Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A09W0021

LOSS OF POWER AND COLLISION WITH TERRAIN

SARVAIR AVIATION LTD.
ROBINSON R44 (HELICOPTER) C-FOBX
GRANDE CACHE, ALBERTA, 20 nm NW
30 JANUARY 2009

Canada

Aviation Investigation Report

Loss of Power and Collision with Terrain

Sarvair Aviation Ltd.
Robinson R44 (Helicopter) C-FOBX
Grande Cache, Alberta, 20 nm NW
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Report Number A09W0021

Summary

The Sarvair Aviation Ltd. Robinson R44 helicopter (registration C-FOBX, serial number 0890) was en route from Grande Prairie to Grande Cache, Alberta, with one pilot and one passenger on board. At approximately 1702 mountain standard time, while climbing over rising terrain, the helicopter lost engine power and main rotor rpm. The pilot turned downhill in an effort to regain main rotor rpm. When this failed, he carried out a forced landing into the trees where the aircraft came to rest on its right side. The pilot was seriously injured when the passenger fell on top of him during impact. The passenger sustained no injury. They spent more than 15 hours on site before being rescued. The emergency locator transmitter did not activate during the impact sequence, thus delaying the search and rescue response.

Ce rapport est également disponible en français.

Other Factual Information

History of Flight

Records indicated that the helicopter was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The helicopter had no known deficiencies before the accident flight. The weight and centre of gravity were within the prescribed limits at the time of the accident. There was sufficient fuel on board to complete the flight.

The flight departed Grande Prairie, Alberta, at 1600 [1] for Grande Cache, Alberta. Prior to departure, the pilot conducted a safety briefing for the passenger who was a company employee and a designated safety briefer for the company's logging operations. The pilot had just purchased a SPOT satellite GPS messenger [2] and carried it during the flight; although, he was not aware that he had subscribed to its 911 function. Neither the pilot nor passenger was familiar with activating the SPOT functions.

During the flight, the helicopter encountered precipitation along an approaching cold front and altered course to the south to parallel the edge of the weather. While approaching Grande Cache, the flight was very near the snow associated with the front. At 1700, the helicopter's engine (Avco Lycoming O-540-F1B5) performance degraded to the point that a forced landing into the trees could not be avoided.

After evacuating the aircraft, the injured pilot instructed the passenger to remove and activate the emergency locator transmitter (ELT). The external antenna had to be cut out of the roof because the ELT auxiliary antenna could not be found. At 1907, the HELP function on the SPOT was activated. SPOT notified a member of the pilot's family who contacted the Joint Rescue Co-ordination Centre (JRCC) in Victoria, British Columbia. However, because of the origin of the SPOT message, the case was transferred for further action to JRCC Trenton in Ontario. The pilot's family and JRCC Trenton held numerous discussions about the urgency of the situation and the level of response required. With no ELT signal reported or detected, JRCC Trenton personnel, in conjunction with family members, decided to wait and see how the situation developed.

SPOT Satellite GPS Messenger

This device uses the GPS satellite network to acquire its coordinates and then sends its location (with a link to Google Maps) and a pre-programmed message via a commercial satellite network. It features HELP and 911 alerting functions.

The HELP function sends a text message to the cell phone of a designated contact person and an email with a link to Google Maps. HELP sends a message and location update every five minutes for an hour or until cancelled.

The 911 function alerts emergency responders of life-threatening events. The GEOS Alliance Emergency Response Center liaises with public response agencies around the world, calls emergency contacts to find out more about the situation, and keeps them informed of rescue progress. GEOS works with all rescue agencies including local urban and rural 911 call centers. 911 sends a message and location update every five minutes until cancelled.

At approximately 2030, the passenger checked the ELT to ensure that it was functioning since they had not heard any aircraft overhead. He discovered that the active light was intermittent and remained so in spite of makeshift repairs.

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1 All times are mountain standard time (coordinated universal time minus seven hours).

2 SPOT is a registered trademark of Spot LLC, a wholly owned subsidiary of Globalstar Inc.

Only after the ELT was struck against a tree several times did the light remain on and the ELT begin to function. At 2041, JRCC Trenton received an ELT signal. At this time, the 911 feature on the SPOT was also activated. The SPOT account showed that the 911 and OK buttons were selected several times during the evening.

At 2107, a Canadian Forces (CF) CC130 Hercules from 17 Wing Winnipeg was tasked and became airborne at 2212. A CF CH146 Griffon from 4 Wing Cold Lake in Alberta had been identified for this tasking, but a crew was not available until the following morning. At 2201, the Shock Trauma Air Rescue Society (STARS) [3] Messerschmitt-Bölkow-Blohm 117 air ambulance based in Grande Prairie was tasked and departed for the scene. Grande Cache Royal Canadian Mounted Police (RCMP), emergency medical services (EMS), and ground search and rescue (GSAR) resources were activated at 2120 and began making their way on the ground to the approximate location. With the aid of night vision goggles, the STARS flight crew located the accident aircraft at 2252. At 2309, the STARS helicopter was able to land on a service road near the accident site. The passenger, who had walked out to the road, met the flight crew and discussed the pilot's condition. The STARS flight crew members were not equipped or trained to conduct any kind of ground rescue. The passenger returned to tend to the pilot while STARS lifted off for Grande Cache to obtain more fuel. Accident location information was relayed by the STARS pilot to STARS dispatch for dissemination to the RCMP and JRCC Trenton.

At 0044, STARS departed Grande Cache to return to the scene but had to divert to Grande Prairie due to reduced visibility in snow and blowing snow. At the same time, ground search personnel were having difficulties locating the accident because they did not have a 121.5 MHz ELT locating device. Furthermore, the ground search party was unable to communicate directly with the Hercules that had arrived overhead at 0230 because radio equipment was incompatible. In addition, poor weather conditions prevented the Hercules search and rescue technicians from parachuting into the accident site. The search continued until approximately 0430, when the passenger met the ground search party on the road, 2 km from the accident site.

At 0930, the CH146 Griffon departed Cold Lake for the accident site via Edmonton to refuel. However, by 1000, the weather had improved enough for STARS to land within 0.5 nautical miles of the accident site and receive the injured pilot who had been transported to that location by GSAR personnel. Therefore, the CH146 Griffon was directed to stand down at 1014. The injured pilot arrived at the Grande Prairie hospital at 1035, over 17 hours after the accident.

Operator and Pilot Information

Sarvair Aviation Ltd. is a privately owned and operated helicopter charter company with bases in Williams Lake and 108 Mile Ranch Airport in British Columbia.

Crew records indicated that the pilot was certified and qualified for the flight in accordance with existing regulations. His total flight time as of 29 January 2009 was 16 454.1 hours, with 275 hours on the accident aircraft type. His flight time during the previous 90 days was 15.1 hours, the previous 30 days, 3.9 hours, and the previous 7 days (excluding the accident flight), 3.9 hours. He held ratings on eight different helicopter types, with the vast majority of his flight experience on turbine-powered helicopters.

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[3] STARS is an Alberta-based non-profit charitable company.

On 13 November 2008, the pilot completed the company operations exam, which included emergency situations, flight following duties, and survival scenarios. From 28 October to 14 November 2008, the pilot completed the Robinson R44 ground and flight training. The written exam had one question related to carburetor heat, asking for the range of the yellow arc (-19°C to 3°C) on the carburetor air temperature gauge.

Weather

The area of flight was under the influence of a low pressure system centered in northwest Alberta with an associated cold front extending south along the Alberta–British Columbia border. The graphic area forecast (GFACN32) clouds and weather chart issued at 1631 on 30 January 2009, for use starting at 1700 on 30 January 2009 was forecasting isolated cumulonimbus clouds topped at 22 000 feet above sea level (asl) and lightning in the Grande Prairie area with local wind gusts up to 45 knots. Strong gusting winds up to 35 knots were forecast after the frontal passage. Moderate-to-severe lee wave mechanical turbulence from the surface up to 12 000 feet asl was forecasted for the foothills of Alberta. The freezing level in the area of flight had a steep gradient (100 km in width) from 5000 feet asl down to the surface along the foothills. The auto observation for Grande Cache at 1700 was temperature 2.8°C, dew point 3.7°C, and wind 300° True (T) at 7 knots. An hour later, the temperature was 0°C, dew point 1.1°C, and wind 270° T at 25 knots. The Transport Canada *Flight Training Manual – Aeroplane* (TP 1102) indicates that, with a temperature between 0°C and 3°C and a dew point between –4°C and –1°C, serious carburetor icing could be encountered at any power setting.

Carburetor Icing

In the R44 helicopter, the application of carburetor heat correlates to changes in collective setting through a friction clutch to reduce pilot workload. Lowering collective mechanically adds carburetor heat and raising collective reduces carburetor heat. The pilot may override the friction clutch and increase or decrease carburetor heat as desired. A latch is provided at the control knob to lock carburetor heat off when not required. The carburetor air temperature gauge should be monitored by the pilot, and carburetor heat must be applied as necessary to keep the needle out of the yellow arc (-19° C to 3° C).

Geo-referencing Formats

Canadian search and rescue (SAR) agencies do not use a common geo-reference format. Most ground SAR agencies and the RCMP use the Universal Transverse Mercator (UTM) format, while civil and military aviation use one of the three latitude and longitude formats. Most GPS units are capable of switching between these three formats, depending on user preference.

During the SAR effort for this accident, three aviation industry formats for geographic position were used: Degrees, Minutes, Seconds (DD MM SS.ss); Degrees, decimal degrees (DD.dddd); and Degrees, Minutes, decimal minutes (DD MM.mm). The aircraft position was recorded in the various SAR event logs as follows:

SPOT position (DD.dddd):	N54.1597°	W119.2696°
RCMP position (DD MM SS.ss):	N54° 9′35.64″	W119° 16′ 8.04″
STARS position (DD MM.mm):	N54° 09.56′	W119° 16.14′

Shortly after locating the accident aircraft, the STARS flight crew members contacted their dispatch to relay the aircraft position. Instead of relaying the aircraft position as N54º 09.56′ (DD MM.mm), it was relayed as N54° 09′ 56″ (DD MM SS). This occurred at approximately 2325 and once again at 0125 when the RCMP called to clarify the aircraft's position. The difference between these two formats resulted in a position error of approximately 2200 feet.

The local GSAR team used a UTM mapping system from the Military Grid Reference System – North American Datum 27. The investigation revealed that grid locations used by the Grande Cache SAR group and the local RCMP detachment produced, on average, a horizontal distance error of approximately 750 feet when converted to latitude and longitude using common internet conversion tools.

In November 2007, the United States National SAR Committee (NSARC) Task Force created a geo-referencing matrix to be used by all NSARC member agencies during an interagency response (see Table 1). This table was designed to establish common geo-referencing formats during inter-agency operations in the United States.

Table 1. United States National SAR Committee Geo-Referencing Matrix [4]

Geo-Reference System User	United States National Grid (USNG)	Latitude/Longitude DD-MM.mmm	GARS [5]
Land SAR Responder	Primary	Secondary	N/A
Aeronautical SAR Responders	Secondary	Primary	Tertiary
Air Space De-confliction	N/A	Primary	N/A
Land SAR Responder/ Aeronautical SAR Responder Interface	Primary	Secondary	N/A
Incident Command: Air SAR Coordination Land SAR Coordination	 Secondary Primary	 Primary Secondary	 N/A N/A

Search and Rescue Communication

The National Search and Rescue Secretariat (NSS) is an independent government agency reporting to the Lead Minister for SAR (the Minister of National Defence). The NSS was established in 1986 to support and promote the activities of the National SAR Program (NSP) as a means to achieve a highly effective and economically responsible SAR program throughout Canada.

The NSS coordinates central activities for federal search and rescue elements, which include six federal departments: the CF (Department of National Defence), the Canadian Coast Guard (Department of Fisheries and Oceans), the Royal Canadian Mounted Police (Public Safety Canada), Transport Canada, the Meteorological Service of Canada (Environment Canada), and Parks Canada.

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4 National Search and Rescue Committee, "Catastrophic Incident Search and Rescue Addendum" to the *National Search and Rescue Manual*, Version 1.1 (August 2008).

5 Global Area Reference System

One of the NSS's initiatives is the SAR Interagency Frequency (SAR-IF). [6] The SAR-IF is a very high frequency-frequency modulated (VHF-FM) simplex radio communications channel (149.080 MHz). Industry Canada has made this frequency available as a standard communication frequency for land, air, and maritime front-line responders during interagency SAR operations. The National Working Group on SAR Radio Communications considered this a top priority, suggesting this channel as they believed that most SAR agencies in Canada already operated in this frequency range.

The NSS and the Ground Search and Rescue Council of Canada (GSARCC) have communicated the availability and promoted the use of this frequency to all Canadian SAR providers. [7] However, implementing the SAR-IF has proven problematic for civil aircraft. Civil aircraft, including those that are part of the Civil Air Search and Rescue Association program, are not normally equipped with this frequency. The primary medium for aeronautical communications in Canada is VHF-AM (amplitude modulation) in the 118 to 137 MHz frequency range. Canadian military SAR aircraft and personnel can use 149.080 MHz but do not; instead, they usually rely on internationally recognized VHF and ultra high frequency (UHF) SAR on-scene frequencies (123.1 MHz and 282.8 MHz). In the maritime SAR environment, communications usually occur on channel 16 (156.8 MHz), which is the international distress frequency or channel 06 (156.3 MHz), which is the international voice SAR on-scene frequency. [8] Moreover, if SAR agencies or individuals wish to use the SAR-IF, they must apply to Industry Canada for a new radio licence or an amendment to their existing licence. Adding this frequency to ground station licences means additional fees.

On 25 February 2009, the GSARCC unanimously supported renewed efforts to adopt the SAR-IF. To date, 50 GSAR jurisdictions out of at least 300 in Canada have done so. Only one air operator in British Columbia has installed the SAR-IF capability in its helicopters. Information gathered during this investigation has shown that several provincial jurisdictions are adopting their own SAR operating VHF and UHF frequencies. Some of these proposed frequencies are not normally available in civil aircraft and not typically used in Canadian military SAR aircraft.

During the rescue effort, the GSAR team had to use several police frequencies to communicate with dispatchers, who then had to make telephone calls to JRCC Trenton, who then had to call the CC130 Hercules and/or the STARS helicopter through their dispatch centres.

Department of National Defence Search and Rescue

The Department of National Defence through the CF has the primary responsibility in Canada for SAR services for all aviation incidents and accidents. The CF must cover an area larger than 15 540 000 km^2, including Canada's landmass, territorial waters, and mid-ocean sections of the Atlantic and Pacific oceans. This is a formidable challenge, with many regions of Canada a considerable distance from a primary SAR aircraft.

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6 *The Search and Rescue Interagency Frequency (SAR-IF),* retrieved 29 July 2009 from the National SAR Secretariat website (http://nss.gc.ca/site/SAR_IF/index_e.asp#5)

7 *The Search and Rescue Interagency Frequency (SAR-IF),* retrieved 29 July 2009 from the National SAR Secretariat website (http://nss.gc.ca/site/SAR_IF/index_e.asp#5)

8 *National SAR Manual*, B-GA-209-001/FP-001, DFO 5449, Chapter 8, October 2000.

The accident occurred in the Trenton SAR region. This region is responsible for responding to all cases from the Alberta–British Columbia border to the middle of Quebec. It has two primary SAR units: 424 Squadron in Trenton (CC130 airplanes and CH146 helicopters) and 435 Squadron in Winnipeg (CC130 airplanes). In this occurrence, 435 Squadron was the primary SAR asset nearest to the accident site. Without its own helicopters, 435 Squadron often requires helicopter support. Helicopters are capable of flying much slower and lower than fixed-wing aircraft, and can hover over a specific spot. CF SAR helicopters also have the ability to hoist persons in and out of accident sites. Fixed-wing aircraft, on the other hand, are ideal for long-range, rapid deployment of SAR personnel and equipment. Both types of aircraft are essential for effective SAR operations. When a CF primary SAR helicopter is not available, the JRCC typically tasks a CF secondary SAR asset. However, CF secondary SAR assets are not on call (24 hours a day/7 days a week), so their response to an occurrence can be significantly delayed as was the case with the CH146. All CF SAR aircraft are normally on a two-hour callout standby after 1600 local time.

The national SAR system relies heavily on non-CF agencies. If CF SAR aircraft are not available, or it will take a considerable amount of time for them to reach the site, JRCC will often task a civilian agency. STARS was tasked because of their proximity to the accident site and their air ambulance capabilities. However, unlike CF SAR helicopter crews, the STARS crew was not trained or qualified to conduct a ground rescue or to insert/extract personnel via rescue hoist.

In 2002, the CF proposed a SAR Level of Service metric that stated: "A primary Canadian Forces SAR aircraft will be capable of arriving at the start of a search pattern (Commence Search Point) for any aeronautical or maritime SAR incident occurring in a Canadian Search and Rescue Region within 4 hours of being tasked for 90% of SAR incidents and within 11 hours of being tasked for 100% of SAR incidents. The above response times may be susceptible to delays due to extreme weather conditions, mechanical failures, or to adhere to flying regulations." This proposed metric attempted to quantify a time interval from distress notification to having a primary SAR aircraft overhead the assigned commence search point. [9] The two primary factors influencing this proposal are the distance of the accident location from a primary SAR resource and environmental conditions. It did not consider the time required to search, to complete the rescue or on-scene medical phase, or to evacuate those requiring assistance. This proposed metric has not been approved. As it stands, the only metric in place for CF SAR operations is that it must meet the prescribed launch times: 30 minutes during normal work hours (between 0800 and 1600, Monday through Friday) and 2 hours during evenings and weekends.

Emergency Locator Transmitter

The helicopter carried a Pointer Avionics Sentry emergency locator transmitter (ELT), model 4000-10, with a Pointer C2020 battery, manufactured in November 2007. The battery was due for replacement in December 2009. The aircraft had a cockpit-mounted remote ELT switch. The pilot did not activate it during the crash sequence. The ELT was removed from the aircraft immediately after the accident.

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[9] The commence search point (CSP) is the geographic location where SAR resources begin any one of a variety of search patterns to locate a search object.

The ELT was sent to the TSB Laboratory for testing and analysis. The transmission characteristics were within the required specifications. There was no evidence found to indicate that the transmitter portion of the ELT would not have performed as designed at the time of impact.

Further testing showed that the inertia switch activation circuitry worked as designed. The linear type inertia switch installed in this ELT was sensitive to forces only along a single axis and only in one direction along that axis. Transport Canada regulations require that an ELT be installed in a helicopter so that the axis of sensitivity is oriented 45 degrees down from the aircraft's longitudinal axis. [10] The aircraft passed through trees vertically and then landed on its side. While these forces may have been significant, they were not along the ELT gravity switch's axis of sensitivity. While other types of ELTs are available that utilize multi-directional inertia switches and are sensitive to activation in multiple axes, they are not required by regulation.

The ELT battery voltage levels measured near full power. The connector leading from the battery to the transmitter was found to be loose, causing an intermittent connection. This resulted in the ELT not functioning as needed, even when the external switch was placed in the ON position. Transport Canada regulations require an annual function check of only the ELT, carried out while in position in the aircraft. [11] A bench test of the transmitted signal and its parameters is required, as well as a battery check or replacement every two years. There is no regulatory requirement to inspect the internal circuits or connectors for integrity or corrosion.

Analysis

The weather at the time of the accident was conducive to the formation of carburetor icing. The pilot had spent most of his career flying turbine-powered helicopters, in which carburetor icing is not a concern. The carburetor heat lever can move away from the required position through movement of the collective arm in flight. The reported loss of power was likely the result of carburetor icing, which could not be corrected by the pilot in the time available.

The different SPOT functions activated by the passenger, coupled with uncertainty among family members during discussions with the JRCC, contributed to the delay in the SAR response.

The full charge of the ELT battery suggests that the ELT likely did not activate, or did not transmit long enough to produce any noticeable drain on the battery. The loose connector prevented the ELT from transmitting until the unit was struck against a tree, at which point it made contact and began functioning. In addition, even if the battery connector was tight, the impact forces likely would not have triggered the gravity switch due to the orientation of the ELT and the single axis switch. The fact that the ELT did not transmit until 2041 contributed to the delayed SAR response. A more in-depth ELT inspection requirement could reduce the probability that defective components either delay or prevent life-saving SAR actions.

Several SAR agencies were involved in the rescue. The various geo-referencing formats used by the SAR agencies involved required conversions to their preferred format. This led to variances in the reported accident location and delays reaching the accident site. Ultimately, the

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10 Section 551.104 of the *Canadian Aviation Regulations*

11 Section 625, Appendix C, of the *Canadian Aviation Regulations*

passenger, who had walked back to the road, led SAR resources to the injured pilot. This occurred more than 11 hours after the accident. A common geo-referencing standard could have helped prevent this confusion.

The lack of a common communication frequency among SAR responders also contributed to the delay in rescue. Faster clarification of the accident location and coordination of tasks would have shortened rescue time. The risk for serious injury and death increases as SAR response time increases.

This occurrence also highlights the potential length of time that people in distress may have to wait for a SAR helicopter because of environmental conditions and/or distance from a SAR base. It also brings to light capability differences between civilian and military SAR resources. The STARS aircraft was able to land within one-half nautical mile of the crash site; however, the crew was not trained or qualified to carry out a ground rescue. As a result, a seriously injured person went without critical medical attention for several additional hours after the crash site was located. Military SAR helicopter crews are trained and qualified for such a rescue operation and would have been able to reach the patient (by land or by hoist) once the wreckage had been located. However, with no primary SAR helicopter tasked, and no secondary SAR helicopter available until the following day, STARS was the best option available.

While environmental conditions are uncontrollable, geographic location of SAR assets can have a significant impact on survivability following an aviation occurrence. A metric that accounts for transit time, search, and actual rescue/recovery of personnel in distress would be a valuable tool for determining whether the level of national CF SAR coverage is acceptable.

The following TSB Laboratory reports were completed:

LP 020/2009 – GPS Analysis
LP 024/2009 – ELT Analysis

These reports are available from the Transportation Safety Board of Canada upon request.

Finding as to Causes and Contributing Factors

1. It is likely that carburetor ice formed resulting in the loss of engine power and main rotor rpm from which the pilot was unable to recover.

Findings as to Risk

1. A loose connector from the battery to the transmitter in the emergency locator transmitter (ELT) prevented the ELT from functioning properly. Current ELT inspection criteria mandated by Transport Canada do not include internal circuitry, which, if faulty, may cause ELT activation failures.

2. An ELT with a unidirectional axis gravity switch may not activate if impact forces are along any other axis, thus delaying search and rescue (SAR) notification.

3. The use of different geo-referencing formats and the position error created during conversions contributed to rescue delay. Canadian SAR agencies do not use a common geo-referencing format, thus increasing the likelihood of position error and longer rescue times during interagency operations.

4. The Canadian Forces (CF) has no SAR level of service metric in place, making it difficult to determine if the level of national CF SAR coverage is acceptable.

5. Unfamiliarity with the functions of the SPOT satellite global positioning system (GPS) messenger may delay the initiation of SAR efforts.

6. The lack of a common communication frequency among SAR participants may result in confusion for search parties and contribute to delays in reaching survivors.

Safety Action Taken

Transportation Safety Board of Canada

On 27 April 2009, the Transportation Safety Board sent Aviation Information Letter A09W0021-D1-L1, *Passenger Safety Briefings - Alternate Means of Emergency Location,* to Transport Canada and other industry stakeholders. This letter highlighted the importance of integrating new equipment, such as alternate means of emergency location (AMEL) devices, into a company's operation through procedures and training.

Shock Trauma and Air Rescue Society

The Shock Trauma and Air Rescue Society (STARS) has changed its standard operating procedures to mandate use of the DD MM.mm latitude/longitude format.

Joint Rescue Co-ordination Centre Trenton

This incident has prompted increased vigilance by search and rescue (SAR) mission coordinators at Joint Rescue Co-ordination Centre (JRCC) Trenton to minimize the possibility of geo-referencing inaccuracy in multiple agency rescue operations by indicating the referencing methodology when tasking any resources.

National Search and Rescue Secretariat

At the 06 October 2009 Ground Search and Rescue Council of Canada meeting, a motion was passed that the National Search and Rescue Secretariat (NSS), in partnership with a provincial/territorial representative, will lead research into the development of a SAR standard for geo-referencing.

Sarvair Aviation Ltd.

Sarvair will continue to carry a SPOT unit on board aircraft that do not have some other alternate means of emergency location (AMEL) installed. All AMEL website codes and passwords have been added to the "Over Due Aircraft" checklist. Sarvair is in the process of creating a SPOT basic use information card to brief passengers and carry on flights with SPOT.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 20 January 2010.

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