



## FATIGUE MANAGEMENT IN RAIL, MARINE AND AIR TRANSPORTATION

In the transportation industry, crews often work long and irregular schedules—sometimes in challenging conditions or crossing multiple time zones—that are not always conducive to proper restorative sleep. Fatigue poses a risk to the safety of freight train, marine and air operations because of its potential to degrade several aspects of human performance.

### The situation

Fatigue is pervasive in modern societies that rely heavily on 24/7 industries like transportation. A Statistics Canada study released in 2017<sup>1</sup> revealed that about a third of Canadian adults slept less than the recommended 7 to 9 hours per night.<sup>2</sup> Short sleep duration and poor sleep quality were also reported as relatively common.

Fatigue can impact human performance in ways that can lead to accidents. This is why the Transportation Safety Board of Canada (TSB) routinely investigates if fatigue was present in an occurrence, if it played a role, and if the operator had practices in place to effectively manage the associated risks.<sup>3</sup>

Transport Canada (TC), also aware that fatigue is an issue requiring attention, held an international multi-modal forum in June 2018, focusing on measures that can reinforce transportation safety through better recognition and management of fatigue.<sup>4</sup>

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<sup>1</sup> J-P. Chaput, S. L. Wong, and I. Michaud, "Duration and quality of sleep among Canadians aged 18 to 79," at <https://www150.statcan.gc.ca/n1/pub/82-003-x/2017009/article/54857-eng.htm>

<sup>2</sup> M. Hirshkowitz, K. Whiton, S. M. Albert et al. "National Sleep Foundation's updated sleep duration recommendations: Final report," *Sleep Health*, Issue 1 (2015); pp. 233–43.

<sup>3</sup> TSB backgrounder, Fatigue in the transportation industry (Watchlist 2018).

<sup>4</sup> The program and presentations from the Fatigue in Transportation Forum 2018 can be found at <https://aqtr.com/association/evenements/forum-fatigue-transports-fatigue-transportation-forum/programmation>



## Number of occurrences in Canada

Since the early 1990s, the TSB has identified sleep-related fatigue as a contributing factor or a risk in at least 91 occurrences—29 in rail, 28 in the marine sector and 34 in aviation.<sup>5</sup> A safety issues investigation conducted in 2012 highlighted the risks that fatigue poses in the fishing industry.<sup>6</sup>

The U.S. National Transportation Safety Board (NTSB) recently released a final investigation report in which pilot fatigue was cited to explain why a major Canadian airline nearly landed on a taxiway in the U.S.<sup>7</sup>

The issue of fatigue management in freight train operations has been on the Watchlist since 2016. Fatigue management is now being extended to include marine and air operations.

## The risks to people, property, and the environment

Despite the existence of work/rest provisions, work scheduling continues to be a challenge for employers and employees in all three transportation sectors. If regulations and procedures do not take into account all factors that can contribute to fatigue, there is a risk that employers will not mitigate those factors, leaving employees vulnerable to fatigue.

For example, if marine operators are not required to implement fatigue management plans, there is a risk that crews will work while fatigued, increasing the likelihood of operational errors. And if marine crews are not trained in fatigue awareness, there is a risk that they will be unable to prevent, or identify and mitigate, the risks or symptoms associated with fatigue.

Ultimately, if employees do not take responsibility for getting adequate rest, or are not provided with opportunities to remove themselves from work when fatigued, there is an increased risk of accidents that could potentially have adverse consequences for people, property, and the environment.

## The call for change

Effective fatigue management and the reduction of associated risks require profound changes in attitudes and behaviours, both at the management and operational levels. This can only be accomplished through generalized and sustained awareness training, and implementation of fatigue management plans that encourage both employers and employees to take responsibility to ensure that no one becomes a casualty of fatigue.

To foster this paradigm shift, the issue of fatigue management in transportation will remain on the Watchlist until several actions are taken in each of the three modes.

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<sup>5</sup> TSB backgrounder, TSB fatigue-related findings, 1990–2018 (Watchlist 2018).

<sup>6</sup> TSB, Safety Issues Investigation into Fishing Vessel Safety in Canada (M09Z0001), 2012, <http://www.bst-tsb.gc.ca/eng/rapports-reports/marine/etudes-studies/m09z0001/m09z0001.asp>.

<sup>7</sup> U.S. National Transportation Safety Board, Taxiway Overflight, Air Canada Flight 759 Airbus A320-211, C-FKCK, San Francisco, California July 7, 2017 <https://www.nts.gov/investigations/AccidentReports/Pages/AIR1801.aspx>.

## Rail sector: Still awaiting a comprehensive approach based on fatigue science

Since the 1986 Foisy Inquiry,<sup>8</sup> there have been a number of government and industry initiatives to address fatigue in the rail sector—through rules and regulations, fatigue management plans and guidelines, even scheduling algorithms, among others. Yet the risks are still not adequately mitigated. Effective fatigue management has proved challenging, notably because of unpredictable start times in freight operations, long duty hours and rotating day and night shifts.

The current work/rest rules do not reflect the latest fatigue science on daily, or cumulative, work and rest periods, and they only apply to operating crews. The regime relies on an individual's ability to judge their own fatigue instead of a shared employer–employee responsibility for proactively managing fatigue. There is no comprehensive approach to managing fatigue that would add consistency across the industry.

### Actions taken

Since 2011, the TSB has directed 16 rail safety advisories and information letters to TC resulting from employee concerns about fatigue. The Board also issued a safety concern in 1999 regarding irregular work scheduling, extended duty times and rest requirements. These were identified during an investigation into an uncontrolled movement occurrence that led to a main-track train collision and derailment in Alberta.<sup>9</sup>

In the rail sector, the Minister of Transport tasked an independent panel to review the rail safety regime, including practices for fatigue management.<sup>10</sup> The regulator has also announced its intent to amend the rail safety regulations to address fatigue.<sup>11</sup> In the meantime, railways in conjunction with unions are conducting various pilot projects, notably to improve scheduling of operating crews, and are exploring new solutions, such as in-cab fatigue monitoring technology.

### Actions required

The issue of fatigue management in rail transportation will remain on the Watchlist until TC takes the following actions:

- Transport Canada develops a policy framework for the management of fatigue based on its review of fatigue management systems, fatigue science and best practices.
- Transport Canada works with industry and employee representatives and fatigue science specialists to develop a comprehensive approach to fatigue management in the rail sector.
- Transport Canada completes amendments to the Work/Rest Rules for Railway Operating Employees, 2011, based on fatigue science.

<sup>8</sup> The Honourable Mr. Justice René P. Foisy, *Commission of Inquiry into the Hinton Train Collision* (December 1986), at <http://publications.gc.ca/site/eng/9.818270/publication.html>

<sup>9</sup> TSB Rail Investigation Report R99E0023.

<sup>10</sup> *Railway Safety Act Review Panel, Enhancing Rail Safety in Canada: Working Together for Safety Communities* (May 2018).

<sup>11</sup> Transport Canada, Notice of intent to amend Canadian rail safety regulations, *Canada Gazette*, Part I: Vol. 151, No. 45 (11 November 2017).

## Marine sector: No fatigue awareness training or fatigue management plans

In the shipping industry, fatigue is linked to the intensive nature of the business: long and irregular hours of work over extended periods, brief or interrupted sleep, rapidly rotating shifts, high workload, and social isolation. Fatigue management currently relies on hours of work/rest regulations, and the master's responsibility to take into account the risks of fatigue when establishing work schedules. The approach to fatigue management also varies substantially from one owner and type of vessel to the next.

Enforcement of hours of work regulations on domestic vessels has been problematic. A strong work ethic, labour shortages and economic imperatives in the marine industry may encourage individuals to work while fatigued because of a real or perceived obligation to do so. This makes it more difficult for them to recognize fatigue as a problem and to take appropriate action. There is currently no requirement for fatigue awareness training or fatigue management plans.

In the fishing industry, approximately 95% of fishing vessels do not have any applicable work/rest provisions under the *Marine Personnel Regulations*. Given the long hours and high levels of physical and mental exertion involved in commercial fishing, fish harvesters need greater awareness of the risks associated with fatigue and effective strategies to mitigate its risks.

### Actions taken

The TSB issued one marine safety letter regarding fatigue in 2013 and six recommendations going back to 1999.<sup>12</sup> The first four recommendations targeted pilotage services, and the other two recommendations (both issued in 2018) were intended for watchkeepers and vessel owners.

In the marine sector, TSB recommendations led TC to develop fatigue management and awareness training materials for marine pilots. Masters and other officers working on large ships will soon receive training on fatigue and stress. In 2017, TC commissioned a comparative analysis of how other countries are addressing fatigue in the marine sector. TC has also worked with the TSB and several member countries of the International Maritime Organization's Sub-committee on Human Element, Training and Watchkeeping to revise the international guidelines on fatigue, which have been submitted to the Maritime Safety Committee for endorsement. There are no plans to address fatigue management for small vessel and fish harvesting operations.

### Actions required

The issue of fatigue management in marine transportation will remain on the Watchlist until the following actions are taken:

- Transport Canada requires that watchkeepers whose work and rest periods are regulated by the *Marine Personnel Regulations* receive practical fatigue education and awareness training to help identify and prevent the risks of fatigue.
- Vessel owners are required to implement fatigue management plans, including education on the detrimental effects of fatigue and support to mariners in reporting, managing and mitigating fatigue.

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<sup>12</sup> TSB backgrounder, New and previous TSB recommendations addressing the risk of fatigue in the marine sector (Watchlist 2018).

- Transport Canada reviews the domestic hours of work and rest provisions in the *Marine Personnel Regulations* in light of the most recent knowledge from fatigue science and, at a minimum, ensures consistency with the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers*.

## Air sector: Need to update and modernize flight and duty-time regulations

Flight operations take place around the clock, and sometimes over long distances, which involves crossing multiple time zones. Fatigue-related impairment has a detrimental effect on aviation safety. Transport Canada has determined that regulations currently in place to manage fatigue in flight operations are not supported by current fatigue science and do not meet the standards of the International Civil Aviation Organization (ICAO). Work to modernize flight and duty-time regulations has been ongoing for several years; Transport Canada has not yet published the final regulations, however.

### Actions taken

After several years of consultation, TC conducted some analysis which, in 2017, led to proposed amendments to the *Canadian Aviation Regulations* (CARs) that would result in more stringent flight and duty-time limitations for pilots. Along with these regulatory changes, the Department plans to encourage operators to use fatigue risk-management systems (FRMS) based on modern principles of fatigue science to address identified risks specific to their operation.<sup>13</sup> However, TC has not yet published the final regulations. In addition, the NTSB recently recommended that TC revise current regulations to address the potential for fatigue for pilots on reserve duty who are called to operate evening flights that would extend into the pilots' window of circadian low.

### Actions required

The issue of fatigue management in air transportation will remain on the Watchlist until the following actions are taken:

- Transport Canada publishes revised flight and duty-time limitation regulations.
- Where required, Canadian air operators implement fatigue risk management systems to address fatigue related risks specific to their operation.

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<sup>13</sup> Transport Canada, Proposal to amend the *Canadian Aviation Regulations*, <http://gazette.gc.ca/rp-pr/p1/2017/2017-07-01/html/reg2-eng.html>