Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

Canada

TSB Recommendation A19-04

Closing gaps in the air-taxi regulatory framework

The Transportation Safety Board of Canada recommends that the Department of Transport review the gaps identified in this safety issue investigation regarding Subpart 703 of the *Canadian Aviation Regulations* and associated standards, and update the relevant regulations and standards.

Air transportation safety issue investigation report	A15H0001
Date the recommendation was issued	07 November 2019
Date of the latest response	December 2023
Date of the latest assessment	March 2024
Rating of the latest response	Unable to assess
File status	Active

Summary of the occurrence

In May 2015, the Transportation Safety Board of Canada (TSB) launched an in-depth safety issue investigation (SII) into the risks that persist in air-taxi operations across Canada. This SII reviewed 15 years of data to identify safety issues in air-taxi operations in Canada that have not been sufficiently mitigated. This SII examined air-taxi operations as a whole and considered safety issues that are germane to the entire air-taxi industry and not just to one specific segment of the industry.

The Board concluded its SII and released report A15H0001 on 07 November 2019.

Rationale for the recommendation

The hazards and risks in air-taxi operations have persisted over many years, with data directly showing the persistence of operational hazards from 1998 to 2015. The SII has illustrated that regulations and standards alone cannot guarantee safety in the sector, but they do provide necessary controls that contribute to safety in the sector. That said, there are gaps in this regulatory framework, namely with regard to training and qualifications, improvements to older aircraft, and fatigue in aircraft maintenance engineers (AMEs).

Training and qualifications

The *Canadian Aviation Regulations* (CARs) set out the required training for operators, but the actual training provided can vary widely, as operators observed. While some operators provide training only to a level that meets the requirements in the regulations, others provide extra training beyond the requirements to address needs and/or to derive benefits that mitigate risk in their operation. However, several operators mentioned that without updated regulations and standards forcing all operators to work under the same rules, the playing field is not level.

Although Subpart 703 of the CARs has mandatory training requirements for certain specialized operations, such as night flying, there are no such requirements for many other specialized operations such as mountain flying and coastal flying. There is also no regulation addressing line indoctrination for air-taxi operations. Mandatory training requirements may therefore be inadequate to meet the many unique aspects of air-taxi operations. Without the requirement for specialty training for high-risk operations, pilots may lack the knowledge and skills to ensure safe flight operations.

Furthermore, pilots conducting medical evacuation operations would benefit from specialized training to help them manage the psychological and traumatic challenges of this type of operation.

The qualifications of key personnel within an air-taxi operation were also identified in the SII as a potential issue. TSB investigations from the study period showed that key positions (e.g., operations manager or chief pilot) do not appear to be given sufficient attention when the regulator approves the appointment of individuals to these positions. More attention needs to be given to an individual's credentials and qualifications, as well as the operational requirements for the key positions at the operator. Furthermore, although there are regulatory requirements relating to the roles and responsibilities that these key positions must fulfill, there are no training requirements for individuals appointed to these positions.

Improvements to older aircraft

The SII also identified the difficulty in making improvements to older aircraft such as installing new avionics because it would require a change to the original aircraft type design. The approval process required by Transport Canada (TC) requires a supplemental type certificate to be developed, which can be a costly and burdensome process; for some smaller operators, the costs may be prohibitive.

Fatigue in aircraft maintenance engineers

The industry consultations revealed that AMEs often experience fatigue when working, especially when they are working in a remote location or away from their main base. Duty days can be long, and duty-day hours for AMEs are not subject to TC's regulations. Some operators stated that duty days for AMEs are often not defined by operators and that AME duty-day regulations are required.

Closing the gaps

Some operators have identified gaps in the existing regulations and standards. Some operators' recommended practices go beyond the current regulatory requirements or include concepts that are not yet addressed by regulations, for example

- carrying out all flights under instrument flight rules
- using 2 pilots for all operations
- establishing their own minimum requirements for pilot flight experience

However, in the face of the competing pressures illustrated by the safe operating envelope model, operators may choose to simply comply with the regulations even though exceeding them would increase safety pressure (e.g., limiting training expenses by providing only the training required by regulation, even when specialized mountain or survivability training would mitigate risks associated with the operation). As long as gaps, such as the ones identified in the SII exist in the regulatory framework, there will be an uneven level of safety in the air-taxi sector.

Therefore, the Board recommended that

> the Department of Transport review the gaps identified in this safety issue investigation regarding Subpart 703 of the Canadian Aviation Regulations and associated standards, and update the relevant regulations and standards.
>
> **TSB Recommendation A19-04**

Previous responses and assessments

January 2020: response from Transport Canada

TC agrees with the recommendation.

TC strives to ensure regulations are appropriate for the sector and has been working on the three main areas identified in the Safety Issue Investigation (SII), namely: Training and qualifications, improvements to older aircraft and fatigue among aircraft maintenance engineers (AMEs).

Training and qualifications

There are two initiatives underway that have the potential to enhance training and qualification requirements in the air taxi sector to increase the focus on managing the types of operational risks highlighted in the air taxi investigation report while maintaining crew competence in basic aircraft maneuvers:

TC is undertaking a review of training and qualification requirements in all subparts of the *Canadian Aviation Regulations* (CARs). This will include an examination of pilot proficiency check schedules, training captain and instructor qualification requirements, operator training curriculum requirements, approved check pilot manuals and flight test guides and the expanded approval of flight training devices, particularly for subparts 702 and 703. This

initiative will begin with communication and consultation with industry in 2020 with drafting of regulatory material by 2022. Implementation of identified changes would be expected in 2023.

As part of Transport Canada's transformation strategy and within the scope of the Civil Aviation Regulatory Review project, a regulatory review is underway to look at training irritants related to personnel training, qualifications and licensing. This package includes Part IV, VI and VII irritants identified in the 2015/16 work (Notice of Proposed Amendments from 1999-2015, internal comments etc.) as well as existing irritants raised from the 2013 Fletcher report, Let's Talk submissions, and the Fall 2018 Treasury Board survey published in the *Canada Gazette*, Part I (CGI). This regulatory package is anticipated for CGI publication in 2020/21.

Improvements to older aircraft

TC is currently updating Airworthiness Manual Chapter 523[1] *Normal, Utility, Aerobatic and Commuter Category Aeroplanes*. The intent of this update is to facilitate design changes on normal category airplanes. The changes will ease the introduction of "life-saving technologies" (angle of attack indicator, moving map GPS displays for example) with less certification administrative burden than has been required under the current prescriptive standards of airworthiness to an increased number of aircraft. TC anticipates having the required guidance documentation to support these changes submitted for consultation through the Canadian Aviation Regulation Advisory Council (CARAC) process early in 2020.

Fatigue in aircraft maintenance engineers

TC has been working to address the issue of fatigue in aviation. Specifically, TC has updated flight and duty time limits for pilots. It is also providing support and input to the amendments to the *Canada Labour Code* (CLC) being proposed by Employment and Social Development Canada (ESDC). These amendments are meant to update the CLC to better align with international standards and improved employee work-life balance. These could have a positive impact on fatigue management. ESDC is currently in the process of launching a last round of stakeholder consultations before drafting supporting regulations, which are anticipated to come into force in late spring, or summer 2020.

Finally, TC continues to work with industry to improve safety and to address TSB recommendations and is making good progress. The report highlights 22 active recommendations as having the potential to enhance safety in the air taxi sector, 18 of which are directed to TC. Our efforts are showing results and the TSB has assessed TC's response to more than 70% of these recommendations as being either "Satisfactory in Part" or "Satisfactory Intent."

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1 *Canadian Aviation Regulations*, Airworthiness Manual, Chapter 523 — *Normal, Utility, Aerobatic and Commuter Category Aeroplanes*. Available at: https://www.tc.gc.ca/en/transport-canada/corporate/acts-regulations/regulations/sor-96-433/part5-standards-523-menu-696.htm

We recognize there is more to be done. The three recommendations cited in the report for which TC has received an "unable to assess" assessment by the Board demonstrate TC's commitment to ensuring that regulatory actions are accomplished in a manner that meets the needs of all stakeholders. In all three cases (A16-12—SMS implementation, A16-10—Terrain Awareness Warning Systems (TAWS) in helicopters and A17-01—stall warning systems for the Beaver aircraft), TC has or is currently undertaking further study to ensure that actions taken address the identified safety deficiency in an effective way that can be implemented by Canadian operators. Detailed updates on TC's actions related to all three of these recommendations were recently provided to the TSB and are awaiting reassessment by the Board.

TC has received an "Unsatisfactory" rating on only two of the recommendations discussed in the report. In these cases, the action proposed by the TSB has been determined to be impracticable to implement (A90-84— helicopter instrumentation and A13-03—passenger shoulder harnesses in float planes). Although TC determined it was not feasible to pursue the specific action recommended by the TSB in these instances, other mitigations were put in place to improve float plane safety and to reduce the incidence of inadvertent flight into poor weather by helicopters. An example of this is the changes to the CARs that will enhance safety for seaplane passengers and crew published in the *Canada Gazette*, Part II in March 2019.[2] The proposed change require passengers and crew of commercial seaplanes with nine passengers or less to wear an inflatable flotation device while the aircraft operates on or over water while in seaplanes with 10 to 19 passengers, flotation devices will continue to be required onboard for all occupants; however, occupants will not be required to wear the flotation device and mandatory training for all pilots of commercial seaplanes on how to exit an aircraft under water.

March 2020: TSB assessment of the response (overall rating: unable to assess)

In its response, Transport Canada (TC) indicated that it agrees with Recommendation A19-04.

TC has initiated work in the following three areas: training and qualifications, improvements to older aircraft, and fatigue among aircraft maintenance engineers (AMEs). TC indicates that it will be taking the following approach to address the safety deficiency identified in Recommendation A19-04:

Training and qualifications (Satisfactory Intent)

In 2020, TC is undertaking a review of training and qualification requirements in all subparts of the *Canadian Aviation Regulations* (CARs), with implementation expected in 2023. This covers:

- The examination of pilot proficiency check schedules
- The training captain and instructor qualification requirements

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[2] Canada Gazette Part II, Vol. 153, No. 5 - Regulations Amending the *Canadian Aviation Regulations* (Parts I, VI and VII — Seaplane Operations) Available at: http://gazette.gc.ca/rp-pr/p2/2019/2019-03-06/html/index-eng.html

- The operator training curriculum requirements
- The approved check pilot manuals and flight test guide review
- The expanded approval of flight training devices, particularly for Subpart 702 and Subpart 703 of the CARs

As part of TC's Civil Aviation Regulatory Review project, a review of training irritants related to personnel training, qualifications and licensing is underway. This regulatory package is anticipated to be published in the *Canada Gazette*, Part I, in 2020–21.

The Board is encouraged that TC has already initiated a regulatory review and looks forward to the published details of the proposed regulatory enhancements in the near future.

Therefore, the response to Recommendation A19-04 specific to training and qualifications is assessed as **Satisfactory Intent**.

Improvements to older aircraft (unable to assess)

TC is currently updating Chapter 523, Normal, Utility, Aerobatic and Commuter Category Aeroplanes, of the *Airworthiness Manual* (AWM) to facilitate design changes on normal category airplanes, making the introduction of "life-saving technologies" such as angle of attack indicators and moving map global positioning system displays easier. The consultation process through the Canadian Aviation Regulation Advisory Council (CARAC) should take place in early 2020.

The information submitted by TC does not contain sufficient details to make an assessment as to how effective the proposed updates to Chapter 523 of the AWM will be in addressing the safety deficiency associated with Recommendation A19-04.

Therefore, the Board is **unable to assess** the response to Recommendation A19-04 specific to improvements to older aircraft.

Fatigue in aircraft maintenance engineers (unable to assess)

To address this issue, TC is supporting Employment and Social Development Canada (ESDC) in developing amendments to the *Canada Labour Code* (CLC).

The Board acknowledges that TC has provided input to the amendments to the CLC through ESDC. The purpose of Recommendation A19-04 was to review the gaps identified in this Safety Issue Investigation (SII) regarding Subpart 703 of the CARs and associated standards, and to update the relevant regulations and standards. The preamble for Recommendation A19-04 refers to the lack of duty day regulations for aircraft maintenance engineers and to the fact that the CARs do not currently address the issue in any way. The TSB is not aware of how TC/ESDC's actions will address this element of the safety deficiency.

Therefore, the Board is **unable to assess** the response to Recommendation A19-04 specific to fatigue in AMEs.

Closing the gaps (unable to assess)

The SII highlighted gaps in the existing regulations and standards that were identified by the operators. These gaps extend beyond those provided in the preamble of Recommendation A19-04. Some operators recommended practices go beyond the current regulatory requirements. As long as those gaps exist, there will be an uneven level of safety in the air-taxi sector. TC did not provide a detailed response with regards to how they plan to address the gaps in the regulations and standards identified in the SII other than the details listed above.

Therefore, the Board is **unable to assess** the overall response to Recommendation A19-04 specific to closing the gaps in the regulations and associated standards.

Latest responses and assessment

December 2020: response from Transport Canada

TC agrees in principle with the recommendation.

In its initial response to this recommendation in January 2020, TC focused on the three areas specifically identified in the preamble to the recommendation: training and qualifications, improvements to older aircraft and fatigue among Aircraft Maintenance Engineers (AMEs). Additional updates related to these three areas are provided below.

In its assessment of TC's response to the recommendation, the TSB indicated that it was unable to assess TC's response as it did not provide a detailed response with respect to plans to address the gaps in the regulations and standards identified in the Safety Issues Investigation (SII) other than the three areas cited in the recommendation. A discussion of this question is provided at the end of this update.

Training and qualifications

In its initial response, TC described two initiatives underway that have the potential to enhance training and qualification requirements in the air taxi sector to increase the focus on managing the types of operational risks highlighted in the air taxi investigation report while maintaining crew competence in basic aircraft maneuvers.

Civil Aviation Regulatory Review Project

TC mentioned, as part [of] the Civil Aviation Regulatory Review project, [that] a regulatory review was underway to identify training irritants specifics to Parts IV, VI and VII - Personnel Training, Qualifications and Licensing of the CARs.

Since it began, 172 training irritants, including many respecting 703 operators, were identified by various sources[3] and will be addressed in a regulatory proposal that will improve the clarity of Parts IV, VI, and VII as well as help in the modernization of the CARs by addressing the advancements seen in aviation technology. Presently, those 172 irritants are under review by the various subject matter experts (SMEs) in Civil Aviation to confirm relevancy as many irritants go back 20 plus years.

Once this internal review is complete, a call out for an external task team will take place to get together and review and recommend a way forward on addressing the issues. It is anticipated to have a regulatory package developed for consultation in the Fall of 2021.

Working Group (WG) on the Modernization of Training and Checking

In its initial response to this recommendation, TC provided details of a review of training and qualification requirements in all subparts of the CARs that includes, among others, an examination of pilot proficiency check schedules, training captain and instructor qualification requirements, operator training curriculum requirements, approved check pilot manuals and flight test guides, and the expanded approval of flight training devices, particularly for subparts 702 and 703.

This work is underway. TC announced its intent to establish a WG with industry to collaborate and evolve pilot training and checking practices in commercial and general aviation in CARs subparts 604, 702, 703 and 704. The WG will evaluate options to enhance the development of core competencies during training and checking and consider regulatory changes to optimize the use of Flight Simulation Training Devices (FSTDs) across the subparts under review.

With respect to subpart 703, air operators who conduct operations under this subpart will benefit from all stated goals in the Terms of Reference.[4] Specifically, these operators will benefit from:

- More relevant and productive pilot training that focuses on the core competencies that greatly influence the prevention, or outcome, of incidents and accidents;
- Better qualified and trained persons who conduct training on other pilots;
- Regulatory changes that incentivize operators to incorporate the use of Flight Training Devices in operator flight training programs. This will significantly enable effective training in the management of abnormal events and emergencies, which cannot be effectively replicated in an aircraft.

Next steps include:

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3 TSB, Standing Joint Committee on the Scrutiny of Regulations, internal consultation, a 2013 national consultation conducted by former Minister of State, "Let's Talk" submissions and Treasury Board regulatory review

4 Transport Canada (2020). Industry Communique – Update on Modernizing and Enhancing Pilot Training Regulation.

- A review of the International Civil Aviation Organization (ICAO) recommendations on Evidence-Based Training (EBT), Competency Based Training and Assessment (CBTA) and use of Flight Simulation Training Devices (FSTDs), and a review [of] training and checking practices in other countries by the end of 2020;
- A draft NPA and any required ACs or TPs for alternate training programs. This will be circulated to TC regions for consultation by September 2022; and,
- The publication of regulatory changes and issue AC and/or TP as applicable by July 2023.

Improvements to older aircraft

In its initial response, TC described work in progress to update the Airworthiness Manual (AWM) Chapter 523,[5] *Normal, Utility, Aerobatic and Commuter Category Aeroplanes* with the intention to facilitate design changes on normal category airplanes.

In early 2021, TC will publish proposed amendments to AWM Chapter 523 that will harmonize Canada's design standards for small aeroplanes with those of Title 14 of the United States *Code of Federal Regulations* (14 CFR) part 23 at amendments 23-64. These amendments intend to provide greater flexibility to applicants seeking certification of their aeroplane designs, and to facilitate faster adoption of safety enhancing technologies (e.g., angle of attack indicators, moving-map GPS displays) in type-certificated aeroplane designs. At the same time, the proposed amendments intend to reduce regulatory time and cost burdens for the aviation industry and TC. The proposed amendments reflect a safety continuum philosophy, which balances an acceptable level of safety with the societal burden of achieving that level of safety, across the broad range of certificated small aeroplane types. This safety-continuum philosophy would maintain aviation safety while enabling a relaxation of the design certification burden for both new aeroplane types, and design changes to existing types, in proportion to the number of passengers and performance of the aeroplane.

In particular, these amendments will allow the use of industry consensus standards accepted by the Minister as a means of compliance to the design standards of airworthiness. The use of these consensus standards as a means of compliance intends to streamline the certification process. However, consensus standards are one means, but not the only means, of showing compliance to the performance-based standards. Applicants will also have the option to propose their own means of compliance, as they do today, but with reduced administrative burden by requiring fewer special conditions or exemptions, lowering costs and causing fewer project delays.

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5 Canadian Aviation Regulations. *Airworthiness Manuel Chapter 523 – Normal, Utility, Aerobatic and Commuter Category Aeroplane*. Available at: https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/standards/part-v-airworthiness-chapter-523-normal-utility-aerobatic-commuter-category-aeroplanes

This change addresses the unintended excessive certification burden for smaller, lower performance aeroplanes that has resulted from the evolution of design standards towards the safety needs of complex and high performance aeroplanes (e.g., very light jets).

Additionally, recent developments in the United States (U.S.) general aviation aftermarket industry have made available certain equipment aimed at enhancing the safety of operation of small aeroplanes. In the U.S., the Federal Aviation Administration (FAA) has approved the production under 14 CFR 21.8(d) of certain Non-Required Safety Enhancing Equipment (NORSEE), where these equipment may be installed in small aeroplanes under FAA rule as an alteration, without necessarily requiring a design approval. In many cases, the NORSEE installation would constitute no more than a minor change to type design of the aeroplane. TC is investigating a means to permit these parts to be installed in Canada on Canadian-registered small aeroplanes.

Fatigue in aircraft maintenance engineers

In its initial response to this recommendation, TC described ongoing work with both the aviation industry and Employment and Social Development Canada (ESDC) to encourage an appropriate balance to manage operational needs of the aviation industry while providing sufficient rest for employees.

The *Canada Labour Code* (CLC) proposed amendments, described in TC's initial response, target work life balance. The scope of the ESDC amendments, which apply to scheduling, breaks and leave provisions to improve work-life balance, have the potential to positively impact on the overall well-being of AMEs in general and to reduce the likelihood of AME fatigue.

In addition to supporting these regulatory changes, TC has a number of provisions in place to address the potential for fatigue in aircraft maintenance organizations. Since 2002, Approved Maintenance Organizations (AMO) require human factors training that includes human performance, factors influencing human error caused by fatigue and error management (Standard 573 – *Approved Maintenance Organizations*[6] and Standard 726 – *Air Operator Maintenance*[7] in the CARs). TC has also published several documents on fatigue including AC SUR-001 - *Development and Implementation of Fatigue Risk Management Systems in the Canadian Aviation Industry*[8], which contains guidance for small operators and AMOs. However, these requirements were developed between 10-18 years ago, and TC does recognize that it may be time to review our current tools with regards to fatigue and its impact on AMEs.

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6 Canadian Aviation Regulations. *Standard 573 – Approved Maintenance Organizations*. Available at: https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/standards/part-v-standard-573-approved-maintenance-organizations-0

7 Canadian Aviation Regulations. *Standard 726 – Air Operator Maintenance*. Available at: https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/standards/part-vii-commercial-air-services-5

8 Transport Canada (2011). Advisory Circular SUR-001 - *Development and Implementation of Fatigue Risk Management Systems in the Canadian Aviation Industry*. Available at: https://tc.canada.ca/en/aviation/reference-centre/advisory-circulars/advisory-circular-ac-no-001

TC is of the opinion that a change to the CARs is not warranted at this time. In addition to the measures described above, TC favours an approach to this issue based on awareness and education. As such, TC will conduct a review of our current guidance materials to determine if new guidance is required in order to provide up-to-date expectations on how certificate holders should be managing fatigue that may affect AMEs. TC expects our initial review to be completed by the end of winter 2021. Further steps, depending on findings and subsequent analysis, will be determined following this initial review.

Closing the gaps in regulation and associated standards

Overall, TSB assessed TC's initial response to this recommendation as "unable to assess", stating that "TC did not provide a detailed response with regards to how they plan to address the gaps in the regulations and standards identified in the SII [safety issues investigation] other than the details listed above."

Given the length and complexity of the SII, TC sought a meeting with the TSB in November 2020 to clarify expectations and to better understand the gaps referred to by the TSB. From this meeting, it was understood that TSB's expectation is that TC review the 19 safety themes identified in section 4 of the report to identify areas where operators were exceeding regulatory requirements to determine if any of these best practices should be reflected in the regulations.

The ICAO Manual of [Aircraft] Accident [and Incident] Investigation (ICAO Doc 9756) states that "a safety recommendation would be warranted if the analysis of the investigation information determines the existence of an underlying factor(s) with high risks for which the defenses are less than adequate."[9] A comprehensive analysis is necessary since, determining appropriate safety action requires a clear understanding of the hazard and the effectiveness of existing defenses to facilitate an analysis of the additional mitigations required to bring the residual risk to an acceptable level.

The 19 safety themes described in the SII do not meet this threshold of validated safety deficiencies, but represent high level descriptions of issues and best practices identified throughout the consultations with operators.[10] While the SII provides a valuable review of issues facing operators and identifies a significant number of best practices, additional work would be required to determine if any of these are indicative of a safety deficiency that would require a regulatory approach to address.

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9 International Civil Aviation Organization (2020). *Doc 9756 – Manual of Aircraft Accident and Incident Investigation – Part IV – Reporting*, 3rd Edition, Appendix 6 to Chapter 1 (Guidelines on the identification, drafting and follow-up on safety recommendations), p. IV-1-49.

10 Transportation Safety Board (2019). *Air Taxi Safety Issue Investigation (A15H0001)*, p. 145: "The information collected in Phase 2 of the SII represents the views of those who participated in the investigation. These views have not been independently validated by the TSB, nor do they reflect ongoing initiatives by service providers or the regulator."

TC takes the safety of the air taxi sector seriously and will continue to focus its efforts on clearly identified safety deficiencies. Significant work is underway to address the specific issues identified in the SII (see updates to recommendations [A19-02 and A19-05] and the specific areas cited in this recommendation [updates above]). In addition, TC welcomes further analysis from the TSB in identifying the existence of specific underlying factors with high risks for which existing defenses are demonstrably inadequate in any of the themes identified in the SII.

December 2023: response from Transport Canada

TC agrees in principle with the recommendation.[11]

In its initial response to this recommendation in January 2020 and the subsequent one in December 2020, TC focused on the three areas specifically identified in the preamble to the recommendation: training and qualifications, improvements to older aircraft, and fatigue among Aircraft Maintenance Engineers (AMEs).

The TSB noted in its evaluation of TC's response to the recommendation that it could not fully assess it as it did not provide a detailed response with respect to plans to address the gaps in the regulations and standards identified in the Safety Issues Investigation (SII) other than the three areas cited in the recommendation.

Given the length and complexity of the SII, TC sought a meeting with the TSB in November 2020 to clarify expectations and to better understand the gaps referred to by the TSB. From this meeting, it was understood that TSB's expectation is that TC review the 19 safety themes identified in section 4 of the report to identify areas where operators were exceeding regulatory requirements to determine if any of these best practices should be reflected in the regulations.

The ICAO Manual of Accident Investigation (ICAO Doc 9756) states that: "*A safety recommendation would be warranted if the analysis of the investigation information determines the existence of an underlying factor(s) with high risks for which the defenses are less than adequate.*"[12] A comprehensive analysis is necessary since determining appropriate safety action requires a clear understanding of the hazard and the effectiveness of existing defenses to facilitate an analysis of the additional mitigations required to bring the residual risk to an acceptable level.

The 19 safety themes described in the SII do not meet this threshold of validated safety deficiencies but represent high level descriptions of issues and best practices identified

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11 All responses are those of the stakeholders to the TSB in written communications and are reproduced in full. The TSB corrects typographical errors and accessibility issues in the material it reproduces without indication but uses brackets [ ] to show other changes or to show that part of the response was omitted because it was not pertinent.

12 International Civil Aviation Organization (2020). Doc 9756 – Manual of Aircraft Accident and Incident Investigation – Part IV – Reporting, 3rd Edition, Appendix 6 to Chapter 1 (Guidelines on the identification, drafting and follow-up on safety recommendations), p. IV-1-49.

throughout the consultations with operators.[13] While the SII provides a valuable review of issues facing operators and identifies a significant number of best practices, additional work would be required to determine if any of these are indicative of a safety deficiency that would require a regulatory approach to address.

TC takes the safety of the air taxi sector seriously and will continue to focus its efforts on clearly identified safety deficiencies. Significant work is underway to address the specific issues identified in the SII. Out of the 18 recommendations that are applicable to the air-taxi sector and referenced in the SII,[14] 3 were closed in the past 2 years, and TC is actively working and providing updates to the TSB on more than 10 of them. In addition, TC welcomes further analysis from the TSB in identifying the existence of specific underlying factors with high risks for which existing defenses are demonstrably inadequate in any of the themes identified in the SII.

March 2024: TSB assessment of the responses (unable to assess)

In its responses from both December 2020 and December 2023, Transport Canada (TC) indicated that it agrees in principle with Recommendation A19-04.

TC has initiated work in the following 3 areas: training and qualifications, improvements to older aircraft, and fatigue in aircraft maintenance engineers (AMEs). TC indicated that it will be taking the following approach to address the safety deficiency identified in Recommendation A19-04.

Training and qualifications

The 2 following initiatives are underway that have the potential to enhance training and qualification requirements in the air taxi sector.

Civil Aviation Regulatory Review project

TC continued work on a Civil Aviation Regulatory Review project to identify irritants regarding personnel training and licensing.

Since the last update, TC has confirmed that a multi-disciplinary task team was convened in 2021 to consult on proposed regulatory changes in relation to personnel training and licensing.

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13 Transportation Safety Board (2019). Air Taxi Safety Issue Investigation (A15H0001), "The information collected in Phase 2 of the SII represents the views of those who participated in the investigation. These views have not been independently validated by the TSB, nor do they reflect ongoing initiatives by service providers or the regulator."

14 Transportation Safety Board (2019). Air Taxi Safety Issue Investigation (A15H0001), "Appendix B – List of active TSB recommendations that are applicable to the air-taxi sector. p. 201. Available at: https://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/etudes-studies/a15h0001/a15h0001.pdf

To that end, TC added a new activity to Notice of Proposed Assessment (NPA) 2022-001.[15] TC anticipates publication of the proposed regulatory changes in the *Canada Gazette*, Part I in April 2024.

Working group on the modernization of training and checking

TC indicated that work is underway to review training and qualification requirements in all subparts of the *Canadian Aviation regulations* (CARs). This includes an examination of pilot proficiency check schedules, training captain and instructor qualification requirements, operator training curriculum requirements, approved check pilot manuals and flight test guides, and the expanded approval of flight training devices, particularly for subparts 702 and 703.

TC also stated its intention to establish a working group (WG) with industry to develop pilot training and checking practices in CARs subparts 604, 702, 703, and 704 operations. The intention of the WG is to assess options to enhance the development of core competencies during training and checking, and to consider regulatory changes to optimize the use of flight simulation training devices (FSTDs) across the subparts under review.

Specific to the air-taxi sector, TC stated the benefits will be:

- more relevant and productive pilot training;
- better qualified and trained persons who conduct training; and
- an incentive for operators to incorporate the use of flight training devices in their flight training programs.

Since its latest responses, TC indicated that a joint WG was established with industry stakeholders in late 2020; however, meetings ended in 2022 due to resource issues. Notwithstanding, WG activities led to the publication of Advisory Circular (AC) 700-062: Alternate Pilot Proficiency Check – Phased PPC.[16] The purpose of the AC is "to describe an alternate means of conducting a **recurrent** [emphasis in original] Pilot Proficiency Check (PPC) under subparts 702, 703, and 704 of the *Canadian Aviation Regulations* (CARs)."[17]

As described in the AC,

> The Phased PPC integrates training and checking in a manner that promotes learning over checking. It is a three-phased model that mirrors the assess – train – reassess concept embodied in advanced training programs such as Evidence-Based Training (EBT) and the Advanced Qualification Program (AQP). […] The Phased PPC differs from

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15 Transport Canada, Notice of Proposed Amendment (NPA) 2022-001: Personnel Qualifications Training and Licensing, at https://wwwapps.tc.gc.ca/Saf-Sec-Sur/2/NPA-APM/npaapmr.aspx?id=3017&GoCTemplateCulture=en-CA (last accessed on 25 April 2024).

16 Transport Canada, Advisory Circular (AC) No. 700-062: Alternate Pilot Proficiency Check – Phased PPC (2021), at https://tc.canada.ca/en/aviation/reference-centre/advisory-circulars/advisory-circular-ac-no-700-062 (last accessed on 25 April 2024).

17 Ibid., Section 1.1: Purpose.

> traditional checking by providing a candidate with the opportunity to improve sub-standard performance before declaring the PPC unsuccessful. It is compliant with the CARs and Commercial Air Services Standard (CASS) and does not require a regulatory exemption. It is assessed and documented in the same manner as the existing PPC, except as noted in this AC.[18]

Additionally, TC noted that work is still underway to assess opportunities to optimize the use of flight simulation training devices (FSTDs) across the CARs subparts.

TC indicated that its review of the International Civil Aviation Organization (ICAO) recommendations on evidence-based training, competency-based training and assessment and use of FSTDs, and that its review of training and checking practices in other countries would be completed by the end of 2020; however, it did not provide the status of these reviews in its December 2023 response.

The Board is pleased with the progress made in the areas of training and qualifications, and is encouraged that TC continues to move towards regulatory amendments; however, until the regulations are amended, the risk associated with the safety deficiency related to this theme will persist.

Improvements to older aircraft

TC published amendments to Chapter 523 of the *Airworthiness Manual* in 2021. The amendments harmonize Canada's design standards for small airplanes with those of Title 14 of the United States (U.S.) *Code of Federal Regulations* (14 CFR), Part 23 at amendment 23-64. TC also indicated in its response that the amendments are intended to provide greater flexibility to applicants seeking certification of their airplane designs, and to facilitate faster adoption of safety enhancing technologies in type-certificated airplane designs. It further stated that the changes are also intended to reduce regulatory time and cost burdens for the aviation industry and TC. It is unclear whether the changes will directly benefit air-taxi operators.

TC also indicated in its response that it is looking at what the U.S. Federal Aviation Administration (FAA) is doing regarding non-required safety enhancing equipment (NORSEE) with a view to seeing if something similar could be implemented in Canada. The FAA has the ability to approve the production of certain equipment aimed at enhancing the safety of operation under 14 CFR 21.8(d). In the U.S., this equipment may be installed in small airplanes under FAA rule as an alteration, potentially allowing installation as a minor change to the airplane type design. Although rotorcraft were not mentioned in TC's response, it is the TSB's understanding that the FAA NORSEE approval is also applicable to products designed for rotorcraft, which could address the cost and burden associated with a rotorcraft design change for installation of safety equipment.

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[18] Ibid., Section 3.0: Background and Section 4.0: General.

Following its latest update, TC has confirmed that upon review, while CARs Subpart 521 (Approval of the Type Design or a Change to the Type Design of an Aeronautical Product) requires a supplemental type certificate to be developed, the cost burden is reduced with the performance-based requirements, as compared to the previous prescriptive design requirements.

The Board is encouraged by the changes that TC has made to date and believes that these actions have the potential to address the risk associated with the safety deficiency related to this theme.

Fatigue in aircraft maintenance engineers

In its December 2020 response, TC reiterated that it has provided input to Employment and Social Development Canada with regards to proposed changes to the *Canada Labour Code* (CLC).

On 19 December 2020, proposed amendments to the CLC that support work-life balance were published in the *Canada Gazette*, Part I. However, the proposed amendments are being implemented with a phased-in approach. As stated in the *Canada Gazette*, Part I:

> The pandemic prevented stakeholders in other sectors, including aviation […] from making submissions following the second round of consultations held in February and March 2020. As a result, regulatory development will resume once these stakeholders indicate they are ready to re-engage.[19]

It remains unclear when proposed amendments applicable to AMEs in the aviation sector will be published in the *Canada Gazette*, Part I, as the proposed regulations only apply to federally regulated employees and employers in the road transportation, postal and courier, the marine (pilotage, marine transportation and long-shoring), and the grain sectors.

In its response, TC stated that the proposed CLC changes have the potential to positively impact the overall well-being of AMEs in general and to reduce the likelihood of AME fatigue. This indicates that TC is uncertain of the extent to which changes to the CLC will affect fatigue in AMEs. It also appears that TC is relying on changes to the CLC to mitigate the risk associated with the safety deficiency related to this theme.

TC stated that human factors training, which includes factors influencing human error caused by fatigue and error management, is already a requirement in the current regulations. TC has previously published fatigue-related guidance material to be used by small operators and aircraft maintenance organizations. TC indicated that because the guidance material is 10 to 18 years old, it would conduct a review of the material; however, it has recently acknowledged that it has not completed a review on this subject. The subject of fatigue and the effect on

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[19] Government of Canada, *Canada Gazette*, Part I, Vol. 154, No. 51 (19 December 2020), Exemptions from and Modifications to Hours of Work Provisions Regulations, available at http://gazette.gc.ca/rp-pr/p1/2020/2020-12-19/html/reg1-eng.html (last accessed 25 April 2024).

maintenance personnel will be discussed at future ICAO Airworthiness Panel meetings. Should ICAO make changes to its Standards and Recommended Practices or guidance material that address the subject of fatigue in maintenance personnel, TC may reassess its position at that time.

The Board remains concerned that TC is not considering any regulatory changes to address fatigue in AMEs at this time. However, TC's response suggests it may be open to such action in the future.

Closing the gaps in regulations and associated standards

In its December 2020 response, TC indicated that it understood, from the high-level meeting with the TSB held in November 2020, that it was expected to "review the 19 safety themes identified in section 4 of the report to identify areas where operators were exceeding regulatory requirements to determine if any of these best practices should be reflected in the regulations." The understanding that a simple review of the 19 safety themes *alone* would suffice to address the gaps in regulations and associated standards is incorrect.

The hazards and risk factors for which defences were demonstrably inadequate were highlighted throughout the report and were grouped under 19 safety themes.

The research methods used to perform the analysis of *all* the data collected followed quantitative and qualitative research methods for which details and references can be found in Section 3.0 *Methods*, and the appendices of the Safety Issue Investigation (SII) report. The safety analysis performed throughout the study applied the TSB's Integrated Safety Investigation Methodology. The 19 safety themes emerged from the analysis of the results of the accident data (Phase 1), industry consultation (Phase 2), and a review of previous safety studies (both phases). To clarify, each theme section of the report includes:

- an analysis and a discussion of the hazards / safety pressures (the context);
- an analysis of previous TSB findings and recommendations (accident data); and
- an analysis of previous safety studies.

Section 4.2 *Information from consultations with industry* contains the data and analysis from industry consultation, i.e., what operators said, but it *also* contains the detailed analysis of *all* the data gathered in Phase 1 and Phase 2 of the SII organized by theme. The title of Section 4.2 may be misleading, as the 19 safety themes found within this section in fact represent hazards / safety pressures for which the defences were demonstrably inadequate. As TC mentioned, the SII provides a valuable review of issues facing operators, and identifies a significant number of best practices. However, the SII *also* highlights gaps in regulations and associated standards for each safety theme in Section 4.2.

The intent of the SII was to identify any underlying systemic safety issues that need to be addressed, so that action can be taken to reduce the persistent risks in air-taxi operations across Canada. The regulatory framework safety theme is only 1 of the 19 hazards / safety pressures identified in the report, and it is where gaps in regulations are discussed the most.

The scope of the SII was *not* limited to identifying issues related to Subpart 703 of the CARs and associated standards. As a result, and due to the diversity and complexity of the air-taxi sector, gaps in regulations also appear in the other 18 safety themes. Therefore, the TSB would like to direct TC to review the report in detail, specifically, but not limited to:

- Section 4.0 *Information gathered during the investigation*:
  - The 19 safety themes (hazards / safety pressures), with particular attention to Section 4.2.18 *Regulatory framework*.
- Section 5.0 *Discussion*:
  - The accident type discussion of how the underlying factors emerged.
  - The list found in the blue box in Section 5.1.2 *Accident types and operating context*, that "identified weak or missing defences that, if improved or addressed, have the potential to enhance safety."
  - Descriptions of risks and conclusions found in tables 27, 28, and 29 (that were *not* derived from actions suggested by operators or TC inspectors) for each of the 19 safety themes (hazards).
- Section 6.0 *Conclusion*:
  - The rationale leading to the safety actions required.
  - Section 6.6.1 *Active TSB recommendations*.
  - Section 6.6.2.3.4 *Closing the gaps*, where "[s]ome operators have identified gaps in the existing regulations and standards. Some operators' recommended practices go beyond the current regulatory requirements or include concepts that are not yet addressed by regulations." This corroborated the TSB findings of the accident data, which themselves emerged from the TSB analysis.

The Board recognizes and is encouraged by TC's continued work to address specific parts of the recommendation related to training and qualifications, improvements to older aircraft, and fatigue in AMEs.

However, these are only 3 of the 19 hazards / safety pressures (safety themes) identified in the SII, and the Board remains very concerned that TC did not provide a detailed response with regard to how it plans to address the gaps in the regulations and associated standards other than those detailed above.

Therefore, the Board is **unable to assess** the overall response to Recommendation A19-04 specific to closing the gaps in the regulations and associated standards.

File status

The TSB will continue to monitor the progress of TC's actions to mitigate the risks associated with the safety deficiencies identified in Recommendation A19-04, and will reassess the response to the recommendation on an annual basis or when otherwise warranted.

This deficiency file is **Active**.