



**Australian Government**

**Australian Transport Safety Bureau**

# A flight navigation instrument event, involving a Beech 1900, VH-YOA

13 km north of Kingscote Airport, South Australia, 19 March, 2014

**ATSB Transport Safety Report**  
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#### **Addendum**

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# A flight navigation instrument event, involving a Beech 1900D, VH-YOA

## What happened

On 19 March 2014, a flight test for the issue of a Civil Aviation Safety Authority (CASA) Approved Test Officer (ATO) delegation<sup>1</sup> was being conducted by two officers from the Civil Aviation Safety Authority (CASA), on the senior check and training captain for the organisation.

The test involved an Instrument Flight Rules (IFR) procedures flight in a Beech 1900D aircraft (1900D) registered VH-YOA (YOA). The captain under test occupied the left seat of the aircraft. He was being observed by the CASA officers, as he conducted an instrument rating test on a newly employed first officer (FO) occupying the right seat. The two officers from CASA were seated directly behind the flight crew.

The first sector of the flight was from Adelaide to Kingscote Airport, Kangaroo Island, South Australia. On arrival at Kingscote, the FO, as the pilot flying, conducted the RNAV-Z RWY19 approach, and then a single engine<sup>2</sup> missed approach. The flight continued beyond Kingscote, with approaches conducted at other airports prior to returning to Adelaide. The weather conditions were good, allowing the entire flight to be conducted in visual meteorological conditions (VMC).

During the test de-briefing, the CASA officers queried why the flight director (FD) bars on the Rockwell Collins electronic attitude director indicator (EADI) (Figure 1), which the FO was following, were not agreeing with the information presented by the Bendix King KLN90B Global Positioning System (GPS) (Figure 2). The course direction indicator (CDI)<sup>3</sup> linked to the GPS, was about half scale deflection out, when the flight director bars were followed. A disconnect between the information given by the FD bars, and that given by the GPS, occurred when the GPS re-scaled<sup>4</sup> in the latter part of the approach. As the majority of the company flight crew reported not engaging the flight director bars when conducting an RNAV approach, the issue had not been previously identified.

To further test the interaction occurring between the GPS and the flight directors, the chief pilot and first officer conducted a test flight using YOA. The test flight departed Adelaide on 26 March 2014, conducting the RNAV approach into Coober Pedy, and two RNAV approaches into Whyalla.

During the first RNAV approach into Whyalla, the crew used a combination of NAV and/or APPROACH modes and noted that, when selected, neither the captain's nor first officer's flight director bars displayed accurate information. This was confirmed during the next RNAV approach to runway 04 at Coober Pedy. During a subsequent RNAV approach for Whyalla, the flight

**Beech 1900D: VH-YOA**



Source: Operator

<sup>1</sup> An ATO delegation allows the holder to conduct flight tests and issue licences and ratings (depending on the delegation), such as instrument ratings, to candidates meeting all CASA pre-requisites and deemed at a competent standard

<sup>2</sup> This is a typical test condition, simulating a failed engine at or near the minima. The pilot flying has to re-configure the aircraft in a timely and safe manner, to conduct a climb on one engine to the minimum safe altitude.

<sup>3</sup> The Course Directional Indicator is an avionics instrument used to determine an aircraft's lateral position in relation to a course (Wikipedia)

<sup>4</sup> The scale factor changes from +- 1.0NM to +- 0.3 NM

director was not selected, and the indications displayed during the RNAV approach using the KLN90B GPS were normal.

**Figure 1: Rockwell Collins Electronic Attitude Director Indicator (EADI)**



Source: Google images

The operator sought clarification from the aircraft flight manual supplements to determine why the discrepancy occurred when the FD's were selected. However the flight manual did not give a clear instruction regarding the use of FD's during an RNAV approach. Other operators utilising the same aircraft type also found a similar lack of information from the flight manual supplements.

**Figure 2: A Bendix / King KLN 90B GPS**



Source: Google images

In the interests of safety, and to be able to give a firm directive to company pilots, the company conducted a similar test flight in their other Beech 1900D aircraft, VH-ZOA (ZOA).

In VMC, they experimented with the selection of different approach modes with the FD's selected, then not selected. Initially they used the NAV only mode, then NAV and APPROACH FD modes. During the RNAV approach into Whyalla, the GPS CDI agreed with the flight director information, however during the RNAV approach into Coober Pedy, the captain's flight director worked correctly, but the first officer's flight director gave erroneous information.

In summary, during several RNAV approaches into a range of different airports, in both of the

1900D aircraft, erroneous information was presented to the flight crew when the FD bars were selected. The crew reported that sometimes the error was from the captain's flight director, and sometimes from the first officer's. The only consistency was that the fault occurred when the GPS was re-scaling during the latter part of the approach. It was determined that there was no error with the KLN90B GPS.

Both the captain's and first officer's flight directors were reported as providing accurate guidance during instrument landing system (ILS), and VHF omnidirectional range (VOR) approaches, and during long range navigation (LNR).

### **Aircraft**

The Beech 1900D is a pressurised 19 seat twin turbo-prop aircraft.

Both YOA and ZOA had a Rockwell Collins electronic flight information system (EFIS-84) fitted. The primary display of the EFIS consists of multicolour cathode ray tube (CRT) displays, which provide both conventional electronic attitude direction indicator (EADI), and electronic horizontal situation indicator (EHSI) functions. Flight directors can be selected for both the captain and first officer's EADI. The operator updates the navigation database in each aircraft every 28 days.

### **Engineering / Avionics report**

The organisation obtained an independent avionics engineering check on the GPS installation for both YOA and ZOA. Both aircraft had the KLN90B wiring continuity tested. It was reported that the wiring and interfaces were in accordance with an approved foreign Supplemental Type Certificate (STC).

### **CASA comment**

With the permission of the operator, CASA were contacted to provide assistance. They were able to rule out maintenance issues, but determined that there were differences between the original equipment manufacturer recommendations and the diagrams of the installation as supplied by the operator.

### **ATSB comment**

A search was conducted of the ATSB database, but no similar occurrences had been reported. Similarly, when contacted, CASA had no similar incidents reported to them through the service difficulty reporting (SDR) system.

The ATSB contacted current Australian operators of the 1900D aircraft type and there were no similar errors reported as for YOA and ZOA.

### **Safety action**

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

### **Operator**

As a result of this occurrence, the aircraft operator has advised the ATSB that they have submitted a Service Difficulty Report to CASA and are taking the following safety actions:

#### ***Flight Crew Directive from the Chief Pilot:***

All crew members B1900 / B200

We have noticed that if the Flight Director is coupled to RNAV approaches, there is a possibility that the Flight Director data is incorrect.

Company procedures have been amended to preclude the use of RNAV approaches with the FD selected.

They are only to be used on long range navigation (LRN), instrument landing system (ILS) and VOR approaches.

**ATSB**

The ATSB was unable to reconcile the differences between the equipment manufacturer’s original wiring recommendations and those for the foreign STC modifications on these aircraft. Both YOA and ZOA were compliant with the wiring installation as provided, but this wiring differs from that recommended by the manufacturer. In light of this, the ATSB is forwarding a copy of this report to the foreign Civil Aviation Authority responsible for the authorisation of the equipment installation instructions for further investigation.

**General details**

**Occurrence details**

Date and time:	19 March 2014 – 0830 CST	
Occurrence category:	Incident	
Primary occurrence type:	Technical Systems – Avionics / Flight Instruments	
Location:	13 km North of Kingscote Airport, South Australia	
	Latitude: 35° 35.88' S	Longitude: 137° 32.45' E

**Aircraft details**

Manufacturer and model:	Beech Aircraft Corporation 1900D	
Registration:	VH-YOA	
Serial number:	UE-143	
Type of operation:	Charter	
Persons on board:	Crew – 2	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

**About the ATSB**

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

## About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.