

AVIATION INVESTIGATION REPORT

A01P0129

ILS FALSE LOCALIZER CAPTURE

SHAW COMMUNICATIONS INC.

BOMBARDIER CL-600-2B19 C-FSJR

VICTORIA INTERNATIONAL AIRPORT, BRITISH COLUMBIA

14 JUNE 2001

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

## Aviation Investigation Report

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### *Summary*

The crew of a Bombardier CL-600-2B16 aircraft (C-FSJR) was on radar vectors for an instrument landing system approach to Runway 27 at Victoria International Airport, British Columbia. When cleared for the approach, the aircraft was about 10 nautical miles (nm) from the airport, about 5 nm north of the localizer course, and descending through approximately 4000 feet above sea level. When the pilot selected the aircraft's autopilot to approach mode, the aircraft turned to the right and the navigation equipment indicated that it had captured the localizer. The crew determined that the autopilot system had taken an inappropriate intercept and was directing their aircraft away from the localizer, which they knew to be about 5 nm south of their position. The crew visually confirmed the false localizer course capture when they broke out below a scattered layer of cloud and noted that the localizer intercept was heading their aircraft toward Mount Tuam on Saltspring Island. The crew switched the autopilot to heading mode and re-established an intercept for the Runway 27 localizer. The aircraft landed safely. No injuries or damages resulted from this occurrence.

*Ce rapport est également disponible en français.*

## *Other Factual Information*

### *ILS Information*

An instrument landing system (ILS) is a precision approach aid that allows pilots to descend safely in inclement weather. An ILS localizer uses VHF (very high frequency) signals to provide accurate course information. This data is combined with UHF (ultra high frequency) signals that provide glidepath information to the pilot. The signals are directional and can normally be received when the aircraft is within 10° to 35° of the on-course track.

The coverage and validity of ILS localizer signals are regularly confirmed by flight inspection within 35° either side of a front- or back-course nominal approach path to a distance of 10 nm and through 10° either side of a front- or back-course nominal approach path to a distance of 18 nm.

### *Automated Flight Control Systems*

Automated flight control systems (AFCSs) provide a pilot with easily interpreted displays of the aircraft's flight path and with autopilot control functions. As part of its operation, an AFCS computes the steering commands necessary to allow an aircraft to intercept and capture a selected localizer track. Under certain conditions, an AFCS may capture an incorrect localizer course and cause the autopilot to turn the aircraft away from the correct localizer beam.

### *Localizer False Course Capture*

After an extensive effort in the early-mid 1990s, Transport Canada concluded that false captures are essentially caused by an incompatibility of ground and airborne instrument landing systems. Relevant information about this type of event was promulgated in *Air Carrier Advisory Circular (ACAC)*<sup>1</sup> 0066, dated 11 May 1994. ACAC 0066 also indicated that this incompatibility results from different standards governing the ILS ground installations and the established localizer capture criterion of AFCS airborne components. The problem can occur even though the ground transmitter and the airborne receiver both meet their respective performance requirements. When crews note a false localizer course capture, they are required to report it to the appropriate Air Traffic Services facility. After this occurrence, the required reporting procedure was followed, and the localizer equipment was checked and confirmed to be serviceable.

False course captures may occur when a pilot prematurely selects approach mode from either heading or lateral navigation mode on the AFCS. According to *Aeronautical Information Publication (AIP)*, although the problem can occur at azimuths of 8° to 35° from the localizer on-course, it is most likely to occur when the aircraft is in the vicinity of 8° to 12° azimuth from the published localizer course. In this occurrence, the aircraft was about 10 nm from the airport and 26° north of the localizer course when the false localizer course capture occurred.

Transport Canada first became aware of the potential for an ILS false localizer course capture in the early 1990s. In response, Transport Canada

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<sup>1</sup> ACACs provide information and guidance on operational matters for the use of Canadian and foreign air operators and pilots operating in Canada.

- formed a working group to monitor the problem and to consider possible recommendations and improvements to reduce the risk of the problem recurring
- issued a Class I notice to airmen to request that all false ILS captures be reported to the chairperson of the Localizer False Capture Working Group
- consulted with major manufacturers of AFCSs for assistance in developing options for corrective measures
- issued ACAC 0045 on 24 February 1993 about the problem
- published an aviation notice on 29 April 1993
- issued ACAC 0066 on 11 May 1994 to provide additional direction to carriers
- amended AIP to promulgate relevant information on this problem (Communications [COM] 3.13)

### *Procedural Defences*

In general terms, the aviation notice, the two ACACs, and the AIP amendment describe a procedure for pilots to reduce the risk of false captures and a methodology to confirm whether the capture is valid. In part, this procedure suggests

- that the approach mode should not be selected until the aircraft is within 18 nm of the threshold and positioned within 8° of the inbound ILS course
- that pilots use raw data<sup>2</sup> sources to ensure that the aircraft is on the correct localizer course before initiating a coupled approach

After Transport Canada introduced new procedural defences, the reports of false localizer course captures ceased, and Transport Canada closed the issue on 15 December 1994.

The TSB is aware of four similar false localizer capture events since then:

- 19 March 1999, Toronto, Cathay Pacific, Airbus A340, Runway 24R
- 17 April 1999, Toronto, Cathay Pacific, Airbus A340, Runway 24R
- 08 May 1999, Halifax, Air Transat, Boeing 757, Runway 24
- 14 June 2001, Victoria, Shaw Communications, Bombardier CL-600, Runway 27 (current event)

A hard copy of AIP is issued to all Canadian pilots, but the document is not yet available through the Internet for easy access by foreign pilots.

### *Analysis*

The crew of the CL-600 received a false localizer course capture when they selected the approach mode on their flight management system. False localizer course capture is a known problem, for which AIP has an established procedural defence at COM 3.13.1. When the crew selected approach mode, the aircraft was well outside the parameters that are recommended by AIP COM 3.13.1 and near (or beyond) the limit at which the integrity of the ILS is verified.

The recent recurrences of false localizer course captures may indicate a requirement to remind pilots of the guidance provided in AIP. This requirement may be even more compelling in the case of foreign air carriers that operate in Canada, because these carriers may not have easy access to AIP.

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<sup>2</sup> *Raw data* refers to any navigational information that has not been processed by the flight director system.

### *Findings as to Causes and Contributing Factors*

1. When the crew selected approach mode, the aircraft was inside the recommended distance from the airfield but near or beyond the limits at which the integrity of the ILS is verified.

### *Findings as Risk*

1. Some ground and airborne ILS equipment are known to be incompatible. This incompatibility may occasionally cause false or incorrect localizer course captures.
2. Recent recurrences of false localizer course captures may indicate a requirement to remind pilots of the guidance provided in AIP.

### *Other Findings*

1. AIP COM 3.13.1 outlines an established procedural defence that, if used, will reduce the risk of false or incorrect localizer captures.

### *Safety Action Taken*

TSB Pacific Region forwarded a copy of Transport Canada's 29 April 1993 aviation notice to the operators involved in this occurrence. These operators then provided copies to all of their pilots.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 13 August 2002.*