



REASSESSMENT OF THE RESPONSE TO TSB RECOMMENDATION A16-05

Emergency locator transmitter system crash survivability standards – Transport Canada

Background

On 31 May 2013, at approximately 0011 Eastern Daylight Time, the Sikorsky S-76A helicopter (registration C-GIMY, serial number 760055), operated as Lifelight 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. 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.

TSB Recommendation A16-05 (June 2016)

In this occurrence, as in numerous others investigated by the TSB,¹ the ELT system was rendered inoperative nearly immediately or within seconds following impact by damage sustained during the crash sequence. As a result, the ELT was unable to transmit a distress signal to the Cospas-Sarsat SAR satellite system. In many instances, ELT signals have not reached the Cospas-Sarsat system due to a broken antenna or a break in the wire connecting the ELT unit to the antenna. In this occurrence, it was determined that although the ELT unit was operable, a broken ELT antenna prevented the signal from being transmitted. The crashworthiness design specifications are robust for the actual ELT unit; however, the specifications are significantly less stringent for the other key components (i.e., the wiring and antenna) of the ELT system.

¹ TSB aviation occurrences A09Q0111, A09Q0190, A10A0041, A10A0122, A10O0125, A10O0145, A10O0240, A10P0142, A10Q0098, A10Q0111, A10Q0132, A11C0047, A11P0117, A11W0151, A12C0005, A12O0170, A12P0070, A13C0150, A13P0127, and A13W0009.

One of the inherent limitations of a 121.5 MHz ELT is its requirement for a whip-style antenna, which extends outward from the aircraft fuselage, significantly increasing the likelihood that it will be damaged or broken by impact with terrain, trees, or other parts from the aircraft during a crash sequence. Modern 406 MHz ELTs permit the use of low-profile (i.e., flush-mounted) antenna installations, which are significantly less susceptible to such damage. TC has recently issued an NPA that would mandate 406 MHz ELTs; however, the NPA also states that the regulation will mandate the carriage of dual 121.5/406 MHz ELTs. According to TC, retaining the 121.5 MHz requirement for new 406 MHz ELT installations, in accordance with Technical Standard Order (TSO) C126b, is to allow for homing. If these dual-frequency units are designed to use a single antenna, that antenna would need to be whip-style to accommodate the 121.5 MHz frequency. Some 406 MHz ELT units now come equipped with a backup, internal global positioning system (GPS) receiver and antenna that meet the specifications of Radio Technical Commission for Aeronautics (RTCA) RTCA DO-204A and European Organisation for Civil Aviation Equipment (EUROCAE) document ED62A. However, the internal antenna has not been tested and approved by Cospas-Sarsat, whose standard does not include details on the design's radiation and power output. Finally, depending on the location of the ELT unit, the signal from an ELT using an internal antenna may be emitted at a reduced effectiveness due to shielding from aircraft components or terrain. TC has indicated that it will not stipulate a dual-antenna requirement for new dual 121.5/406 MHz ELTs. As a result, if the design standards allow for a single antenna, versus separate 121.5 MHz and 406 MHz antennas, to be used on dual-frequency units, the risks associated with the use of a whip-style antenna will persist.

ICAO establishes International Standards and Recommended Practices for member states. However, it has not established any ELT system design standards; these are currently determined by national regulatory bodies such as TC, the Federal Aviation Administration (FAA), and the European Aviation Safety Agency (EASA). In Canada, Canadian Aviation Regulations (CARs) Part V – Airworthiness Manual (Chapter 551: Aircraft Equipment and Installation) states that ELTs must meet the performance standards for 121.5 MHz and 406 MHz ELTs set out by the RTCA. In the United States, although there is no regulatory requirement for 406 MHz ELTs, the FAA only accepts requests for new ELT technical standard order authorizations for 406 MHz ELTs. As in Canada, the FAA relies on the performance specifications set out by the RTCA. In Europe, EASA has taken a similar approach, requiring that ELTs meet the design specifications set out by EUROCAE. A considerable body of research now indicates that current ELT design standards do not ensure a reasonable degree of crash survivability.

As a result, it is highly likely that aircraft equipped with ELT systems that meet the current design standards will continue to be involved in occurrences in which potentially life-saving SAR services will be delayed as a result of damage to the ELT system, decreasing the survivability of an accident.

Therefore, the Board recommended that

the Department of Transport establish rigorous emergency locator transmitter (ELT) system crash survivability requirements that reduce the likelihood that an ELT system will be rendered inoperative as a result of impact forces sustained during an aviation occurrence.

Transport Canada's response to Recommendation A16-05 (September 2016)

Transport Canada agrees in principle with this recommendation.

Emergency Locator Transmitter (ELT) technology and its development is an international effort. In Canada, ELTs in use typically meet FAA TSO-C91a and/or TSO-C126 or later revision, which incorporates by reference the consensus-based standards of RTCA/DO-204. These standards are paralleled in Europe by EASA's ETSO-2C126, incorporating EUROCAE ED-62. ELTs meeting the latest TSO-C126b standard must meet the test criteria for shock and crash safety of RTCA/DO-204A, sections 2.3.4.1 and 2.6.3.2. Transport Canada has recently joined the RTCA Special Committee SC-229, which is tasked to update the DO-204 standards to address the latest design, performance, installation and operational issues for emergency beacons. In parallel to crash survivability requirements, the SC-229 will consider the need to develop standards for pre-accident automatic ELT activation.

Transport Canada Update (December 2016)

Transport Canada Aircraft Certification Standards personnel have reviewed DO-204B/ED-62B drafts and provided feedback when necessary. SC-229 meetings have been attended (when possible) via teleconference. Transport Canada is planning to participate in the upcoming SC-229 meeting via teleconference as well as review minutes, actions, and provide feedback on meeting deliverables.

Transport Canada is publishing an article in *Aviation Safety Letter* (currently targeted for January 2017) to raise awareness of ELT installations, and to recommend that hook and loop fasteners not be used, and where they are used to closely adhere to the instructions provided by the manufacturer (as the FAA advised all ELT manufacturers to address hook-and-loop installations via Special Airworthiness Information Bulletin (SAIB) HQ-12-32 in May 2012).

In the medium term, as part of NPA 2015-013, the standards in Airworthiness Manual 551.104 are being revised and will require a minimum standard TSO-C126 but will provide for the approval of ELTs which meet the standards currently being developed. This will be subject to public comment as part of the *Canada Gazette*, Part I review.

TSB assessment of Transport Canada's response to Recommendation A16-05 (December 2016)

In its response, Transport Canada indicated that ELT technology and its development is an international effort. Transport Canada also indicated that it had recently joined RTCA Special Committee SC-229, which is tasked to update the DO-204A international standards which are adopted by reference as the Canadian standards. It is encouraging that Transport Canada is now a member of SC-229, and able to provide direct input into the work being done to update the DO-204A international standards. The Board is also encouraged by Transport Canada's short- and medium-term plans to publish an article in the *Aviation Safety Letter* and to revise the standards in the Airworthiness Manual.

The Board believes that the planned updates to DO-204A and ED-62A, once formalized, could substantially reduce or eliminate the safety deficiency associated with Recommendation A16-05.

Therefore, the response to the recommendation is considered to be **Satisfactory Intent**.

Transport Canada's response to Recommendation A16-05 (May 2019)

TC agrees in principle with this recommendation.

In previous updates to this recommendation, TC has indicated that it would: participate in international working groups charged with updating Emergency Locator Transmitter (ELT) certification standards; publish an article in the *Aviation Safety Letter* to raise awareness of ELT installations and recommend hook and loop fasteners not be used and update the standards contained in the AWM.

To date, TC has published the article in the *Aviation Safety Letter*.²

As a result of a number of priorities with the certification activities of the Bombardier Global 7500, we have not been able to carry out the other work planned to address this TSB recommendation.

We do not have any new information to provide regarding this recommendation at this time. The latest update for this recommendation remains valid.

TSB reassessment of Transport Canada's response to Recommendation A16-05 (December 2019)

In its response, Transport Canada (TC) reaffirmed that it agrees in principle with this recommendation. However, since its last update in 2016, the only action taken by TC has been to publish an article in the *Aviation Safety Letter* (TP 185E) recommending that hook-and-loop fasteners not be used. TC has not been able to carry out other work to address this recommendation.

In December 2018, the Radio Technical Commission for Aeronautics (RTCA) published DO-204B, a new Minimum Operational Performance Standard (MOPS) for first- and second-generation 406 MHz emergency locator transmitters (ELTs) that includes:

- more robust antenna cabling specifications;
- crash survivability specifications; and,
- installation guidance, including mounting location for both external and internal antennas and additional information regarding antenna cables.

This revision makes DO-204B technically equivalent to the European Organisation for Civil Aviation Equipment (EUROCAE) ED-62B, also published in December 2018.

In response to this revised document, the Federal Aviation Administration (FAA) issued Technical Standard Order (TSO)-C126c, *406 MHz Emergency Locator Transmitters*, in March 2019, making it mandatory for first- and second-generation 406 MHz ELT models to meet the requirements of RTCA/DO-204B.

² Transport Canada, *Aviation Safety Letter TP 185E, Issue 1/2017, Emergency Locator Transmitter (ELT): Using Hook-and-Loop Fasteners*, available at https://www.tc.gc.ca/media/documents/capublications/ASL_1_2017E.pdf (last accessed on 13 February 2020).

At the time of this update, TC had not updated CAN-TSO-C126 to be harmonized with FAA TSO-C126c. As a result, in Canada, first- and second-generation 406 MHz ELT models are not required to meet the updated standards found in RTCA/DO-204B.

Until TC establishes rigorous ELT system crash survivability requirements, the risks associated with the safety deficiency identified in Recommendation A16-05 will remain. Since TC is unable to provide any additional information regarding the timeline for its action plan, there is no indication if, or when, TC will take the necessary actions to substantially reduce or eliminate the risks associated with this recommendation.

Therefore, the Board considers the response to the recommendation to be **Unsatisfactory**.

Transport Canada's response to Recommendation A16-05 (September 2020)

TC agrees with the recommendation.

Subsequently to the NPA 2019-022³ consultation notice that was sent to the Canadian Aviation Regulation Advisory Council (CARAC) Members on November 25, 2019, Airworthiness Manual (AWM) Chapter 537 has been amended,⁴ effective January 23, 2020, to include the revised CAN-TSO-C126c (identical to FAA TSO-C126c (03/07/19)). New CAN-TSO design approval applications may be made against CAN-TSO-C126b until September 7, 2020. After this date, only applications against CAN-TSO-C126c will be accepted. The consolidated version of the *Canadian Aviation Regulations (CARs)* standards will be updated shortly.

On June 4, 2019, via CARAC Notice, NPA 2015-013 to AWM 551 was made available for review in parallel to the pre-publication in *Canada Gazette* Part I⁵ of the proposed amended rules for equipage of 406/121.5 MHz Electronic Locator transmitters (ELTs) under Parts I, V and VI of the CARs. AWM 551 provides the standards of airworthiness for the application of CAR 605.38, which as proposed for amendment would require certain aircraft to be equipped with one or more 406 MHz/121.5 MHz capable ELTs, as appropriate.

The proposed regulations may be satisfied where each required ELT meets both CAN-TSO-C126 and FAA TSO-C91a, or CAN-TSO-C-126a or later revision. Per the proposed regulations, existing installations of 406/121.5 MHz ELTs would be allowed to remain in service. Hence, the proposed amendments to the CARs and AWM would not require compliance by in service aircraft with the enhanced ELT crashworthiness provisions of CAN-TSO-C126c (RTCA/DO-204B), nor would it preclude ELTs using hook and loop fasteners to remain in service.

³ **Transport Canada (2019)**. *Notice of Proposed Amendment – 2019-22: Canadian Technical Standard Orders (CAN-TSO) – Airworthiness Manual Chapter 537 Appendix A*. Available at:

<https://wwwapps.tc.gc.ca/Saf-Sec-Sur/2/NPA-APM/npaapmr.aspx?id=2970&lb=1&lang=eng>

⁴ **Transport Canada (2020)**. *Airworthiness Manual Chapter 537 – Airworthiness Standards*. Available at: https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/standards/airworthiness-manual-chapter-537-airworthiness-standards-appliances#app_A

⁵ **Canada Gazette Part I, Vol 153, No. 22 (June 1st, 2020)**. *Regulations Amending the Canadian Aviation Regulations (Parts I, V and VI – ELT)*. Available at: <http://www.gazette.gc.ca/rp-pr/p1/2019/2019-06-01/html/reg9-eng.html>

For ELT designs, the minimum performance standards of CAN-TSO-C126b and CAN-TSO-C126c, as incorporated by reference into AWM 537, does preclude the use of hook and loop fasteners as a primary means of securing an ELT in its mounting tray for future ELT designs. Under *CAR 521*, new applications for design approval of an ELT after September 7, 2020, would require an ELT meeting the latest CAN-TSO-C126c.

TC is consistent with the FAA on this matter. The maintenance performance standards of CAN-TSO-C126b and CAN-TSO-C126c, as adopted into Chapter 537 of the AWM, do preclude the use of hook and loop fasteners as a primary means of securing an ELT in its mounting tray for future ELT designs. Under *Chapter 521* of the *CARs*, new applications for design approval of an ELT would require an ELT meeting the latest CAN-TSO-C126c.

TSB reassessment of Transport Canada's response to Recommendation A16-05 (March 2021)

The Board is pleased that Transport Canada (TC) has amended the *Canadian Aviation Regulations* (CARs) to require that, as of 07 September 2020, new applications for design approval of an emergency locator transmitter (ELT) meet the latest Canadian Technical Standard Order CAN-TSO-C126c, which incorporates the requirements of RTCA/DO-204B.

The Board is also pleased that, since TC's most recent response, amendments to the CARs were published in the *Canada Gazette*, Part II on 25 November 2020. These amendments make it mandatory for aircraft required by regulation to carry an ELT to be equipped with one or more 406 MHz/121.5 MHz-capable ELTs, as appropriate.

The Board considers that the actions taken by TC will significantly reduce the risks associated with the safety deficiency identified in Recommendation A16-05.

Therefore, the response to Recommendation A16-05 is assessed as **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.