



TSB Recommendation A00-13

Packaging standards

The Transportation Safety Board of Canada recommends that the Department of Transport ensure that air operators store aircraft survival gear on aircraft in flame-resistant material and package emergency pyrotechnics and other highly flammable survival equipment at least to the standards required by International Air Transport Association (IATA) *Dangerous Goods Regulations*.

Air transportation safety investigation report	A99W0061
Date the recommendation was issued	28 August 2000
Date of the latest response	December 2023
Date of the latest assessment	March 2024
Rating of the latest response	Satisfactory in Part
File status	Active

Summary of the occurrence

The Aerospatiale AS 355 F1 Twinstar helicopter had completed a routine gas pipeline patrol and was returning to Fairview, Alberta, with the pilot and one passenger on board. During a shallow cruise descent into Fairview, at about 800 feet above ground, the red battery temperature light illuminated on the warning caution advisory panel. The pilot observed that the voltmeter and ammeter indications were normal and turned off the battery. About three minutes later, at approximately 500 feet above ground and as the pilot was contemplating a precautionary landing, the helicopter lost all electrical power and the cabin and cockpit began to fill with smoke and fumes. The pilot and passenger opened the side windows to ventilate the cabin, and the pilot accomplished an emergency landing at once on an available farm field. After landing, the pilot shut down the engines and both occupants evacuated the helicopter without further incident or injury. Flames were observed to be emanating from the vicinity of the right baggage compartment, and the helicopter was subsequently destroyed by an intense ground fire.

The Board concluded its investigation and released report A99W0061 on 28 August 2000.

Rationale for the recommendation

The survival and emergency equipment carried on board the helicopter included a five-person survival shelter and an emergency survival kit that contained emergency flares. The bags that housed the survival and emergency equipment were made of flammable nylon; the bags were not required to be flame-resistant. During testing, the bag materials ignited quickly, melted, dripped, and were totally destroyed by fire. The highly combustible nature of this packaging material contributed to the severity of this occurrence by providing a ready source of fuel in the face of the arcing event. In addition, survival equipment transported in flammable packaging reduces the likelihood that this equipment will be available for its intended purpose.

The survival kits in each of the four company helicopters contained two hand-held, marine-type, parachute flares and four day/night smoke flares. All flares on board the accident helicopter had ignited and discharged during the fire. The flares are classified as 1.2G and 1.4G explosives. Materials classified as 1.2G explosives are forbidden to be shipped on cargo and passenger aircraft under International Air Transport Association (IATA) *Dangerous Goods Regulations*. Goods classified as 1.4G explosives can be shipped on cargo aircraft, provided that they are packaged in accordance with the appropriate packaging instructions. The emergency flares in two of the three survival bags in the company sister ships were packaged in crumpled newspaper to prevent abrasion. IATA Dangerous Goods Packing Instruction 905 requires signal devices transported as dangerous goods to be packaged in plastic or fibreboard inner containers. Current *Dangerous Goods Regulations* do not apply to products that are necessary for the safety of the persons on board the means of transport. Any condition that unnecessarily increases the potential for the initiation or propagation of a fire on board an aircraft is hazardous, putting passengers and crew at risk.

Therefore, the Board recommended that

the Department of Transport ensure that air operators store aircraft survival gear on aircraft in flame-resistant material and package emergency pyrotechnics and other highly flammable survival equipment at least to the standards required by International Air Transport Association (IATA) *Dangerous Goods Regulations*.

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Previous responses and assessments

November 2000: response from Transport Canada

In its letter of 22 November 2000, Transport Canada (TC) agrees with the intent of the recommendation, which is to ensure the likelihood that survival equipment will be available after an accident for the intended purposes and to reduce the potential for this equipment to initiate or propagate a fire on board an aircraft.

TC stated that it will proceed with the development and distribution of a Commercial and Business Aviation Advisory Circular (CBAAC) incorporating the TSB recommendation to store

flares in survival equipment to International Civil Aviation Organization (ICAO) Technical Instruction packing standards. A Notice of Proposed Amendment (NPA) to the *Canadian Aviation Regulations* (CARs) will also be prepared. The NPA will be submitted to the Part VI Technical Committee of the Canadian Aviation Regulation Advisory Council (CARAC) for consultation with stakeholders by June 2001.

November 2000: TSB assessment of the response (Satisfactory Intent)

In its reply of 22 November 2000, TC indicated that it agrees with the intent of the recommendation and that it will proceed with the development and distribution of a CBAAC incorporating the TSB recommendation to store flares in survival equipment to ICAO Technical Instruction packing standards. Additionally, an NPA to the CARs will be prepared and submitted to the Part VI Technical Committee of the CARAC for consultation with stakeholders by June 2001. Given that the CBAAC has not been issued, that the proposed amendments to the CARs may depend on a positive response from the CARAC Technical Committee, and that amendments to the CARs will not occur until after the consultative process with CARAC is completed, the response is considered **Satisfactory Intent**.

December 2005: response from Transport Canada

On 14 May 2001, TC issued CBAAC 0184 entitled *Stowage and Packaging of Survival Equipment and Emergency Flares* incorporating the TSB recommendation to store flares in survival equipment to ICAO Technical Instruction packing standards. Subsequently, the Survival Equipment Working Group report was presented on 06 January 2005. An NPA to the CARs will be prepared. The NPA will be submitted at a future Part VI Technical Committee of the CARAC for consultation with stakeholders.

July 2006: TSB assessment of the response (Satisfactory Intent)

On 14 May 2001, TC issued CBAAC 0184 recommending that air operators ensure that "life-saving appliances" such as survival equipment are stored in compliance with ICAO's Packing Instruction 905 when required to be carried on board the aircraft in accordance with pertinent airworthiness requirements or operating regulations. TC's activity update of 14 December 2005 states that an NPA will be prepared to address the deficiency raised in Recommendation A00-13. The NPA will be submitted to a future Part VI Technical Committee of the CARAC for consultation with stakeholders.

Because the proposed action, if fully implemented, will reduce the safety deficiency described in Recommendation A00-13, the assessment remains at **Satisfactory Intent**.

February 2007: response from Transport Canada

Preliminary research for the development of an NPA indicates that imposing a particular flammability standard for survival equipment packaging may be difficult, as no such standard currently exists. Research is on going.

July 2007: TSB assessment of the response (Satisfactory Intent)

TC is continuing to look into this issue; however, no action has yet to be taken. The stated action, if fully implemented, will substantially reduce the risks associated with Recommendation A00-13.

Therefore, the assessment remains at **Satisfactory Intent**.

March 2008: response from Transport Canada

In its response of 6 March 2008, TC reported that, in May 2001, it distributed a Commercial and Business Aviation Advisory Circular (CBAAC - 0184) incorporating the TSB recommendation to store flares in survival equipment to the ICAO Technical Instruction packing standards.

TC also stated that research for the development of an NPA indicates that imposing a particular flammability standard for survival equipment packaging is insurmountable as no such standard currently exists to reference.

In addition, TC considers this recommendation CLOSED because:

- Implementation of the original recommendation is not feasible given that no standard exists to reference.
- Over and above the original recommendation, TC raised operator's awareness of this issue thus reducing the risks associated with the identified safety deficiency.

TC also stated that it would not be taking any further action in response to Recommendation A00-13.

August 2008: TSB assessment of the response (Satisfactory in Part)

TC's development and distribution, in May 2001, of a Commercial and Business Aviation Advisory Circular (CBAAC - 0184) incorporating the TSB recommendation to store flares in survival equipment to the ICAO Technical Instruction packing standards is commendable, in that it should have made air operators aware of the risks identified in TSB Recommendation A00-13 in the short term.

Although, TC states that no standard exists for reference, IATA *Dangerous Goods Regulations* exist and are published on a yearly basis. As well, TC has changed from its original plan to establish permanent regulatory requirements for packaging survival equipment.

TC's decision to not pursue its original plan to establish permanent regulatory requirements for packaging survival equipment and to not take further mitigating action will result in a situation wherein the action taken will reduce but not substantially reduce or eliminate the deficiency underlying Recommendation A00-13.

Therefore, the assessment rating has regressed to **Satisfactory in Part**.

February 2010: response from Transport Canada

TC's latest response restates the fact that it issued CBAAC 0184 in 2001. Additionally, it states that the issue remains open and will be addressed as part of its ongoing implementation of the CARAC's Survival Equipment Working Group (SEWG) Final Report recommendations. The response does not provide details of the SEWG recommendation that deals with the deficiency identified in TSB Recommendation A00-13. However, it does state that the SEWG's recommendations have been ranked 211th in a Branch priority setting exercise.

July 2010: TSB assessment of the response (Satisfactory in Part)

TC's recent response does not describe the relevant SEWG recommendation or whether or not it advocates on behalf of the establishment of a regulatory requirement for packaging survival equipment. Nor does it indicate how or when, given its 211th ranking on the Branch priority list, TC plans to implement the SEWG recommendation.

The lack of information in TC's response with respect to its action plan to address the deficiency identified in Recommendation A00-13 results in a status quo situation. The planned action may reduce but not substantially reduce or eliminate the deficiency underlying Recommendation A00-13.

Therefore, the assessment rating remains as **Satisfactory in Part**.

May 2017: TSB review of deficiency file status (rating Satisfactory in Part; file status changed to Active)

The Board requested that Recommendation A00-13 be reviewed to determine if the deficiency file status was appropriate. After an initial evaluation, it was determined that the safety deficiency addressed by Recommendation A00-13 needed to be reassessed.

A request for further information was sent to Transport Canada and a reassessment will be conducted upon receipt of Transport Canada's response.

Therefore, the assessment remains as **Satisfactory in Part**.

Consequently, the status of Recommendation A00-13 is changed to **Active**.

May 2019: response from Transport Canada

TC agrees in principle with the recommendation and has taken steps to reduce the risks associated with the identified safety deficiency.

Commercial and Business Aviation Advisory Circular (CBAAC) 0184 *Stowage and Packaging of Survival Equipment and Emergency Flares* was published by TC on May 14, 2001. The Circular recommends that operators store survival equipment in non-flammable packaging and containers and indicates that TC would present a Notice of Proposed Amendment (NPA) reflecting this recommendation to the Canadian Aviation Regulation Advisory Council.

In preparing the NPA, however, research indicated that attempting to impose a particular flammability standard for the survival equipment packaging was problematic as no such standard existed that could be referenced in the proposed regulation.

As survival equipment is specifically exempt from having to meet any standards specified in the Airworthiness Manual (AWM), which is where aviation flammability standards and test criteria are specified, there was no clear method to respond to the portion of the recommendation “...that air operators store aircraft survival gear on aircraft inflame-resistant material...” beyond the guidance contained in CBAAC 0184. In 2008, TC communicated to the TSB that no additional work would be carried out on this recommendation since a standard was not available to be employed in a regulation and TC had already raised operator’s awareness of the risks associated with this safety deficiency.

TC does not plan to carry out additional work in this area at this time.

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

In its May 2019 response, Transport Canada (TC) indicated that it agrees in principle with Recommendation A00-13.

To address the safety deficiency identified in the recommendation, TC has taken the following actions:

- In May 2001, TC published Commercial and Business Aviation Advisory Circular (CBAAC) 0184, *Stowage and Packaging of Survival Equipment and Emergency Flares*;
- In January 2005, TC presented the Survival Equipment Working Group’s report to the Civil Aviation Regulatory Committee (CARC).

TC has determined that the guidance material contained in CBAAC 0184 is adequate to mitigate the hazard identified in TSB Recommendation A00-13.

Since its last update, TC published proposed amendments to certain regulations under the *Transportation of Dangerous Goods Act* (Part 12 and International Harmonization Update)¹ in the *Canada Gazette*, Part I in November 2022. The main objective of the proposed regulations is to align, to the extent possible, the *Transportation of Dangerous Goods Regulations* (TDGR) with the most recent versions of the United Nations’ (UN’s) Recommendations, the International Civil Aviation Organization’s (ICAO’s) Technical Instructions (TIs), the *International Maritime Organization Dangerous Goods Code*, and Title 49 of the U.S. *Code of the Federal Regulations – Transportation*.

¹ Canada Gazette, Part I, Volume 156, Number 48 (26 November 2022), Regulations Amending Certain Regulations Made Under the Transportation of Dangerous Goods Act, 1992 (Part 12 and International Harmonization Update). Available at: <https://www.gazette.gc.ca/rp-pr/p1/2022/2022-11-26/html/reg3-eng.html>

Through this harmonization, the proposed amendments, which apply to all modes of transport regulated by TC, would:

- facilitate the transport of dangerous goods between Canada and the U.S.;
- introduce a technical standard for the manufacture of large packaging;
- enhance safety for Canadian businesses by adopting cost-saving amendments and safe alternative provisions in the TDGR;
- improve clarity, consistency, and certainty for stakeholders by ensuring that the same requirements apply to both domestic and international transport of dangerous goods; and
- facilitate the transport of dangerous goods by air within Canada, particularly for remote locations, by clarifying and updating the air provisions of the TDGR to better reflect current domestic needs.

Notably, Section 12(8) of the proposed amendments to the TDGR states that dangerous goods not installed in an aircraft but required to ensure the safety of individuals on board the aircraft or for the operation or safety of the aircraft would be subject to certain specific means of containment and marking requirements. For example, the dangerous goods would need to be stored in a means of containment that is designed, constructed, filled, closed and maintained so that under normal conditions of transport, including handling, there will be no release of dangerous goods that could endanger public safety.

Additionally, Section 12.28(c) of the proposed TDGR would require some low-hazard explosives (Class 1.4S, such as flares) transported by air in Canada under an exemption from the ICAO TIs to meet certain marking, mass and means of containment requirements. They would need to be placed in metal or plastic clips or in partitions and placed in an inner means of containment that is a box that fits snugly in an outer means of containment that is designed, constructed, filled, closed, secured, and maintained so that under normal conditions of transport, including handling, there will be no release of the dangerous goods that could endanger public safety.

The Board is encouraged by the proposed regulatory changes to the TDGR to align with international air transportation standards. If regulations are implemented as published in the *Canada Gazette*, Part I, the risks associated with the safety deficiency identified in Recommendation A00-13 will be, in part, addressed. Given the protracted delays in addressing this recommendation, more needs to be done in the interim to ensure operator awareness of the risks associated with this safety issue. At a minimum, given that the CBAAC was published more than 20 years ago, TC should consider updating the circular.

The Board remains concerned that TC has not taken any action toward imposing a particular flammability standard for survival equipment storage material. In the next update, the Board would like TC to advise the TSB on existing international standards or guidance related to this safety deficiency.

Therefore, the Board considers the response to Recommendation A00-13 to be **Satisfactory in Part**.

Latest response and assessment

December 2023: response from Transport Canada

TC agrees in principle with the recommendation and has taken steps to reduce the risks associated with the identified safety deficiency.²

Following the publication of Transportation Safety Board (TSB) Recommendation A00-13 in 2000, TC published Commercial and Business Aviation Advisory Circular (CBAAC) 0184 *Stowage and Packaging of Survival Equipment and Emergency Flares*³ on May 14, 2001. The Circular recommended that operators store survival equipment in non-flammable packaging and containers and indicates that TC would present a Notice of Proposed Amendment (NPA) reflecting this recommendation to the Canadian Aviation Regulation Advisory Council.

In 2007, while preparing an NPA to address the issue, research indicated that attempting to impose a particular flammability standard for the survival equipment packaging was problematic as no such standard existed that could be referenced in the proposed regulation.

In 2008, TC communicated to the TSB that no additional work would be carried out on this recommendation since a standard was not available to be employed in a regulation and TC had already raised operator's awareness of the risks associated with this safety deficiency.

As survival equipment is specifically exempt from having to meet any standards specified in the Airworthiness Manual (AWM), which is where aviation flammability standards and test criteria are specified, there was no clear method to respond to the portion of the recommendation "...that air operators store aircraft survival gear on aircraft in flame-resistant material..." beyond the guidance contained in CBAAC 0184.

Since the May 2019 update, TC published in December 2021 an updated version of Transport Canada Publication (TP) No. 4711, in which it states that "Transport Canada recommends that air operators ensure that life-saving appliances or survival equipment are stored in compliance with Packing Instruction 905 of ICAO TI 9284 when required to be carried on board an aircraft in accordance with applicable airworthiness requirements or operating regulations."⁴ The updated TP 4711 also mentions that "[c]onfirmation of the use of non-flammable packaging and stowage containers for survival and pyrotechnic emergency equipment is essential for air

² 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.

³ Cancelled and now incorporated in Transport Canada Publication (TP) 4711 Volume 2 – *Air Operator Certification Manual: Commercial Air Operation*. Available at: <https://tc.canada.ca/en/aviation/publications/air-operator-certification-manual-tp-4711>

⁴ Transport Canada (2021). Transport Canada Publication (TP) No. 4711 Volume 2 – *Air Operator Certification Manual: Commercial Air Operation*, Subsection 4.2.22.4 (1). Available at: <https://tc.canada.ca/en/aviation/publications/air-operator-certification-manual-tp-4711>

operators carrying such equipment. Where necessary, modification or a change to the container or packaging materials may be required to comply with the ICAO TIs and the TDGRs.”⁵ This update to TP 4711 supersedes and cancels CBAAC 0184 by incorporating it.

Finally, TC has proposed amendments to regulations under the *Transportation of Dangerous Goods Act* in the *Canada Gazette*, Part I in November 2022⁶, aiming to align them with the latest international standards. The proposed changes cover various aspects, including facilitating the transport of dangerous goods between Canada and the U.S., introducing a technical standard for large packaging, enhancing safety for Canadian businesses, and improving clarity for stakeholders. Notably, specific means of containment and marking requirements are outlined for dangerous goods in aircraft, emphasizing safety measures under normal transport conditions.

TC does not plan to carry out additional work in this area at this time.

March 2024: TSB assessment of the response (Satisfactory in Part)

In its latest response, Transport Canada (TC) reaffirmed that it agrees in principle with the recommendation and stated that it has taken steps to reduce the risks associated with the identified safety deficiency.

Since its update in May 2019, TC released an updated version of the *Air Operator Certification Manual* (TP 4711) in December 2021. In this version, TC advises air operators to ensure that when life-saving appliances or survival equipment are required to be carried on board an aircraft, they are stored according to Packing Instruction 905 of the International Civil Aviation Organization (ICAO) Technical Instruction (TI) 9284, in line with airworthiness requirements or operating regulations. Additionally, the updated TP 4711 emphasizes the importance of using non-flammable packaging and stowage containers for survival and pyrotechnic emergency equipment. Air operators must confirm the use of such packaging and containers, and modifications may be necessary to comply with ICAO TIs and the *Transportation of Dangerous Goods Regulations* (TDGR). Consequently, TC confirmed that TP 4711 effectively supersedes and replaces its Commercial and Business Aviation Advisory Circular (CBAAC) 0184 *Stowage and Packaging of Survival Equipment and Emergency Flares* (14 May 2001) by incorporating its contents.

⁵ Transport Canada (2021). Transport Canada Publication (TP) No. 4711 Volume 2 – *Air Operator Certification Manual: Commercial Air Operation*, Subsection 4.2.22.4 (2). Available at: <https://tc.canada.ca/en/aviation/publications/air-operator-certification-manual-tp-4711>

⁶ Transport Canada (2022). *Canada Gazette*, Part I, Volume 156, Number 48 (26 November 2022), Regulations Amending Certain Regulations Made Under the Transportation of Dangerous Goods Act, 1992 (Part 12 and International Harmonization Update). Available at: <https://www.gazette.gc.ca/rp-pr/p1/2022/2022-11-26/html/reg3-eng.html>

Furthermore, TC reiterated that in November 2022, it published proposed amendments to regulations under the TDGR in the *Canada Gazette*, Part I, aiming to align them with the latest international standards. Currently, TC has no plans for additional work in this area.

This recommendation was issued over 23 years ago. While the Board is encouraged by the updated publication of TP 4711 and the proposed regulatory changes to the TDGR to align with international air transportation standards, TC confirmed that no further action is planned to address the safety deficiency identified in Recommendation A00-13. The Board is of the opinion that if regulations are implemented as published in the *Canada Gazette*, Part I, the risk associated with the safety deficiency identified in Recommendation A00-13 will be, in part, addressed.

Therefore, the Board considers the response to be **Satisfactory in Part**.

File status

The TSB will continue to monitor the progress of TC's planned actions to mitigate the risk associated with the safety deficiency identified in Recommendation A00-13, and it will reassess the response to the recommendation on an annual basis or when otherwise warranted.

This deficiency file is **Active**.