



REASSESSMENT OF THE RESPONSE TO AVIATION SAFETY RECOMMENDATION A95-07

Global positioning system (GPS)

Background

On 10 November 1993, a Hawker Siddeley HS 748 Series 2A aircraft (C-GQTH), owned and operated by Air Manitoba Limited (Air Manitoba), departed Winnipeg, Manitoba, on a scheduled flight that included stops at Sandy Lake, Ontario; St. Theresa Point, Manitoba; Island Lake, Manitoba; and return to Winnipeg, Manitoba. On arrival at Sandy Lake, the crew attempted to land but was unable to because of the low ceiling and visibility. They then diverted to St. Theresa Point. After a normal turnaround, the flight returned to Sandy Lake. The aircraft took off from Sandy Lake and immediately entered a right turn. After turning through approximately 120 degrees, the aircraft descended into 100-foot trees and crashed. The aircraft struck the ground about one nautical mile northwest of the airport. All seven occupants of the aircraft were fatally injured, and the aircraft was destroyed.

The Board determined that, after takeoff, the crew most likely lost situational awareness and, as a result, did not detect the increasing deviation from their intended flight path. Contributing to the loss of situational awareness was the lack of AC power to some of the flight instruments; the reason for the lack of AC power could not be determined.

As a result of this accident, the Board issued 4 aviation safety recommendations.

The Board concluded its investigation and released Aviation Investigation Report A93H0023 on 14 March 1995.

Board Recommendation A95-07 (March 1995)

The global positioning system (GPS) installation in C-GQTH was used in instrument meteorological conditions (IMC) as a primary navigation aid during the approaches to Sandy Lake. The GPS installation was not approved for such use. The TSB has identified other occurrences in which pilots have misused GPS while conducting instrument flight rules (IFR) flights, or in which pilots on visual flight rules (VFR) flights have continued flight into adverse weather while using GPS and encountered conditions with which the pilot and/or aircraft could not cope. Evidence suggests that both recreational pilots (seeking an inexpensive navigational system) and commercial, passenger-carrying operators are employing GPS in order to get into airports without approved instrument approaches. It is doubtful that these locally improvised GPS approaches take into account the obstruction clearance criteria used in the design of approved approaches, including the acquisition of valid local altimeter settings.

While the Board is concerned over the misuse of GPS, it recognizes the potential of this equipment and what it could offer to the Canadian aviation community. The potential benefits

of GPS have been widely publicized; the safety implications of improvising in the use of GPS in a non-regulated environment have received less publicity. The benefits may be tempting pilots and operators to accept risks that would normally be unacceptable without GPS. Therefore, to reduce the potential for GPS-related occurrences resulting from the use of unapproved equipment, inadequate understanding of the system, or lack of approved approaches, the Board recommends that:

The Department of Transport expedite the implementation of approved GPS standards and procedures for use in Canadian airspace.

TSB Recommendation A95-07

Transport Canada's response to Recommendation A95-07 (June 1995)

Transport Canada Aviation (TCA) agrees with both recommendations (A95-07 and A95-08). In fact, TCA has been devoting considerable resources to global positioning systems (GPS). In late 1992, a Global Navigation Satellite System (GNSS) Working Group was established to explore the potential of GPS and develop safety standards. This was succeeded in July 1994 by a Satellite Navigation Program Office (SNPO), with dedicated staff and funding. The SNPO coordinates TCA's GPS efforts; its priorities are to develop safety standards and to communicate with users.

A considerable amount of information has been provided to users. In February 1993, a section on satellite navigation was included in the *Aeronautical Information Publication (AIP) Canada*. The text, updated regularly, explains the operation, features and shortcomings of GPS. It specifically warns against using uncertified receivers for instrument flight rules (IFR) flight. All major aviation organizations have been briefed, as have staff in regional offices. A "GNSS Update" newsletter provides technical information and the latest news on GPS. The first issue, published in April 1993, contained a clear warning against using uncertified receivers for IFR. In each region, a SNPO point of contact coordinates communications with local users.

These IFR GPS approvals are classified as supplemental (as opposed to sole means). Supplemental use imposes certain limitations. Firstly, the crew must always have available, and in some cases continuously monitor, a conventional navigation aid (i.e., VOR [VHF omnidirectional radio range] or NDB [non-directional beacon]). GPS can be used to navigate the aircraft, but because the chance of loss of service or provision of wrong information is greater than aviation standards permit, a navigation aid that meets the standards must be used as backup. This safeguard permits early benefits to the industry and increases operational experience with GPS. Secondly, the receiver used must be certified to the standards of TSO C129 and must meet installation requirements. This ensures acceptable receiver performance, user interface, and compatibility with other aircraft systems, etc.

TCA has also been active in standards development. In 1992, TCA began working with the United States Federal Aviation Administration (FAA) to explore the potential of GPS and to develop standards and procedures to ensure safe operations. A Technical Standard Order (TSO C129) for receivers was developed in the United States in 1992 and applies in Canada.

Joint TCA/FAA trials proved that TSO C129 receivers would support IFR en route and non-precision approach operations. This led to the first approval to use GPS for IFR in the

United States in June 1993 and in Canada in July 1993. The TCA approval (revised in February 1995) is detailed in a Special Aviation Notice provided to all Canadian pilots. The Notice specifies receivers meeting TSO C129. In August 1993, TCA issued an Air Carrier Advisory Circular encouraging all Canadian operators to use GPS and providing guidance to help them to obtain approval. During the same period, TCA Airworthiness developed receiver installation standards. An Aeronautical Information Circular (AIC) issued 21 July 1994 amended A.N.O. V, No. 22 - IFR Flight Instruments and Equipment Order to allow a certified GPS receiver to replace one VOR or ADF [automatic direction finder] receiver. TCA has designated 149 GPS non-precision approaches overlaying existing VOR and NDB approaches. Pilots must monitor the traditional aid during these approaches to ensure safety while gaining experience with GPS. There is no overlay approach at Sandy Lake. All TCA documents specify that TSO C129 receivers must be used for IFR operations.

TCA is currently working with the FAA to develop GPS augmentations to permit sole means use and precision approach. TCA will ensure that these new systems are safe through trials, studies and participation in standards development.

In summary, TCA agrees with the recommendations, will continue to expedite the development of standards, and will continue to promote the safe use of GPS. Specifically, an Aviation Notice and an article in the Aviation Safety Letter newsletter will be published at the next opportunity, highlighting the hazards of improper use of GPS.

Board assessment of the response to Recommendation A95-07 (July 1995)

Transport Canada (TC) agrees with the recommendations, and outlines several existing and planned initiatives to expedite the implementation of global positioning system (GPS) standards and raise the awareness of the aviation community to the limitations and safe use of GPS. Included in these efforts will be an Aviation Notice and an article on GPS in the Aviation Safety Letter (ASL). The ASL is distributed to all licensed pilots in Canada and is considered to be a very effective safety publication.

TC's efforts should address the deficiencies identified.

Therefore, the response to Recommendation A95-07 is assessed as **Satisfactory Intent**.

Board reassessment of the response to Recommendation A95-07 (November 1997)

NAV CANADA SAT NAV office is working in cooperation with the Federal Aviation Administration (FAA) to implement a phased approach to the full realization of global positioning systems (GPS) for all phases of flight in Canada.

Therefore, the assessment of the response to Recommendation A95-07 remains **Satisfactory Intent**.

Board review of Recommendation A95-07 deficiency file status (April 2014)

The Board requested that A95-07 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 A95-07 needed to be reassessed.

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

Therefore, the assessment of the response to Recommendation A95-07 remains **Satisfactory Intent**.

Consequently, the status of Recommendation A95-07 is changed to **Active**.

Transport Canada's response to Recommendation A95-07 (July 2015)

Transport Canada has addressed this issue in *Canadian Aviation Regulations* (CARs) 803.02/TP 308 and criteria that allow for the use of global navigation satellite systems (GPS [global positioning system] in this case). There exist today several GNSS instrument procedures in Canada as well as instrument flight rules (IFR)-approved GNSS receivers.

Board reassessment of the response to Recommendation A95-07 (March 2016)

The regulatory changes identified in Transport Canada's July 2015 response now allow for the use of global navigation satellite systems for all phases of flight in Canada.

These changes should substantially reduce or eliminate the safety deficiency identified in Recommendation A95-07.

Therefore, the response to Recommendation A95-07 is assessed as **Fully Satisfactory**, and no further action is required.

This deficiency file is **Closed**.