



REASSESSMENT OF THE RESPONSE TO AVIATION SAFETY RECOMMENDATION A16-06

Emergency Locator Transmitter First Burst Delay

Background

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. 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 A16-06 (June 2016)

In this occurrence, the aircraft's ELT system was unable to transmit a signal that could be detected by the Cospas-Sarsat satellite system. The ELT system in this instance was compromised within the prescribed 50-second (± 2.5 seconds) period from activation to first transmission of a distress signal. This 50-second delay, referred to as the first-burst delay, is a Cospas-Sarsat design requirement. The first-burst delay was initially intended to allow time for one of the earlier-generation components, called an oscillator, to stabilize; but it also evolved into an opportunity to deactivate an inadvertently activated beacon before its first transmission. Modern ELT systems no longer require a period this long before being capable of transmitting a distress signal.

The TSB has investigated a large number of occurrences¹ in which an ELT system was rendered inoperative within the first-burst delay, preventing a distress signal from reaching the Cospas-Sarsat system responsible for SAR alerting, detection, and response in Canada.

Although initially there were component-related reasons for the introduction of the 50-second first-burst delay, it is no longer necessary. However, the first-burst specification has not been updated to reflect this reality. As a result, ELT distress signals will not be received if an ELT system is compromised during the 50-second first-burst delay period.

If an ELT system is compromised (i.e., damaged or submerged) before its first-burst delay period has elapsed, it is highly likely that critical life-saving SAR services will be delayed, potentially leading to further injury or death following an aviation accident.

Therefore the Board recommends that:

Cospas-Sarsat amend the 406-megahertz emergency locator transmitter first-burst delay specifications to the lowest possible timeframe to increase the likelihood that a distress signal will be transmitted and received by search-and-rescue agencies following an occurrence.

TSB Recommendation A16-06

Cospas-Sarsat's response to Recommendation A16-06 (February 2017)

As anticipated at the time of your initial correspondence with us, the specifications being finalized for our next generation of beacon technology ("second-generation" beacons) require that such beacons shall commence transmissions within three seconds of beacon activation.

Moreover, the repetition interval for the next five bursts shall be five seconds, to provide six total bursts within approximately the first 30 seconds after beacon activation. Thereafter, the interval will increase to 30 seconds and, depending on the beacon type, may increase to 120 seconds after one-half hour. This arrangement permits quick detection and localization, in particular by the MEOSAR space segment now being deployed², before possible damage or submersion post-crash, while also conserving battery power for longer overall duration of beacon function. It is important to note in this context that beacons built to this specification will have a "cancellation" function to transmit a message that assistance is not required (e.g., in the case of an inadvertent activation or resolution of the emergency).

In light of the Report and other information, the Cospas-Sarsat Joint Committee meeting of its Technical Working Group and Operations Working Group, 18 to 27 September 2016, reviewed the first-burst transmission delay for future beacons that may be designed in accordance with the existing legacy specification (which continues to be valid). Taking note of the high false-

¹ TSB aviation occurrences A09Q0190, A09Q0111, A10A0085, A10O0240, A10Q0087, A10Q0111, A10Q0132, A10Q0133, A11P0117, A11C0047, A11Q0136, A11W0070, A11W0151, A12P0134, A13C0105, A13C0150, A13O0125, A13P0127, and A13P0278.

² Medium-altitude Earth-orbiting search and rescue satellite system.

alert rate of ELTs from manual cockpit activation (normally due to human fault in test procedures, with such beacons not having a cancellation function to easily remedy such mistakes), the Joint Committee observed that reducing the first burst delay for such ELTs in case of automatic activation, while avoiding a likely increase in false alerts by not reducing the delay for manual activation, appeared to be an acceptable compromise that would address the recommendations of the Board without adversely impacting the ELT false-alert rate (where resources could be diverted from real emergencies). The Cospas-Sarsat Council, at its open meeting of 5 to 8 December 2016, approved a change in the specification as recommended by the Joint Committee, such that “ELTs when automatically activated by G-switch / deformation shall transmit the first 406 MHz distress message as soon as possible, which shall be within no more than 15 seconds after beacon activation.”³ Fifteen seconds was considered by ELT manufacturers as a worst-case design boundary given existing technology limitations.

The responsible standards-setting bodies (e.g., RTCA and the European Organisation for Civil Aviation Equipment (EUROCAE)), as explained in our 18 September 2015 letter, are continuing to address the issue of ELT survivability, and the Cospas-Sarsat Programme, in the context of new requirements of the International Civil Aviation Organization, is finalizing specifications for ELTs for in-flight distress tracking (so-called “ELT(DT)s”), which will have a first-burst transmission delay of less than five seconds.

For clarification purposes, Cospas-Sarsat provided the following additional information regarding the first burst delay specification:

- Cospas-Sarsat has adopted a “new” C/S T.001 “first” generation beacon specification requiring the shortest possible (no more than 15 seconds) first-burst delay (when activation is automatic by g-switch or deformation) that will come into effect for 406-MHz ELT models submitted for new type approval on or after 01 January 2018 (pending implementation-date confirmation in May 2017).
- Manufacture of 406-MHz ELT models with a 50-second first-burst delay will continue to be permitted if a type approval is received prior to 01 January 2018; however manufacturers have the option to begin immediately to design and seek type approval using the “shortest possible time (no more than 15 second)” first-burst delay.
- Cospas-Sarsat is working on a next-generation (labeled “second-generation”) ELT specification that will offer a number of enhancements over the current-generation ELTs (e.g., first burst delay \leq 3 seconds, intelligent transmit scheduling, variable message fields for additional distress-related data, etc.). This specification will be optional (although manufacturers already are building prototypes and can be expected to see marketing advantages in the additional features).

³ Cospas-Sarsat, *Specification for COSPAS-SARSAT 406 MHz Distress Beacons (C/S T.001)* (December 2016), section 4.5.6.

- Cospas-Sarsat is also working on specifications for a new class of ELT, ELT(DT)s (ELTs for autonomous in-flight distress tracking) to meet new International Civil Aviation Organization (ICAO) requirements (entering into force in 2021) for distress tracking of all aircraft on international routes (27 metric tons or more).

TSB assessment of Cospas-Sarsat's response to Recommendation A16-06 (March 2017)

The Board is encouraged by Cospas-Sarsat's prompt action to address the risks associated with the current "first" generation 406-MHz ELT specification, which permits a 50-second first burst delay. According to Cospas-Sarsat, a new "first" generation 406-MHz ELT specification is scheduled to come into effect on 01 January 2018. Under this updated specification, new "first" generation 406-MHz ELT type approvals obtained following 01 January 2018 will be required to have a first burst delay that is no more than 15 seconds. However, Cospas-Sarsat has indicated that the manufacture of 406-MHz ELTs with a 50-second first-burst delay will continue to be permitted if a type approval is received prior to 01 January 2018.

Cospas-Sarsat is also working on a "second-generation" ELT specification that will offer a number of enhancements over the current specification, including a first burst delay that is no more than 3 seconds. Although this new specification will be optional, Cospas-Sarsat has indicated that manufacturers have already started producing 406-MHz ELTs meeting this specification because of the marketing advantages.

In addition, Cospas-Sarsat is also working on a new class of ELT for aircraft operating on international routes, that will provide autonomous in-flight distress tracking to meet new ICAO requirements, scheduled to come into effect in 2021.

Although 406-MHz ELT type approvals designed to meet the current 50-second first burst delay specification will continue to be permitted following 01 January 2018, their use will likely diminish through attrition, and as manufacturers and operators recognize the benefits associated with the new "first" or "second" generation 406-MHz specifications.

Once fully implemented, these efforts, will significantly reduce the safety deficiency associated with this recommendation.

Therefore, the response to Recommendation A16-06 is assessed as **Satisfactory Intent**.

Cospas-Sarsat's response to Recommendation A16-06 (July 2019)

Cospas-Sarsat's letter of 24 February 2017 [see Cospas-Sarsat's response to Recommendation A16-06 (February 2017)] explains in detail the steps taken by Cospas-Sarsat to address the TSB's related findings in Aviation Investigation Report A13H0001 (A1507).

By virtue of the steps taken, as described in the letter, and the international endorsement that was received in December 2016 from the more than 40 Participant States of the Cospas-Sarsat Programme, Cospas-Sarsat considers the matter closed and no further action is intended.

TSB reassessment of Cospas-Sarsat's response to Recommendation A16-06 (March 2020)

The Board is pleased with the advances that have been made with regards to improving first burst delay specifications. To date, the following actions have been taken by Cospas-Sarsat:

For new first-generation 406 MHz emergency locator transmitters (ELTs):

- In June 2018, Cospas-Sarsat published Revision 3 of the *SPECIFICATION FOR COSPAS-SARSAT 406 MHz DISTRESS BEACONS*, which limits the delay of the first distress signal to no more than 15 seconds after the beacon is activated.

For existing first-generation 406 MHz ELTs:

- 406 MHz ELTs manufactured in accordance with type approvals obtained after 01 January 2018 are required to have a first burst delay that is no more than 15 seconds. Even though the manufacture of 406-MHz ELTs with a 50-second first burst delay will continue to be permitted if a type approval is received prior to 01 January 2018, manufacturers have the option to design and seek type approval using the “shortest possible time (no more than 15 second)” first burst delay. Over time, existing first-generation 406 MHz ELTs will be replaced by newer models that meet the revised certification standards.

New class of ELTs:

- Cospas-Sarsat is working on a new class of ELT that will provide autonomous in-flight distress tracking for aircraft operating on international routes. These ELTs will meet International Civil Aviation Organization (ICAO) requirements and are scheduled to come into effect in 2021; and
- Cospas-Sarsat is also working on a second-generation ELT optional specification that will offer enhancements over the current-generation ELTs.

The Board considers that the actions taken by Cospas-Sarsat have significantly reduced the risks associated with the safety deficiency identified in Recommendation A16-06.

Therefore, the Board considers the response to the recommendation to be **Fully Satisfactory**.

Next TSB action

This deficiency file is **Closed**.