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Inadvertent landing gear retraction involving Aero Commander 500-S VH-YJS

Toowoomba Airport, 21 August 2012

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Inadvertent landing gear retraction involving Aero Commander, VH-YJS

AO-2012-110

What happened

On 21 August 2012, at about 1530 Eastern Standard Time[1] an Aero Commander 500S, registered VH-YJS (YJS), departed Charleville, Queensland for Brisbane Airport via, Roma, Dalby and Toowoomba on a freight charter flight under the IFR[2]. The pilot was the only person on board.

Aero Commander

Source: Copyright Steve Bottom

At about 1835, the pilot performed a straight-in approach to Toowoomba and noted as part of the final checks that the landing gear was down with three green lights illuminated. The pilot reported flying a slightly higher approach than he would during daylight hours and the touchdown being slightly heavier than normal. Otherwise, the pilot reported that there was nothing out of the ordinary with the approach and touchdown phase.

About 300 m into the landing roll, the pilot recalled intending to retract the flaps, when the main gear collapsed. The aircraft slid along the runway for a short distance on the lower fuselage. The nose gear remained in the locked down position and the aircraft came to rest on the runway.

The pilot shut down the aircraft normally leaving the navigation lights on. The pilot then contacted air traffic control to report the incident and alert them to the aircraft on the runway. The pilot exited the aircraft without injury, however, the aircraft's lower fuselage was damaged due to contact with the runway surface.

Landing gear operation and inspection

To lower the landing gear, the aircraft checklist required the pilot to move the gear handle to the down position and confirm that the landing gear was down and locked. Confirmation that the landing gear was down was through the illumination of three green lights which corresponded to, the two main gear and nose gear. The pilot was then required to position a manual safe pin to the locked position (Figure 1). The manual safe pin was a design feature to prevent inadvertent movement of the gear selector to the UP position.

Movement of the gear selector to the UP position opened a solenoid which released 1000 psi pressure from down actuators. To move the gear selector to the UP position required the following actions:

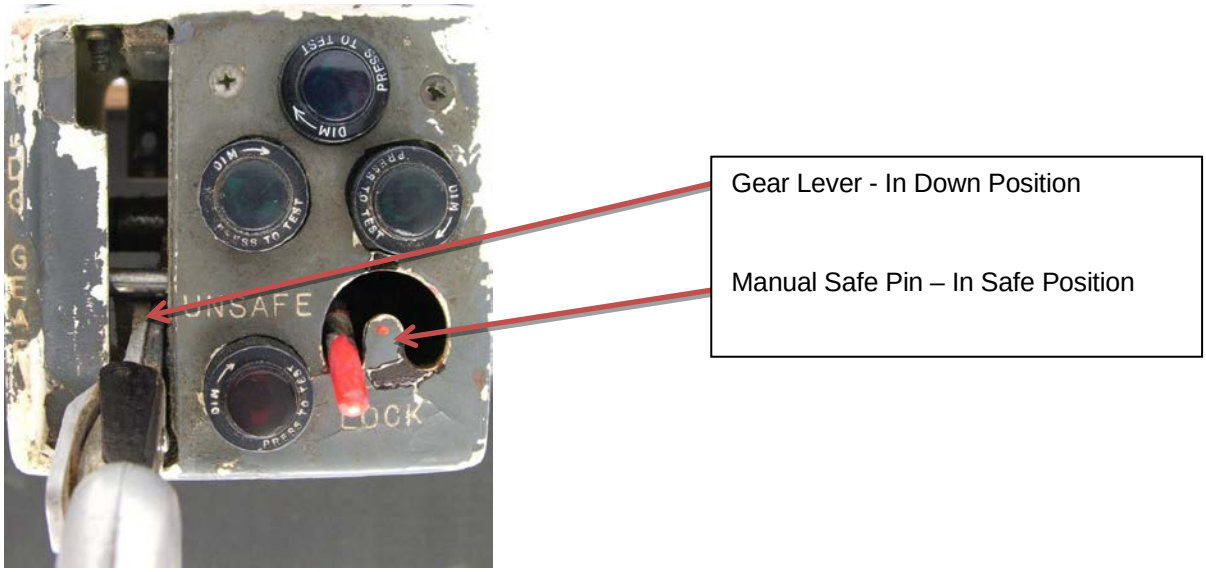
- if the manual safe pin was in the safe position; movement of the safe pin from the locked position to the unlocked position (Figure 1)
- squeeze the safety lock
- movement of the gear handle to the left to release indent pin
- movement of the gear handle to the UP position

[1] Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours

[2] Instrument flight rules permit an aircraft to operate in instrument meteorological conditions (IMC), which have much lower weather minimums than visual flight rules. Procedures and training are significantly more complex as a pilot must demonstrate competency in IMC conditions, while controlling the aircraft solely by reference to instruments. IFR-capable aircraft have greater equipment and maintenance requirements

The day after the incident, the aircraft was inspected by engineers and a number of landing gear extensions and retractions were performed without fault.

Figure 1: Gear Selector



Source: *GAM Air*

Pilot information and comments

The pilot held an Airline Transport Pilots Licence, with a current medical. The pilot had a total of 2,450 flight time with 760 hours on type.

During the landing roll, the pilot reported looking towards the parking area to locate a suitable parking area for YJS. At the same time, the pilot reported retracting the flaps during the landing roll, which the pilot stated was his usual practice to increase braking efficiency and was in accordance with the aircraft flight manual.

The pilot thought that while intending to retract the flaps he may have inadvertently retracted the landing gear and there were two possibilities as to how this happened;

- Either he did not place the safety pin in the safe position when the landing gear was extended in accordance with the checklist or alternatively;
- He unconciously repositioned the safety pin as part of a well rehearsed muscle program used to operate the landing gear selector.

The pilot also reported some issues with the checklist which included:

- They were difficult to see and awkward to use
- There was ambuiguity between the aircraft checklist and the standard operating procedures (SOPS). The SOPs required items on the checklist to be performed out of order, particularly the point at which the flaps were to be retracted after landing.

The pilot reported being 20 minutes behind schedule as the freight had been delayed in Roma. This placed the pilot under significant pressure as the landing time in Brisbane had been allocated prior to departure, and could not easily be changed. The pilot considered after the event that he would have been fatigued due to the combination of the following:

- He had commenced duty at 0400 and estimated that he had an hour and 45 minutes of broken sleep in the middle of the day before signing back on for duty at 1430.
- The pilot had only recently been cleared by his DAME[3] to flying duties following an extended period of illness.
- The pilot reported being under a degree of financial and personal stress.
- The pilot also reported instability and unpredicatablity with the flying roster.

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 proactive safety action in response to this occurrence.

Aircraft operator

As a result of this accident, the aircraft operator has taken the following safety action:

- The method of notifying pilots of important operational information is being reviewed with the aim of making the system effective and robust. In addition to the current digital receipt via AirMaestro[4], a signature from each pilot will be required confirming that the notice/instruction has been read and understood.
- Aircraft checklists are being reproduced with a matt finish to provide a non-reflective surface to aid in the reading under artificial light and or bright day light.
- Modification of the landing gear control to an automatic gear control lock once gear is selected down and or an alarm to sound if the gear control is not manually locked after gear selected down. The alarm will be a voice alarm - “Check Gear- Check Gear”
- Implementing of random flight checks by check and training captains to ensure pilots are operating in accordance with standard operating procedures.
- Negotiating with the client for a “doors closed” time, ensuring departure times are kept within a time frame, allowing pilots to meet their allotted landing slot time in Brisbane.

ATSB comment

The manual safe pin was a design feature intended to prevent inadvertent retraction of the landing gear. However as a design feature, its effectiveness could be reduced over time, as it could be operated without conscious awareness. That is, once a pilot put their hand on the undercarriage lever, the safe pin could be repositioned to the unsafe position without further thought. The aircraft design did not incorporate a squat switch[5], a design feature that prevents retraction of the landing gear whenever there is weight on the aircraft wheels.

On 24 October 2012, the same operator had a further inadvertent landing gear retraction at Mount Gambier Airport, South Australia. The aircraft type was an Aero Commander 500S registered VH-KAK. The circumstances were similar to the incident on 21 August 2012. As a result of the

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[3] Designated Aviation Medical Examiner

[4] Air Maestro® is a web-based aviation software application allowing your personnel to update and manage operational information via a connection over the internet.

[5] Switch triggered by sustained compression of main or nose landing-gear struts on touchdown; prevents inadvertent retraction of landing-gear.

latest incident, the ATSB has been advised by the operator that retrofitting a squat switch to prevent retraction of the landing gear while there is weight on the aircraft wheels is a priority.

Safety message

Research on human skill development has provided insight on why pilots make errors related to habit. As pilots progress in flying skills, the physical activities of flying become automatic, causing some pilots to make control inputs "by habit" in certain situations[6]. Automatic information processing occurs without conscious awareness and represents the unfolding of pre-programmed sensory-motor response sequence similar to a stored computer program. Skill based errors are related to response selection, timing and coordination. A slip occurs when a pilot performs an unintended action during the execution of a well-practiced and familiar task, in this case inadvertently retracting the landing gear while intending to retract the flaps following a normal runway landing.

Pilots are reminded to positively identify any control lever before actioning.

For further reading on skill based errors and muscle memory please see the following:

- Human Factors Checklist Provides Tools for Accident/ Incident Investigation - Flight Safety Digest Vol 20 No 2 Febuary 2001 www.flightsafety.org/fsd/fsd_feb01.pdf
- Inattentional blindness: let's not blame the victim just yet - Canadian Aviation Maintenance Council www.camc.ca/fr/SMS_40/Articles_270/8.html

Aircraft details

Manufacturer and model:	Rockwell Aero Commander 500S	
Registration:	VH-YJS	
Type of operation:	Charter (freight)	
Location:	Toowoomba Airport, Queensland	
Occurrence type:	Incorrect aircraft configuration	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Damage:	Substantial	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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.

[6] Fitts, P.M.; Posner, M.I. Human Performance. New York, United States: Academic Press 1967

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.