



TSB Recommendation M18-02

Fatigue management plans on vessels

The Transportation Safety Board of Canada recommends that the Department of Transport require vessel owners whose watchkeepers' work and rest periods are regulated by the *Marine Personnel Regulations* to implement a comprehensive fatigue management plan tailored specifically for their operation, to reduce the risk 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	Unsatisfactory
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 for Training, Certification and Watchkeeping for Seafarers* does not apply to non-convention vessels, such as small tugs and fishing vessels.

In addition to providing fatigue education and awareness training, all 24/7 transportation operations must effectively manage the risks associated with fatigue. Although training is one layer of defence, it is not enough to effectively and reliably prevent fatigue; a proactive, multifaceted approach is necessary.

An FMP is a proactive, multifaceted means of establishing more than just sufficient periods during which watchkeepers can achieve restorative sleep. It can address other important issues, such as fatigue awareness training; policies, procedures, and a working environment that mitigates factors that contribute to fatigue; and mechanisms that strive for continual improvement in fatigue management.

Implementing effective fatigue education and awareness for watchkeepers is one step that will assist the marine industry in going beyond the regulations to mitigate the risk of fatigue. Implementing comprehensive FMPs within the marine industry will bring it in line with approaches to fatigue management that have already been adopted by the rail and air transportation modes.

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.

Therefore, the Board recommended that

the Department of Transport require vessel owners whose watchkeepers' work and rest periods are regulated by the *Marine Personnel Regulations* to implement a comprehensive fatigue management plan tailored specifically for their operation, to reduce the risk of fatigue.

TSB Recommendation M18-02

Previous responses and assessments

August 2018: response from Transport Canada

Transport Canada (TC) agrees in part with the Board's recommendation. TC is presently exploring a full range of possible solutions to reduce the risk of fatigue with international partners at the International Maritime Organization.

Effective implementation, compliance, and enforcement of an updated fatigue management framework requires a coordinated international effort as foreign vessels, such as the *Nathan E. Stewart*, routinely transit through Canadian waters whose certification and training is governed by the flagged state of the vessel.

Presently, Canadian marine regulatory requirements related to fatigue are aligned with international requirements set out in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW) and the Maritime Labour Convention, 2006, which specify hours of rest and training for seafarers. Amendments to the *Marine Personnel Regulations* are now underway that implement updated STCW 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.

Furthermore, following the revision of the Guidance on Fatigue Mitigation and Management at the IMO, which is expected at the end of 2018, TC will review the findings of the international body and implement changes using the most appropriate regulatory instrument which takes into account that the *Marine Personnel Regulations* regulate work and rest periods on vessels of significantly different length, varying crewing profiles based on functions carried out onboard and operate in waters ranging from sheltered to unlimited waters. Ultimately, this work will directly influence approach regarding the TSB recommendation to implement a comprehensive fatigue management plan in whole or in part.

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

Transport Canada has indicated that it agrees in part with this recommendation and is exploring a range of solutions to reduce the risk of fatigue with the International Maritime Organization (IMO).

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's response to amend the *Marine Personnel Regulations* to implement updated *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* mandatory training has been included in TSB's assessment of Recommendation M18-01.

TC plans to review the findings of the international body and implement changes using the most appropriate regulatory instrument. However, there is no indication as to what the changes will be and it is unclear if and how the ensuing changes will address the intent of this recommendation. TC's response does not contain sufficient details to enable the Board to make a meaningful determination about whether the safety deficiency will be reduced or eliminated.

Therefore, the Board is **unable to assess** the response to Recommendation M18-02.

January 2019: response from Transport Canada

Transport Canada (TC) agrees in part 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 do perform [*sic*] 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 recommendations for ship owners and companies to incorporate fatigue management guidelines in their daily operations and ship management systems. 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.

October 2018: 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*.

However, the actions taken to date and the actions planned by TC do not address the safety deficiency associated with this recommendation. The Board has called for the implementation of comprehensive fatigue management plans tailored specifically for the type of operation in order to reduce the risk of fatigue. TC's response provides a number of individual actions, but it does not provide a comprehensive and integrated approach to reduce the risk.

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 & 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 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 (unable to assess)

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.

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 in 2020–21 to verify compliance with the hours of work and rest provisions of the amended *Marine Personnel Regulations* which is scheduled for publication in the *Canada Gazette*, Part I, in 2020.

The initiatives proposed by TC are encouraging; however, the Board is concerned that the initiatives are general in nature and may not be specific enough to satisfy the intent of this recommendation, which is to require vessel owners to implement comprehensive fatigue management plans tailored specifically for their operation to reduce the risk of fatigue.

The Board is **unable to assess** the response to the recommendation.

February 2021: response from Transport Canada

Transport Canada agrees in part with this recommendation. The Department is exploring a range of solutions.

As opposed to regulating vessel owners in this regard, the Department remains focused on addressing those most directly in control of an operating vessel, through direct training to relevant masters and crew members, and through intended regulatory amendments. The proposed amendments to the *Marine Personnel Regulations* are anticipated to include mandatory fatigue management through training in leadership and teamwork and in leadership and managerial skills for masters and officers on vessels of 500 gross tonnage (GT) or more who are seeking to acquire a new or upgraded Standards of Training, Certification and Watchkeeping for Seafarers (STCW) certificate of competency. The intent of the proposed

regulations align with recommendations that the Department made to industry in Ship Safety Bulletin 09/2017 respecting leadership and teamwork skills, at the operational level, and in leadership and managerial skills, at the management level.

The Department acknowledges the Transportation Safety Board's March 2020 comment that the intent of recommendation M18-02 is to require vessel owners to implement a comprehensive fatigue management plan tailored specifically for their operation to reduce the risk of fatigue. However, the Department remains focused on addressing those most directly in control of an operating vessel, through direct training to relevant masters and crew members, and through intended regulatory amendments, as opposed to regulating vessel owners in this regard. This focus has taken into consideration that the parties most directly responsible for the discharging of on-board operational responsibilities are relevant vessel masters and crew members. This is also being addressed through proposed amendments to *Marine Personnel Regulations* which outline masters' and crew members' certification.

Additionally, a number of vessel owners/operators have indicated to Transport Canada that they have voluntarily established formal fatigue management plans. International Maritime Organization guidelines have assisted in establishing these plans.

March 2021: TSB assessment of the response (Unsatisfactory)

Although it has been nearly 3 years since the Board published Recommendation M18-02, Transport Canada (TC) is still exploring different options in regard to addressing this safety deficiency. TC's response notes that the proposed amendments to the *Marine Personnel Regulations* will include mandatory fatigue management training for officers on vessels of 500 gross tonnage (GT) or more who are seeking to acquire a new or upgraded Certificate of Competency under the STCW Convention. TC also notes that these regulations will align with Ship Safety Bulletin 09/2017. The Board would like to underline that this training will only be effective if it is used to develop a fatigue management plan for all vessels hiring newly certified seafarers, not just those over 500 GT.

TC's response also mentions that it will remain focused on addressing fatigue management through direct training to masters and crew members, as opposed to regulating vessel owners. The Board notes that some vessel owners and operators are voluntarily adopting formal fatigue management plans, indicating that they recognize the need to establish such plans. However, TC's continued focus on masters and crew members does not consider the fact that these individuals do not establish crewing levels and vessel schedules and, as a result, they may not be able to apply the training that they receive. The Board is also concerned that the proposed amendments to the *Marine Personnel Regulations* do not provide a comprehensive solution to this safety deficiency, as they do not address personnel on vessels under 500 GT.

The Board encourages TC to re-consider the role that vessel owners have to play in reducing the risks of fatigue at sea, and remains concerned that the initiatives TC has proposed are general in nature and not specific enough to sufficiently mitigate the risk posed by the safety deficiency addressed by the recommendation.

Therefore, the Board considers the response to Recommendation M18-02 to be **Unsatisfactory**.

December 2021: response from Transport Canada

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

- *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 Standing Committee on Personnel on December 1, 2021.

Transport Canada still remains focused on addressing fatigue management and it is still a departmental priority. TC continues to evaluate the action plan, the associated timelines and implementation of the plan. TC will address through an updated Ship Safety Bulletin on fatigue guidelines and continue with stakeholder engagement.

Transport Canada welcomes the opportunity to discuss the proposed amendments to the *Marine Personnel Regulations* at the convenience of the Transportation Safety Board.

March 2022: TSB assessment of the response (Unsatisfactory)

Transport Canada's (TC) response indicates that the publication of the new *Marine Personnel Regulations* (MPR) in the *Canada Gazette*, Part I, has been further delayed from late 2021 to late 2022. TC's response also indicates that it will continue to evaluate its options, engaging with stakeholders, and that it will release an updated Ship Safety Bulletin on fatigue guidelines.

As mentioned in the Board's previous reassessment of this recommendation, TC's continued focus on masters and crew members does not consider the fact that these individuals do not establish crewing levels and vessel schedules and, as a result, they may not be able to apply the training that they receive. As well, this training is only required for officers on vessels of 500 gross tonnage (GT) or more who are seeking to acquire a new or upgraded certificate of competency under the STCW Convention. The Board is also concerned that vessels of 500 GT or more to which the STCW Convention applies represent less than 2% of the total number of TC-registered vessels. The Board would like to underline that training is not a substitute for a fatigue management plan.

The Board continues to encourage TC to re-consider the role that vessel owners have to play in reducing the risks of fatigue at sea, and remains concerned that the initiatives TC has proposed are general in nature and not specific enough to sufficiently mitigate the risk posed by the safety deficiency addressed by the recommendation. Additionally, the Board is concerned that there may be further delays in the advancement of the MPR.

The Board considers the response to Recommendation M18-02 to be **Unsatisfactory**.

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.

February 2023: TSB assessment of the response (Unsatisfactory)

Transport Canada's (TC's) response indicates that the publication of the new *Marine Personnel Regulations* (MPR) in the *Canada Gazette, Part I* has been further delayed from late 2022 to the fall of 2023. The Board is concerned about the repeated delays in the publication of the new MPR.

The Board notes that TC's response does not provide a new approach to fatigue management plans. It thus appears that training will still be aimed at masters and crew members; these individuals do not establish crewing levels and vessel schedules and, as a result, may not be able to apply the training that they receive. The Board continues to underline that training is not a substitute for a fatigue management plan established by the owner of a vessel.

Due to the ongoing publishing delays and lack of a clear intent to require vessel owners to establish fatigue management plans on Canadian vessels, the Board considers the response to Recommendation M18-02 to be **Unsatisfactory**.

Latest response and assessment

December 2023: response from Transport Canada

In the spring of 2022, Transport Canada (TC) awarded a contract to Memorial University to produce a research report on fatigue. The final report was delivered in August 2023, and was presented by the lead researcher at the Standing Committee on Personnel at the November 2023 meeting of CMAC. In early 2024, Transport Canada will launch a ***Let's Talk Transportation*** consultation with industry and labour on the topic of how to improve fatigue management in Canada's marine sector, to seek feedback on the incorporation of fatigue management plans onboard Canadian vessels.

February 2024: TSB assessment of the response (Unsatisfactory)

Transport Canada's (TC) response highlights the contract it awarded to Memorial University for a research report on fatigue, which was presented at the November 2023 Canadian Marine Advisory Council (CMAC). The department also intends to launch consultations with industry to improve fatigue management in Canada's marine sector and seek feedback on the incorporation of fatigue management plans. In responses to other recommendations, TC also 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 encouraged that TC is attempting to explore new approaches to fatigue management through consultation with industry and labour, the Board remains concerned over the lack of clear intent to require vessel owners to establish fatigue management plans on Canadian vessels and the continuous delays in the publication of the amended MPR.

Therefore, the Board considers the response to Recommendation M18-02 to be **Unsatisfactory**.

File status

The TSB will continue to monitor Transport Canada's progress.

This deficiency file is **Active**.