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**ACCIDENT**

<b>Aircraft Type and Registration:</b>	Cessna 152, G-OPJC	
<b>No &amp; Type of Engines:</b>	1 Lycoming O-235-L2C piston engine	
<b>Year of Manufacture:</b>	1979	
<b>Date &amp; Time (UTC):</b>	6 October 2007 at 1620 hrs	
<b>Location:</b>	St Mary's Marsh, 4 mile NE of Gravesend, Kent	
<b>Type of Flight:</b>	Training	
<b>Persons on Board:</b>	Crew - 2	Passengers - None
<b>Injuries:</b>	Crew - None	Passengers - N/A
<b>Nature of Damage:</b>	Damage to nose gear and forward fuselage	
<b>Commander's Licence:</b>	Commercial Pilot's Licence	
<b>Commander's Age:</b>	48 years	
<b>Commander's Flying Experience:</b>	4,279 hours (of which over 1,000 were on type) Last 90 days - 130 hours Last 28 days - 64 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and AAIB enquiries	

**Synopsis**

The pilot made a forced landing after smoke had started to fill the cockpit. The smoke was attributed to an internal failure of the 'flaps up' switch located behind the console in front of the right seat, although the precise cause of the switch failure could not be identified.

**History of the flight**

The aircraft was flying normally at 2,000 ft with an instructor and a student pilot on board, and had been airborne for fifteen minutes. Without warning the instructor felt a sharp stinging sensation on his right ankle, and also noticed a burning smell, and smoke then started to fill the cockpit. The instructor promptly declared a 'MAYDAY' and switched both the fuel

and the magnetos off, and selected a field for a forced landing. He recalled that the smoke cleared during the descent, and he continued with the forced landing into a field that he felt was suitable, on St Mary's Marsh. Having successfully touched down, during the ground roll the aircraft went into a drainage ditch at the end of the field. This resulted in damage to the nose gear leg and the forward fuselage. From the air the field had appeared suitable and the instructor had thought that the ditch, which had been visible, was a path. The instructor and student exited normally and were uninjured. The Coast Guard attended the scene as a result of the 'MAYDAY' call.

After landing the instructor noticed that the flaps were not deployed, despite having selected full flap during the approach. He also noticed burn marks on his shoe and sock.

### Aircraft information

The Cessna 152 has an electrically operated flap system. On the instrument panel is a selector switch and located next to the switch is a flap position indicator, see Figure 1. To operate the flaps the selector is moved to the desired detent position; this activates either the 'flaps up' or 'flaps down' switch as appropriate, which then powers the flap motor in the wing. There is a mechanical feedback system from the cable that links the left and right flaps and this moves the flap position indicator on the instrument panel.

The electric circuit for the flap actuation is protected by a 15 Ampere circuit breaker. Such circuit breakers are designed to open should the current exceed the rated value, and the time it takes to trip is dependent on the magnitude of the overcurrent in excess of the rated value.

### Inspection of flap control system

The flap actuation lever and indication assembly were inspected on the aircraft, and the indicator was found to be bent upwards such that it did not protrude from its slot on the console, (Figure 1), and could potentially have offered some mechanical resistance. The flap actuation lever and indicator assembly was removed along with the associated wiring and circuit breaker. There was evidence of mechanical scoring by the position indicator on the mounting plate, see Figure 2, although it was not possible to determine when this took place. The wiring was checked and found to be correct, however there was significant heat damage to

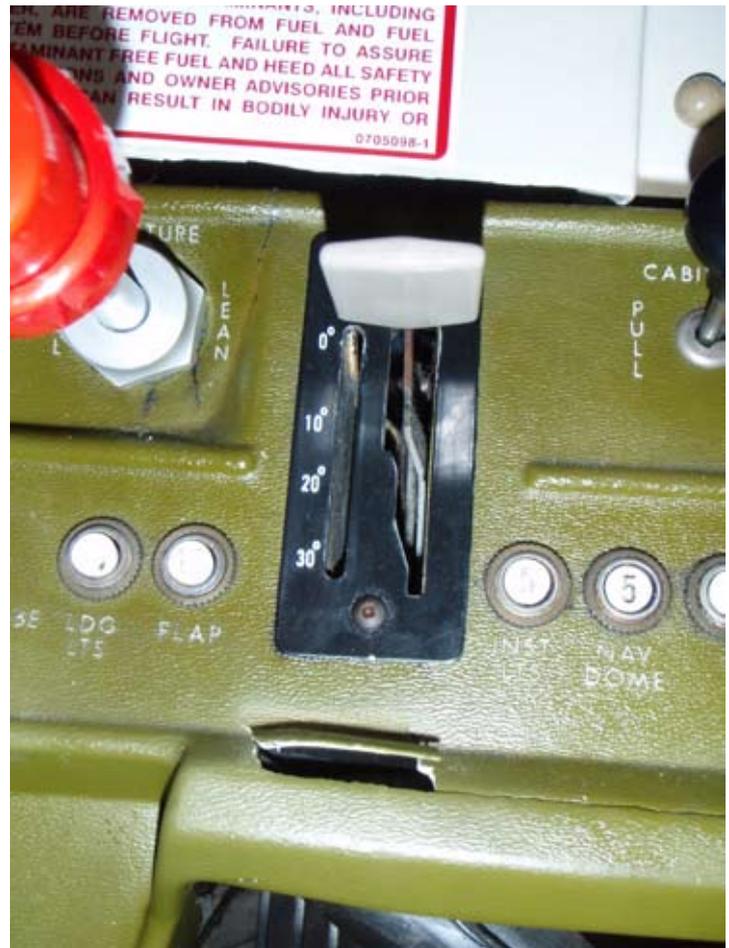


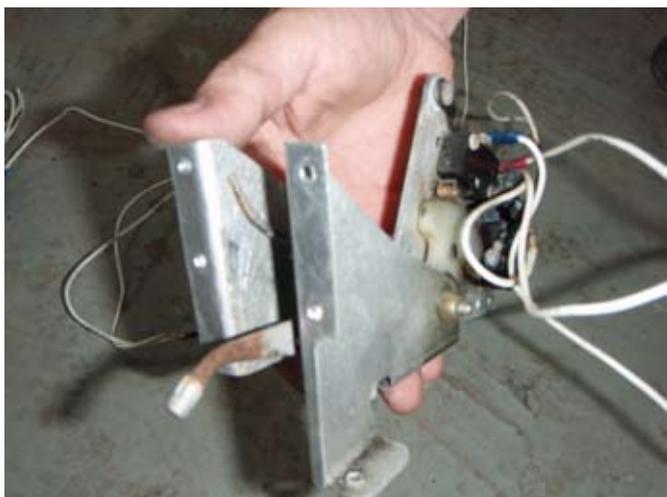
Figure 1

the 'flaps up' switch, see Figure 3. The circuit breaker had not tripped.

Three-dimensional X-ray images were taken of both the circuit breaker and flaps switch assembly and no pre-accident mechanical defect could be found.

The circuit breaker was then tested at various currents in a laboratory and it was concluded that it would not trip at 14 Amperes, but would trip at greater than 15 Amperes.

The 'flaps up' switch was disassembled and examined. The damage appeared to have been caused by arcing inside the switch, although it was not clear from the



**Figure 2**



**Figure 3**

damaged components why the arcing had occurred. It was not possible to determine when the switch was made, although it may well have been at the time of the aircraft, around 30 years ago.

### **Comments**

Circuit breakers, as their name suggests, are designed to protect all the components of a circuit, and the current rating is driven by the peak current in the circuit, in this case the current for the flap motor. From the tests on the circuit breaker it appears that it did not carry more than its rated load otherwise it would have tripped 'open circuit'.

It is considered unlikely that the bent position indicator contributed to this accident, since the flaps selector was not used during the fifteen minutes after takeoff and before the smoke appeared in the cockpit. The pilot stated that the flaps were checked prior to takeoff and that they operated satisfactorily. The most likely cause would appear to be arcing within the 'flaps up' switch.