TSB Recommendation A16-10

Terrain awareness and warning systems for helicopters

The Transportation Safety Board of Canada recommends that the Department of Transport require terrain awareness and warning systems for commercial helicopters that operate at night or in instrument meteorological conditions.

Air transportation safety investigation report	A13H0001
Date the recommendation was issued	15 June 2016
Date of the latest response	October 2022
Date of the latest assessment	March 2023
Rating of the latest response	Satisfactory in Part
File status	Active

Summary of the occurrence

On 31 May 2013, at approximately 0011 Eastern Daylight Time, the Sikorsky S-76A helicopter (registration C-GIMY, serial number 760055), operated as Lifeflight 8, departed at night from Runway 06 at the Moosonee Airport, Ontario, on a visual flight rules flight to the Attawapiskat Airport, Ontario, with 2 pilots and 2 paramedics on board. As the helicopter climbed through 300 feet above the ground toward its planned cruising altitude of 1000 feet above sea level, the pilot flying commenced a left-hand turn toward the Attawapiskat Airport, approximately 119 nautical miles to the northwest of the Moosonee Airport. Twenty-three seconds later, the helicopter impacted trees and then struck the ground in an area of dense bush and swampy terrain. The aircraft was destroyed by impact forces and the ensuing post-crash fire. The helicopter's satellite tracking system reported a takeoff message and then went inactive. The search-and-rescue satellite system did not detect a signal from the emergency locator transmitter (ELT). At approximately 0543, a search-and-rescue aircraft located the crash site approximately 1 nautical mile northeast of Runway 06, and deployed search-and-rescue technicians. However, there were no survivors.

The Board concluded its investigation and released report A13H0001 on 15 June 2016.

Rationale for the recommendation

This occurrence was a controlled flight into terrain (CFIT) accident, in which a serviceable aircraft was unintentionally flown into the ground. During an attempt to conduct a night visual departure in extremely dark conditions, an inadvertent descent developed, and the aircraft struck the terrain. When the flight crew recognized that an inadvertent descent had developed, they were at an altitude from which they were unable to recover. Although some aircraft of the operator's S-76A fleet were equipped with a terrain awareness and warning system (TAWS), the occurrence aircraft was not, and was not required by regulation to be equipped with one. As a result, the flight crew did not receive a timely warning of the inadvertent descent or the impending impact.

A large number of commercial helicopters routinely conduct flight operations at night or in instrument meteorological conditions (IMC), or both. Without the benefit of TAWS, such aircraft are at significantly greater risk for CFIT. The TSB has investigated a number of helicopter occurrences that took place at night or in IMC where TAWS may have proven useful in preventing an accident.

In Canada, commercially operated aeroplanes and some privately operated aeroplanes are required by regulation to be equipped with TAWS. However, there is no such regulatory requirement for commercial helicopters, despite the fact that they often operate along similar routes as commercial fixed-wing aircraft, and sometimes carry larger numbers of passengers. As a result, the regulations do not currently provide for an equivalent level of safety between commercial fixed-wing versus commercial rotary-wing operations.

Until there is a requirement for Canadian-registered commercial helicopters to be equipped with TAWS, the crew members and passengers who travel on those aircraft at night or in IMC will continue to be at increased risk for injury or death due to CFIT.

Therefore, the Board recommended that

> the Department of Transport require terrain awareness and warning systems for commercial helicopters that operate at night or in instrument meteorological conditions.
>
> **TSB Recommendation A16-10**

Previous responses and assessments

September 2016: response from Transport Canada

Transport Canada agrees in principle with this recommendation.

TC will engage the helicopter community in 2017 to inform the department on how to address this recommendation.

December 2016: update from Transport Canada

Transport Canada will be sending out a letter in 2017 to the helicopter community requesting data on terrain awareness & warning systems. The data will then be analyzed and TC will determine a way forward.

December 2016: TSB assessment of the response (unable to assess)

In its response, TC indicated that it agrees in principle with this recommendation and advises that it will be sending out letters to the helicopter community in 2017 to seek their input on this issue. As there is no indication as to what actions will be taken once the data collected has been analysed, it is unclear how and if the ensuing actions will address the intent of this recommendation.

Therefore, the Board is **unable to assess** Transport Canada's response to Recommendation A16-10.

October 2017: response from Transport Canada

TC agrees in principle with the recommendation.

While TC has not heard back from the Helicopter Association of Canada (HAC), TC will follow up and discuss this subject during HAC's upcoming safety meeting in the fall.

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

In its response, TC indicated that it was waiting to hear back from the Helicopter Association of Canada (HAC) and that it would follow up and discuss this issue at the HAC safety meeting that took place in November 2017. The TSB has not received any additional information following this meeting, indicating if TC has started collecting and analyzing data on terrain awareness and warning systems or determined what actions it intends to take in order to mitigate the risks associated with the safety deficiency identified in Recommendation A16-10.

The TSB is concerned with the lack of progress in addressing this safety deficiency.

Therefore, the Board remains **unable to assess** Transport Canada's response to Recommendation A16-10**.**

March 2019: response from Transport Canada

TC agrees in principle with the recommendation.

TC is considering making use of terrain awareness and warning systems (TAWS) mandatory in rotorcraft. Industry stakeholders, reporting to the night visual flight rules (NVFR) working group, are currently reviewing the available technology and its limitations, to develop appropriate wording intended for incorporation in the regulations and standards. This work is ongoing, and recommendations should be ready for submission for decision making by spring, 2020.

In the interim until a decision is taken, TC will promote the voluntary use of TAWS for rotorcraft starting in the summer of 2019 through social media, online engagement, and conference discussions.

May 2019: TSB assessment of the response (unable to assess)

In its response, Transport Canada (TC) indicated that it agrees in principle with this recommendation and advises that it is considering making terrain awareness and warning systems (TAWS) mandatory in rotorcraft, depending on recommendations from the night visual flight rules (VFR) working group. Until a decision is made, TC will promote the voluntary use of TAWS for rotorcraft starting in the summer of 2019.

As there is no indication as to what actions will be taken once the recommendations from the night VFR working group are received, it is unclear how and if the ensuing actions will address the intent of this recommendation.

Therefore, the Board remains **unable to assess** Transport Canada's response to Recommendation A16-10.

December 2019: response from Transport Canada

TC agrees in principle with the recommendation.

The topic is still under discussion in the TC Night VFR Working Group. No recommendation has been made yet, as emerging technologies such as enhanced visual systems are being evaluated to determine if they might be more effective or applicable. The working group meetings and deliberations are ongoing.

In the interim, beginning in early 2020, TC will promote the voluntary use of terrain awareness and warning system for rotorcraft through social media, online engagement, and conference discussions.

December 2020: additional information from Transport Canada

TCCA [Transport Canada, Civil Aviation] is addressing this matter by separately assessing safety considerations for helicopter operators who only operate VFR [visual flight rules] (day or night), from helicopter operators who also conduct Instrument Flight Rules (IFR) operations.

For VFR only operators (day or night), TCCA acknowledges the potential benefits of HTAWS [helicopter terrain awareness and warning systems] but does not support the mandatory requirement for HTAWS. Rather, TCCA believes that a more balanced solution is to continue to have industry associations and TCCA encourage the use of HTAWS and other parallel capabilities, complemented by the current effort to revise the *Canadian Aviation Regulations (CARs) 602.114* and *602.115* to redefine visual references for flight at night.

The next effort for TCCA is to assess safety matters (including HTAWS) for IFR helicopter operations. As discussions continue, TCCA will remain mindful of the International Civil Aviation Organization's recent recommendation to shape regulations in a "*capability based*" manner, which in the context of this matter, discourages the mandating of prescriptive aircraft equipment requirements in favor of a broader capability. For example, a "*capability*" to reduce the risk of a controlled flight into terrain could be achieved through any combination of Terrain Awareness Systems, Radar Altitude systems, Night Vision Imaging System, other emerging technologies, and/or regulatory changes.

February 2021: TSB assessment of the response (unable to assess)

In its responses, Transport Canada (TC) indicated that it agrees in principle with Recommendation A16-10 and outlined the following:

- The topic of helicopter terrain awareness and warning system (HTAWS) is still under discussion in the TC Night Visual Flight Rules (VFR) Working Group. To date, no recommendations have emerged from this working group.
- TC plans to address the safety considerations for helicopter operators who conduct only VFR operations (day or night) separately from those who also conduct instrument flight rules (IFR) operations.
- For VFR-only helicopter operations, TC will continue to encourage the use of HTAWS and other capabilities, while continuing its efforts to amend *Canadian Aviation Regulations* (CARs) 602.114 and 602.115 to redefine visual references for flight at night.
- For IFR helicopter operations, TC will assess the safety deficiency, keeping in mind the International Civil Aviation Organization's (ICAO's) recent recommendation to shape regulations in a capability-based manner.

As there is no clear indication as to what actions will be taken, and when those actions will be completed, it is unclear how and if the ensuing actions will address the intent of this recommendation.

Therefore, the Board remains **unable to assess** Transport Canada's response to Recommendation A16-10.

September 2021: response from Transport Canada

Transport Canada (TC) agrees in principle with the recommendation.

Since the recommendation was issued, TC has consulted with industry through the night visual flight rules (VFR) working group and industry associations on the best means to address this recommendation while encouraging the voluntary installation of helicopter terrain awareness warning systems (HTAWS) in commercial helicopters.

In TC's December 2019 update and December 2020 update,[1] the Department committed to:

- Addressing the question of HTAWS for night VFR applications through the night VFR working group;
- Encouraging the use of HTAWS for VFR night operations while continuing its efforts to amend *Canadian Aviation Regulations* (CARs) 602.114 and 602.115 to redefine visual references for flight at night; and,
- Further assess the need to mandate HTAWS for Instrument Flight Rules (IFR) operations.

Following efforts to date on this subject, TC has concluded that, for both VFR only operators (day or night) and IFR operators, TC acknowledges the potential benefits of HTAWS but does not support their mandatory requirement.

As noted in previous updates, TC is mindful of the International Civil Aviation Organization's recommendations to shape regulations in a "capability based" manner, which in the context of this matter, discourages mandating prescriptive aircraft equipment requirements in favour of a broader capability. For example, a "capability" to reduce the risk of a controlled flight into terrain could be achieved through any combination of Terrain Awareness Systems, Radar Altitude systems, Night Vision Imaging System, other emerging technologies, and/or regulatory changes.

In keeping with this approach, in lieu of seeking to mandate HTAWS, TC will promote any combination of Terrain Awareness Systems, Radar Altitude systems, Night Vision Imaging System, other emerging technologies, and/or regulatory changes to continue to reduce the risk associated with controlled flight into terrain accidents.

Since the last update, TC published an article[2] in the June 2020 Aviation Safety Letter that promoted the voluntary use of TAWS for rotorcraft. Also, as noted in the update for recommendation A16-08, TC is currently conducting a disposition of comments following the closure of NPA 2020-007– *Minimum Visual Meteorological Conditions for VFR Flight - Sections 602.114 and 602.115 of the Canadian Aviation Regulations*[3] comment period and still plans to

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1 Transportation Safety Board of Canada (2021). *Additional information from Transport Canada (December 2020)*. Available at: http://www.bst-tsb.gc.ca/eng/recommandations-recommendations/aviation/2016/rec-a1610.html

2 Transport Canada (2020). Aviation Safety Letter (TP185E – Issue 3/2016) - *Helicopter terrain awareness and warning system (HTAWS)*. Available at: https://tc.canada.ca/en/aviation/publications/aviation-safety-letter/issue-1-2020/helicopter-terrain-awareness-warning-system-htaws

3 Transport Canada (2021). NPA 2021-007 - *Minimum Visual Meteorological Conditions for VFR Flight -Sections 602.114 and 602.115 of the Canadian Aviation Regulations*. Available on the CARAC website at:

make revisions to the night VFR regulations for all sectors (General Aviation included). The intent is to continue with regulatory changes to night VFR regulations, which should provide significant safety improvements to all sectors.

The target timelines for Stakeholders consultation for the NPA amending Part VI of the CARs was from May 1st to June 25th 2021 and for the NPA amending Part I, IV and VII of the CARs was from July 15th to August 15th 2021. It is anticipated that the NPAs will be published in *Canada Gazette* Part 1 in June 2022.

March 2022: TSB assessment of the response (Unsatisfactory)

In its response, Transport Canada (TC) stated that it agrees in principle with Recommendation A16-10; however, TC also indicated that while it acknowledges the potential benefits of helicopter terrain awareness and warning systems (HTAWS), it does not support their mandatory requirement. Alternatively, TC indicated it will promote any combination of terrain awareness systems, radar altitude systems, night vision imaging system, other emerging technologies, and/or regulatory changes to continue to reduce the risk associated with controlled-flight-into-terrain (CFIT) accidents.

As justification for not supporting HTAWS for commercial helicopters that operate at night or in instrument meteorological conditions, TC cites International Civil Aviation Organization recommendations to shape regulations in a "capability based" manner. However, similar Canadian regulations currently require the installation of terrain awareness warning systems on aeroplanes based on criteria such as the category of air operations as well as the size, seating configuration, and engine type.[4] The regulations do not currently provide a comparable level of safety for private and commercial helicopter operations.

The Board acknowledges that TC will continue to promote ways of reducing the risk of CFIT accidents; however, the Board is concerned that this will be insufficient to ensure an acceptable level of protection against CFIT accidents within the commercial helicopter sector. As a result, it is highly likely that the risks associated with the safety deficiency identified in Recommendation A16-10 will persist.

Therefore, TC's response to Recommendation A16-10 is assessed as **Unsatisfactory**.

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https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/canadian-aviation-regulation-advisory-council-carac

4 *Canadian Aviation Regulations* subsections 605.42(1), 703.71(1), 704.71(1)(2), and 705.84(1).

Latest response and assessment

October 2022: response from Transport Canada

Transport Canada (TC) agrees in principle with the recommendation.[5]

Since the recommendation was issued TC has consulted with industry through the night visual flight rules (VFR) working group and industry associations on the best means to address this recommendation while encouraging the voluntary installation of helicopter terrain awareness warning systems (HTAWS) in commercial helicopters.

Following efforts to date on this subject, TC has concluded that, for both VFR only operators (day or night) and IFR operators, in TC's September 2021 update, the Department acknowledged the potential benefits of HTAWS but does not support their mandatory requirement until there are overall improvements in HTAWS systems as there are still issues with this equipment on helicopters.

At this time, TC's approach would be a safety campaign with voluntary adoption which was carried out by the publication of an article[6] in the June 2020 Aviation Safety Letter that promoted the voluntary use of TAWS for rotorcraft. TC promotes any combination of Terrain Awareness Systems, Radar Altitude systems, Night Vision Imaging System, other emerging technologies, and/or regulatory changes to continue to reduce the risk associated with controlled flight into terrain accidents.

Also, as noted in the update for recommendation A16-08, Notice of Proposed Amendment (NPA) 2021-007 – *Minimum Visual Meteorological Conditions for VFR Flight - Sections 602.114 and 602.115 of the Canadian Aviation Regulations*[7], in addition to introduce new definitions of VFR (Part VI), TC will be proposing additional equipment requirements (Part VI). This NPA is seen as the catalyst for several other initiatives to improve safety in night VFR and IFR and TC plans to include more formal discussion on the implementation of HTAWS into these future discussions and drafts.

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5 All responses are those of the stakeholders to the TSB in written communications and are reproduced in full. The TSB corrects typographical errors 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.

6. Transport Canada (2020). Aviation Safety Letter (TP185E – Issue 3/2016) - Helicopter terrain awareness and warning system (HTAWS). Available at: https://tc.canada.ca/en/aviation/publications/aviation-safety-letter/issue-1-2020/helicopter-terrain-awareness-warning-system-htaws

7. Transport Canada (2021). NPA 2021-007 - Minimum Visual Meteorological Conditions for VFR Flight – Sections 602.114 and 602.115 of the *Canadian Aviation Regulations*. Available on the CARAC website at: https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/canadian-aviation-regulation-advisory-council-carac

March 2023: TSB assessment of the response (Satisfactory in Part)

In its latest response, Transport Canada (TC) stated that it agrees in principle with Recommendation A16-10.

As previously indicated, TC is assessing separately the safety concerns raised by Recommendation A16-10 for helicopter operators who operate only under visual flight rules (VFR) (day and night) and for those who operate under instrument flight rules (IFR).

- For VFR-only operators, TC acknowledges the potential benefits of helicopter terrain awareness warning systems (HTAWS), but it does not support its mandatory requirement. TC believes that a more balanced solution is to encourage the use of HTAWS and other parallel capabilities. Additionally, as per Notice of Proposed Amendment (NPA) 2021-007, TC intends to revise the *Canadian Aviation Regulations* (CARs) sections 602.114 and 602.115 to redefine visual references for flight at night. These proposed changes, expected to be published in the *Canada Gazette*, Part I in late 2023, will complement the use of HTAWS and other technologies to enhance safety during VFR operations.
- For IFR operators, TC is mindful of the International Civil Aviation Organization's recommendation to shape regulations in a "capability-based" manner. As such, TC indicated that it discourages the mandating of prescriptive aircraft equipment requirements in favor of a broader capability. In keeping with this approach, in lieu of seeking to mandate HTAWS, TC will promote any combination of Terrain Awareness Systems, Radar Altitude systems, Night Vision Imaging Systems, other emerging technologies, and/or regulatory changes to continue to reduce the risk associated with controlled flight into terrain (CFIT).

The Board is pleased to see progress being made towards amending sections 602.114 and 602.115 of the CARs to address VFR-only operations. However, it is unclear if TC's approach to promote or require a combination of technologies will ensure an acceptable level of protection against CFIT accidents for helicopter operations. As a result, it is likely that the risks associated with safety deficiency identified in Recommendation A16-10 will persist.

Therefore, the Board considers the response to Recommendation A16-10 to be **Satisfactory in Part**.

File status

The TSB will continue to monitor the progress of TC's planned actions to mitigate the risks associated with the safety deficiency identified in Recommendation A16-10, and it will reassess the deficiency on an annual basis or when otherwise warranted.

This deficiency file is **Active**.