



TSB Recommendation M18-01

Fatigue education and awareness training for watchkeepers

The Transportation Safety Board of Canada recommends that the Department of Transport require that watchkeepers whose work and rest periods are regulated by the *Marine Personnel Regulations* receive practical fatigue education and awareness training in order to help identify and prevent the risks of fatigue.

Marine transportation safety investigation report	M16P0378
Date the recommendation was issued	31 May 2018
Date of the latest response	December 2023
Date of the latest assessment	February 2024
Rating of the latest response	Satisfactory in Part
File status	Active

Summary of the occurrence

On 13 October 2016, the articulated tug-barge composed of the tug *Nathan E. Stewart* and the tank barge *DBL 55* went aground on Edge Reef near Athlone Island, at the entrance to Seaforth Channel, approximately 10 nautical miles west of Bella Bella, British Columbia. The tug's hull was eventually breached and approximately 110 000 L of diesel oil were released into the environment. The tug subsequently sank and separated from the barge. The tug was removed from the environment 33 days after the occurrence.

The Board concluded its investigation and released report M16P0378 on 31 May 2018.

Rationale for the recommendation

Sleep is a fundamental biological need. Fatigue is the biological symptom of the unsatisfied need for sleep. Obtaining an insufficient quantity or quality of sleep results in fatigue, which impairs performance and, in the extreme, inevitably leads to falling asleep. A number of factors can increase a person's level of fatigue, including the nature of the work being undertaken, having a poor sleep environment, and working a 6-on, 6-off shift schedule.

Although the 6-on, 6-off shift schedule has been called into question by various studies and experts internationally,^{1,2,3,4,5} it continues to be used throughout the marine industry. For example, in this occurrence, the watchkeepers of the *Nathan E. Stewart* had been working this schedule for over 2 days prior to the grounding. Opportunities to sleep were provided, but the second mate's inability to nap, combined with the sleep-inducing conditions on the bridge, led to increased fatigue and resulted in the second mate's falling asleep while on watch. Consequently, a planned course alteration was not made and the tug ran aground.

Given that accidents caused by fatigue still occur, there is a compelling need for seafarers to recognize and address the factors that contribute to fatigue.

Internationally, fatigue is recognized as a safety issue. The annex of the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* was amended in 2010 to include the requirement that seafarers undergo training on how to manage fatigue. As a basis for ensuring that seafarers obtain sufficient sleep, the Seafarers' Training, Certification and Watchkeeping (STCW) code also establishes minimum hours of rest. However, the *International Convention on Standards of Training, Certification and Watchkeeping* does not apply to non-convention vessels, such as small tugs and fishing vessels.

TC's *Marine Personnel Regulations* (MPR) provide the regulatory means by which risks of fatigue are addressed in the Canadian marine industry, and incorporate the STCW code. However, the MPR do not identify what fatigue is or its associated risk factors. This approach is limited because of the impossibility of regulating sleep, as opposed to rest periods. Regulations that specify hours of work and rest represent one layer of defence, but they do not guarantee that seafarers will obtain adequate sleep.

Although fatigue is widely accepted as an unavoidable condition within the marine industry and is recognized as a contributing factor in many marine accidents,⁶ there is a general lack of awareness of the factors that cause fatigue. If watchkeepers have an understanding of those factors and of the practical actions that can be taken to minimize their effects, there may be a significant reduction in the number of fatigue-related occurrences.

¹ M. Härmä, M. Partinen, R. Repo, et al., "Effects of 6/6 and 4/8 Watch Systems on Sleepiness among Bridge Officers," *Chronobiology International*, Vol. 25, No. 2 (April 2008), pp. 413–423.

² M. Lutzhoft, A. Dahlgren, A. Kircher, et al., "Fatigue at sea in Swedish shipping—A field study," *American Journal of Industrial Medicine*, Vol. 53, No. 7 (2010), pp. 733–740.

³ United States Coast Guard, Department of Homeland Security, *Crew Endurance Management System Newsletter* (spring 2009), p. 5.

⁴ M. R. Grech, "Fatigue Risk Management: A Maritime Framework," *International Journal of Environmental Research and Public Health*, Vol. 13, No. 2 (2016), pp. 175–184.

⁵ TSB marine investigation reports M14C0219, M12N0017, and M07L0158.

⁶ The World Maritime University, *Fatigue at Sea: A Review of Research and Related Literature* (Malmö, Sweden: VTI, the Swedish National Road and Transport Research Institute, April 2006), at <http://www.transportportal.se/ShipDocs/2013-11-15rec162016.pdf> (last accessed 17 April 2018).

The Board therefore recommended that

the Department of Transport require that watchkeepers whose work and rest periods are regulated by the *Marine Personnel Regulations* receive practical fatigue education and awareness training in order to help identify and prevent the risks of fatigue.

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Previous responses and assessments

August 2018: response from Transport Canada

Transport Canada (TC) agrees in principle to the TSB's recommendation. TC requires further research and industry engagement to determine the most effective means to address the recommendation.

Transport Canada continues to take an active position to address fatigue in the workplace by collaborating with international partners to update standards and applicable guidance material. At the international level at the International Maritime Organization (IMO), the Sub-Committee on Human Element, Training and Watchkeeping (HTW) established a correspondence group, coordinated by Australia, to review the amendments to the Guidance on Fatigue proposed in MSC/Circ.1014. A number of IMO Member States participated in the correspondence group, including Canada, Singapore, and the UK. Of note, Transport Canada would like to acknowledge the work of the Transportation Safety Board representing Canadian interests on this subject.

Recently, the HTW Sub-Committee requested that the Maritime Safety Committee extend the target completion year for the output to 2018. With this additional time, Member States and international organizations have submitted relevant proposals for consideration to HTW 5, to be held in July 2018. To this end, Australia, Canada, and New Zealand submitted a joint paper titled, Revision of the Guidelines on Fatigue (HTW 5/8) which proposes amendments to the Guidance on Fatigue Mitigation and Management, published June 12, 2001. This updated guidance material is intended to support and assist companies in making informed decisions regarding appropriate and usable approaches to managing the risks of fatigue in their respective operations.

Following the outcome of the HTW correspondence group, which is expected at the end of 2018, Transport Canada will review the findings of the international body and implement changes using the most appropriate regulatory instrument.

Furthermore, in response to M18-02, Transport Canada indicated that,

Amendments to the *Marine Personnel Regulations* are now underway that implement updated STCW [*International Convention on Standards of Training, Certification and Watchkeeping for Seafarers*] mandatory training on fatigue management, through training in Leadership and Teamwork and Leadership and Managerial Skills, for masters and officers on vessels of 500 gross tonnage or more seeking a Canadian certificate of competency.

October 2018: TSB assessment of the response (unable to assess)

Transport Canada agrees in principle with this recommendation.

TC plans to continue collaborating with international partners (IMO) on the Human Element, Training and Watchkeeping subcommittee, which began in 2015, to address fatigue in the workplace by updating standards and applicable guidance material. TC also indicates that it requires further research and industry engagement.

In July 2017, TC began amending the *Marine Personnel Regulations* to implement the updated STCW by including mandatory training on fatigue management for masters and officers on vessels of 500 gross tonnage or more who are seeking to acquire a new or upgraded certificate of competency. However, this means that all currently licensed watchkeepers working on larger vessels, and all watchkeepers on smaller, non-convention vessels, such as the *Nathan E. Stewart* (i.e., the vast majority of watchkeepers), will not benefit from the same training requirements and, as a result, may not have the same level of awareness about fatigue and its risk factors.

Without any indication as to what changes will be made once the updated standards and guidance material have been reviewed by TC, it is unclear if and how the ensuing changes will address the intent of this recommendation. Furthermore, the proposed changes will not apply to currently licensed watchkeepers working on larger vessels and all watchkeepers on smaller non-convention vessels, such as the *Nathan E. Stewart*. TC's response does not contain sufficient information to enable the Board to make a meaningful determination about whether the safety deficiency will be reduced.

Therefore, the Board is **unable to assess** the response to Recommendation M18-01.

January 2019: response from Transport Canada

Transport Canada (TC) agrees in principle with the recommendation. Hours of work and rest play a major role in fatigue management. TC is playing a more robust role in ensuring that hours of rest are respected through our on-board inspections. The current *Marine Personnel Regulations* (MPRs), under Part 3, stipulate that the Master of the vessel must ensure that the crewmembers are well rested in order to perform their duties and functions in a safe manner. The regulations also contain a provision that stipulates that seafarers must inform the Master if they are unable to perform their duties.

The proposed amendments to the MPRs will reinforce the hours of rest and add a provision regarding commuting times. The amendments will specify that, when the seafarer is not residing on the vessel, the time the seafarer commutes back and forth to the vessel cannot be considered as part of the hours of rest. In addition, commuting time will also take into account extended travel distances necessary for the seafarer to meet up with the vessel (long-distance commuting). The key to avoid fatigue is rest and TC will be working to convey this information to the marine community. The amended MPRs are expected to be published in the *Canada Gazette*, Part I, in the spring of 2019.

The International Maritime Organization (IMO) *Guidelines on Fatigue* were presented at the National Canadian Marine Advisory Council (CMAC) meeting in November 2018. These were also discussed at the MPR consultations that took place throughout the regions from November 19-29, 2018. The Guidelines provide information on the causes and consequences of fatigue, and the risks it poses to the safety and health of seafarers, operational safety, security and protection of the marine environment. They also contain suggestions for ensuring seafaring wellness in terms of appropriate sleeping accommodations, resting and leisure areas. These guidelines are expected to be approved by the Maritime Safety Committee (MSC) at the IMO in December 2018. Once approved, Transport Canada will issue a Ship Safety Bulletin (SSB) in January 2019, advising all marine stakeholders to take these guidelines into account when planning and undertaking their daily operations.

Once the proposed amendments to the MPRs become law, TC plans to conduct information sessions with marine stakeholders across the country. These sessions will also provide an opportunity to discuss the importance of the *Guidelines on Fatigue* and reinforce safety messaging pertaining to the dangers that exist when operating vessels with fatigued crew.

March 2019: TSB assessment of the response (Unsatisfactory)

The Board appreciates TC's proposed action to amend the MPR to clarify that commuting time cannot be considered as part of hours of rest and to issue an SSB to draw awareness to the IMO *Guidelines on Fatigue*.

The Board also notes that TC has not provided an update about the research and industry engagement to determine the most effective means to address the recommendation as referenced in its 2018 response. Further, the Board notes that TC has not provided an update on proposed regulatory changes following its review of the findings of the IMO HTW Sub-Committee, also indicated in its 2018 response.

The actions taken to date by TC are not sufficient to ensure that watchkeepers whose work and rest periods are regulated by the MPR will receive practical fatigue education and awareness training in order to help identify and prevent the risks of fatigue.

Without this training, masters may not be able to determine if their crew are well rested, and crew members may be unable to determine when fatigue is affecting their ability to perform their duties.

The Board considers the response to the recommendation to be **Unsatisfactory**.

January 2020: response from Transport Canada

Transport Canada (TC) agrees with the recommendation. Transport Canada acknowledges the role fatigue has played in a number of marine incidents and the risks associated with it. As such, and in response to both TSB recommendations M18-01 and M18-02, TC has committed to undertaking a 5-year Fatigue Action Plan to address fatigue among seafarers. This multi-pronged approach covers training and awareness, international engagement, increased

oversight, as well as a communications plan to ensure TC's messages on fatigue and its associated risks reach a wide audience.

Beginning in 2017, Transport Canada has ensured that the marine training curriculum that seafarers must take to obtain a STCW Basic Safety certificate of proficiency or a STCW validate certificate of competency for a Master, Chief Mate or Watchkeeping Mate included training on fatigue. Specifically,

- TP 4957 requires 1 hour of fatigue training to those seafarers required to obtain a certificate in STCW Basic Safety.
- TP 15337 requires 2 hours of fatigue training for seafarers seeking a STCW validate certificate of competency for a Master, Chief Mate or Watchkeeping Mate.

In December 2018, the International Maritime Organization (IMO) Guidelines on Fatigue were approved by the Maritime Safety Committee (MSC). On June 7, 2019, Transport Canada released a Ship Safety Bulletin entitled *New Guidelines on Fatigue – 10/2019* advising all marine stakeholders of these newly revised guidelines which provide information on the causes and consequences of fatigue, and the risks fatigue poses to the safety and health of seafarers, operational safety, security and protection of the marine environment.

Transport Canada is currently working to ensure the course curriculum for all seafarer certification programs (including Certificates of Competency) includes mandatory training on fatigue. This new requirement will come into effect with the publication of the proposed amendments to the *Marine Personnel Regulations* (expected to advance to the *Canada Gazette*, Part I, in 2020).

Additionally, to reinforce the importance of fatigue education and awareness for all seafarers, Transport Canada announced at the November 2019 national Canadian Marine Advisory Council (CMAC) meeting that the department will be hosting fatigue training and awareness sessions across the country, beginning in the winter of 2020. These half day sessions will review the IMO Guidelines on Fatigue, as well as review and discuss incidents caused by fatigue internationally and within Canada. The training sessions will include a short examination to ensure sufficient comprehension of the material and participants will be given a certificate for attending the session. Supplementary fatigue education material will be provided to all training course participants throughout the year in order to maintain awareness and continue engagement on this issue.

Hours of work and rest are key factors that can affect human performance and compromise the safety of the marine transportation system. As such, oversight and enforcement is an important element of TC's approach on fatigue and will be enhanced through a planned concentrated inspection campaign (CIC) in 2020-2021 to verify compliance with the hours of work and rest provisions of the amended MPRs (currently scheduled for publication in the *Canada Gazette*, Part I, in 2020).

In order to guide policy decisions across all modes of transportation, including marine, and to ensure that there is a consistent application of fatigue science and fatigue management

principles across the sector, TC recently established the Transport Canada Center [sic] for Fatigue Expertise (CFE). Through a multimodal working group, a number of initiatives will be assessed through the CFE in the coming months and years, including assessing the need for a general framework for fatigue risk management system development and implementation. Expertise from specialists on fatigue will be drawn on as required.

A social media campaign will also be launched in early 2020 for the remaining 3 years of the Fatigue Action Plan to ensure the work TC is undertaking on fatigue is made widely available to the public and to create a better general understanding of fatigue and its risks in transportation.

March 2020: TSB assessment of the response (Satisfactory Intent)

The Board notes that Transport Canada (TC) has committed to undertake a 5-year fatigue action plan to address fatigue among seafarers and that this multi-pronged approach covers training and awareness, international engagement, increased oversight, as well as a communications plan to ensure TC's messages on fatigue and its associated risks reach a wide audience.

On 07 June 2019, TC released a Ship Safety Bulletin entitled *New Guidelines on Fatigue – 10/2019* advising all marine stakeholders of the new IMO *Guidelines on Fatigue*. The IMO *Guidelines on Fatigue* provide information on the causes and consequences of fatigue, and the risks fatigue poses to the safety and health of seafarers, operational safety, security and protection of the marine environment.

The Board also notes that TC recently established the Transport Canada Center for Fatigue Expertise (CFE) which will focus on the effect of fatigue across all modes. Through a multimodal working group, a number of initiatives will be assessed through the CFE in the coming months and years, including assessing the need for a general framework for fatigue risk management system development and implementation.

In addition to the existing STCW fatigue training required under TP 4957 and TP 15337, TC is currently working to include mandatory training on fatigue in the course curriculum for all seafarer certification programs (including Certificates of Competency). This new requirement is anticipated to be included in the proposed amendments to the MPR (expected to advance to the *Canada Gazette*, Part I, in 2020).

TC also announced that it will host fatigue training and awareness sessions in Canada beginning in the winter of 2020. The sessions will review the IMO *Guidelines on Fatigue* and discuss incidents caused by fatigue internationally and within Canada. The training sessions will include a short examination and participants will receive a certificate of attendance. Fatigue education material will be provided to all training course participants throughout the year in order to maintain awareness and continue engagement on this issue.

TC is also planning for a concentrated inspection campaign (CIC) in 2020–21 to verify compliance with the hours of work and rest provisions of the amended MPR which is scheduled for publication in the *Canada Gazette*, Part I, in 2020. Lastly, TC has indicated that it is

proposing a social media campaign to create a better general understanding of fatigue and its risks in transportation.

The initiatives proposed by TC are encouraging. However, until such time as the new regulations are published, the safety deficiency identified in this recommendation will remain.

The Board considers the response to the recommendation to show **Satisfactory Intent**.

February 2021: response from Transport Canada

Transport Canada agrees with this recommendation. The Department remains committed to the implementation of its 5-year Fatigue Management Action Plan to address fatigue among seafarers. The Department launched its fatigue training awareness campaign in 2020, however this was interrupted by the COVID-19 pandemic. From January to March of 2020, departmental officials were able to provide half-day fatigue awareness sessions to authorized representatives, seafarers and labour organizations in 10 different cities across Canada. The Department anticipates continuing these sessions following the resumption of normal operations following the COVID-19 pandemic.

The proposed amendments to the *Marine Personnel Regulations* intend to reinforce existing provisions respecting hours of rest and require that commuting times be taken into consideration when assigning work schedules. These amendments to the regulations are anticipated to advance to the *Canada Gazette*, Part I, in late 2021 and be published in the *Canada Gazette*, Part II, in summer 2022.

Since the end of the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) transitional period in January 1, 2017, every seafarer required under *Marine Personnel Regulations* to provide a training certificate in respect to STCW Basic Safety per the Marine Emergency Duties TP4957, will receive one hour of fatigue management training. In addition, every candidate applying for a Certificate of Competency at the operational level (deck and engineering) must provide a training certificate of completion in “Leadership and Teamwork” (TP 15337E) which includes a two hour module on managing fatigue and stress. Moreover, every candidate applying for a Certificate of Competency at the managerial level (deck and engineering) must provide a training certificate of completion in “Leadership and Managerial Skills” which includes a two hour module on stress and fatigue. In summary, all candidates that obtain a Certificate of Competency at the managerial level after January 1, 2017 will have received a total of 5 hours of fatigue management training.

March 2021: TSB assessment of the response (Satisfactory Intent)

Transport Canada (TC) has indicated that it agrees with the recommendation. In its response, TC noted its commitment to its 5-Year Fatigue Management Action Plan, which was interrupted by the COVID-19 pandemic. Prior to this, TC indicated having provided half-day fatigue awareness sessions to authorized representatives, seafarers, and labour organizations in various cities across Canada. The Board notes that these sessions will continue upon the resumption of normal operations.

The Board acknowledges that the proposed amendments to the *Marine Personnel Regulations* will reinforce existing provisions respecting hours of rest and require commuting times to be taken into consideration when assigning work schedules. These amendments are now anticipated to be published in the *Canada Gazette*, Part II, in summer 2022.

The requirements in the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention are a positive step in addressing the issue of fatigue in the marine industry. However, TC is still in the process of approving the revised curriculum from each of the training providers to comply with the STCW Convention. Therefore, until this training becomes a requirement in the *Marine Personnel Regulations*, seafarers who have not taken the training will continue to be provided a Certificate of Competency by TC and the risk posed by the underlying safety deficiency in this recommendation will remain.

Therefore, the Board considers the response to Recommendation M18-01 to show **Satisfactory Intent**.

December 2021: response from Transport Canada

Proposed amendments to the *Marine Personnel Regulations* are now targeted for publication in:

- *Canada Gazette*, Part I, December 2022
- *Canada Gazette*, Part II, Summer 2023

Transport Canada discussed the proposed *Marine Personnel Regulations, 2023* in detail at the National Canadian Marine Advisory Council (CMAC) Standing Committee on Personnel on December 1, 2021.

March 2022: TSB assessment of the response (Satisfactory Intent)

Transport Canada's (TC) response indicates that the pre-publication of the new *Marine Personnel Regulations* (MPR) in the *Canada Gazette*, Part I has been further delayed from late 2021 to late 2022. Until such training becomes a requirement in the MPR, seafarers will continue to be provided a Certificate of Competency by TC even though they have not received training, and the risk posed by the underlying safety deficiency in this recommendation will remain. As there have been a number of delays in the publication of this regulation, the Board is concerned that there may be further delays in the advancement of this regulation.

The Board considers the response to Recommendation M18-01 to be **Satisfactory Intent**.

December 2022: response from Transport Canada

Transport Canada continues to advance work to amend the *Marine Personnel Regulations* to address this recommendation. Consultations with key stakeholders are ongoing, including at the National Canadian Marine Advisory Council (CMAC) Standing Committee on Personnel on November 10, 2022. As a result, revised targets for amendments to the *Marine Personnel Regulations* include publication in *Canada Gazette, Part I* in Fall 2023 and *Canada Gazette, Part*

II in 2024. Transport Canada is currently developing on-line fatigue training that would be available for all Canadian seafarers to access.

February 2023: TSB assessment of the response (Satisfactory Intent)

Transport Canada's (TC) response indicates that the pre-publication of the new *Marine Personnel Regulations* (MPR) in the *Canada Gazette*, Part I has been further delayed from late 2022 to Fall 2023. Until such training becomes a requirement in the MPR, seafarers will continue to be provided a Certificate of Competency by TC even though they have not received fatigue management training, and the risk posed by the underlying safety deficiency in this recommendation will remain. Although the Board remains concerned that there may be further delays in the advancement of these regulations, it considers the response to Recommendation M18-01 to be **Satisfactory Intent**.

Latest response and assessment

December 2023: response from Transport Canada

Transport Canada is working to complete the draft regulations that will amend the *Marine Personnel Regulations* to address this recommendation and is now anticipating they will be published in the *Canada Gazette*, Part I, in 2024. Transport Canada acknowledges and understands the concerns expressed by the TSB with respect to delays in amending the *Marine Personnel Regulations* and has made the completion of the draft amendments for publication in 2024 a priority. Concurrently, TC is finalizing an online fatigue awareness course which should be available to every Canadian seafarer. The rollout of this course is anticipated in early 2024.

February 2024: TSB assessment of the response (Satisfactory in Part)

Transport Canada's (TC) response indicates that the pre-publication of the new *Marine Personnel Regulations* (MPR) in the *Canada Gazette*, Part I has been further delayed from fall 2023 to 2024. While the Board notes that TC is developing online fatigue training, it will not be made mandatory for all seafarers. The effectiveness of this voluntary training in reducing the underlying risk remains unknown.

Continuous delays in publication of the new MPR mean that seafarers will continue to be provided a Certificate of Competency by TC, even though they have not received fatigue management training, and that the risk posed by the underlying safety deficiency in this recommendation will remain.

Therefore, the Board considers the response to Recommendation M18-01 to be **Satisfactory in Part**.

File status

The TSB will continue to monitor Transport Canada's proposed actions.

This deficiency file is **Active**.