Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – AO-2007-042

Final

Electrical System Event
130 km SE of Mackay Aerodrome, Qld
4 September 2007
VH-YJR
Rockwell Aero Commander 500-S

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Abstract

During cruise at 9,000 ft, the aircraft encountered severe turbulence and the electrical system failed. The pilot unintentionally lost control of the aircraft when he leaned forward on the control column yoke and used both hands to search in the dark for a torch on the cockpit floor.

After recovering the hand-held torch, the pilot was able to light the instrument panel and return the aircraft to the required heading and altitude. When the battery master switch was turned off, the electrical system returned to full operation on alternators.

Maintenance personnel found that an internal electrical short in one of the 12 volt batteries had contributed to the electrical failure. After replacement of the faulty battery and completion of satisfactory electrical system checks, the aircraft was returned to service.

The pilot of the aircraft now secures his torch to his shirt with a strap to enable him to use both hands to keep control of the aircraft should a similar situation arise.

The aircraft operator now secures torches in all its aircraft with the addition of a quick release strap on the torch container.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external bodies.

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.

Purpose of safety investigations

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

It is not the object of an investigation to determine blame or liability. However, 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.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

History of flight

On 4 September 2007, at about 2120 Eastern Standard Time[1], the pilot of a Rockwell Aero Commander 500-S (Shrike Commander), registered VH-YJR, reported severe turbulence during cruise at 9,000 ft and all electrical power was lost. The aircraft was being flown on autopilot on a night positioning flight from Mackay to Thangool Qld and the pilot was the sole occupant.

The cockpit torch and the pilot's torch were dislodged the from their stowage positions by the severe turbulence. While searching with both hands for a torch on the cockpit floor, the pilot leaned forward on the control column and unintentionally lost control of the aircraft. When the pilot recovered one of the torches, he noticed that the aircraft was on descent through 8,000 ft at 2,000 ft/min, in a 40 degree turn and 70 degrees off the original heading. The pilot managed to regain control of the aircraft with one hand while holding the torch in the other. He climbed the aircraft back to 9,000 ft and brought the aircraft onto the original heading to Thangool.

With the aircraft under control, the pilot checked all circuit breakers and avionic master switches. When no faults were found, he decided to turn off the battery master switch to prevent a possible electrical fire. This action restored electrical power to the aircraft. The pilot then checked the engine driven alternators for correct charge rates and amperage, and these appeared to be operating correctly.

The pilot responded to a request from Brisbane air traffic control (ATC) who wanted to know if operations were normal as they had lost radar and radio contact with the aircraft. The pilot informed them of the electrical system event and advised that he was continuing to Thangool Aerodrome. The pilot re-engaged the autopilot and continued to monitor the aircraft electrical system during the remainder of the flight to Thangool.

At the time the severe turbulence was encountered, the pilot recalled that it was cloudy and raining with no lightning. He said that the severe turbulence lasted for approximately 15 seconds.

Earlier that day, the pilot had obtained a weather forecast for the region while at Gladstone before flying to Rockhampton, then Thangool and on to Mackay. The weather forecast was for cumulonimbus cloud and turbulence. The aircraft was not fitted with weather radar.

Maintenance action

An initial examination of the aircraft by the operator's maintenance engineer showed no signs of arcing or burning or insecure batteries.

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1 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time, as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

Further electrical system checks showed that one of two 12 volt lead-acid batteries had an internal fault. The battery was unable to produce any voltage while under an electrical load.

When a serviceable battery was fitted, the electrical system operated normally. After other electrical system checks were satisfactorily completed, the aircraft engines were run-up and the battery charging system was seen to be operating normally. The aircraft was returned to service.

ANALYSIS

The pilot unintentionally lost control of the aircraft while searching in the dark for a torch on the floor that had been dislodged during severe turbulence. During the search, he took both hands off the control column yoke and leant forward on the control column, resulting in the aircraft descending, banking, and moving off heading.

It is most likely that the internal short in one of the 12 volt batteries drew all the current from the aircraft's alternators causing a complete loss of lighting and power to instruments and radios. When the battery master switch was turned off, the power drain from the alternators to the defective battery was isolated and essential electrical power was restored. When a new battery was subsequently fitted following the event, the electrical system functioned normally.

FINDINGS

From the evidence available, the following findings are made with respect to the electrical systems failure event involving VH-YJR on 4 September 2007 and should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- During cruise at night, the aircraft encountered severe turbulence for a short period, displacing the pilot's and cockpit torches from their stowage positions.
- Concurrent with severe turbulence, the aircraft lost electrical power to the cockpit lighting, instruments and radios, due to an electrical short in one of the aircraft's batteries.
- While searching for a torch on the cockpit floor, the pilot leaned forward on the control column, resulting in an unintentional loss of control of the aircraft.

Other key findings

- The pilot's action in switching off the battery master switch restored electrical power to the aircraft by isolating the electrical short in one of the aircraft's batteries.

SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Action sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Pilot in command

As a result of this occurrence, the pilot has reported that he now secures his torch to his shirt with a strap to enable him to use both hands to keep control of the aircraft should a similar situation arise.

Aircraft Operator

As a result of this occurrence, the aircraft operator has advised that it now secures torches in all its aircraft with the addition of a quick release strap on the torch container.