

THE PRICE OF SAVING LIVES

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Spurred by public opinion and the media, some governments are imposing tighter safety regulations which force railways to spend more or restrict operations, thus diverting traffic to the roads. Ian Savage argues that it is the operators who are best placed to deliver value for money.

In May 1991, the President of the Railway Association of Canada, Bob Ballantyne, addressed a conference in Calgary on major industrial accidents. He pointed out that Transport Canada (the transport ministry) employed 120 people in its Railway Safety Directorate, while a further 125 in the Dangerous Goods Directorate dealt specifically with railway matters. In addition, the Transportation Safety Board of Canada employed 50 investigators to examine railway incidents.

Within the Dangerous Goods Directorate there are 27 persons forming the Risk Management Branch who, said Ballantyne, “are all looking at the risk of transporting dangerous goods by rail - rail, just rail.” He pointed out that “this concentration of activity can only be justified if it leads to new regulatory initiatives,” placing a heavy burden on railways which were “desperately trying to comply with a continuous stream of new directives.”

Ballantyne questioned whether society really wanted to see dangerous goods switched from rail to the “less controllable” highway mode as a consequence of these pressures. Transport Canada reported 10 deaths and 51 injuries in 1989 resulting from the movement of dangerous goods on the roads, while the railways recorded no injuries or deaths. “In fact,” he said, “there has never been a fatality in a dangerous goods railway accident in Canada.”

Excessive Safety Investment

It is a story which could be retold in different ways by railway managers throughout the world. There are a number of reasons why - as transport professionals - we should be concerned about what appears to be excessive levels of mandated safety investments. Elementary economics suggests that as you invest more in safety, the incremental cost will rise as the incremental benefits fall. At some point it is no longer wise to continue investing. Common sense suggests that this point is unlikely to be at the level of “absolute safety,” as interpreted by regulators.

It is our professional duty to ask whether mandated safety investments are a good use of money. This is all the more necessary where railways are publicly owned, as tax monies spent on safety investments could be used to improve public health education or providing better hospitals, for example. If the government’s mandated safety investments are funded internally by the railways, as tends to happen in North America where many freight carriers are private companies, the adverse consequences are a little less obvious. Excessive safety investments will push up rail

charges, leading to a modal shift away from rail to the statistically less safe roads. One could therefore get the perverse result that overall transport casualties could actually increase.

These comments, of course, do not apply solely to rail. The investment cost per predicted life saved of installing windshear detectors at the end of airport runways is massive compared with that of requiring newly manufactured cars to have headlights that are illuminated at all times, or providing police with extra resources to enforce drink-driving laws. One might conclude that a rational policy would divert safety investment funds from air or rail to highways.

It would be wrong to suggest that science is totally absent from decisions on safety expenditures. For rail, waterways, aviation and highways there is a long standing methodology for making investment evaluations within the framework of cost-benefit analysis (CBA). Safety aspects of CBA are particularly important for highways where a large portion of the benefits claimed for improved road alignments, junction signalling and bypasses around towns takes the form of a reduction in accidents causing casualties and damage.

Most governments apply or recommend monetary values related to predicted savings in life and limb, so that the safety benefits can be compared with investment costs. Currently, Britain's Department of Transport values a fatality averted at £665,000, commonly known as "value of life."

This value has been considerably inflated in recent years as a result of pioneering work conducted by Professor Michael Jones-Lee and his colleagues at the University of Newcastle-upon-Tyne. Jones-Lee used "stated preference" techniques to ascertain what people would be willing to pay in order to reduce the probability of death of their own death.

Given the existence of these evaluation techniques, and the considerable government funded research into the value of life, one may ask why these same governments often require rail safety investments with implicit values of life much greater than those which their own transport ministry uses or recommends for highway investments.

Value of Life on Rail

We now come to the crux of the issue, and also to a major professional disagreement. Consider two safety investments which are competing for government funding:

Project A: \$50m spent on realigning a particularly dangerous stretch of road is professionally estimated to avert 10 deaths over the life of the project;

Project B: \$50m spent on replacing flammable materials in a fleet of metro trains is likewise estimated to avert 0.2 fatalities over the remaining life of the rolling stock.

If one asked any safety or transportation professional, they would choose project A as being more desirable. However if one presented the public - whose opinions influence the media and, indirectly as voters, determine government policy - one might well get a different answer.

The popular preference for project B seems to indicate that people attach a higher value of life to rail passengers than road users. The transport professional may regard this as a crazy choice. However, work by the psychologist Paul Slovic and his colleagues in Eugene, Oregon has provided us with an understanding of this phenomena.

Slovic found that people systematically underestimate the probability of common and high frequency hazards such as road accidents, and overestimate the probability of infrequent events such as rail or air crashes. Thus the average person in the street may subjectively deflate the lives saved by Project A and inflate the values when contemplating Project B. People are also excessively worried about hazards which have similar characteristics to major rail accidents - whether it be a collision, a metro fire, or a chemical release in an urban area.. Slovic found that people particularly feared multiple fatality events - disasters - and also circumstances where they do not have ability to “escape” from any potential hazard by their own dexterity or skill. Most motorists believe that they are better than the “average” driver, and have the ability to swerve, brake or take other evasive action when a hazardous situation arises. People do not feel that they have the same control when strapped in an aircraft seat or standing in a crowded and burning metro train.

Finally, Jones-Lee has found that valuation of life increases with a person’s income, and varies by age with middle-aged people claiming a higher value than the young or elderly. Thus if modes of transport have different average characteristics of users, then the appropriate value of life will be different.

So who is to be believed in these circumstances? The transportation professionals - readers of this article - could with some justification consider that the public, and hence the media, are misinformed. They are unable to comprehend probabilities correctly, and have irrational fears of flying, confined railway tunnels and automated trains. Furthermore, the public would be better off if we, the professionals, decided what was best on the basis of our engineering models.

I must break with the angelic chorus of professional opinion to say that such a view is at best patronizing and at worse could lead to incorrect decision making. It is an axiom of western capitalism that consumer preferences are paramount. If consumers prefer their breakfast cereal to have a certain level of sweetness then that is what the successful manufacturer will produce. It smacks of former socialist command economies if the breakfast cereal manufacturer states that it is in the customer’s best interest to consume less sugar.

By direct analogy, if the public feels fearful of flying or being in underground tunnels, then higher levels of safety should prevail. Therefore my conclusion as a transportation economist is that one should expect higher safety standards on railways than on the roads. By implication the valuation of life used in cost-benefit analysis of rail projects should exceed that used in highway evaluation.

What Difference?

This begs the question: how much more? Twice as much, ten times, a thousand times? An internal analysis of 250 safety projects approved by British Rail for the year ending March 31, 1992 using quantified risk assessment, showed that about 20 percent cost more than £100m per life saved, more than a hundred times the British government's highway valuation.

I am afraid that the academic community cannot help you too much at this time. I can tell you that the Canadian government at one time used a value of life for aviation ten times that for highway projects (C\$2.5m versus C\$280,000) when setting departmental spending priorities. However, there has been a change of heart and C\$1.5m is now used for all projects. The U.S. Federal Aviation Administration at one time used a slightly higher value of life in its cost-benefit calculations than did the Federal Highway Administration, but now a common value is used by all branches of the Department of Transportation.

My own opinion is that if the implicit valuation of life in a mandated railway safety project exceeds twice that recommended for highways, then railway management may justifiably question it. The Appleton report (*Railway Gazette International* Oct. 1992 p. 647) provides clear evidence that some of the fire safety investments mandated by regulations issued after the King's Cross fire on the London Underground should be regarded as an inappropriate use of money.

Management Action

I believe there is reasonable scope for railway management to influence this apparent burden on rail competitiveness. It must be said that this is partly because a poor job has been done of shaping an intelligent and informed debate among opinion makers and politicians in the past.

We have seen that part of the reason why people attach higher values of life to rail safety is because they overestimate the dangers of rail versus road accidents. Consumers are actually well informed about road accidents. Nearly everybody travels substantial distances as a car driver or passenger, and has personally witnessed the full gamut of possible road accidents.

Air and rail accidents hit the headlines, yet the true state of the risks to the public can only be obtained by reference to obscure government reports. Perhaps rail management should be less shy in presenting comparative safety information to the public. If the public comprehend that rail is already relatively safe, then there will be less pressure for mandated safety investments.

The railways should also not be shy about linking monetary values and deaths averted in trying to shape informed public debate. It is ridiculous to say to the public "do you really want automatic train protection" because the answer is invariably "yes." Rather, railways should say something like "implementing this particular investment will reduce the probability of you being involved in a train crash from once every 300 years to once every 350 years and cost you an additional £5 on your monthly season ticket." The public response will then be much different.

The public perception of accident probabilities is not helped by the poor image the railways put forward. The public rather understandably think that railways are badly managed, have low quality and scruffy staff, have dubious Victorian equipment and have accidents more frequently in recent years than they used to. They thus demand that something is done about it.

The railways should look to slick professional safety image portrayed by the airlines, which has been very successful in helping the public to overcome its reluctance to sit in an aluminum tube travelling at 900 km/h some 10 km above the earth's surface. The management of Eurotunnel would also be well advised to consider that smart staff uniforms and a positive safety image can help fend off calls for extensive safety related expenditures.

Finally the railways could demand a new form of safety regulatory relationship with government.

Currently governments control safety by regulating tangible "inputs" such as approving signal system design or specifying staff training schedules. Decisions on these inputs are usually made by government officials with impeccable engineering qualifications, but no commercial or budgetary responsibilities. They are rarely optimised in any numerate or scientific way to yield value for money. Consumers do not particularly care about the specifics of such regulation. All they worry about is the "output" of safety: the probability of an accident occurring and the likely consequences.

It might make logical sense for governments to mandate that the railway "can only have x number of wrong side signal failures or y vehicle fires per million train-km," or "incidents per million train-km must improve by 3 per cent per annum." The best results are likely to be achieved if the railway's management is totally free to decide how it will meet these targets in the most cost efficient way, but is subject to large financial penalties if it does not.

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