

FIVE CORE QUESTIONS ON RAIL SAFETY

Dr. Barry Wellar, MCIP,
Distinguished Research Fellow
Transport Action Canada,
Professor Emeritus
University of Ottawa,
Principal, Wellar Consulting Inc.
wellarb@uottawa.ca
wellarconsulting.com



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1. INTRODUCTION

In an earlier report, *Transport Action Canada Compendium of Transportation Research Topics: A New Approach for New Thinking* (Wellar, 2010), I noted that matters of interest to Transport Action (TA) Canada include but are not limited to:

- the development of rail passenger services in Canada;
- the future of inter-city bus services;
- urban and commuter transit systems;
- the implications to consumers of the deregulated airline industry in Canada;
- the role of marine and coastal services;
- the effects of and alternatives to rail branch line abandonments;
- the role of government regulation in all public transportation;
- the impact on the public interest of demands for new highway spending;
- the safety of air, rail, and other public carriers;
- the promotion of intermodal links to improve the accessibility and cost-efficiency of public transport;
- increasing the safety, comfort and convenience of pedestrians;
- improving cycling facilities and services;
- increasing the sustainability of passenger and freight transport modes;
- designing and testing new methods and techniques of measuring transport system performance;
- evaluating the methods and techniques used by provincial and municipal governments to identify, adopt, and implement transport decisions; and,
- investigating the contribution of telecommuting to Canada's transportation future.

During the past year my research, advising, and publishing program, as well as my media commentaries, had regard for many of those matters of interest, a number of which were incorporated in five activities involving the rail mode:

1. Termination of the Northlander train service and divestment of the Ontario Northland Transportation Commission by the Ontario government;
2. Cancellation of federal funding which supports operations of the Algoma Central Railway;
3. The National Dream Renewed Project;

4. Designing questions to “test” the thinking behind decisions to cut VIA passenger rail service on the one hand, or restoring, expanding, and enhancing VIA rail passenger service on the other; and,
5. Rail safety.

For this report the matter of interest in the above list is,

“the safety of air, rail, and other public carriers”,

and passenger rail and freight rail safety in particular. There are two primary reasons behind the decision to focus on rail safety for this Compendium report.

First, and as illustrated by numerous media items – editorials, columns, interviews, articles, programs, news specials, letters to editors, etc., – of the past three years or so, and which are represented by the headlines in Table 1, there is widespread concern about an urgent need to correct weaknesses, shortcomings, defects, flaws, and so on that are negatively affecting the safe movement of rail passenger and rail freight traffic in Canada.

Moreover, the items frequently refer to or wonder about the causes of rail safety situations or incidents that are deemed to be in urgent need of answers from governments (elected and appointed officials) at all levels, as well as from private sector corporate entities and from individuals who compromise rail safety. And, I should add, Transport Action Canada also receives its share of inquiries.

Table 1 could go on for multiple pages to more comprehensively illustrate where, when, and why the media have reported on rail safety situations, incidents, accidents, and other safety-related matters.

However, the stories covered by the provided headlines appear sufficient to illustrate that the topic of needed improvements in rail safety is one of broad public concern with a less-talk-and-more-action aspect.

That is, the public wants timely action by governments and businesses in ascertaining how to effectively and efficiently achieve needed improvements in rail safety, and in putting this knowledge to work (1).

The second reason for the present focus on rail safety is based on my role as Distinguished Research Fellow at TA Canada.

As Research Fellow, I provide an advisory service for the organization, which includes responding to requests from the TA Canada Board, as well as from the media, university faculty, graduate students, consultants, lawyers, community association

representatives, concerned citizens, and elected officials seeking explanations or interpretations about the known, the probable, or the possible causes of rail safety situations or incidents, and their impacts.

In regard to the nature of responses to requests, they include media interviews, expert opinions, referrals to pertinent literature or other productions, suggested source persons and organizations, and reports such as *Five Core Questions on Rail Safety*.

Consistent with my designation as Research Fellow at TA Canada, I respond to as many requests as time and resources permit, with an emphasis on providing evidence-based comments regarding rail safety situations or incidents and their impacts.

Unfortunately, and all the more so given the importance attached to this topic as indicated by the headlines in Table 1, providing this service has proven very difficult or even impossible on a number of occasions due to a general and pervasive obstacle.

That is, due to policies, motives, practices, procedures, etc., specific to government agencies and officials, or to private sector corporate entities and officers, I was often unable to obtain the information necessary and sufficient to derive evidence-based comments, directives, or opinions about rail safety matters (2).

As a result, when dealing with questions for which evidence in the public domain was too limited to form an opinion which was sufficiently substantive for the circumstances, my responses were usually organized around two lines of thought regarding the information shortfall.

Initially, I established how insufficient information affected my ability to comment, and I offered several cautions about speculating and basing opinions on insufficient information. My remarks are summarized as follows.

- I was explicit in communicating that there was insufficient information in the public domain for me to derive an evidence-based opinion.
- I strongly advised against speculating about causal factors in the absence of substantive information when dealing with rail safety situations and incidents.
- I strongly recommended that opinions based on the insufficient information currently available be dismissed outright, or at minimum be run through the “skepticism filter” multiple times.
- I strongly urged that pressure be applied to both government and business officials to provide pertinent evidence, and to make it readily accessible to the public so we can examine it for ourselves.

Table 1. A Selection of Media Headlines about the Urgent Need to Deal with Rail Safety in Canada

10 of Canada's worst train accidents – Canada's vast railroad network has borne witness to many deadly crashes prior to the disaster in Lac-Mégantic, Quebec

2013 Was a Record Year for Oil-Train Accidents, and Insurers Are Wary

Alberta has highest number of fatal train accidents in the country

A look at train accidents in Canada in the last 6 months

Are derailments the cost of CP Rail's efficiency drive?

Battle over rail secrecy intensifies

B.C. municipalities work to prevent a disastrous accident as rail transport of oil skyrockets

Burlington council seeking action on train safety issue

Canadian agency says crude oil that exploded during 2013 fatal train crash as explosive as gas

Canadian Pacific says reducing rail speeds not the solution

CN defends safety record after Alberta accident, third train derailment within a month

CN says rail accident contingency plans in place: Thorold officials talk rail safety

CN staying on track with rail safety: Recent fatalities have put focus on local tracks

Derailed Via train's event recorder found: Transportation Safety Board probes crash that killed 3 engineers

Des accidents de train au Canada en 2013

Editorial: What's better, rail or pipeline to deliver oil? Experts disagree, but we need safeguards to deal with accidents

Feds won't monitor phase-out of old rail tankers shipping oil

How crude-by-rail accidents may impact the U.S. oil market

Interactive map: Railway accidents in Canada involving dangerous goods

Investigation found CN under-reported derailments [Updated]: TSB required CN to change the way it reports accidents

More must be done to prevent another oil-by-rail disaster, critics say

New fines issued for violating Railway Safety Act

New rail safety measures announced by Lisa Raitt

Table 1. (Continued) A Selection of Media Headlines about the Urgent Need to Deal with Rail Safety in Canada

Obstructed view contributed to 2013 school bus railway crossing accident in Carlyle, Saskatchewan

Off the rails: B.C. train derailments jump 20 per cent to five-year high (with map and chart): A total of 110 incidents in 2013 marked a five-year high, according to the Transportation Safety Board

Rail accidents and disasters in Canada: Most collisions, derailments not fatal

Rail accidents involving dangerous goods on the rise one year after Lac-Mégantic disaster

Rail deaths on the rise in Canada

Rail Safety Week underway – Special enforcement blitzes are being held at rail crossings in New Brunswick this week

Railway accident data in Canada ‘inaccessible,’ researcher says

Railway accidents, fatalities increase in Sask

Railways ordered to stop using older tank cars in Canada for hazardous goods

Safety board recommends fail-safe mechanism after deadly Via Rail crash

Should CEOs Get Jail Time For Oil-By-Rail Accidents Like Lac Megantic?

Tanker cars derail over sagging Calgary bridge

The high stakes of transporting oil by rail

Train carrying oil derails, catches fire in New Brunswick, Canada

Train derailment west of Saskatoon

Transport Canada orders 5,000 most dangerous tanker cars off rail system

Transport Canada proposes new rail regulations to reduce accidents and save lives: Protecting the safety of Canadians travelling by rail and road at federally regulated grade crossings

Transport Canada safety record back under microscope following Ottawa crash

Via trains blocked by Brockville CN derailment

White Rock residents rail against railway

Source: The headlines are from traditional public media (print, television, and radio), as well as from social media including YouTube.

Then, in the spirit of “lighting a candle rather than cursing the darkness”, and in the interests of obtaining information that was actually pertinent to the rail matters behind headlines such as those in Table 1, I made suggestions and recommendations in publications, media commentaries, and list serve discussions about the kinds of research-based evidence that is needed to develop an informed opinion about:

1. The cause(s), circumstance(s), source(s), etc., responsible for a rail safety situation or incident; and
2. The various and preferred ways and means of negating, mitigating, or rectifying a cause of a rail safety situation or incident.

Since the suggestions and recommendation about obtaining and using research-based evidence were borne of many years of public sector and private sector experience, including involvement in transportation safety matters, it was my belief that this was sound advice. However, after a number of unsuccessful, evidence-seeking forays, I learned that making suggestions and recommendations about obtaining and using research-based evidence in the field of rail safety was easier said than done, and led directly to the decision to produce this report. My experience is summarized as follows.

In brief, searching the literature for materials on rail safety research in Canada that could directly and fully explain situations, incidents, accidents, etc., such as those behind the headlines in Table 1, and help me to better prepare for media interviews and other tasks, was not productive. Rather, the search was time-consuming, perplexing, led to more dead ends than open files, and was totally frustrating to put it politely.

The following four findings outline my general view of the state of railway safety research activities and documentation in Canada *vis-à-vis* the research that should have been done, and the documentation that should be readily available to address the research problems, questions, issues, concerns, hypotheses, etc., contained in the stories behind the headlines presented in Table 1.

1. The research may have been done, but reports are not in the public domain.
2. The research may have been done, but finding and accessing hard copy or even digital productions in a timely manner is most unlikely.
3. The research may have been done, but finding and accessing pertinent productions is a difficult and time-consuming task, even in the digital mode.
4. The research has not been done.

It is possible that each of the findings could be discounted by governments and private sector entities providing ready access to research productions dealing with the rail safety issues, concerns, problems, etc., inherent in the headlines in Table 1, and in other headlines that could be added to the list. Indeed, such a development would be most welcome.

In the interim, however, and based on prior experience, it is assumed that nothing will be done in the foreseeable future to discount the findings.

As a result, the findings are used in section 3 as the bases of rail safety research questions that could be used as a means to:

1. Significantly improve the body of research material which substantively investigates the kinds of rail safety issues, problems, concerns, etc., identified in Table 1.
2. Significantly accelerate the process of improving access to data, information, and knowledge on rail safety.

Section 2 which follows, is the bridge between section 1 and section 3, and it is here that I develop the terms of reference for designing the research questions in section 3.

Again, it warrants emphasizing, the origin of this initiative lies in suggestions and recommendations that I have made on a number of occasions regarding

“...the kinds of research-based evidence that is needed to develop an informed opinion about:

1. The cause(s), circumstance(s), source(s), etc., responsible for a rail safety situation or incident; and
2. The various and preferred ways and means of negating, mitigating, or rectifying the cause of a rail safety situation or incident.”

Therefore, the terms of reference which I develop in section 2 are designed to be sufficient for the purposes of this report, and are not to be construed otherwise.

Before closing the Introduction I want to emphasize that while Canada is the specific focus of *Five Core Questions on Rail Safety*, all the questions are generic.

Consequently, they appear to be applicable to many other jurisdictions, including the U.S., which is the origin and destination of a number of passenger and freight trains running to and from Canada.

It is entirely possible, of course, that these questions or their variations have already been asked in other jurisdictions, but any investigation along that line is beyond the scope of the present report. However, it is appropriate to serve notice that since Canada's rail system is of vital importance to the country's economic, financial, political, and social fabric, it follows that we should want to know what others have already learned, or are in the process of learning, when it comes to core questions and answers to core questions about rail safety.

Given, therefore, my belief that this is a very important policy research issue with significant legal, public safety, planning and development, economic, industrial, and financial implications, I would welcome learning of such previous research. Materials and contact information would be placed in a "Next Steps" file, in anticipation that a comparative study involving Canada might receive funding from a Canadian government, business, and/or organization.

2. TERMS OF REFERENCE

The precedent production, *Transport Action Canada Compendium of Transportation Research Topics: A New Approach for New Thinking* (Wellar, 2010) provides statements summarizing how TA Canada engages in, supports, and promotes theoretical and applied research. The statements which serve as terms of reference for the design and contents of this and other research reports are presented in Table 2.

The terms of reference in Table 2 demonstrate the importance that TA Canada attaches to research as a core part of the organization's mission, as well as its value in providing a substantive basis for acting on consumer advocacy, environmental, public hearing, regulatory, and safety matters that are important to the organization.

And, they provide a very explicit and directive context for the design and contents of this contribution to the rail safety element of the Transport Research Topics Compendium.

For the second source of terms of reference material, I turn to Transport Canada, a federal agency which has posted a large number of rail safety productions on its website under the heading of Rail Transportation:

<http://www.tc.gc.ca/eng/rail-menu.htm>

The production of particular significance to this report is the latest (2007) *Railway Safety Act Review* (http://www.tc.gc.ca/eng/tcss/RSA_review/index.htm), and especially chapter two and chapter six. Several paragraphs from each chapter are sufficient to outline the contribution of Transport Canada to the design and contents of this report.

Table 2. Statements from Transport Action Canada which Serve as Terms of Reference for this Contribution to the Rail Safety Element of the Transport Research Topics Compendium

Consumer Advocacy. Transport Action represents consumers and relays their complaints and requests to carriers, the media, and public agencies. Transport Action also assists groups and communities in the development of applications and interventions before various regulatory bodies.

Environment. Transportation, as a significant consumer of fossil fuels, is responsible for much of the air-borne pollution, noise, and congestion in our cities and towns. Transport Action promotes the increased use of transport modes – walking, cycling, and transit – which cause the least damage to our atmosphere and quality of life.

In addition, highway and roads have claimed enormous amounts of valuable and even irreplaceable natural habitat, agricultural, residential, and recreational land. Transport Action promotes research into ways and means of protecting the environment from the negative consequences of private motor vehicle-oriented transportation system expansions and uses.

Public Hearings. Transport Action and its regional associations appear before federal, provincial and municipal regulatory agency hearings to defend the public interest in matters related to service changes or rail abandonments, applications for new services, fare increases, complaints about carriers, and other transport-related matters of public interest.

Regulation. Changing economic and political goals have resulted in a significant reduction in the role of government regulation in transport planning and operations. Transport Action monitors the impact on communities, users, and assists these groups as they prepare their responses to changes such as rail line abandonments, loss of air service, and increased highway use.

Research. Transport Action undertakes original research on matters related to users of public transport services. Major research papers are made available to the public and relevant agencies. Research is also undertaken under contract for other organizations.

The Transportation Research Topics Program is designed to broaden and deepen participation in transportation research activities across Canada by providing ideas and suggestions for students, researchers, advocates, government agencies, consultants, businesses, and other interested parties.

Table 2. (Continued) Statements from Transport Action Canada which Serve as Terms of Reference for this Contribution to the Rail Safety Element of the Transport Research Topics Compendium

Safety. Public safety is of paramount importance to all forms of transport. Transport Action's objective is improved safety standards in all modes. Transport Action encourages all agencies with responsibility for transportation facilities and services to place emphasis on ensuring superior safety performance, and through its reports and presentations is a leader in promoting public awareness about the political, social, legal, and other aspects of safety-related duty of care and standard of care obligations for all modes of transportation.

Source: Barry Wellar, 2010. *Transport Action Canada Compendium of Transportation Research Topics: A New Approach for New Thinking.*

<http://www.transport-action.ca/dc/TRTCompendium2010.pdf>

2.1. “Chapter 2: State of Rail Safety in Canada”

The following excerpt from chapter 2 of *Railway Safety Act Review* is sufficient for the purposes of this report.

“An important initial step in conducting the *Railway Safety Act* (RSA) Review was to examine and understand the current state of rail safety in Canada. We examined published statistics on rail accidents and incidents and commissioned independent research on this subject. Using this information, we examined the safety record of railways in terms of total accidents, category of accident (i.e., main track, non-main track, grade crossing, trespasser and dangerous goods), and severity.

- In assessing the results, it became clear that the publicly available data has limitations. In our examination of the information, we identified certain key factors that make it difficult to rely exclusively on the numbers and draw firm conclusions about the overall state of rail safety. These included the following:
- changes to the reporting regulations implemented in 1992 affected the number of accidents being reported;
- accident rates are not normalized in a manner that effectively takes into account fluctuations in railway traffic over time;

- data does not reflect changes in the size of the rail network under federal jurisdiction, such as the proliferation of short lines in the 1990s and the July 2004 CN takeover of BC Rail;
- comprehensive severity data is not available to accurately assess the consequences and impact of rail accidents;
- the Transportation Safety Board (TSB)¹ database does not include data on provincial railways, making it impossible to get a complete picture of the state of rail safety in Canada; and
- the TSB recently clarified its reporting requirements and adjusted its statistics for the previous five years to deal with a difference in interpretation of the reporting requirements.

Despite these shortcomings, the Panel was able to make certain observations about the state of rail safety in Canada but the numbers tell only part of the story. In examining the data, the Panel was sensitive to the fact that the state of rail safety also has to be measured in terms of whether the risk of accidents and the resulting damage to people, property or the environment is acceptable to the public.”

The headlines in Table 1 represent a “real world” context for commenting on these paragraphs, and for indicating why *Five Core Questions on Rail Safety* is structured the way it is, including the invitation for others to contribute to the rail safety component of the Compendium. I believe that the following four, brief comments are sufficient to illustrate why the research orientation of this report is different from that of the *Railway Safety Act Review*.

1. The opening paragraph refers to “rail accidents and incidents”, but in the remainder of the text the term “accident” or “accidents” appears six times, and there is no mention of the term “incident” or “incidents”. The headlines in Table 1 suggest that the matter of rail safety is not limited to so-called “accidents”, and that the matter of “incidents” deserves more attention than it is accorded in chapter 2.

(Note. In a previous report (Wellar, 2000, pages 231-235), I examined the widespread use of the term “accident” to refer to single-party and multiple-party collisions, crashes, roll-overs, skids, slip-and-falls, loss of control, and other traffic-related events. As discussed, the term is often used indiscriminately in non-scientific venues, such as any element of the media, with an unfortunate consequence. That is, it is the exception rather than the rule for evidence to be duly considered before referring to the event as accident, rather than the likely or inevitable result of, for example, a failure to undertake due diligence, a failure to

have proper regard for duty of care obligations, a failure to achieve a proper standard of care, or, for that matter, a deliberate act.

It is quite possible, of course, that the panel responsible for the Railway Safety Act Review had access to research similar to that outlined above, and took that research into account in preparing its report. However, it would have been far more informative, and far more conducive to producing a self-contained and comprehensive report if the panel had explicitly considered this fundamental terminology issue in chapter 2 of the Review.)

2. The *Review* focused on rail-specific events (accidents and incidents) that have occurred, but this narrow approach has no regard for factors and forces which are external to the rail domain *per se*, and which could have caused or contributed to rail accidents and incidents.

3. The *Review* focused on examining data on events such as (so-called) accidents and incidents, but the stories behind the headlines in Table 1 suggest that knowing about the situations in which events occur can be critical to understanding why they occurred, and the options for avoidance or mitigation measures.

4. Finally, the quoted text closes with the statement,

“In examining the data, the Panel was sensitive to the fact that the state of rail safety also has to be measured in terms of whether the risk of accidents and the resulting damage to people, property or the environment is acceptable to the public.”

The use of the word ‘fact’ in that sentence is troubling to say the least, because searches of the *Review* and other pertinent documents did not yield empirical evidence or otherwise verifiable evidence, including information about the source of the statement, which is needed to establish that the so-called fact is indeed a fact. And, a call-out to members of the Tr2000 list serve group, as well as communications to academics who have considerable expertise and experience in these matters, confirmed my position. Terms used to comment on the practice of claiming something to be a fact when there is seemingly no evidence to support the claim included misconception, misrepresentation, misnomer, misleading, misunderstanding, and misguided (3).

It may be instructive at this point to emphasize that I am examining a report by the panel responsible for the *Railway Safety Act Review*, and not a blurb, brochure, manifesto, public relations release, or other self-serving production of a political party, government agency, or vested interest group.

As a result, the analytical test applied is whether or not the contents of the *Review* pass validity tests associated with methodologically designed research, and the onus is on the panel to demonstrate within the *Review* document that such a level of rigor was applied with due diligence from start to finish of the review process. There are hundreds of texts which discuss this topic in detail, but *Fact and Method* (Miller 1987), *Research Methods* (Hubbard, 1971), and *The Logic of Social Inquiry* (Ackoff, 1953) are especially pertinent because they establish that the principles of methodologically designed research have been available for many years, and long before the production of the *Railway Safety Act Review* of 2007.

As for the improper use by the panel of the word ‘fact’ to describe something which in the absence of evidence is not fact, may have been due to many things, such as: it was simply a questionable word choice by the panel; or, the panel has its own definition of “fact”; or, the panel could not think of the term which accurately represented the thought that it wished to convey; or, the statement sought to construe a panel hope, thought, or musing as a ‘fact’.

Whatever the reason for the problematic statement, it strikes me as very worrisome that the panel responsible for the *Railway Safety Act Review* used the word ‘fact’ to represent what is at best a dubious policy, plan, or program variable, and/or an ideological notion, or, perhaps just a flight of wishful thinking. As a consequence, I believe it logically follows that the rail safety research agenda is in serious need of the kind of sound, second opinion research, including counterfoil research, which could be expressed in Transport Action Canada’s Research Topics Compendium.

Finally, the statement is at odds with the stories behind the headlines in Table 1. And, it is also at odds with the duty of care and standard of care position that Transport Action Canada takes in Table 2 in regard to safety.

Transport Action encourages all agencies with responsibility for transportation facilities and services to place emphasis on ensuring superior safety performance, and through its reports and presentations is a leader in promoting public awareness about the political, social, legal, and other aspects of safety-related duty of care and standard of care obligations [underline added] for all modes of transportation.

It is my general finding, therefore, that the research underlying the “State of Rail Safety in Canada” as described in chapter 2 is too narrow in scope to address the safety issues, concerns, etc., in the stories behind the headlines in Table 1, and the flaws in that narrowness are exacerbated by the notion of subjecting the safety issues and concerns about rail safety situations and incidents to measures of risk rather than measures based on duty of care and standard of care obligations or responsibilities.

2.2. “Chapter 6: Information Collection Analysis and Dissemination”

The following excerpt from chapter 6 of *Railway Safety Act Review* is sufficient for the purposes of this report.

“In order to advance safety, it is crucial for railway companies and regulators alike to have the right data at the right time. The importance of sound data for critical analysis and interpretation cannot be overstated. Similarly, providing clear information to the public on the state of railway safety is equally significant and plays a vital role in the development of public policy. Railway safety data collection, analysis and dissemination were a recurring theme brought to our attention throughout the consultations. Generally speaking, there is dissatisfaction from all quarters on this issue. As a Panel, even after using publicly available data from government sources and commissioning a statistical study,¹ we still experienced some difficulty in determining the true state of railway safety in Canada, due to deficiencies in the data.

In looking back at recommendations from previous reviews of railway safety,² we note that many of the same themes were raised, such as insufficient data, an absence of thorough analysis and a lack of performance indicators. Similar deficiencies still exist today. As noted earlier in our report, measuring railway safety using the data currently collected does not provide a comprehensive or unambiguous portrait of how safe the system is or should be. We fully recognize that measuring railway safety is a complex topic involving a number of various entities. Despite efforts over the years to improve upon this aspect of railway safety, we believe there is still much room for improvement and that a high priority needs to be placed on achieving results”

I begin my comments on the material from chapter 6 by recalling the final sentence:

“Despite efforts over the years to improve upon this aspect of railway safety, we believe there is still much room for improvement and that a high priority needs to be placed on achieving results.”

Based on numerous comments on the matter, there is widespread agreement with the panel’s observation that there is “still much room for improvement” in the matter of “railway safety data collection, analysis and dissemination”. My earlier remarks about chapter 2 of the Review provide an indication of my thoughts about needed improvements, and present some of the reasons behind the design and contents of this report, *Five Core Questions on Rail Safety*.

In addition to the final sentence, there are several statements in the two paragraphs from chapter six of the *Railway Safety Act Review* which are pertinent to the design and contents of this report.

First, the panel will get no argument from me about stating that "... it is crucial for railway companies and regulators alike to have the right data at the right time. The importance of sound data for critical analysis and interpretation cannot be overstated."

However, where I part company with the panel is its seeming failure to appreciate that one reason we do not have the data which are needed to properly understand the state of rail safety in Canada is due to a failure in research methodology. That is, at a summary level, and I put this comment in bold for emphasis,

Issuing exhortations about the need to have better data are hollow exercises if relatively little thought, effort, and resources are expended on getting to the root of the data problem, which begins with a clear and comprehensive understanding of what is known, what must be known, and what should be known about rail safety.

Unfortunately, it does not appear that the panel went down this path, so we are left with an exhortation about needed or missing crucial, vital, critical, etc., data, but no instruction or direction about solving the data problem.

The report, *Five Core Questions on Rail Safety*, is a step in that direction by emphasizing the necessity to improve or enhance the general understanding of what is known, what must be known, and what should be known about rail safety. Then, once that context is in place, time and effort can be productively spent in deliberations about what data to collect, analyse, and disseminate.

Second, there are numerous referrals in the *Railway Safety Act Review* to 'statistics' (4). However, it is a puzzlement that at minimum the same prominence was not given to parameters of the population of rail accidents and incidents which the panel must surely have had access to during the review process.

There are of course limits to what can be done by TA Canada, but one distinct possibility is that reports such as *Five Core Questions on Rail Safety* can provide infusions of seemingly much-needed practical, applied, and methodologically sound research advice to bodies such as those responsible for the *Railway Safety Act Review*.

The final comment about chapter 6 of the *Review* involves the heading, "Information Collection Analysis and Dissemination", which I suggest does not accurately represent the text.

Moreover, the heading may actually mask a fundamental misunderstanding about the relationship between data and information, which in turn could lead to misunderstandings and misrepresentations by the panel and others about the actual state of railway safety in Canada.

That is, upon inspection it can readily be ascertained that the text of chapter 6 largely deals with data, rather than information, which raises disconcerting questions about why a report such as the *Railway Safety Act Review* does not have all due regard for the huge differences between the two terms.

Consequently, in the interests of accuracy and usefulness the heading of chapter 6 should be “Data Collection, Analysis, and Dissemination”, and I suggest that the panel extend its work by adding a chapter to the *Review* which does justice to the title, “Information Collection, Analysis, and Dissemination”.

Or, to re-phrase, the text of chapter 6 in the *Review* actually deals with data, not information, and the heading does not represent that reality. Moreover, a number of the statements lead me to suggest that much more substantive thought needs to be given to the use of and need for synthesis to achieve the data-to-information transform that appears to be implied by the title of chapter 6, but is not demonstrated in the text.

I believe that an additional chapter is needed in the *Review* to properly explain how information differs from data as a means of reporting on the existing state and the preferred state of railway safety in Canada.

With those terms of reference providing directions, in the next section I propose five core questions which are part of the large set of fundamental questions which require answering.

The immediate end game, so to speak, is to have evidence upon which to base our understanding of the current state of railway safety in Canada, and evidence upon which to base decisions about negating, mitigating, or rectifying situations, processes, events, etc., which compromise rail safety.

3. RESEARCH QUESTIONS TO INITIATE THE RAIL SAFETY ELEMENT OF THE TRANSPORT RESEARCH TOPICS COMPENDIUM

The mission of this report is to present a selection of research questions which could serve as means to:

1. Significantly improve the body of research material which substantively investigates the kinds of rail safety issues, problems, concerns, etc., identified in Table 1.

2. Significantly accelerate the process of improving access to data, information, and knowledge on rail safety.

At the time of this writing, five core questions have been selected for inclusion in section 3. It is anticipated that the report will be updated by adding questions that arise as part of my research and/or consulting activities.

3.1. How have the priorities that governments (including crown corporations) and private sector entities assigned to duty of care obligations, standard of care practices, and risk management targets affected passenger rail safety, and freight rail safety, respectively, in Canada? (Q1)

3.1.1. Background for Q1.

A range of duty of care obligations, standard of care practices, and risk management options is available to all levels of government and their agencies, as well as to private sector entities which engage in operating, regulating, using, or otherwise being involved with passenger and freight rail systems, infrastructure, services, etc.

Q1 is therefore what might be termed a “tip of the iceberg question”, or “nested question”, because the answer to the initial question will likely precipitate follow-on questions, including those which seek to ascertain whether patterns, thresholds, tipping points, etc., in various mixes of duty obligations, care practices, and risk options affect rail safety, and could be the cause of unsafe situations, and/or rail accidents, incidents, etc.

At the risk of belaboring the obvious, Q1 begins with “How have” rather than “Have” because “How have” subsumes “Have”, and this phrasing is intended to move the discussion in the direction of causes and solutions rather than spending scarce time on non-actionable musings, such as getting into the technical details of the parameters and statistics describing the state of passenger rail safety and freight rail safety in Canada.

Finally, the question and background statement are designed to be broadly applicable to all levels of government and their agencies, as well as to private sector entities which engage in operating, regulating, using, or otherwise being involved with passenger and freight rail systems, infrastructure, equipment or rolling stock, services, etc.

Of particular interest in the immediate term, however, are responses from the Minister of Transport Canada, the panel responsible for *Railway Safety Act Review*, and from the Transportation Safety Board of Canada.

3.2. How has urban encroachment as a result of planning and/or development decisions by municipal and provincial governments, and property developers, compromised rail safety? (Q2)

3.2.1. Background for Q2.

Passenger rail transport and freight rail transport systems have played and continue to play a central role in Canada's economic and urban development. However, in a number of areas where the location of rail routes has been unchanged for decades, the land on one side or both sides of the railways was re-designated. That is, land which was formerly rural and used for agriculture, forestry, and related low-intensity purposes became designated urban, and its associated uses for residential, commercial, institutional, and related high-intensity purposes.

As a result, whereas the railways used to be in a rural environment "out in the boondocks", they are now in the midst of encroaching urbanism on one or both sides, and are often the butt of a perverse kind of 'nimbyism'. That is, although the railways were there first, often many years in advance of urban development, it has become a practice of many individuals who chose to locate proximal to the already-in-place rail routes to complain about or object to train noise, train whistles, train bells, train cargoes, etc., affecting their quality of life, property values, and so on.

Q2 is therefore what might be termed a "tip of the iceberg question", or "nested question", because the answer to the initial question will likely precipitate follow-on questions, including those which seek to ascertain whether the land use planning and development decisions, and/or the responses by governments or business entities to complaints or objections regarding trains, could be the cause of unsafe situations, and/or rail accidents, incidents, etc.

Again at the risk of belaboring the obvious, Q2 begins with "How has" rather than "Have" because "How has" subsumes "Have", and this phrasing is intended to move the discussion in the direction of causes and solutions rather than spending scarce time on non-actionable musing about planning and development decisions that cannot be undone, or about the thinking of those who yell "*NIMBY!*" at trains as they pass by, and have been passing by for decades before the subdivision was constructed.

Finally, Q2 and the background statement are designed to be broadly applicable to all levels of government and their agencies, as well as to private sector entities which engage in operating, regulating, using, or otherwise being involved with passenger and freight rail systems, infrastructure, equipment or rolling stock, services, etc. Of particular interest in the immediate term, however, are responses from the Minister of Transport Canada, the Railway Safety Act review panel, and the Transportation Safety Board of Canada,

3.3. How has physical conflict between trains and trains, and trains and other modes of ground-based transport, compromised rail safety? (Q3)

3.3.1. Background for Q3.

Materials on this topic have been compiled for decades for all types of ground transport conflict involving trains, that is: trains v. trains; trains v. light rail transit (LRT) vehicles; trains v. buses; trains v. private motor vehicles, trains v. bicycles, and trains v. pedestrians.

The conflict zones include: rail tracks; rail intersections with LRT tracks; rail intersections with highways and roads; rail intersections with busways; rail intersections with bike paths; rail intersections with sidewalks; as well as rail rights-of-way.

The essence of the Q3 problem is that when a train vies with another train, or with LRT vehicles, buses, private motor vehicles, bicycles or pedestrians in any of the zones noted above, the possibility of conflict arises and the consequences may range from relatively minor to major delays or route adjustments, and from relatively minor to major collisions and crashes.

Q3 is therefore what might be termed a “tip of the iceberg question”, or “nested question”, because the answer to the initial question will likely precipitate follow-on questions, including those which seek to ascertain whether the individual conflicts, groups of conflicts, or patterns of conflicts in any of the zones noted above directly or indirectly affected rail safety.

Following the logic of Q1 and Q2, Q3 begins with “How has” rather than “Has” because “How has” subsumes “Has”, and this phrasing is intended to move the discussion in the direction of causes and solutions rather than spending scarce time on non-actionable musing that does not directly address the intimate spatial and temporal relationships between the rail mode and all modes of surface transportation, and especially in urban and urbanizing areas.

Finally, Q3 and the background statement are designed to be broadly applicable to all levels of government and their agencies, as well as to private sector entities which engage in operating, regulating, using, or otherwise being involved with passenger and freight rail systems, infrastructure, equipment or rolling stock, services, etc.

Of particular interest in the immediate term, however, are responses from Minister of Transport Canada, the Railway Safety Act review panel, and the Transportation Safety Board of Canada.

3.4. How have passenger rail safety and freight rail safety been factored into transportation funding decisions by federal, provincial, and municipal governments? (Q4)

3.4.1. Background for Q4.

Questions 1, 2, and 3 are all pertinent to Q4 and vice versa, in that informed responses to Q1, Q2, and Q3 include taking into account Q4, and vice versa. As a result, the background statements for Q1, Q2, and Q3 are pertinent to Q4, and vice versa.

One aspect of Q4 that does not appear to have received widespread attention is its scope.

That is, since federal, provincial, and municipal governments across Canada collect taxes and spend public money to support all modes of surface transportation, Q4 is therefore applicable to any government which provides funding for passenger rail or freight rail transport, as well as to those governments which have passenger rail and/or freight rail traffic within their jurisdictions.

I decided to forego an expanded background statement for Q4 so as to not dilute the several core messages that I wish to emphasize. As a result, the reader is referred to the background statements for Q1, Q2, and Q3 for an introduction to what I believe are some of the key legal, political, and planning and development aspects of Q4.

Further, Q4 is what might be termed a “tip of the iceberg question”, or “nested question”, because the answer to the initial question will likely precipitate follow-on questions, including those which seek to ascertain whether the funding decisions were based on due regard for passenger rail safety and freight rail safety in multi-modal transportation environments.

Again at the risk of belaboring the obvious, Q4 begins with “How have” rather than “Have” because “How have” subsumes “Have”, and this phrasing is intended to move the discussion in the direction of causes and solutions rather than spending scarce time on non-actionable musing that does not directly address the reasoning behind the decisions by federal, provincial, and municipal governments to give due consideration to matters involving rail safety when making transportation funding decisions.

Finally, Q4 and the background statement are designed to be broadly applicable to all levels of government and their agencies.

Of particular interest in the immediate term, as might be expected, are responses from Minister of Transport Canada, the Railway Safety Act review panel, and the Transportation Safety Board of Canada,

3.5. How have geographic information systems (GIS) technology and science assisted rail carriers and government departments or agencies make better passenger rail safety and freight rail safety decisions? (Q5)

3.5.1. Background for Q5.

There is a spatial aspect to questions 1, 2, 3, and 4, and Q5 deals with various aspects of specifying, collecting, analyzing, disseminating, displaying, and managing spatial data and spatial information. Consequently, in principle Q1, Q2, Q3, and Q4, are all pertinent to Q5 and vice versa, in that informed responses to Q1, Q2, Q3, and Q4 include taking into account Q5, and vice versa. And, further in that regard, the background statements for Q1, Q2, Q3 and Q4 are pertinent to Q5, and vice versa.

I decided to forego an expanded background statement for Q4 so as to not dilute the several central messages that I wish to emphasize in this report.

As a result, the reader is referred to the background statements for Q1, Q2, Q3, and Q4 for an introduction to what I believe are some of the key legal, political, and planning and development aspects of Q5.

Two reasons are behind building a question around the topic of geographic information systems (GIS) technology and science.

First, there is a spatial aspect to all the preceding questions, so it is logical to include a question about how GIS (a spatial-based technology and methodology) is used for decision support assistance.

It would no doubt be informative to learn about all the decision support methods and techniques used in rail safety decisions, but an exploration of that type is beyond the purview of this report. Rather, it is appropriate to limit the scope of Q5 to GIS technology and science.

Then, when responses to Q5 have been published, it would likely be productive to inquire about the use of other decision methods and techniques, such as those discussed in [Sampler of Commentaries on Methods and Techniques that Could be Used in Making Decisions about Identifying, Adopting, or Implementing Sustainable Transport Practices](#) (Wellar, 2009).

Second, as part of the evidence-gathering and evidence-presenting process, there is the matter of how to best represent spatial characteristics and distributions of rail safety situations, incidents, and accidents.

Previous documentation on this topic includes the report done for Transport Canada on sustainable transport decision-making (Wellar, 2009), and in many hundreds, indeed,

thousands of reports published by organizations such as the Urban and Regional Information Systems Association (URISA) and Esri Canada.

They conclusively demonstrate that great strides have been made in the GIS field over the past two or three decades in improving the collection, processing, analyzing, disseminating, displaying, and using spatial data and spatial information.

For a case in point, I refer to a map story created by Esri Canada which illustrates several of the spatial aspects of the Lac-Mégantic derailment. <http://esricatsg.maps.arcgis.com/apps/MapTour/index.html?appid=b205d72426344a9f9ebc2a20ba6a88e&webmap=3b1546b0428a43fc93440267ac2474d8>

However, I do not recall a significant discussion of the GIS topic in the *Railway Safety Act Review*, although a number of statements appear in the *Review* about longstanding data and information problems, which seems to me to underline the need to make Q5 front and center item in the safety data discourse.

And, similar to Q1, Q2, Q3, and Q4, Q5 begins with “How have” rather than “Have” because “How have” subsumes “Have”, and this phrasing is intended to move the discussion in the direction of causes and solutions rather than spending scarce time on non-actionable musing that does not directly address the reasoning behind the decisions by rail carriers and government departments or agencies about using geographic information systems (GIS) technology and science to assist in making better, evidence-based passenger rail safety and freight rail safety decisions.

Finally, Q5 and the background statement are designed to be broadly applicable to all rail carriers and levels of government and their agencies.

Of particular interest in the immediate term, however, are responses from the Minister of Transport Canada; other federal departments and/or agencies whose management or operations functions include rail safety data or GIS technology or science; the Railway Safety Act review panel, and the Transportation Safety Board of Canada.

There are other questions which come to mind, but they can wait for another day. Those asked should be sufficient to generate a first round of questions and responses which advance the mission of this paper, which is to:

1. Significantly improve the body of research material which substantively investigates the kinds of rail safety issues, problems, concerns, etc., identified in Table 1.
2. Significantly accelerate the process of improving access to data, information, and knowledge on rail safety.

4. NEXT STEPS

It is my expectation that after the responses to the five “How” questions presented here have been given their due deliberation, the “Why” questions that lie behind each of the “How” questions can then be asked, and thereby significantly increase the body of documentation on the reasons behind past, present, and future decisions by carriers, users, and governments which affect passenger rail safety and freight rail safety in Canada.

And, of course, recalling the stories behind the headlines in Table 1, and all the other stories that could be cited in an extended Table 1, as well as what we might learn about core research questions posed in other jurisdictions, it is clear that we have just broached the list of important rail safety questions to be asked, answered, and acted upon. Clearly, many next steps remain to be identified and taken.

5. CONCLUSION

The mission of this report is to present a selection of research questions which could serve as means to:

1. Significantly improve the body of research material which substantively investigates the kinds of rail safety issues, problems, concerns, etc., identified in Table 1.
2. Significantly accelerate the process of improving access to data, information, and knowledge on rail safety.

Towards that end, the following five questions are designed to elicit informed responses, which in turn are expected to contribute to more informed decisions about how to improve passenger rail safety and freight rail safety in Canada.

- **Q1. How have the priorities that governments (including crown corporations) and private sector entities assigned to duty of care obligations, standard of care practices, and risk management targets affected passenger rail safety, and freight rail safety, respectively, in Canada?**
- **Q2. How has urban encroachment as a result of planning and/or development decisions by municipal and provincial governments, and property developers, compromised rail safety?**
- **Q3. How has physical conflict between trains and trains, and trains and other modes of ground-based transport, compromised rail safety?**

- **Q4. How have passenger rail safety and freight rail safety been factored into transportation funding decisions by federal, provincial, and municipal governments?**
- **Q5. How have geographic information systems (GIS) technology and science assisted rail carriers and government departments or agencies make better passenger rail safety and freight rail safety decisions?**

As discussed, these are all “tip of the iceberg” or “nested” questions, which in turn spawn more questions about the state of passenger rail safety and freight rail safety in Canada, and about better ways and means for making decisions and taking actions to improve rail safety.

Feedback from parties with deep interest in the respective questions confirms that each question is important in its own right, and that by emphasizing their interdependency, this report breaks significant new ground in our thinking about the rail safety element of the Transport Research Topics Compendium.

6. ENDNOTES

1. For reasons of time and resource constraints, it is necessary to limit the scope of this report. Perhaps future contributions to the Compendium will consider the connections between rail safety and many of the other topics in the list of TA Canada interests. And, as a related, important matter that deserves due consideration in view of some recent carrier and government decisions, there is the standard of care aspect associated with moving people and goods by rail because, under some circumstances, rail transport is regarded as a relatively safer mode.

2. Readers wishing to know more about the challenges and difficulties of extracting information from elected and appointed government officials may benefit from examining reports from the ONR-ONTC Research Task Force project. The mission of the Task Force was to obtain and evaluate the evidence used in the decisions by the Government of Ontario to terminate the *Northlander* rail service, and to divest the Ontario Northland Transportation Commission.

A total of 13 reports were produced for that project, all of which address issues, obstacles, challenges, problems, difficulties, etc. that can be encountered when attempting to obtain information from government bodies or officials. The reports are posted on the Transport Action Canada website at http://www.transport-action.ca/dc/BW_ONR-ONTC_OPINION.pdf

3. As coincidence would have it, at the time of this writing the word “gridlock” has made another appearance in a media headline, and I am again explaining that there has never been an evidence-based “ traffic gridlock event” in the history of Canada, media headlines to the contrary.

I used the same terms – misconception, misrepresentation, misnomer, misleading, misunderstanding, and misguided – among others to dismiss claims of gridlock when the actual traffic state is simply congestion, which is a natural part of the urban traffic condition.

4. The term ‘statistic’ shares a similarity with the term ‘accident’, in that it too is frequently used in erroneous ways (Wellar, 2000, pages 233 and 236).

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About the Author

Barry Wellar graduated from Queen's University (Hon. BA) and Northwestern University (MS, PhD). He is Professor Emeritus, University of Ottawa; Principal, Wellar Consulting Inc.; President, Information Research Board; Distinguished Research Fellow, Transport Action Canada; former Research Advisor, Federation of Urban Neighbourhoods; and Distinguished Research Scientist, Lab for Applied Geomatics and GIS Science, University of Ottawa. A Past President of URISA (1978), and former Director, Geography Awareness Week, Canadian Association of Geographers, he has received the Horwood Award, the Anderson Medal, and the Ullman Award, and was inducted into the GIS Hall of Fame in 2011. He is a Member of the Canadian Institute of Planners, is a Registered Professional Planner (RPP, Ontario), and is a Geographic Information Systems Professional (GISP).

Previously he was a Senior Policy Advisor, Ministry of State for Urban Affairs, Government of Canada, and an Assistant Professor and Research Associate, University of Kansas. He has published more than 200 books, reports, and professional articles on transportation, created the Walking Security Index for measuring the safety, comfort, and convenience provided pedestrians, and has contributed to more than 1000 media stories, including a number on rail safety. Current consulting activities include expert assignments in land use planning and transportation, expert witness assignments involving vehicular traffic incidents, and pedestrians' safety, and organizer of the ***Research Colloquium and Conference on Designing and Applying the Retrospective Approach to Mine for GIS Nuggets***, which is to be held February 13-15, 2015 at the Esri campus in Redlands, California.