4,000 fatalities per annum on the highways, 200 marine deaths and some 110 deaths in aviation. The railways with 61 fatalities including crossing accidents in 1988 are at the bottom of the list. Crossing accidents, have always been a great concern of government railway safety authorities, but highway authorities have sometimes tended to dismiss this on the grounds that the fatalities amount to less than 1.5% of total highway deaths. As previous speakers have argued, railway transport is extremely safe and it is becoming even safer.

2. The Canadian public is not aware of the good safety record of the railways.

It is surprising the extent to which railway accidents attract media attention. In the first three months of 1986, there was one really tragic accident to a passenger train at Hinton, Alberta and there were also several other major derailments, highly photogenic but not causing any deaths. The media coverage was impressive in respect of every one of these accidents. The international coverage of the Canadian media can sometimes be sparse - except for railway accidents which will receive coverage no matter where they occur in the world. There is no doubt about it - railway accidents have media appeal.

The railway network in Canada, or at least Western Canada, and there has always been keen interest in railway operations. Railway cars strung across a track after an accident present great opportunities for press photographs and live media coverage "lying over the accident site". Perhaps, a railway accident gives an object lesson in human limitations, a lesson as to how fragile can be the greatest technological achievement of the 19th century. Perhaps, we go back to
childhood and remember how much we enjoyed wrecks in our model train sets, more than watching the trains going quietly around the tracks. I believe that there is almost a media obsession with railway accidents - but I do not know why. Some three years ago, I attended a two-day conference organized by government on media relations and none of the highly qualified instructors were able to give me an adequate explanation.

Perhaps, the problem lies not in the accidents which actually occur, but in the catastrophes which people fear. Over the last few years, there have been a number of cases, mostly in the southern United States, of railway accidents followed by clouds of chlorine floating across the countryside and killing those in its path. Admittedly, there have been no deaths from the transport of dangerous commodities on the railways in Canada, but we came very close in the Mississauga derailment of 1979.

There may be low probability of a catastrophic leak of dangerous commodities in a railway accident and there may be an even lower probability of this occurring in a highly urbanized area. The railways have taken very considerable action to minimize this risk even further. However, in any transport mode, it is not possible to say that any disaster will absolutely never happen. I think that it is this fear that underlies part of the media preoccupation with railway accidents. It is a difficult public policy decision to determine how much resources should be spent to prevent an accident, which could have dire consequences but which has a very low probability of ever happening. I leave this question for further discussion by our panel later.

3. Railways must be financially viable to be safe

Mr. Kelsall has pointed out that the railways have a very strong self-interest in maintaining railway safety. I know that this is so from my personal exposure to the railways and from the elementary observation that cars that have left the tracks are not earning money. In addition, the railway needs to make a reasonable return on its operations in order to have a cash flow to maintain cars and infrastructure in good condition and to avoid so-called postponed maintenance.

Over the years, the Canadian railways have not been very profitable enterprises in absolute terms, although they have performed well compared with U.S. railroads and brilliantly compared with those in most parts of the world. During the regulatory reform activities of 1987, the government stressed that safety was a first priority in all its changes. However, as far as the railways were concerned, the regulatory reform was very much a piece of shippers' legislation in some of the burdens it placed on the railways, such as the requirement to implement competitive line rates and the upper limit on the extent of branchline abandonment.

Government must remember that, unless the railways are financially viable, they will not be truly safe and the separation over the last two years of economic regulation from safety regulation has its obvious dangers.
4. The extent of government regulation of railway safety depends as much on the mind-set of bureaucrats as on the details of the relevant safety legislation.

The new Railway Safety Act has been welcomed earlier this morning as opening the way for less government regulation for the railways. This would be a desirable development and I certainly share the views already expressed that government regulation has been and continues to be excessive. However, once Parliament passes an act in any area of activity, it tends to forget about it for many years, absent a disaster to bring it immediately back to mind.

It is safer in the civil service to be regarded as the scourge of the railways rather than have a reputation for constructive cooperation. Some bureaucrats prefer confrontation and are determined to extract every last ounce of power out of the legislation which they are called upon to administer. While I am confident that this will not happen under the administration of Transport Canada’s present Director-General of Railway Safety, nevertheless, it would be naive for the railways to expect that a change in legislation is always followed by a change in attitudes. I suspect that there are still ample residual powers tucked away in various parts of the new legislation to allow rigorous regulation.

Government is presently in process of introducing a new intermodal accident investigation board. Let us pass for a moment the irony that the failures of the Canadian Aviation Safety Board (CASB) are the justification for the extension of this method of accident investigation to all modes. My specific fear is that a separation of railway safety monitoring in Transport Canada from railway accident investigation in the new board will not be conducive to a smooth integration of government activities in the rail safety area. Following the example set by CASB, I am certain that this separation of functions will lead to an increase in the number of civil servants involved in railway regulation. The railway members of this panel will certainly agree with my view that the devil finds work for idle civil servants!
As an introduction to my subject, I would point out that no industry has ever concentrated so much on safety issues as we have in the trucking industry with so little obvious or visible effect on the public at large. We must look at this today and try to understand the basis of this phenomenon, because if we have not lessened the concerns of the public for all the effort made, then there must be good reasons for this.

To start with, why has trucking developed into the massive service it is today? How many times have we heard other motorists curse those trucks or heard demands that trucks be kept off so-and-so street. Why are they there? I can assure everyone that with the capital and operating costs of a truck today, there is not one single solitary trip made unnecessarily. The truck is there for good reasons. Someone is paying for it, as it is in the process of moving commodities from one place to another. North America could not survive without reliable truck transportation and that is what the industry tries to offer - but it has its price and, quite properly, it has its detractors.

I have mentioned the large cost of acquiring and operating a truck, but this is where we have an enigma because there is, and has been since the early '80s, an excess carrying capacity in the for-hire truck transportation industry in Canada. The primary reasons for this are three-fold. First, we have seen some shifts in direction of freight movement with more cross-border traffic internationally. Secondly, there have been new entrants and expansions as carriers jockey for market share. Thirdly, there has been a sharp increase in private carriage, which now carries the largest percentage of over-the-road freight.

This, of course, requires reaction as shippers quickly realize they are in the driver's seat (so to speak) and become very rate conscious as the competitive environment sharpened. So what do they do?

The price of trucks will not be any less. Labour has its own price, parts and supplies continue to increase, and the cost of regulation from Workers Compensation to employment equity to government reporting needs, etc., etc., adds to an already burdensome cost ratio. There are primarily three options to survival. First, create economies of movement by carrying more weight; although in the current climate this benefit accrues to the shipper and not the carrier. Secondly, improve market share of existing markets by aggressive salesmanship or merging/acquiring other companies. Thirdly, seek new markets via expanded operating authorities. There is a fourth option and this will be dealt with within the context of this paper - that is to take short-cuts which prejudice safety of machines and people.

There is no doubt about it, the modern truck is a marvel of engineering and, if properly maintained, is a safe servant. I am not a technical expert in motor transport development, but I

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do know that we have come a long way with technological developments in brakes, engines, tires and other components which contribute to safety and efficiency. As importantly, we can now monitor operator performance through electronic reporting devices, but here I want to add a word of caution. There is not one iota of sense in having the ability to record this information, if we do not act upon it to either remove delinquent operators or to influence a change in attitude and performance.

And so, after skipping very lightly over the machine, I now enter my field of expertise which is safety training and recruiting.

A lot of words have been written about this, but I can tell you that safety is an area which allows no relaxation and is an area where we are perhaps in the middle of the learning curve. In a recent study, it was stated that large trucks have a safety record about as good as other vehicles on the road. It went on to say that most large truck accidents are caused by two main factors, human and environmental, but few are the direct result of the truck's configuration. This study has served to reiterate once again that the one factor which has the most direct input over truck accidents is at times paid little or no heed. The human element has the most direct input. Ongoing training or retraining of drivers is the obvious solution.

How do we train and what does training mean? Does it mean giving someone a book to read or subjecting them to a series of lectures? Do we train on the job? Do we offer the examples of others for emulation? Do we offer incentives? Do we concentrate on attitudes? Do we emphasize adjustment? Do we do it full time, part time, or as the circumstances seem to warrant it? Do we do it continuously or spasmodically? Do we measure performance and results? In the past we would pick and choose what we did. Many in the industry paid little or no heed to training. To most, it was management by circumstance.

In today's complex world of trucking, we must follow all the methods of training outlined above, if we are doing our job right. We have to follow performance and we have to train and re-train and, very occasionally, we have to admit defeat and resort to dismissal. Because we do, indeed, have an onerous burden to bear. We send truck combinations on to the highways weighing close to seventy tons to mix with four wheelers and recreational vehicles. Yes, we are awesome and we have to respect the rights of others to share the road with us. This is why the responsible players in the industry get so upset when they hear of any acts of discourtesy by any commercial truck driver.

Driver training is specific to each company, but for the larger companies, there are some industry standards developing and there are criteria laid down before individuals are entrusted with vehicles costing up to $120,000 and loads which could be valued at $1 million. The most advantageous situation is to establish hiring standards that are very clear and concise, and then not waiver from them. We have to be selective and ensure we take on only an individual with some years experience and an acceptable safety and claims record. As well, this person must have the right attitude, so he can accept the company's policies and be receptive to change, recognizing the importance of promoting the image the company wishes to portray. Otherwise, he may not be hirable. However, this is becoming a problem, as the trucking industry is already experiencing a driver shortage which, over the next five years, is expected to result in a demand for many thousands of new entrants into the industry. It will be appreciated that this will have a number
of effects on us including an increased demand for training, refined methods of sorting out the wheat from the chaff, a considerably increased cost to the industry and more trainers.

Apart from company training methods, which usually include classroom and supervised on-the-job instruction, we can expect to see an increased number of professional truck driver training schools cropping up. In the past, the industry has scoffed at these, as they have felt the graduates need extensive training when employed, but I think we have not been entirely fair as we should not expect someone who has just achieved a Class I license to be totally experienced in all aspects of freight handling. Anyway, this training void will be partially filled in this way as it is only the larger companies which can afford sophisticated training programs.

Trucking associations, too, have their place in training as they can offer programs which are more widely industry related, such as recognition of excellent performance and incentives to encourage others to emulate the achievements of the superior records of their compatriots. These include driving competitions and Driver of the Year/Driver of the Month Awards. These are supplemented by courses in the transportation of hazardous commodities and in professional driver improvement.

I mentioned earlier that one method adopted to improve the viability of the trucking industry has been the allowance by the authorities of increased gross vehicle weights and axle weights. The latest increase is generally known as the RTAC weights and were approved nationwide after a three year, $3 million study into pavement response and the safety factors involved. The industry agreed to support this study financially without any guarantees whatever of the outcome. As it was, there were some gainers and losers with perhaps the most common combination in Canada today, namely the A-train, being the loser. As an industry, we have to accept this, as at certain weights the tests indicated some instability in specific circumstances. I mention this only to emphasize that we have as much interest in equipment safety as we do in driver training - the two are inseparable parts in the safety chain.

With the effort that the industry has put into safety, we saw a real threat when economic de-regulation was approaching a reality some three or four years ago. We had the benefit of seeing the U.S. experience; of seeing numerous new entrants and of seeing the kind of rate competition which followed. The results of this highly competitive, low profit era saw many carriers compromise safety to compensate. We certainly did not want that in Canada and the for-hire carrier industry was a leader in promoting, both federally and provincially, national standards of safety as they relate to all aspects of driver training. We promoted reciprocal vehicle inspection standards and safe load security regulations. And, much to the dismay of many, we promoted uniform hours of service regulations and the enforcement of log books. With the National Safety Code, these are now a fact, but the point I want to emphasize here is that we must have uniform and equitable enforcement. Safety legislation is useless without compliance, but compliance is not generally attainable without enforcement. A paradox! A partnership must be formed between the industry who can train and educate and government who must ensure equitable enforcement for compliance to be an industry standard. Unless we have that, we have wasted our time.

The for-hire trucking industry, like many, does not appreciate government regulations which have been created without consideration of all concerned. For example, deregulation, without the National Safety Code, would have been pure folly. All the industry has asked for has been a level playing field where legislation is not solely directed at the for-hire carriers. Legislation which binds
international as well as private carriers, is not an unreasonable request. This industry has never been afraid of competition as long as the rules are the same for all the players.

Confrontation never was and never will be a proper means of communication. While this industry must break down its own walls in communicating with governments, so too must all the other levels of government as they vie for jurisdiction.

Governments, at all levels, play a role in safety, not only by legislation but also by ensuring a proper road system and proper maintenance. This industry contributed $6.2 billion to the federal coffers through fuel taxes, yet only $200 million was returned to it for the up-keep of such things as the highways. Who then bears these costs? Ultimately, via the shipper and the retailer, the consumer has all of these costs passed on to him with no perceived return. A four-lane divided highway across this nation would go a long way to assisting all users, whether public or industry. The deferral of this type of upgrading only increases costs at a later date.

The media also play a very vital role in safety. Unfortunately, we are sometimes left with the impression that they hide behind the public's right to know, in particular, with their use of sensationalism. "TRUCK HITS CAR AND INJURES TWO". How many times have we seen this type of heading, usually in bold type? The public perceives the worst and rightfully so! If there is a covering story, then the truth may well be in the last paragraph, where it states the automobile ran a red light and struck the half-ton truck. The truth is there, but the problem exists in knowing whether the public has read the entire article or just the heading. The PCB spill in Northern Ontario is a prime example of how the power of the media can arouse the general public and influence government to react solely to appease public back-lash rather than reacting to the recommendations of their experts.

As a consequence, our industry is very guarded in its opinion of all the media. Suffice to say, the power of the pen, the microphone and now the video camera, are respected by this industry. Sensationalism only detracts from the many carriers who operate safely over tens of millions of miles per year. Regrettably, we seldom hear of the truck driver who has stopped at the scene of an accident to give support and comfort to the injured or the ones who have stopped at -40 C in the middle of winter, in the middle of nowhere, to help a stranded motorist. In our present society this is not considered newsworthy. It would, however, go a long way in enhancing the image of the road carrier.

It would be wrong to leave you with the impression that we are a bunch of philanthropists. Yes, we have an obligation to the public, but I have no hesitation in stating that safety also pays. It pays in less lost labour time, with less loss of equipment use, with lower freight claims, with lower Workers Compensation Board premiums and with less administration to attend to the results of poor safety practices. It also pays in image - with the assurance that if you entrust your goods to me, the chances are that they will get to their destination. We ask for government regulation of safety because safety is everyone's business, and we cannot relax our vigil if we are to serve our public, the people of Canada.
A FURTHER CARRIER PERSPECTIVE

G. Engel*  
Reaction Panelist

I would like to discuss three areas that I feel are very important, and that have to be recognized not only by the motor carrier industry, but also by the general public. These areas are regulatory change, safety within the industry and government relations.

If anybody was in attendance last Friday afternoon, at the Manitoba Trucking Association Convention, we had an excellent presentation by Mr. Jack Fraser, the President of Federal Industries, the owner of Motorways and Kingsway. They are a very large player in the field and Mr. Fraser is a man of more than thirty years experience. His comments were that the changes that have occurred within the industry in the last ten years are unbelievable.

In the last ten years, deregulation has been the biggest regulatory change that we have experienced. Deregulation has caused new entrants into the market place and this has meant a great deal of pressure put on the market for qualified drivers. With the pressure, we are seeing in the smaller companies, and even to some extent in some of the larger, more vocal companies, a deterioration in the level of the driver that they are accepting. That is very dangerous.

We have also seen new regulations come forth concerning hazardous materials in the late 1980's. Now, we can identify, as an industry, what we are carrying. The public can also identify what we are carrying on our trailers on the roads in both Canada and the United States.

Another change that we have experienced is the National Safety Code. The National Safety Code encompasses many areas. A very key area is the inception of the hours of service regulations which are still being negotiated. I don't know if there is anyone within the industry that knows exactly what the regulations are - Ontario feels a little bit different than Alberta, and Saskatchewan feels a little bit different than Manitoba, and so forth.

With deregulation, the U.S. is going to be a major player in the transportation industry in the years to come. We are going to see a lot more of a shift in the traffic flows. Presently, we are experiencing traffic flows that go in an east-west movement. We receive our freight out of Ontario because the freight is produced in Ontario. We are seeing a shift in this movement. We are seeing more patterns from the north to the south. We will be serviced more out of Chicago and Dallas than out of Ontario. We will see a great movement into the U.S. and will need harmony with their regulations. If we do not, we will continue to bang our heads against the wall, and the regulations we write here will not be worth anything to the people enforcing the laws in the U.S.

Another pressure on the industry is increased insurance costs over the past five years. These increases are due to precedents being set in certain areas. Ontario is a province where third party

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liability suits are very high. They are offering huge cash settlements to members of the family that they may not have seen for twenty years. Pressures, like this, have greatly affected the industry.

In the last ten years, we have seen tremendous changes in the industry, such as the shortage of drivers, the increased insurance costs, the inception of the Hazardous Materials Act, and the National Safety Code. These changes have put a lot of pressure on the industry to enforce safety. We are doing just this. When I say we, I am speaking of carriers like ourselves - the larger carriers that have been in the business a long time. We have a commitment to safety.

That is why I want to speak about company philosophies. With all the new entrants to the market place today, government can write all the rules and all the regulations they please about safety, but it's very important that they are enforced. It is very important that companies have a philosophy and an appreciation for safety.

Our company has a philosophy that was written by the president of the company. I will quote that philosophy: "No job is so urgent that it cannot be done safely". Every driver that we hire, whether it be a city driver or a line haul driver, must adhere to this philosophy. In the case of line haul drivers, I sit down with them after they have completed their orientation program, and we talk about the philosophy. If there is anybody within our operation that decides to think differently from the philosophy that the company has written down in ink, then they had better talk to the president about changing it. This constitutes our basic philosophy - "No job is so urgent that it cannot be done safely".

The best way that I can define safety, when speaking to my employees, is to speak of personal limitations. I refer to the individual, and not to a broad group of drivers, if I talk about a specific lane, for example, Winnipeg to Saskatoon, which we service on an overnight basis. For this route, we have an allowed a suggested running time for our line haul driver of twelve hours. We have some drivers that do this route in eleven hours and some drivers that do it in eleven and a half hours. But, the driver that does that route consistently in eleven hours is not doing a better job than the driver who does that route consistently in twelve hours.

I want to share an example with you concerning philosophies. Some time ago, in a conference, I spoke to another carrier about a run between Winnipeg and Thunder Bay. A dispatcher had sent a driver out on this trip, which had a suggested running time of twelve hours. The dispatcher told the driver he wanted him to be there in seven hours. He said that, if the driver was not there in seven hours, the plant would have to close and the carrier would have a large claim from the customer. The dispatcher had put all the responsibility on the shoulders of the driver. The driver tried to do the trip in seven hours. He got as far as Kenora, and he stopped for coffee. He got as far as Dryden, and everything was going well. But, between 3:00 A.M. and 4:00 A.M., the driver started to become the victim of fatigue. In the back of his mind, he was saying that he had better stop and sleep. But, he also knew he was supposed to have the load in Thunder Bay in seven hours. He tried to do it, but he failed. The driver ended up in a catastrophic vehicle accident. He totally demolished the equipment he was operating, received a tremendous claim to the cargo, and suffered personal injury.

Speaking to the carrier about this accident, I asked what they did to the dispatcher. The man replied that nothing was done to the dispatcher. Then, I asked about what they did to the driver.
The man answered that he had fired the driver. I said that I thought this was odd. The dispatcher relayed this information to the driver. The driver did his best, and got caught short because he was exceeding his limitations. This is not a good example of a good company philosophy.

These are some of the philosophies that we deal with in the industry, and these are the philosophies that we have to change. The only way that we are going to change them is to have a philosophy from the top. You have to have support as far as safety is concerned right from the top of the company.

We are working in a very labour intensive industry. You can have the most safely designed pieces of equipment in the yard, but the key is the driver - the personal additive that you put behind the wheel. That is going to determine whether you have a clean safety record or a dismal safety record. As an industry, our commitment to safety must be paramount.

The third area on which I would like to speak is the relationship between industry and government. A four-lane highway between Vancouver and the east coast would be beneficial. In Manitoba, the major lane between Winnipeg and the United States market, Highway 75, should be and is being converted to four-lane. However, the government also started to pave a four-lane, divided highway between Winnipeg and Beausejour before commencing with Highway 75. How many trucks run between Winnipeg and Beausejour? Paving the route between Winnipeg and Beausejour before paving the highway between Winnipeg and the U.S. is not promoting a good relationship between the industry and government.

We need to develop a better relationship, we need to share ideas and act on suggestions, we need to develop workable rules and regulations. Safety must be maintained as our number one priority. Last, but not least, the rules must be enforced consistently throughout the nation. We must work in harmony if we are to make our highways of tomorrow a safer place for the general public.
A REGULATORY AGENCY PERSPECTIVE

Adam Hrabinski*
Reaction Panelist

To build on Mr. Shostak's remarks, I propose to discuss the background and current status of the National Safety Code.

Responsibility

Transport safety is primarily a provincial responsibility. The office of the Registrar is responsible for the examining, testing, licensing and monitoring of drivers as well as ensuring all motor vehicles meet certain safety standards.

Purpose of National Safety Code

Following deregulation of the trucking industry in the United States, the National Safety Code is proposed for Canada as an added measure of protection from unfair competition for the existing trucking industry. Prior to deregulating the industry, the existing carriers cautioned government officials that Canada's streets and highways would be unsafe if the floodgates of regulation were thrown wide open. We were advised that in the short-run, transport equipment which is not maintained properly is cheaper to operate than well maintained equipment. It was argued that cheaper or deferred operating costs would result in unfair competition - we agreed!

It was felt that a comprehensive set of safety standards if applied equally to all truckers would prevent unscrupulous new entrants from jeopardizing public safety. More importantly, it would remove the element of unfairness for those who operate well maintained equipment.

Who has a comprehensive set of safety standards?

The existing carriers have them, that's who. Some carriers are more sophisticated than others and some are more successful than others. Clearly, the existing carriers have the information and track record to discuss transport safety in an informed manner.

Prior to implementing the National Safety Code, the government officials responsible for highway safety had fairly definitive safety plans for drivers and vehicles. These plans were in various stages of development. The focus provided by the National Safety Code merely changed some implementation schedules to bring them forward.

Standards relating to driver training, testing and licensing were fairly well entrenched before the arrival of the National Safety Code. Some driver related standards were implemented without major changes for purposes of interprovincial uniformity.

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Similarly, vehicle inspection standards through government approved self-certification shops have been active in Manitoba for some time. Nevertheless, the introduction of mandatory inspection of truck-tractors and semi-trailer equipment was a change. Previously, this equipment would become subject to inspection on a random basis. Now, it is mandatory for truck-tractors to be inspected and certified safe every six months, and annually for semi-trailers.

In large part, the National Safety Code standards were derived from good business practices of existing carriers. The National Safety Code, in reflecting a large measure of these practices, essentially, has given rise to a cloning process of the industry. For example, it was normal practice for existing carriers to insist on driver abstracts before hiring a driver. Drivers were required to fill out trip inspection reports and maintain log books, particularly if the operation had a U.S. component to it.

What is the effect of this cloning process?

It is my view that the National Safety Code has created a large number of better informed truckers. Manitoba's application forms for operating authority, for example, have a section on safety. This section has provided ample opportunity for staff at the Motor Transport Board to counsel new entrants in National Safety Code standards. The standards are reviewed from the perspective of current industry practices as they relate to hiring drivers, monitoring driving activities, reporting on accidents, maintaining log books and equipment inspection reports, safe handling of dangerous goods and ensuring vehicles are kept in safe operating condition.

These new entrants understand the aspect of responsibility and control required in order to receive a Fitness Certificate. The independent trucker who may have been perceived as a free spirit is merely a down-sized clone of an Atomic, Motorways or Reimer operation. Before transporting his first load, the independent trucker must understand and ensure that all of the safety related components of his operation comply with the NSC standards. The trucker may be free to travel where he wishes, but he is not free to neglect safe operating practices.

For a closer examination of some of the changes arising from implementation of the NSC, I have grouped the standards into three broad categories.

I. Driver related standards
II. Vehicle related standards
III. Carrier related standards

The relative importance of each standard is difficult to appraise as each has obvious safety implications. Although each of the three categories form an independent whole, I will attempt to guide you through them separately, so I may emphasize the particular safety implications of each.

I. Driver Related Standards

As noted earlier, the standards relating to drivers have been in existence for a considerable period of time. The NSC initiative provided an opportunity for the Provinces to rework many existing practices into uniform training, testing and classification standards.

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There are 11 individual standards which are driver related. These standards are:

1. Single Drivers' Licence Concept
   - prohibition against holding more than one licence - recent legislative changes require a driver to disclose to an employer all driver licences the driver may hold in various jurisdictions in both Canada and the United States;

2. Knowledge and Performance Test
   - uniform tests of basic driver capabilities;

3. Driver Examiner Training Program
   - driver examiner standards uniform across Canada;

4. Classified Driver Licensing System
   - same class of licence classification across Canada;

5. Self-Certification Standards and Procedures
   - allows industry trained drivers;

6. Medical Standards for Drivers
   - same level of medical fitness from one province to the next;

7. Driver Profiles
   - record of accidents, convictions, suspensions on drivers' files - a driver must produce an abstract of his driving record for each new employer, as well as an annual abstract - the driver is responsible for reporting to his employer all accidents and moving infractions occasioned by his use of an NSC vehicle;

8. Short-Term Suspension
   - temporarily suspending a drivers' ability to drive;

9. Security of Loads Standards
   - ensures all loads are stable and secured in a manner which poses no threat to the public or the driver of the vehicle;

10. Trip Inspection Reports
    - standard industry practice to ensure equipment failures are inspected, reported and repaired - may also help to prevent irresponsible carriers from dispatching unsafe equipment;

11. Hours of Service Regulations
    - limits the number of hours a driver operates a vehicle.

II. Vehicle Related Standards

There are two vehicle related safety standards. They are:
1. Commercial Vehicle Inspection Standards;

2. Commercial Vehicle Safety Alliance Standards.

Basic vehicle safety standards have not been modified as a result of the NSC. Because of the NSC, the jurisdictions now are recognizing and accepting each others' inspection and certification standards. Manitoba's Commercial Vehicle Inspection Program which allows shops to repair, maintain, and certify vehicle safety on behalf of the Province has been in effect since January, 1987. On March 17, 1989, a Regulation came into effect which mandates annual and semi-annual certification of all semi-trailers and truck tractors.

Over the next two to three years, it is expected that more government approved inspection facilities will be trained and licensed giving greater accessibility for certification of commercial vehicles. Commercial vehicles other than the semi-trailer configurations may become subject to the mandatory inspection and certification process over a period of time.

In addition to monitoring vehicle safety standards through certified shops, there is a program to check for vehicle safety at the side-of-the-road. The Commercial Vehicle Safety Alliance inspection program (CVSA) was introduced as an annual pilot project within Manitoba in 1984. The CVSA inspections are carried out at roadside locations - normally in concert with highway weigh scale inspections. Some upgrading of inspection areas at weigh scale sites was necessary last year to facilitate implementation of this program on a province-wide basis.

CVSA inspections of all commercial vehicles will continue as in the past. This summer, the Department plans to increase the full-time inspection teams to permit five percent of commercial vehicles to be inspected. This change should result in a general upgrade of equipment, as more provinces and states devote attention to this inspection program. Any deficiencies must be corrected within a specified period of time. Critical safety defects result in the vehicle being detained until repaired or towed away for repair.

III. Carrier Related Standards

The greatest impact in the area of change under NSC relates to ascribing responsibility for safety to motor carriers. The carrier is the focal point of the NSC. The underlying rationale for the NSC is the promotion of responsible behaviour on the part of the carrier who employs drivers and maintains vehicles involved in commercial transport. Two standards which make carriers more accountable are carrier profiles and facility audits.

1. Carrier Profiles:

This carrier related NSC standard has not yet been implemented in Manitoba. For each carrier operating a vehicle over 4500 kg, we plan to create a separate file into which basic insurance and fitness information can be recorded. All infractions incurred by the operator of an NSC vehicle will be recorded to the carrier profile. Simultaneously, information on accidents and driving offences will be recorded against the driver profile from which driver abstracts are compiled. It is not our intention to attempt to keep track of which drivers work for which company. Infractions assigned to a carrier's profile will contain the offense reference by a driver licence number.
The carrier profiles are intended to be used for carrier improvement and control. Carriers with poor safety compliance records will be counselled, interviewed, warned, and, if necessary, prosecuted or have their registrations revoked.

The impact of these changes on the trucking industry should result in a far more homogeneous industry. Carriers with the weakest safety records will be impelled to upgrade their safety performance and gravitate upward toward the carriers with the best safety records.

2. Facility Audits

Audits will not be undertaken in a programmed fashion until such time as the carrier profiles are built. Recently, facility audits have been carried out on behalf of other jurisdictions. Some carriers have designated their base jurisdiction outside Manitoba, but since they maintain their principal accounting and company records within Manitoba, inspectors have performed facility audits to ensure these carriers do not gain advantage by switching head-office locations.

The purpose for carrier profiles and facility audits is to monitor carriers who may have an aversion to highway inspection stations. Circumventing weigh scales would not free them from inspection and audit of their safety related conduct. Audits would review such safety related documentation as log books, trip inspection reports, dispatch records and other material which would confirm the NSC standards are being complied with.

Facility audits are complementary to the carrier profile package to identify and direct attention at carriers who may have difficulty complying with safe operating principles and practices.

Summary

In total, the National Safety Code is a fairly comprehensive package for licensing, monitoring and improving drivers' equipment and the attitudes of carriers. There are provisions to guard against irresponsible behaviour and prevent drivers and their employers from escaping basic safety practices and procedures.

Manitoba is in the process of phasing in deregulation of the trucking industry. This phasing process will be completed by January, 1993. Under the prevailing relaxed entry standards, the National Safety Code appears to be accomplishing its goal of preventing unsafe drivers and unsafe vehicles from entering the transport system.

Mr. Shostak's remarks about transport safety indicated that safety training is a continuum. The task of hiring, training and monitoring the safe conduct of professional drivers is a responsibility which industry has taken very seriously. In the past, government has worked very closely with industry, as it is to our mutual best interest to ensure that only qualified drivers are permitted to use our streets and highways. We propose to continue working closely with the industry in the future as we have in the past.

The safety programs currently practised and promoted by the industry assure me that transport safety is not being compromised in an increasingly competitive environment.
A PUBLIC INTEREST PERSPECTIVE

Michael J. Colledge*
Reaction Panelist

I would like to preface my remarks today with a little history regarding traffic safety. First, let's take a look at vehicle safety. It is a popular misconception among some people that the cars of the fifties and sixties were safer because of their greater mass: automobiles weighing 3,500 to 5,000 lbs. were common. However, a heavier vehicle is only safer relative to the lighter mass with which it collides, while the interiors of these old vehicles were killing people. Toggle switches, steering columns, hard dashboards, non-flexible sun visors were all killers.

The Motor Vehicle Safety Act came into effect in 1971 and since that time, all vehicles sold in Canada have had noticeable improvements incorporated into them. Examples of these improvements include impact absorbing steering columns and dashboards; replacement of sharp edged switches, controls and door handles; non-reflective surfaces in the driver's field of view; safety glass windows; three point front seatbelts; roof and side door intrusion protection; and vastly improved braking systems. We can say vehicles of today are safer than their old cousins.

Now let's look at our roads and streets. Our driving population is increasing and our roads are deteriorating. But, our roads are much safer and better designed than they were thirty or so years ago. The driving environment has been improved in respect of twinning, channelization, grade separations, hill and curb geometry, and attractive rest areas.

Of course, we cannot pass this look at the history of safety without looking at the steps that have been taken with the human factor, the driver. Certainly, driver education has played a part in preparing our young people for the modern, complex driving task. Drivers have to take a written test, vision test and driving test. The problem with this testing procedure is that it has not changed much over the past several years and more important is the fact that these tests only address very basic standards. But again, generally, things have improved.

Enter the fourth facet of this safety equation, public awareness and education campaigns. Seatbelts and child restraints were the most visible next to anti-drinking and driving. I do not intend to debate their merits but suffice it to say that they have had a significant effect. Yes, we have come a long way in improving safety in the driving environment, but at the same time we have created, and are in the process of expanding a massive problem.

That problem is the truck auto mix on our highways.

In the fifties and sixties, cars were heavier than today, trucks were lighter than today, trucks were fewer than today. Now, cars are lighter, trucks are longer, heavier and wider and, if it were not for old bridges, I am sure they would be higher.

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Motorists operate in a dynamic system, with lane widths of 12 feet or less, passing each other in opposite directions at combined speeds of as much as 200 km per hour or more. This leaves little room for error. Drivers are of all physical and psychological conditions. Vehicles are all shapes and sizes and have widely varying capabilities. Drivers in small automobiles are sharing the road with huge commercial vehicles which can be 40 or 50 times their weight. There exists a delicate balance of operations, which when upset, can have serious consequences.

Trucks do get involved in accidents. In truck/car collisions, studies have shown that the potential for a fatality in a truck/car accident is about 32 times greater for the car occupant than for the truck occupant. USA Today ran an article describing truck accidents that occurred in just one week across the U.S.A. These accidents killed 53 people.

The trucking industry, over the years, has argued that larger trucks will allow them to become more competitive while reducing the number of trucks on the road.

We, the motorists, are concerned that vehicles should have operating characteristics which reduce the probability of creating dangerous situations and also allow the driver a maximum opportunity to control the vehicle when emergency manoeuvres must be executed to offset human error.

Longer trucks will substantially increase the danger of passing on two lane or multi-lane roadways. On two lane roads, drivers are forced to occupy the opposing lane for several seconds longer than necessary, greatly increasing the danger. In addition, the extra length intimidates drivers wishing to pass causing them to stay behind the truck. This can result in huge line ups of traffic, increasing the frustration level and causing some drivers to take chances. Other trucks can be prevented from passing in many instances due to the additional passing distance required. The traffic stream effects of this can have serious consequences.

It has been said many times that trucking companies assign their best drivers to the more difficult to drive combination trucks. However, if the number of double trailer trucks increases, some of the drivers assigned to drive these vehicles will, by default, be less experienced drivers. Thus, there could be a degradation of the safety record of highways.

Let's see what drivers themselves believe is happening. A recent study indicated that 34% of drivers stated that they had driven for more than 10 hours in the past 24 hour period, and 24% stated that they had driven more than 60 hours over the past 7 day period. 43% of the drivers had exceeded either the day or the per week maximum hours of service. This has to have an effect on fatigue and other related factors. The majority of drivers in the study, 85%, stated that they never had difficulty staying alert while driving a truck. However, 50% claimed that they knew drivers who had accidents or close calls after falling asleep at the wheel and 37% knew drivers who used stimulants, and I do not mean tea or coffee, to keep them alert while driving a truck.

Having said all that, let me emphasize that I am not opposed to trucks. I have heard all the arguments from the trucking industry for greater weights and greater lengths, and I can understand their situation. However, we have the other side of the coin. Trucks are a threat to other motorists either as a real threat or a perceived threat.
The real threat, as I have mentioned, manifests itself in longer passing times, greater splash and spray, greater side or cross-wind buffeting, and greater intimidation by size. The perceived threat comes from people who are unsure of how to deal with those larger trucks. This problem will be compounded over the next 20 years or so, as we will have a larger percentage of drivers in the driving population who are over the age of 55.

On our highways, there is little room for error and when a 2000 lb. automobile is meeting or passing an 8 1/2 wide, 100,000 lb. truck combination, driving in a 12 foot highway lane, the margin for error is nil.

This problem is not going to go away. It can only be solved by taking steps to help those on both sides of the equation. Motorist groups, trucking interests and governments have to pull together to maximize the safe motoring environment that we have all been working so long and so hard to achieve.
The Physics

Velocity is distance travelled or displacement(s) per unit of time (t). In equation form \( v = s/t \). Acceleration is time rate of change of velocity, i.e. \( a = v/t \).

The severity of a crash environment is often expressed in terms of the acceleration (deceleration) level, rather than force. The essential factor causing acceleration is net force which is unbalanced or resultant force.

The magnitude of net force is measured in how much acceleration it can impart to a given mass.

Therefore: \( a = \frac{\text{net force}}{\text{mass}} \)

Since feet per second per second, or meters per second per second are awkward units to use, acceleration is conventionally measured in multiples of gravity or g (32.2 ft. per second per second).

It can be shown by rearranging the above relationships that impact force in a vehicle collision is directly proportional to the square of the velocity change, and indirectly proportional to the stopping (starting) distance or displacement.

In equation form: \( F = \frac{mv^2}{2s} \)

where \( F = \text{Force} \)
\( V = \text{Velocity} \)
\( s = \text{displacement} \)
\( m = \text{mass} \)

Stress is force per unit area.

In equation form: \( \text{stress} = \frac{F}{A} = \frac{mv^2}{2As} \)

where \( A \) is the area to which the force is distributed

Distributing force to a wider area, therefore, reduces stress (tissue damage). All impact attenuating devices introduced and regulated under the Motor Vehicle Safety Act are based upon these fundamental relationships. Interior trim and padding over crushable surfaces, for example, eliminate sharp edges (force concentration) and increase the stopping distance when impacted. The hard, outer shell of a motorcycle helmet prevents force concentration, while the crushable energy absorbing liner affords the head and neck up to an inch of additional stopping distance.

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Effect of Vehicle Design

Optimal management of collision energy involves absorption of motion energy through controlled crush of vehicle structure and objects struck, and occurs over the greatest possible time duration.

The Government of Canada, in 1971, put into effect the Federal Motor Vehicle Safety Act. Through various standards, this specifies minimum dynamic performance criteria covering occupant protection which all new cars sold must meet when a flat faced barrier is impacted at 30 miles per hour. (Since 1980, under the U.S. New Car Assessment Program, cars, and more recently light trucks, vans and utility vehicles, are being crash tested at 35 mph, fully 1/3 more severe than the 30 mph level used in compliance testing.)

It was recognized during early government crash test programs that occupant contact with interior parts occurred. The industry, therefore, developed a variety of impact attenuation devices, in addition to seat belts, including interior padding, an energy absorbing steering wheel and column, and a compliant, high penetration resistant windshield.

The downsizing of passenger cars mandated by governments in response to the energy crisis of the mid 70's, led to technological changes in passenger cars of the 80's which, in frontal collisions with a flat faced barrier, permits survival for fully restrained occupants at impact speeds up to 40 mph.

Improved crashworthiness was made possible by a shift to unit body construction. State-of-the-art vehicle bodies of the 80's consist of a system of thin walled, hollow tubular structures, linked to assembly points and inner fender skirts, and aligned as longitudinal members in the front and rear crash deformation zones, approximately at bumper height. Energy absorption is maximized and transfer to the occupant minimized when the tubular structures collapse like an accordion in uniform fashion without bending or buckling.

In the ideal system, axial forces acting upon the structure during collapse are released with each fold thereby decreasing the bending moment generated further along the structure and the tendency to buckle. Also, when there is controlled collapse instead of buckling, the collapsing process is relatively long in duration and the resulting acceleration levels acting upon the vehicle are correspondingly lower.

 Appropriately placed cross members mean that, in a collision, the struck side is not called upon to bear the full load. Rearward or forward transfer and absorption of impact energy takes place by vehicle deformation well beyond the crash zone. (The difficulty in identifying and correcting all so-called induced damage is a compelling reason for disallowing the right to repair and return such vehicles to general use.)

Compartment intrusion is undesirable since it diminishes the space needed for seat belt stretch and deceleration ride-down, and contributes to the harmful "second collision" between occupant and the intruding structure.

In the early sub-compact research safety vehicles, the basic concept for the front end was a crash zone divided into three regions. Zone I, the bumper employed a high density polyurethane skin
(over low density energy absorbing foam) to provide pedestrian impact protection and minimize vehicle damage during low speed collisions. Zone 2 was designed for compatibility when striking the side and rear of other vehicles, and zone 3 for vehicle occupant protection.

A very low profile and a somewhat egg shaped front end tends to centre the force experienced by struck pedestrians well below their centre of gravity, thereby 'scooping' them onto the engine hood rather than knocking them down. In front-to-side collisions with other vehicles, the near side occupant is less likely to come into direct contact with the striking vehicle's front end. This contrasts sharply with the unyielding, aggressive, high profile of older cars and current light trucks.

Seat Belt Design

The function of belt restraint systems is to control occupant motion and prevent ejection. Optimally, the occupant's stopping distance and acceleration level are kept in the range of the vehicle's cg and second impacts with the vehicle interior are prevented. Ideally, loads imposed by the belt are transferred to the body through the bony pelvis and thoracic skeleton.

The dimensions of the available internal "living" space are critical and must be coupled to occupant size and restraint system. The head-to-windshield and head-to-windshield-header distance is of utmost importance because brain injuries can occur from the "second collision".

Low speed impacts are more common than high speed accidents. The performance of the vehicle, in terms of occupant protection, must reflect its ability to provide protection in low speed collisions and its ability to protect the passengers in high speed collisions.

In order to deal with the practical case, the dimensions and deformations of the structure and belts have to be very carefully considered, again in terms of the entire population at risk.

Unfortunately, belt loads tend to increase with increased belt strength and stiffness indicating that while a reduction in Head Injury Criterion values may be obtained, the risk of abdominal and chest injuries to people at the lower end of the tolerance spectrum is increased.

In the research safety vehicle sub-compact development era, the front seat restraints featured an inflatable torso belt which served two functions. The inflation process tightened the belt around the upper torso early in the crush thereby allowing the occupant to 'ride-down' the structure during more severe collisions. The inflation device around the belt also improved the distribution of forces in both the upper torso and pelvis, thereby reducing the stress.

The Canadian Motor Vehicle Safety Act, under Regulation 208, requires that seat belts be installed for all occupant positions. Test conditions and specifications are written for driver and front seat passenger fitted with 3-point lap and shoulder belts. Dynamic performance specifications must be satisfied in tests carried out at 30 mph with the seat in the mid position. Occupants of rear seats, fitted only with lap belts, are excluded from compliance.

Unfortunately, current model lap and shoulder belts fitted with emergency locking retractors require up to 35 milliseconds (of the typical 100 millisecond crash pulse) before slack is taken up, thereby,
substantially reducing the time for a given velocity change. Since acceleration varies inversely with time, there is a proportionate increase in acceleration and force levels.

Belt slack and soft bench-type seats both contribute to an undesirable motion sequence known as submarining in which the pelvis moves downward and forward. The lap belt applies heavy belt loads to the soft parts of the abdomen, instead of the load resistant bones of the pelvis. In addition, the shoulder belt load is applied to the lower thorax, instead of the sternum, and can lead to lower rib fractures as well as a rupture of the spleen and liver. The submarining phenomenon occurs more often to rear seat occupants seated on a soft bench seat and restrained by a lap only safety belt.

In current sub-compacts and in most other cars, bench seats have been replaced with firm, carefully designed bucket seats. During crash conditions, the firm cushion prevents downward and forward movement of the pelvis. The seat, therefore, limits force to the lower torso from seat belt loading.

The Negative Impact of Truck Design

Probably because of intended commercial and work-related use, light trucks and vans were exempt from compliance with the regulations of the Motor Vehicle Safety Act, when it was introduced in 1971. Therefore, trucks and similar vehicles have not benefited fully from newer occupant protection technology.

However, multipurpose vehicles, such as utility vehicles and mini vans now capture nearly one third of the new car market, and are widely employed as private passenger vehicles. They should be reclassified as cars, so that all occupants will be assured of an equivalent level of minimum safety protection.

Truck design has seen little change throughout the 20th century. There are still no energy absorbing structural rails in the crash deformation zones. Typically, a cab and/or box is attached to long, heavy, channel steel frame rails extending full length bumper to bumper. In heavier vehicles, the engine and spring shackles are located well forward, usually within one foot of the grill, further adding to their aggressivity.

The frame rails, when subjected to large, longitudinal loads, simply buckle leaving the flimsy fenders to bear the full load of an impact above bumper height, to crush and pile up against the fire wall, with little energy absorption taking place.

In head-on collisions, where the force is centred outside the frame rails, there is marked intrusion of the occupant space, since there are no side guard beams in the doors to prop the "A" and "B" pillars apart - reminiscent of crash patterns seen in cars of the 50's and 60's.

Even when intrusion is minimal or absent, an adverse factor for safety engineers is the short distance available in light truck cabs for the occupant to stroke forward when the seat belt is loaded and stretched, before the chest impacts the steering wheel, and the head strikes the windshield. In fact, the distance between driver chest and steering wheel in sub-compact cars is nearly twice that of a 3/4 ton pick-up when the seats are retracted full rearward.

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Owing to the non-compliant front end, when a truck collides with another truck, there is a short duration high "spike-like" acceleration/time tracing which translates into high forces to belted occupants.

However, the major contributor to human loss of life is collisions between trucks and passenger cars. By reason of its design, the front end of a commercial truck is essentially a non-yielding structure. In a car/truck collision, where the momentum of each is the same, crush to the car is greater than that sustained in an equivalent velocity, flat faced barrier impact, thereby contributing to increased occupant space intrusion.

In head-on collisions, the truck’s large wheels and high bumper override the car’s front end, thereby, defeating the car’s crash deformation zone. Within a few milliseconds, the structural integrity of the car must bear the full load of the impact force. The inevitable result is intrusion of the car’s occupant space by the truck. Even when occupant space intrusion is not marked, the car experiences its full velocity change in say one foot, instead of in the two to two and a half feet, available if the front deformation zone has not been by-passed.

In addition, when large trucks override cars, the saddle fuel tanks of the truck rupture from contact with the underriding car creating a perilous fire hazard for all involved occupants, and seriously hampering rescue operations. This situation is heightened by the placement of the truck’s battery box and fuel tanks, thereby, producing a source for ignition of spilled fuel, whenever the battery is shorted out by displaced metal. (More often than not, a small fire erupts from spillage of gasoline from the car’s carburetor, which is then fed by leaking diesel fuel from the truck tanks.)

In truck/car front-to-side intersection collisions, the high truck bumper overrides the lower side rail of the car, again causing severe occupant space intrusion and heavy occupant loading. The truck grill, without crushable energy absorbing material, strikes the near-side occupant’s head causing life-threatening injuries. In head-on offset truck/car collisions, when only one side of the truck ramps up over the car, a tipping moment results which may lead to truck rollover during its separation trajectory.

Typically, damage to the cab of heavy trucks in truck/car collisions is insignificant. However, not infrequently, even in low velocity collisions, the bolts affixing the front axle to the spring are sheared off from horizontal forces. As a consequence, the front axle is displaced rearward and the steering system defeated leading to loss of steering control. The vehicle is then in danger of veering off into a secondary collision, or into a jack-knife or rollover configuration, both of which can lead to crushing of the cab by heavy cargo. Being fully aware of the small amount of lateral acceleration needed to cause the vehicle to overturn, commercial vehicle operators may hesitate to attempt a collision avoidance manoeuvre.

Finally, a design feature of trucks and truck-trailer rigs which proves hazardous to other road users is lack of a device to prevent car underride. An underride crash occurs when a smaller vehicle collides with the rear-end or side of a rigid truck or trailer and, owing to the high frame of the large vehicle, the smaller vehicle glides beneath.

Car/truck rear-end underride has received most attention from regulatory agencies. However, semitrailer underride, in our experience, is seen more often. In this crash mode, the windshield, "A"
pillars and roof structure of the underriding vehicle, not designed to absorb impact energy, are the first to make contact with the larger vehicle's frame. There is gross intrusion into the passenger space of the smaller vehicle, often decapitating its occupants.

While state-of-the-art collision energy management technology has not found its way into light truck design, it would be unfair to say that benign neglect has been the stance taken by regulatory agencies and manufacturers alike. Occupant protection components, including steering column rearward displacement (standard 204), high penetration resistant windshields (205), windshield bonding (212) and seatbelts for all occupant positions (208) have been included in light truck design, mandated by law. Nation-wide accident investigation studies, funded by federal agencies, have shown that roof crush in rollover collisions, head rests in rear impact collisions and side guard beams in side impact collisions probably would not contribute significantly to human salvage.

While light trucks have been downsized and their components made lighter, they are larger and more rigid than cars. Light trucks, in particular the multipurpose recreation-type vehicles, are very unforgiving in terms of dynamic stability because of their high centre of gravity, narrow track and short wheelbase. This can lead to loss of steering control and "spin-out" which in turn results in rollover.

What is more regrettable is the lack of experimentation with alternative designs, and system testing for crashworthiness (occupant protection) that has characterized the entire truck industry. A golden opportunity for system testing was missed during design and development of the current mini vans. With the realization that a major intended function was a substitute for the full size station wagon, compliance with at 35 mph ought to have been a minimum requirement.

Ford and General Motors mini vans are built on light truck chassis and the undesirable override in collisions with passenger cars continues to surface. Data suggests that adding energy absorbing material in trucks and vans may produce less severe injury in impacts. Standardizing bumper and lower side sill heights would lessen the chance of underride/override and occupant space intrusion. Positioning the fuel tanks inside the frame rails would reduce the chance of fuel spillage.

Detachable impact attenuation devices could be added to the front of trucks, for highway use only. These devices would provide the 2 to 3 feet of stopping distance needed to give survival a chance in the 25-35 mph impact velocity range. In addition, such a device should dramatically lower and shape the profile to something similar to a passenger car, centre the impact force to near bumper and side rail heights and lessen the chance of override by the large truck tires. The device could also be made to serve as a wind dam, and substantially improve fuel consumption.

Summary and Conclusions

In order to prevent death or serious injury to an occupant of a vehicle involved in a collision, the resulting forces or the crash environment experienced by the occupant must be controlled so that human tolerance limits are not exceeded. To provide assurance that these limits are not exceeded, the structure must meet three basic requirements. First, it must be compatible with the restraint system since the occupant's crash environment is dependent upon the interaction of the energy absorbing properties of both the vehicle structure and the restraint system. Second, the structure
must be strong enough so that the occupant's living space is protected. In other words, compartment integrity must be maintained.

Note that these two requirements are in conflict, since in order to prevent excessive acceleration loads to the occupant, the structure must be sufficiently "soft", whereas to maintain compartment integrity, the structure must be sufficiently "hard".

The third requirement is that vehicle structure must not be excessively aggressive to any other vehicle when involved in a vehicle-to-vehicle crash, so compartment integrity of the struck vehicle is maintained and its occupant(s) are not excessively loaded. The third requirement, then, necessitates that compatibility must exist between two vehicles - compatibility in both crush and restraint system performance.

Regarding restraint system performance, occupant displacement with respect to the compartment must not exceed the internal available distance to prevent the "second collision". To maximize the internal occupant "stroke" distance, the vehicle should be operated with the seat in the full rearward position.

Note that a dilemma exists with the restraint system similar to that of vehicle structure, in that the restraint system must be effectively "hard" to prevent excessive motion of the occupant with respect to the available interior distance. But it must also be effectively "soft" to prevent the occupant from experiencing excessive decelerations.

In some current model passenger cars, the bucket seat is considered an important component of the restraint system. The seat imposes a counter force into the pelvis thereby preventing excessive forward displacement of the occupant.

Slack in the seat belt seriously degrades its effectiveness. Therefore, the belt should be worn snug at all times, preferably beneath bulky clothing. Tension-relieving devices that can introduce slack in the belt system ought to be prohibited under standard 208.

Trucks and similar vehicles fall short of meeting most of the basic requirements of crash survival. Among the missing components is an energy absorbing (low profile) front end, standard bumper height, side guard beams in the doors, bucket seats and head restraints. The fitment of an appropriately designed and shaped impact attenuating device to its front end would go a long way to correcting the shortfall. In addition, an impact attenuating device to prevent rear and side underride ought to be made mandatory.

For all cars and multipurpose vehicles, the addition of a firm bucket seat and 3-point safety belt to front and rear outboard positions ought to be a requirement under standard 208. Appropriate testing must be carried out to ensure that all occupants share in a minimal level of protection.
AIR SAFETY

Roger Morawski

This is a conference on safety, and, more specifically, the current session deals with air safety. I think that it is appropriate, therefore, to start off by defining "What is safety?"

I am frequently asked whether something is safe, and most of the time, I find it difficult to answer the question posed. Why? Well, obviously, some situations are not safe, like for instance: disarming mines, test flying prototype airplanes or sky diving. But, in most situations, we are likely to be involved in a more appropriate way of posing the question: "Is something safe?" would be "Is something safer than something else?" or "Is something safe enough?" We will all agree that driving on dry pavement in daylight on brand new tires and brakes is safer than driving on an icy road at night in an older car. In this latter set of conditions, we are less safe, but we have decided that it is "safe enough", so we go! On most matters dealing with safety, we have to realize that safety is not absolute and, in real life situations, we are looking at safety in relative terms. Safety is relative.

The reason I started by suggesting this principle is because I believe it applies well to the two main areas of air safety I would like to deal with today.

1. Are "aging" airplanes less safe?

2. Are new technologies making airplanes safer?

Let's deal with the first one. Having worked in this area extensively for many years, I believe that the industry is fairly well convinced that "aging airplanes are safe, provided they are well maintained."

I suppose that on the face of it, this sounds like "good news". Unfortunately, however, the aging aircraft safety issue has gained momentum as a result of inattention to the heavy maintenance efforts required.

Good aircraft maintenance is a very demanding task and, above all, it calls for a high degree of experience, know-how, skills, training, motivation, dedication and extensive resources, both human and in facilities, tools and equipment. In Air Canada, for instance, we have a team of approximately 5,000 people and a budget of over 400 million dollars annually devoted to this task. The task becomes more involved, demanding and expensive as the fleet "ages". The only way to ensure that safety is not compromised is to ensure good maintenance which equates with: "Know what to do and do it right!".

But, obviously, the most important element in the system we are discussing are the people involved - and people are not perfect and things do get out of control and accidents occur. The recent

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accident of an Aloha Airlines Boeing 737, in Hawaii, illustrates this point very well. This was an old airplane, but the mode of the structural failure that occurred at 35,000 feet was a well known problem on Boeing 737 aircraft ten or fifteen years ago. Inspections and repairs were well developed and provided to airlines all over the world long before the Aloha accident. At the risk of over-simplifying, the fuselage of an airplane is a pressure vessel made of aluminum sheets, lap jointed together, and these lap joints can develop corrosion between overlapping sheets. This condition will weaken the structure and if unattended, will progress to a rupture of the vessel. Proper maintenance calls for inspections of all joints using various methods, X-ray, ultrasonic, eddy currents, etc. and, where corrosion is detected, repairs must be performed. Obviously, in this case, people involved "did not know what to do" or "did not do it right" or maybe both.

The purpose of recounting the foregoing is not to "point fingers" or gloat over somebody else's mishap, but only to demonstrate that with proper maintenance this accident could have been avoided in spite of the "advanced age" of the structure.

Let's examine the second question frequently asked when discussing air safety: "Are new technologies improving the level of air safety?"

First, look at this question in a historical perspective. Most of us remember the dramatic improvement in aviation safety when turbine engines replaced "pistons". But this was not an isolated area of aircraft design and development. In parallel, new technologies were introduced in structures, hydraulics, pneumatics and other mechanical systems and, above all, in the field of electrical and avionics systems. The introduction of transistors, microprocessors and more recently digital components has made this side of the aircraft operation paramount where safety is involved. No one manufacturer or even any one country has "a corner" in this area. Air transports produced today by Boeing, McDonnell-Douglas, Airbus or Fokker employ all these latest technologies to various degrees. The range covered cannot be covered in this paper. I would like, however, to deal with four areas to illustrate the subject:

1. "Fly by Wire" aircraft
2. Data link
3. Windshear protection
4. TCAS (Traffic-alert and collision avoidance system)

**Fly-By-Wire**

Dealing with the "Fly by Wire" aircraft, the pilot through conventional controls is no longer connected or "in the same loop" with the flight controls of the aircraft. In a "Fly by Wire" situation, the pilot "flies" a computer. The computer in turn activates the flight controls and hence "flies the aircraft". The integral feature of this arrangement is that the computer is programmed to ensure the aircraft is always flown within its "design envelope". In other words, the pilot is assisted by the computer to ensure that a "wrong" command is not given by the pilot to the aircraft. This virtually eliminates the danger of stall, upset, spin or structural overload on "manoeuvres" which have frequently caused accidents in the past.

The first commercial transport to employ fully the "Fly by Wire" design is the Airbus 320, currently on order by Air Canada and Canadian for deliveries starting early in 1990. One of the first of the
320's delivered in Europe was involved in an accident last year. In this accident, out of approximately 150 passengers and crew, all but 3 survived with minor injuries. Subsequent investigation of the event concluded that a similar accident involving a conventional non "Fly by Wire" aircraft would most likely have resulted in significantly heavier casualties.

Data Link

Another new technology is the "Data Link". I am especially interested in discussing this system, since at Air Canada we are in the forefront in the design, development and the application of the "Data Link" system among the world airlines. In short, the system provides, in real time, a communication system between aircraft in-flight and on the ground anywhere in North America and Europe, including trans-Atlantic crossings for automatic data transmission. The system was primarily developed to assist the crew with flight planning and weather information. It is now extended into a number of other applications. Some of these have direct application to maintenance. We can now interrogate our aircraft in-flight from our engineering office and "read" off various parameters of engine performance: temperature, R.P.M., fuel flow, etc. This provides our specialist great feedback on the condition and performance of the equipment and when necessary can be used for "troubleshooting" of potential system malfunctions.

Windshear

Windshear is another air safety problem area being addressed by advance technology.

Low-altitude windshear is a sudden change in wind direction and/or speed over a relatively short distance in the atmosphere. This presents a great hazard to the performance of an aircraft if encountered on the ground during takeoff, or if encountered relatively close to the ground during climb-out or approach to landing.

From 1964 to 1983, there have been 28 airplane accidents on take-off or approach-and-landing in which low-altitude windshear was determined to be a causal factor.

Airborne Windshear detection systems are available today which give aural and visual warnings to the flight crew that a windshear has occurred. The crew, then, applies full power and follows the pitch commands computed by the windshear computer.

TCAS

Finally, the latest and greatest in collision avoidance technology is embodied in a new instrument called TCAS. Prior to the advent of these new systems, the commonly accepted means of avoiding collision worldwide has been the "see and be seen" concept. This concept required flight crews, with the assistance of ground radar, to be able to see an oncoming aircraft and take evasive action if required.

TCAS uses aircraft radar signals to plot the relative position of nearby traffic. Electronically searching for a collision threat, the TCAS computer analyzes the projected path and altitude of each aircraft within range. If a collision threat is identified, the TCAS instrument warns the flight crew in time to take avoidance action.
The ultimate benefit of these advanced systems is that serious accidents will be avoided in the future and air safety will be enhanced.

In my introduction this morning, I suggested that safety is not absolute, but rather is relative, and in the real world, including the world of transportation, we are constantly ensuring that things are "safe enough".

In the air side of transportation, the most pressing problem is that of aging fleets, and, here, I am suggesting the technological side of the problem is "under control" because we have the people in the loop to "do the right things".

On the other side of the spectrum, there is good news. The development of new technologies making airplanes safer is continuing. But, even so, it will always be people flying, maintaining, loading and performing a myriad of functions in the operation of the aircraft. People working the air traffic control system, people operating airports and many others involved in air transport are the guardians of safety in the air. Safety depends on people.
The Canadian Airlines' safety policy is integrated into the company's operating plan. Our Corporation Mission Statement emphasizes a 'Safe Dependable Airline Service' which is considered integral with every manager's job description.

The company's senior executive supports and promotes our safety management program. This is evident in the prominence given the Safety Department, with its Director reporting to the Group Vice President, Operations, who in turn reports to the President and the Board of Directors. All safety programs are managed through one department Director responsible for Flight Safety, Industrial Safety and the Transportation of Dangerous Goods. The Director and his staff have full access to all operating departments.

The prime responsibility in the flight safety program is to identify safety deficiencies and prevent them from becoming serious occurrences or aircraft accidents. This is accomplished in the following manner:

a) Safety (operational) reviews are conducted as (soft) audits. This is an ongoing requirement utilizing on site inspection and incident trend analysis.

b) Occurrence reporting.

The company has classified eight categories of occurrence reporting. This ranges from serious, catastrophic airplane accidents to reportable occurrences and incidents affecting the safety of flight. Incident reporting is coordinated through the System Operations Centre at the Senior Dispatcher's position. From here the appropriate authorities and internal management are notified.

c) Incident investigation and reporting.

Standard investigative techniques are utilized to conduct investigations and produce reports, providing factual information, analysis, findings, and recommendations.

d) All 'Occurrence Investigations' are conducted by a safety department investigator. Independent of other operating departments, the safety investigator is able to analyze the occurrence in an impartial manner, presenting his findings and recommendations.

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e) Investigative reports are presented to the company’s Senior Executive complete with recommendations designed to prevent recurrence.

f) Incident report recommendations are followed up by the Flight Safety Manager to ensure policy, procedures and standards have been reviewed and amended as necessary.

g) Confidential, anonymous reporting from flight crews is encouraged in order that we may detect problems of a sensitive nature and conduct discreet inquiries.

Technical Safety Committee

A company system committee designed to review flight safety issues is an integral part of the flight safety management process. Flight safety issues presented by safety representatives of the Canadian Air Line Pilots Association are tabled at each meeting. Membership is made up of representatives from the Tech Safety Committee from CALPA and appropriate senior management within Flight Operations and Maintenance and Engineering. The committee meets on a regular basis (at least every 4 months). It reviews all significant occurrences and follows up to ensure recommendations from incident investigation have been reviewed. The process ensures management/union discussion outside the normal concerns of contractual negotiation. The committee has been a successful and positive step in promoting flight safety within the airline structure.

STAS (Safety Trend Analysis System)

This is an incident reporting and trend analysis system built on a mainframe computer. It is designed as a safety management tool which is accessible throughout Canadian Airlines’ system to those who have a need to monitor and detect trends. Incident reports are submitted to the Safety Department for review and analysis. Completed incident reports are then entered into the mainframe computer system. Incident summaries are distributed monthly to Flight Operations and Maintenance management and to members of the system Flight Safety Committee. STAS is designed to track such things as rejected take-offs, bird strikes, engine shutdowns, runway excursions and ATC losses of separation. At present, there are over 600 occurrences in the mainframe database. These have been gathered over a period of 18 months since the introduction of the new Canadian Airlines service. The system is designed as a management tool to detect system deficiencies and identify problem areas which are external to the airline's operation. The system has already been instrumental in providing factual information for our concern in areas related to ATC losses of separation and bird strikes at major Canadian airports. The database is providing a useful tool in the process of safety management.

Safety Promotion

The feedback of safety information to flight crews is accomplished through the "Flight Safety Newsletter" which contains current incident reports (both internal and external) pertinent to the three types of aircraft operated within our company. In addition, relevant safety articles are reproduced for our flight crews. The newsletter which is produced on a quarterly basis is
addressed to all pilots, pilot managers, and dispatchers in our system. In addition, selected senior executives within the company are provided with copies. We also exchange safety information with external agencies and companies such as Boeing, British Airways and Transport Canada.

Emergency Response Plan

As part of our safety management program, the Company has established an Emergency Response Plan and Manual of Operations. This deals with Category A through D occurrences which are identified as serious aircraft accidents. The plan is designed to ensure an organized response to serious accidents. The response plan is designed to deal with every facet of emergency response, i.e. accident investigation, security, insurance, legal, finance, administration, passenger lists, notification of next-of-kin. The plan utilizes a 'field' and 'headquarter' management approach. Individuals named to this plan are required to respond from any place with our system. A section of the group identified for responding to the emergency will investigate on behalf of the company. This investigation is conducted in accordance with ICAO Annex 13 and is designed to ensure a complete review of applicable policy, procedures and standards. Accident investigation includes union representatives and ensures coordinated professional liaison with the investigative authority.

Canadian Airlines has successfully combined four former Canadian companies to form one. Our flight safety management program has been designed to detect serious system deficiencies before they cause serious occurrences or aircraft accidents. There is sufficient flexibility in our program to be responsive to concerns throughout a diverse system of operation. Flight safety personnel are ready to respond to any and all incidents which occur in the system. Our prime objective is to ensure a safe, dependable operation.
Introduction

As a member of the reaction panel, my tasks are twofold: to respond to the principal speaker's remarks, and possibly to make a few of my own. In this way, and in the ten minutes available, I hope to contribute in a small way to the commendable objectives of this Transport Safety Conference.

Reaction

I am not sure the Canadian Sport Parachute Association would agree with the assertion that sky diving is unsafe, but that is a horse of another color and this is a conference on Transport Safety. However, I am sure they, and many others would agree with the socratic wisdom of asking, as suggested by our principal speaker, "Is there a safer way of doing this?" Questions, such as this, asked persistently and conscientiously over the last 86 years by aviation professionals have yielded an air transportation system that is capable of offering extraordinary safety, unquestioned economic viability and unparalleled personal freedom.

The need to devote extra resources to monitoring older aircraft is a priority with Transport Canada, as with the airlines. New defect reporting systems, improved analysis and inspection techniques and rapid service bulletins are some of the methods used by Transport Canada's continuing airworthiness staff.

With respect to technology, the gains have been both rapid and impressive as aviation history and safety and economic statistics will prove. Often the driving force behind these changes has been the airline industry itself. Other times, it has been the professional associations. Not infrequently, it has been government regulation. And, it is to that topic that I now turn.

Presentation

"Salus Populi Suprema Lex" is an oft cited Latin legal and political maxim that "the people's safety is the highest law." How does Transport Canada conform to this ancient principle?

To arrive at the proper answer to that question, I submit we must not look only at Transport Canada's response, but also to that of others. To do otherwise might offer us a distorted view of the truth.

Aviation has evolved and succeeded on a philosophy where virtually every critical object or decision has an alternate and frequently the alternate has a back-up, and not infrequently the back-up has

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its own spare. This is true in aircraft and system design and in the planning of a flight. The whole enterprise seems to be built around frustrating this fellow named Murphy and his vexatious laws! Critical systems are duplicated, triplicated or even quadruplicated, each capable on its own of assuring safety, combined, capable of providing an extremely high margin of safety. The result is that Transport Category aircraft, which include most, but not all those in passenger service today, are capable of achieving a fatal accident rate of one in 10 million from any or all systems failure.

Thus, it is normal in professional aviation operations to have a layered approach to aviation safety, each layer complimenting and buttressing the other. Some of the more obvious safety systems include:

**Aviation Safety Education**

It may have been possible to know everything critical to aviation in the early days, but after 86 years of experience, aviation education has expanded exponentially, into dozens of fields, much of it, especially in the early years, the result of hard lessons learned. Recent examples include dealing with highjackers, windshear and cockpit resource management.

**Training**

This has been built upon that knowledge, enhanced by advances in training methods and technology that rival that of any profession. Examples include computer based learning and Flight Simulators.

**Professional Discipline**

Because of the emphasis on knowledge and training, aviation science quickly evolved into a group of disciplined professions. Examples include professional ethics and the work of associations in safety committees.

**Organization**

Aviation activities are organized internationally, nationally and regionally, in many of the areas of jurisdiction. Governments are members of the ICAO, have their own CAA and may have regional, provincial or municipal offshoots or affiliates. Air carriers meet internationally, nationally and regionally, likewise for pilots and air traffic controllers. The common cause to all of these organizations is the standardization of safe and efficient operating practices. Government examples include ICAO, the FAA, Quebec Ministry of Transportation, TC's Central Region and the Edmonton Municipal Airport. Industry examples include IATA, ATAC and the Central Air Carriers Association. Employee associations include IFALPA and CALPA and its own highly developed internal organization.

**Manufacturers, Suppliers and Service Outlets**

As our principal speaker described, aircraft manufacturers and suppliers of aviation components take advantage of the latest technology to design and build in the highest standards of safety. These standards often exceed that required either by law or by market demands. Examples include radio and navigation equipment requested by flight crews.
Infrastructure

The importance of a well designed and well maintained airport contributing to aviation safety cannot be ignored. Whether operated by public or private authorities, airports meet or exceed internationally accepted standards prescribed in law. Air navigation systems made up of navigational aids, air traffic control and flight services and allied weather stations also contribute, whether under private or public control, to the safety of the travelling public. Examples of recent initiatives include upgrading the Air Traffic Control Radar system and the hiring and training of new Air Traffic Controllers.

Management

The travelling public is also safeguarded by the competence of managers in successful aviation enterprises. The transportation sophistication of Canadian travellers is such that only a good product or service stands a chance at surviving. Many companies have established reputations for technical excellence with in-house standards that often exceed, sometimes by a wide margin, those required by law.

Labour

The labour movement has traditionally been associated with the drive to improve safety standards in the workplace. Aviation unions take a back seat to none in their quest for safety for their members and the travelling public. An example of this includes fitness programs and hours of work limitations developed by CALPA.

Public

An informed and responsible public plays an important role in ensuring aviation safety. Awareness of what might constitute dangerous practices or behaviour, and a willingness to comply with safety instructions given by flight and cabin crew are vital examples of how the public can protect itself. Other examples include consumerism and participating in the rule-making process.

Legal

To be restrained only by considerations of civil and criminal legal liability may suggest a situation more desperate than normal, nevertheless, the publicity, financial, regulatory and insurance consequences make these powerful deterrents to unsafe behaviour.

Having thus attempted to show a truer picture of the context in which Transport Canada carries out its regulatory mandate, let us now examine Transport Canada's role in promoting the highest possible standard of aviation safety and the major programs it undertakes in support of that role.

Aviation and Airports Authority Groups

On October 15th, 1985, Transport Canada established two distinct organizations to emphasize its focus on air safety, and to streamline the management structure of airports. The two groups, Aviation and Airports Authority provide Transport Canada with a stronger regional orientation,
more efficient administration, and improved service delivery. Because of time constraints, I discuss only the Aviation Regulation Directorate of the Aviation Group today.

Role of the Aviation Group

The role of the Aviation Group is to keep the national, civil air transportation system safe; to attend to the development and operation of the national, civil, air navigation system for the efficient movement of aircraft, and to contribute to safe international, civil aviation.

Organization of Aviation Group

The Aviation Group, headed by the Assistant Deputy Minister of Aviation, has five operating branches: Air Navigation Systems, Flight Services, Aviation Regulation, Aviation Safety Programs, and Planning and Resource Management.

Aviation Regulation Directorate

The principal activities of the Aviation Regulation Directorate are to develop aeronautical legislation, regulations, orders and standards; to licence pilots, flight engineers, navigators, aircraft maintenance engineers and aircraft; to certify and inspect air carriers; to type approve domestic and foreign aeronautical products; to enforce the Act, regulations and orders; and to coordinate Canadian participation in the technical activities of ICAO and other international bodies within the mandate of the Aviation Group.

The Aviation Regulation Directorate is divided into five operating sections and I will describe the broad functions of each in turn.

a) Enforcement and Legislation

The functions of this operating section are to develop and maintain aeronautical legislation; to develop and manage the aeronautical regulatory enforcement program, including the aviation OSH program; to develop and standardize aeronautical terminology; and to conduct an ongoing legislative review which contributes to the regulation and control of civil aeronautics.

b) Licensing and Certification

The functions of this operating section are to license aircraft, aviation personnel and aeronautical facilities; to certify domestic and foreign commercial aircraft operators; and to inspect air carrier operations, equipment and facilities.

c) Airworthiness

The functions of this operating section are to inspect, approve or accredit persons, companies and institutions engaged in the design, manufacture, distribution, and maintenance of aeronautical products and training of maintenance personnel; to approve initial type design and changes to the type design of aeronautical products,
to control continuing airworthiness of aeronautical products designed or operated in Canada; to develop policies, standards and procedures for the airworthiness of aeronautical products and to establish agreements with foreign authorities for mutual recognition of airworthiness certification procedures.

d) Aviation Safety Programs Branch

The Aviation Safety Programs Branch does the following promotion activities: produces and distributes aviation safety promotional materials - written information, audio-visual presentations, posters and displays; conducts surveys; does regional aviation safety activities; and does CASARA (Civil Aviation Search and Rescue Association) activities.

e) Civil Aviation Medicine

The functions of Civil Aviation Medicine are to organize and coordinate the Federal Aviation Medicine Service to Transport Canada; to advise aviation regulation representatives on national acromedical aspects of aviation safety and the requirements for civil aviation medicine research and development; to advise air navigation services’ representatives on the occupational health programs for air traffic controllers; and to promote aviation safety through the promulgation of acromedical information to the aviation industry.

Results

What has been the result of these combined efforts? Looking at the statistics available from the Canadian Aviation Safety Board, one might say a single, recent and as yet unexplained, fatal passenger jet accident in the last six years. Of course, aviation safety is far more complex than mere statistics. Safety is neither a statistical anomaly, nor is it something that can, per se, be legislated into existence. Safety is both a state of mind and a state of affairs, and requires a commitment from everyone.

Quo Vadis?

Air transport in Canada continues to progress through the mechanisms identified earlier, coupled with the competitive pressure of the market place, held to a common safety standard by Transport Canada. Transport Canada, in turn, continues to adapt itself to a dynamic industry by streamlining its operations through an ambitious program of internally and externally driven reforms. In this way, we can realistically embrace that other cherished saying of yore that has inspired millions of aviators: "Per ardua ad astra".
A LABOUR UNION PERSPECTIVE

Capt. R. E. Cook*  
Reaction Panelist

I note from the agenda that this is a "reaction panel", and that I am meant to supply "A labour union perspective". I think I can react to the principal speaker, but as a representative of Canada's professional airline pilots, I am not sure that I can respond strictly from a labour union point-of-view, for the Canadian Air Line Pilots Association is more than that.

CALPA was founded in 1937 with two major objectives: 1) to promote and protect the interests of the airline piloting profession and individual members; and 2) to promote and maintain the highest standards of flight safety. It currently represents over 3600 airline pilots flying for Air Canada, Canadian Airlines, Air Ontario, Quebecair, Time Air and Air Nova, with more member groups expected to join in the near future.

As a trade union, CALPA negotiates collective agreements with member airlines to ensure that pilots receive equitable wages and working conditions. As a professional association, CALPA is the recognized voice of the airline pilot who is charged, under the law, with the ultimate authority over and responsibility for his or her aircraft, passengers and crew. The two roles - trade union and professional voice - have been complementary, even indivisible, enabling the Association to do much to enhance airline safety in Canada. This was recognized by Canada's Aviation Hall of Fame last year when CALPA became the first organization to be inducted into the Hall, being given the Belt of Orion Award for Excellence.

It is from this perspective that I offer my comments. As an airline pilot, I have a direct and vital interest in air safety, on both a personal level and as one with a legal obligation to my passengers. Usually, my interest and my passengers' interests coincide, for on each flight we share the same wish, and if I arrive safely, so do they.

This brings us to my first reaction to the principal speaker, who posed the $64,000 question, "What is safety?" My dictionary - a very old Webster - defines it as "freedom from danger, injury or damage". This is clearly impossible in aviation where there is always some risk involved by the very nature of the endeavour. So, we are really talking about an acceptable risk, or relative safety as the principal speaker said.

But, what is "safe enough"? As professionals in the air transport industry, whether pilots, air traffic controllers, maintenance engineers, designers, etc., we owe our passengers a duty to ensure that they are as safe as they expect to be. When we sell them a ticket, they should be able to trust the system, whether their journey is on a Boeing 747 or a Dash B.

*Past President, Canadian Air Line Pilots Association
Clearly that trust is faltering. Fed a steady diet of near misses, structural failures, avoidable accidents, an apparently inept regulatory body and so on, the public is wondering whether aviation is indeed "safe enough".

About ten years ago, at a conference in London, a British safety expert noted some interesting American statistics. They showed that for every person killed in an aircraft accident, 26 were killed by motor vehicles, 11 by air pollution, 4 by fire or explosion, 3 by drowning, 1.5 by firearms, and 2 by water transport.

The point is that you are far more likely to get killed by almost anything other than an airplane, and the safety statistics have improved since then. But expectations have also risen, and the perception is that safety is suffering.

Is it? I believe it is. We may not be less safe than we were a couple of decades ago, but we are not as safe as we should be.

The culprit is economics. As one dependent on a viable industry, I understand very well that our airlines must make money, and the link between economics and safety is very plain. Back in 1937, when debating the regulation of a fledging air transport industry, the U.S. Senate stated: "It should be unnecessary to point out that a profitable operation is necessary for safety". That is every bit as true today.

But we now have economic deregulation, with "lowest cost", the avowed aim. Still, we are assured that safety will not suffer, for it is still regulated - Big Brother will take care of us. At the same time, Big Brother is committed to the twin dogmas of "reduced government interference" and "reduced government spending", a potentially lethal combination when applied to civil aviation.

In the new environment, it is evident that the financial 'bottom line' is becoming more important as carriers are forced to examine all elements of their operating cost to stay competitive. In fact, the U.S. experience indicates that certain safety-related expenditures, such as aircraft maintenance, are especially susceptible to this new management philosophy. Cost reduction exercises are also thought to be eroding the origin of safety which the established carriers used to maintain above the minimum safety standards required by law.

That is from a 1987 Department of Transport report, before Canada deregulated.

The level of aviation safety in Canada is, in theory, the responsibility of the Minister of Transport who is charged with establishing certain standards and then monitoring the industry to ensure compliance. In practice, however, the high level of safety we have enjoyed in Canada, and in the U.S., has been dependent on airlines' willingness and ability to operate to standards well above the levels demanded by government. But they don't have to; all they have to do is meet the legal standard, no more, no less. Is that good enough? Well, the former Administrator of the U.S. Federal Aviation Agency (whose regulations we adopt virtually unchanged in Canada) has stated that "We cannot accept any tendency to move down to the minimum standards".
Under economic deregulation, the Department of Transport will continue to monitor and enforce its standards, but in a now highly competitive industry where the bottom line becomes all important, the self policing aspect of our industry may fade. Capital demands will force the industry to trade as close to the marginal line of safety as the enforcement agency will permit. To quote our previous Assistant Deputy Minister of Transport; "Safety is not the end objective for companies".

Money and safety are inextricably linked. It's nothing new - for example, some 15 years ago the first big oil price increase led to the practice of what is called "no alternate IFR", which means that on certain carriers, on certain flights, when the destination weather forecast is good, minimal spare fuel is carried. This is purely an economic measure, as carrying extra fuel means more weight which means burning more fuel to carry the weight. While this practice has never to my knowledge led to an accident or incident, and so can by regarded as "safe", it is at least marginally less safe.

The increasing use of twin-engined aircraft on long overwater routes is another economically driven development that is arguably "less safe" than using three or four engined aircraft. So far, there have been no accidents, though there have been some diversions necessitated by an engine problem. Using twins on what are called Extended Ranger Operations or EROPS has led to a new definition of the acronym: EROPS - Engines Running or Passengers Swimming! No wonder a past chairman of engine maker Rolls Royce, when asked why he would not fly on any aircraft with less than four engines, replied "Because there are no five engined aircraft".

I am not singling out any particular airline, because to be competitive in financial terms, they must all follow the same sort of practice. Nor am I suggesting that carriers would deliberately set out to lower their safety standards. However, as Jerry Lederer, president emeritus of the independent and prestigious Flight Safety Foundation, says; "Industry does not remain indifferent to tragedy, but it faces a selection of priorities based on limited resources". When the highest priority is economic survival, then costly safety measures may have to take a back seat, and there is disturbing evidence that the traditional safety margins of the air transport industry are already being eroded.

In fact, government may be one of the worst offenders in terms of reducing margins and increasing cost pressures in the industry. We have seen attempts to cut back on rescue and fire fighting services, and on snow clearing. In the area of security - surely a matter of general public interest - we see the responsibility of passenger screening forced upon the airlines who, of necessity, must look to the lowest bidder for these services. We see an air traffic control system short staffed and underequipped. We see airports becoming even more crowded on the airside, yet no measures being taken to build more runways.

There is no doubt in my mind that our industry is becoming economically driven. This is not necessarily at the expense of increased safety, but it is a secondary consideration.

To refer to some of the principal speaker's examples, fly-by-wire is basically an economic advance, being lighter and more efficient while its safety ramifications remain to be seen. Data link is also based on economic considerations, though there may, on occasion, be a safety implication. Windshear protection would appear to be strictly safety - provided it is not used to persuade pilots to enter areas they might otherwise avoid. TCAS appears to be a safety advance, until one sees
the thrust towards using it for decreased separation standards to allow more economic use of airspace.

I have no objection to new technologies provided that they improve safety or at least maintain it. What concerns me is where the emphasis is placed. We seem to have accepted a certain standard of safety, and are standing pat, which is an open invitation to complacency.

Several years ago, Gerry Bruggink, formerly of the NTSB and now assisting in the Dryden inquiry, stated that: "The bottom line in safety is the degree of care exercised by individuals, and the responsibility for the ability and willingness to exercise the proper degree of care is shared, in a complex and overlapping way, by the regulatory agency, corporate entities, and individual operators". Clearly, safety does depend on people, as our principal speaker said. The challenge is to ensure that they are properly motivated and given the tools to do the job.

The pressures on aviation are now immense. Its growth has far outstripped that of the infrastructure upon which it depends, including airports and air traffic control systems, manufacturers, and availability of experienced personnel. Our increasingly aware and often frightened passenger may well ask himself whether the lower airfares promised by deregulation have been delivered at a price which he is not prepared to pay, for no amount of statistical evidence will convince him that there is not serious cause for concern.
A PUBLIC INTEREST PERSPECTIVE

Jennifer Hillard*
Reaction Panelist

A large report was written by C.A.C. in April last year called "A Matter of Faith" and we started with the question "Airline travel may be safe but is it as safe as it could be and is it as safe as it should be?" Very simply, a passenger is a consumer paying for a service and a consumer expects the service to be performed efficiently and safely. Air travel is a very special case in that by the time the passenger realizes that something is wrong, it's too late to do anything.

Airline companies have an incentive to operate safely, but this incentive operates imperfectly. Although passengers will avoid an airline that is perceived as being unsafe, few passengers are capable of determining whether or not an airline is unsafe unless it has a horrendous safety record. Regulation is essential to ensure that airlines operate safely.

Compared to the situation in the United States, air travellers in Canada have very little information available to them about safety of air travel. The information that exists in the United States about near misses or the adequacy of the air traffic control system is not available here. One ironic result is that Canadian travellers who read about the fines levied against American airlines and other scheduled jet carriers for maintenance violations or read articles criticizing the FAA probably assume it is much less safe to fly in the United States. The truth is there is no compelling reasons to assume that flying in Canada is any safer than it is in the United States.

Should Canadian air travellers be concerned about the airworthiness of the planes in which they fly? The CAC does not know. We know that in the spring of 1986, Eastern Airlines cancelled or delayed as many as 35 flights a day for mechanical reasons, but we do not have comparable figures for any Canadian airlines. We were also not able to obtain Canadian figures on maintenance spending by type of aircraft or the number of STIs filed dealing with metal fatigue cracking. At present, Canadian carriers are not required to file some of the information and CAC has not found Transport Canada to be forthcoming with the information they do have.

As consumers, we have several concerns about air safety - the initial design of the aircraft and the standards which can be applied, especially for survivability in accidents; the safety standards and the training and maintenance supplied by the air carriers; and the regulations by Transport Canada and the adequacy of staff to enforce all these regulations.

With regards to the first concern, Canada does not have a comprehensive set of standards or airworthiness requirements to which a manufacturer has to conform. Canadian manufacturers are allowed to use either U.S. federal air regulations or British civil airworthiness requirements. The design of the aircraft in which we fly is a legitimate concern for air travellers. Design flaws have contributed to a number of accidents. Unfortunately, we can do little except hope that aircrafts have been designed and built to make them as airworthy as possible. Mr. Justin Dubin felt that

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Transport Canada should accept the FAA certification process for American manufactured planes because the department does not have the expertise or the resources to conduct its own certification process. It would seem that Canadian travellers have little choice but to put their faith in the FAA.

One of the grim realities of airplane crashes is that many of the people who die survive the initial impact but succumb to a post-crash fire or a failure in cabin furnishings. During the last few years, hundreds of people have died in what should have been survival accidents. CAC is very concerned about the lack of standards applied within the cabin of the aircraft. The soft furnishings are flammable and toxic fumes come off them inside the cabin and create a lot of smoke and destroy vision. The only place you can see is along the floor and there are no lights on the floor leading to the exits. A lot of people cannot get out of the plane quickly enough.

There are also problems concerning the seats in aircrafts. The seats in an airplane have lower standards for being secured to the floor than the seats in a family car. In an aircraft, there are no three point seat belts, just lap belts. There are new regulations coming in with regards to seats. Unfortunately, they are not going to be enforced in existing planes, they are only going to apply to new planes. Therefore, it is going to be a very long time before we have satisfactory standards in all aircraft. A rear facing seat would, in fact, be a lot safer than the front facing seats that we have now. However, this is not even being studied. How to make existing seats safer is what is presently being looked at.

Baggage that flies around inside the aircraft is also a major problem in an impact. This is very much the consumer’s responsibility, but it is also the responsibility of the airline to let us know very clearly and to enforce the regulations on the plane.

The issue of cabin safety including the flammability of the fabrics and the provisions for smoke hoods, the structural integrity of seats etc. raise a number of larger questions about air safety. The integrity of seats or the toxicity of fumes released by burning polyurethane only becomes important in the event of a crash or an aircraft fire. If you could eliminate crashes and fires, there would be no reason to worry about the interior of the passenger cabin. This suggests an obvious question about the way to improve air safety - does it make more sense to concentrate on eliminating accidents or does it make more sense to assume that some accidents are inevitable and try to make cabin interiors safer. We are all flying around the skies in potential Titans - they are wonderful machines but with inadequate lifeboats. Since we live in an imperfect world with limited resources, it is necessary to raise the question of priorities.

The next area which is of great concern to the CAC is the safety standards and the maintenance standards of the staff training of the various airlines.

One issue in this area is the age of planes which has received a great deal of recent media coverage. The CAC feels that whether the age of the aircraft is a threat to its airworthiness depends upon how well the aircraft is maintained by the airlines. There is considerable reason to question how well some American airlines are maintaining their planes. Unfortunately, unless Canadians are willing to accept Transport Canada's assurances as a matter of faith, we cannot be sure that similar problems do not exist in Canada. Mr. Justin Dubin reported serious deficiencies
in the way in which airworthiness was monitored. It would be comforting to know from Transport Canada that some of these deficiencies have been corrected.

Another concern of consumers is that deregulation is having an adverse impact on air safety. This seems to be backed by concrete examples. Deregulation has eroded the margin of safety as air carriers have lowered their safety standards. Deregulation has also allowed new carriers to enter the industry and small carriers to expand. These airlines are less safe than the established carriers with whom they are competing. Deregulation has accelerated the development of hub and spoke systems increasing the number of landings and departures and increasing traffic at the hubs. Deregulation has expanded the role of commuter airlines which are not as safe as the larger airlines. Finally, deregulation has increased the volume of traffic and the air transportation system cannot safely handle the increased traffic.

We do not entirely agree with all these points, but we do see a number of economic pressures on the airline industry and definitely an increase in traffic. The head administrator of the FAA has acknowledged implicitly that these pressures do exist. He said "We cannot accept any tendency for people to move down to the minimum standards." This is an incredible statement for the head of the FAA to make. It suggests that he does not think that the standards established by the FAA are adequate to ensure the safe operation of commercial aircraft. If this is the case, obviously, we have to increase the standards.

There is no conclusive evidence that deregulation has seriously jeopardized air safety in the United States. There is reason to believe that deregulation will have even less impact in Canada. The gradual liberalization of the regulatory environment and the example of the American experience has given Canadian carriers a chance to adjust to a deregulated environment. For example, carriers have already started to merge and form alliances with regional feeder carriers. As well, carriers have already started to realign their route systems.

The sudden transition to a deregulated environment in the U.S. created opportunities for new entries that are not likely to be repeated in Canada. Entry will occur in Canada but not on the scale it did in the U.S. Without the rash of new entrants and without the sudden dose of cost-cutting that occurred in the U.S., there is less reason to suspect that deregulation will have an impact on safety in Canada.

Whether deregulation has an effect on safety will depend in part on the response of Transport Canada. In a deregulated environment, carriers will face greater pressures to cut costs and some companies might be tempted to reduce spending on maintenance or save money by using inexperienced crews. It is essential that Transport Canada has sufficient resources to make sure this does not happen. The mistakes that were made in the United States must not be repeated.

The Canadian Air Safety Board has assigned a human error factor to 88% of the accidents that have been reported. In a sense, it is not surprising that human error plays such a large part in aviation accidents. There are so many people involved and so many opportunities for mistakes to be made; this is partly why it has proven so difficult to reduce the number of accidents caused by human error. Aircraft can be inspected for cracks or water components, but it is not possible to subject humans to the same kind of scrutiny, nor do humans come with built-in design redundancies.
Another concern of consumer groups is regulation by Transport Canada and the adequacy of staff to deal with implementation and enforcement of these regulations. In the last year, there have been many new developments and problems have surfaced that did not exist a year ago. There is a shortage of inspectors, air traffic controllers, and personnel to test pilots. Canada’s airports are becoming increasingly congested. There has obviously been a failure to learn from the U.S. experience.

Conventional wisdom that take-off and landing are the most dangerous parts of a flight are quite true. Aircraft almost never fall out of the sky once they are at cruising altitude and they almost never collide with one another at 10,000 metres. According to one breakdown of where accidents occur, 4% take place while aircraft are taxiing, 35% during take-off and climb, 7% while a plane is cruising, 27% during descent and approach, and 27% during landing. This breakdown indicates that over 90% of all accidents occur at or in the vicinity of airports and stresses the need for adequate traffic controllers.

The problems flowing from this dramatic increase in traffic are the result of the failure of deregulation but of its success. The solution to overcrowding is not deregulation, but making more efficient use of existing airports or if necessary constructing new airports. The flying public attribute these problems at airports to insufficient staff and to congested airports.

The CAC has followed with considerable concern the reports of disension within the CASB. A body such as the CASB is critical not only to investigate safety but to monitor the state of air safety in Canada. The disension within the board raises serious concerns about the board’s effectiveness.

Another concern of the CAC is that sabotage and terrorism on airlines has become a major safety factor. We feel that Transport Canada is abrogating its responsibilities in tendering out the security systems at airports. Because they mostly are tended to the lowest bidder, the security at airports is enforced by unqualified people with a very low education level and poor training. Often, there is a very rapid turnover in staff. Therefore, the security system lacks in efficiency. Travellers see an enormous variation in the security at different airports and this automatically makes people nervous about how effective the security system can be.

In the absence of any consistent scrutiny of the way in which Transport Canada regulates safety, air travellers have no way of knowing whether Transport Canada is doing everything it can and should to make flying as safe as possible. Our report began by asking whether it is safe to fly in Canada and the United States, but the answer is not a simple one. Using accident rates or fatality rates on a mile for mile basis, it is apparent that flying is an immensely safer form of travel than driving. One deregulation advocate suggested that even if deregulation in the United States has made air travel less safe, which he doubted, it has clearly made travel, in general, much safer because it has taken so many people off the highways.

If we look at the safety of flying on its own rather than in relation to the safety of other forms of travel, there is more reason to question the safety of air travel. The conclusion of our report was that air travel, although it may be comparatively safe, is certainly not as safe as it should be and not as safe as it could be.
WATER SAFETY AND PLEASURE BOATING

Sandra Stoddart

Good afternoon ladies and gentlemen. I would like to begin by saying what a pleasure it is for me to be here today to talk to you about water safety and recreational boating. It is also a pleasure to attend another of UMTI's excellent conferences. I have been to all of the conferences since June, 1987 and have found them thought provoking, informative and very useful to my work in the transport field. In my view, this particular conference is certainly measuring up to the high standards of its predecessors.

The theme of this conference is transportation safety and we have learned that the measures taken to enhance safety include: enforcement, licensing, regulation, certification and education/training. We have also seen that the mix and intensity of these measures varies from mode to mode in the commercial sector of transportation.

In my remarks this afternoon, I have three objectives. First, I would like to pick up on the multimodal theme of the conference and take a comparative look at recreational safety programs. (I should mention that in my remarks, when I refer to safety programs, I am referring to the whole range of interventions from regulatory instruments to educational programs.)

Secondly, I will be making a few comments about the costs and benefits of safety programs, and, thirdly, I'd like to spend a few moments talking about public attitudes towards boating safety.

While I will offer a few ideas which I will share with you for future action to improve boating safety, my intention is to leave you with questions to ponder rather than suggest that all the answers to the problems of boating safety are known. Back to my first objective.

One might suggest that there is a problem inherent in comparing safety programs directed at recreational transportation in the surface, air and marine modes. In the marine mode, with a few exceptions, pleasure crafts share the waterways, navigational aids and other services with commercial traffic. The situation is the same in the air mode. The surface mode, however, is different. While commercial trucks and buses share the roads with privately operated automobiles, most solely recreational surface vehicles are operated "off road" (i.e. all terrain vehicles, snowmobiles, dirt bikes, etc.)

The problem of comparability I alluded to a minute ago can best be approached by answering two questions:

1. Where recreational traffic shares infrastructure with commercial traffic is there a greater need for safety programs?

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2. In the two modes where infrastructure is shared, should the level of safety program intervention be the same?

I think there is general agreement that the fundamental reason that safety programs exist is to reduce the risk of accident and injury. It is reasonable to assume that where there is a mix of commercial and recreational traffic, traffic densities will be higher and therefore the level of risk will be higher. To offset this increased risk, there is a greater need for safety programs.

In response to the second question: "In the case of the air and marine recreational modes, is the level and type of safety program intervention the same?"

I think that most of us know that the safety programs in the air and marine recreational modes are quite different. Let's compare them for a moment:

Recreational Flyer:

- Must be 17 years of age to hold a license, but as we all know from Emma Houlton's flight last summer, a person younger than 17 can fly with a qualified instructor;
- In order to be licensed, must complete ground school and in-flight training, pass a medical exam and a series of theory and practical tests;
- Must adhere to air navigation orders, aviation regulations and air traffic instruction;
- Is subject to imposition of sanctions for contravention of orders or regulations;
- Vehicle must be licensed and undergo periodic checks to certify mechanical fitness.

Pleasure Boater:

- No age restriction;
- No licensing requirement;
- No mandatory training or testing requirements;
- Must adhere to small vessel regulations and collision regulations;
- Is subject to regulatory sanctions, although the level of scrutiny is much less;
- Vehicle must be licensed (or registered), mechanical fitness certification not required.

It is clear that the safety programs for these two recreational modes are not the same. Now, back to part two of my second question: "Should they be?"

In terms of their relative operational complexities and risks, I think there is justification for differences in the level of safety program intervention.
For example:

- The nature of the mix of recreational and commercial traffic is very different. A Cessna 150 with one on board could cause the downing of a Boeing 747 with 500 on board resulting in 501 fatalities, not to mention the fatalities on the ground.

- A 16 foot runabout with one on board running into a ferry boat with 500 on board would likely result in one fatality.

But, if the levels are so markedly different, is there a need to increase the level of safety programs for pleasure boaters?

After last year's accidents on the Red River, there were many suggestions reported in the press that more control (read safety programs) should be put in place. In this instance, it was suggested there was a need for greater enforcement on the river and a need for operator licensing. While these tragic incidents bring these views into sharp focus, there are members of the boating public who view pleasure boating as one of the last frontiers of freedom and have lobbied against any move to introduce licensing and mandatory training. They would argue that, by and large, pleasure boat owners are a responsible group who have a good safety record, and who have formed associations to further the cause of boating safety. In fact, the Canadian Power and Sail Squadron, the Canadian Yachting Association, The Red Cross and yacht and boating clubs across the country boast sizeable memberships of boaters who have completed basic training in vessel handling, operational regulatory requirements and safety requirements.

What do statistics tell us about the boat owner's claims? In 1987, there were 203 fatalities directly resulting from pleasure boat accidents. To place this figure in perspective, it should be noted that there were 1,459,000 households in Canada owning recreational marine craft. This yields a ratio of one fatality for every 7,187 households owning a marine pleasure craft. Leaving ownership aside, this low fatality ratio would be even lower if statistics were available on the number of operators and passengers actually using pleasure craft each year.

On the basis of this ratio, perhaps, boaters who have resisted licensing initiatives may have a point. In researching these remarks, I personally was quite shocked to find the raw number of fatalities as high as it is (and it has been over the 200 level for the last three years). Would a system of operator and/or vehicle licensing reduce accidents? A licensing system is more effective if there is a concurrent enforcement capability. Given the geographic magnitude of the country's water-space and the number and diversity of pleasure craft, it would be costly to put in place an enforcement program in support of an operator licensing program. There would also be cost associated with administering the licensing program itself.

On the benefits side of the equation are questions such as:

- What is the statistical value of human lives which would be spared as a result of safety programs?

- What is the cost of search and rescue operations which would not have to be undertaken because of safety programs?
Among the non-monetary benefits are:

- The greater assurance that operators who possess a license meet a minimum standard of operational ability and regulatory knowledge.
- A greater ability of regulatory agencies to impose negative sanctions on offenders.
- A greater ability to deal with the ever-increasing problem of boat theft.

These are questions that Transport Canada is looking at now and they are not easy questions to answer. And, in finding answers, it will be important to clearly identify which interventions will make the greatest impact. At the outset, I mentioned that my third objective was to talk about attitudes towards safety. An understanding of attitudes and the behaviour that stems from them can help in pin-pointing sources of problems.

In the Red River accidents of last summer, alcohol use was a contributing factor. Alcohol use features regularly as a contributing factor in boating accidents across the country. From the professional sailor’s “tot of rum”, there has been an attitude that "booze and boating" go together. The old saying "one for the road" illustrates that this same attitude existed in the case of the private automobile. Within the last five years, this attitude has changed dramatically. The attitude change was greatly motivated by citizen organizations like MADD and SADD. I also believe that enforcement programs like the alert program and advertising programs have had an impact on attitudes towards drinking and driving. Both government and the distilleries and brewers have reinforced the message that drinking and driving do not mix. The old adage has a new sound -- "none for the road". The attitude amongst boaters towards alcohol use is changing too, but more slowly. Perhaps, this can be explained by the fact that enforcement programs are very difficult to implement, except on the very restricted waterways. So, how can the attitude change be tackled? I believe that all responsible boaters can make a difference by exemplifying the premise that being under the influence while underway is socially unacceptable behaviour. I have seen in the last three or four years evidence to suggest that this approach works, and I am happy to see that this message has made its way into the curricula of basic boating courses.

With the advent of more powerful boats and greater levels of boating activity, risk levels are increasing. Boaters must become aware that there is an important need to acquire skills and be knowledgeable of the regulatory framework within which they will be operating. It is here that I think the marine sales industry would be well served to join in the effort to further boating safety. Developing kits of free information for new boat buyers with booklets such as The Canadian Coast Guard’s Boating Safety Guide and Safety Programs Information Booklet, and by urging new boat buyers to seek training would go a long way to promoting responsible boat operation.

Perhaps, the marine insurance industry could offer discounts to owners who have passed basic training programs and encourage owners who haven’t made the effort, to do so. An economic incentive might be the rebate of training costs upon completion of a recognized safety course.

Advertising programs, educational demonstrations and even on-water surveys have the effect of raising awareness that boaters do have responsibilities and that they are operating in a risk environment and as straight forward as they sound, these initiatives do pay dividends. A recent
coast guard educational initiative directed at the small fishing boat operator has resulted in an 80% reduction in accident rates amongst that group.

I have not touched upon the question of cost recovery for safety programs - perhaps another time. What I set out to do today was give you a quick environmental scan of the current situation and leave you to think about the question of what is the most appropriate level and mix of safety program intervention for boating.
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