

Total electrical failure in IFR during initial climb, main landing gear collapse during return landing

⁽¹⁾All the times given
are local time.

Aircraft	Beech 200 registered F-GMPO
Date and time	Friday 7 January 2011 at 8 h 13 ⁽¹⁾
Operator	Company
Place	Montpellier Aerodrome (34)
Consequences	Aircraft seriously damaged

HISTORY OF FLIGHT

The crew took off from Runway 13 left for an IFR flight bound for Albert Bray (80) with two passengers. During initial climb, the co-pilot, PF, found that the left horizon was unusable. The Captain, in the right seat, took over the controls and used the information from the right horizon to continue the flight. The co-pilot noticed that the amber generator lights were on. He tried unsuccessfully to stop and start them. The Captain decided to abort the flight.

He asked the co-pilot to extend the landing gear. During the extension sequence, the aircraft suffered a total electrical failure. The lighting conditions in the cockpit were then very dark and the crew had difficulty in reading the instrument displays. The Captain shouted to the co-pilot to shine a flashlight on the instruments. He briefly saw the threshold of runway 31 right. The co-pilot suggested that he go around as he was unsure that the gear was locked down. During the aerodrome circuit at low height the co-pilot continued extending the landing gear manually. The emergency landing being imminent, the co-pilot stopped doing this, even though he was unsure that the gear was locked down because he didn't feel enough resistance to indicate that the gear was extended and locked down. Given the weather and the difficulty of reading the instruments, the Captain decided to land. During the landing roll the main landing gear collapsed slowly, the fuselage came into contact with the ground and the aircraft stopped on the runway.

ADDITIONAL INFORMATION

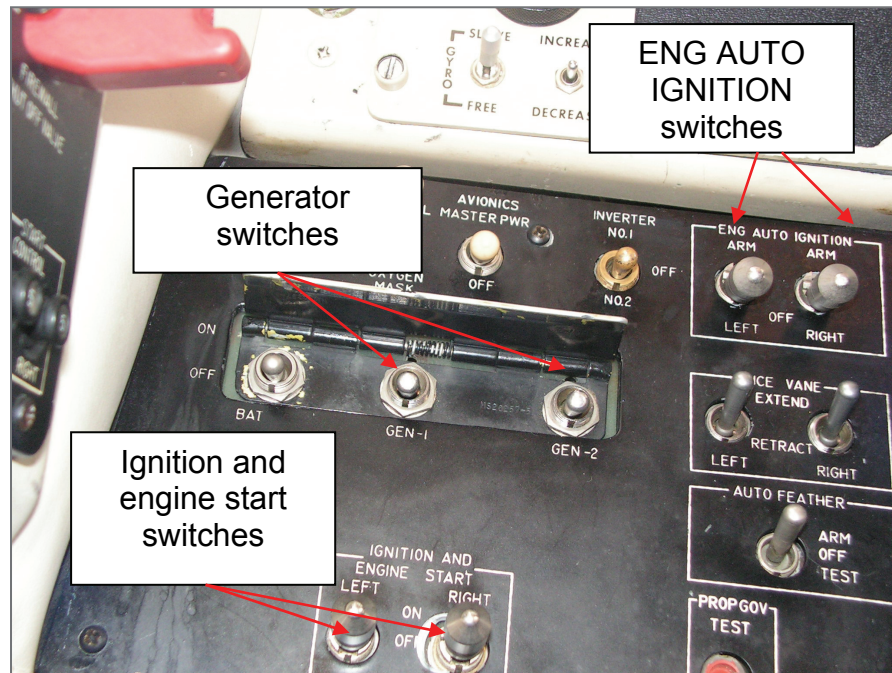
Tests on the airplane

A bench test of the voltage regulators and the onboard battery as well as the operational test of the generators on the aircraft did not bring to light any malfunctions.

Aircraft information

The pre-takeoff procedures include, among other things, positioning the ENG AUTO IGNITION switches in the ARM position when icing conditions are forecast (see photo below).

Note: The crew said they wanted to do this because of the weather.



The two IGNITION AND ENGINE START switches, used to start the engines, are located near the ENG AUTO IGNITION switches and their appearance is similar (see photo above).

Note: The IGNITION AND ENGINE START switches are 3-position type and the ENG AUTO IGNITION switches are 2-position type.

In case of accidental positioning of the IGNITION AND ENGINE START switches in the ON position when the engines are in operation, the two generators are automatically disconnected. The two L DC GEN and R DC GEN amber lights come on in the panel at the bottom centre of the instrument panel and an amber light flashes on the MASTER CAUTION panel located at the top centre. Electrical charge is then supplied only by the battery. The amber MASTER CAUTION warning light can be switched off by a pilot action.

The DUAL GENERATOR FAILURE procedure corresponding to a failure of both generators includes an attempt to reconnect the generators, and in case of continued failure, an emergency extension of the landing gear.

Weather conditions were as follows: FEW at 700 ft BKN at 900 ft and BKN at 2,000 ft, visibility between 4,400 and 8,000 metres, wind from the east-south-east 10 to 17 kt, temperature 12 ° C, QNH 1013. Sunrise was at 8 h 19.

The captain had a commercial pilot's license, a valid instrument rating, an instructor rating and type rating on the Beech 200. He had accumulated 13,400 flying hours of which 1,800 on type and 14 hours in the previous month.

The co-pilot in the left seat had a commercial pilot's license, a valid instrument rating and a type rating on the Beech 200. He had accumulated 560 hours, of which 320 on type and 14 hours in the previous month, all on type.

Similar events

Other similar cases had occurred on the same type of aeroplane and had led to total electrical failure.

- ❑ **On 8 April 2000, Beech 200 registered N258AG (United States):** Just after takeoff, the pilot noticed that the warning lights from the two generators were on. He tried a generator stop/start, without any result. He made an emergency extension of the landing gear. During the landing, the gear collapsed. The NTSB determined that the pilot had taken off with the IGNITION AND ENGINE START switches in the ON position and the generators in the OFF position.
- ❑ **On 28 March 2006, Beech 200 registered G-PCOP (United Kingdom):** Shortly after takeoff, the aeroplane suffered a complete electrical failure. The aeroplane flew into some clouds and the pilot lost control of it. The pilot came out of the clouds and managed to land without any damage. The AAIB determined that the pilot had taken off with the IGNITION AND ENGINE START switches in the ON position and the generators in the OFF position. Following the investigation, the AAIB issued a recommendation asking the manufacturer to improve information on the fact that it is not possible to reset the generator switches when the IGNITION AND ENGINE START switches are in the ON position. The AAIB also mentioned in its report a recommendation by the CAA asking EASA to issue an Airworthiness Directive intended, among other things, to ensure that a red warning light comes on when the two generators are cut.

CONCLUSION

Shortly before takeoff, the PF likely confused the ENG AUTO IGNITION and IGNITION AND ENGINE START switches. Pushing the latter by mistake it automatically disconnected the two generators. The crew did not immediately notice the warning lights coming on that resulted from this and continued the take-off. The PF only noticed the anomaly when the left horizon was lost. The generator stop-start performed by the co-pilot had no effect because the IGNITION AND ENGINE START switches remained in the ON position. The total electrical failure then occurred when the co-pilot extended the landing gear. In a stressful environment, in low light conditions and worsening weather conditions, the pilots made an emergency landing while the manual landing gear extension sequence was not finished.

The accident resulted from:

- ❑ A confusion between the ENG AUTO IGNITION and IGNITION AND ENGINE START switches that was undetected by the crew despite the amber MASTER warning light coming on;
- ❑ The non-application of the DUAL GENERATOR FAILURE procedure; the application of this procedure, however, was made very difficult by environmental conditions;
- ❑ The incomplete application of the procedure for landing gear emergency extension in a phase of flight that left little time to undertake this procedure.

The similarity between the ENG AUTO IGNITION and IGNITION AND ENGINE START switches, and their proximity in the cockpit was a contributing factor.

Since this accident occurred, the operator has completed installation of foolproof ENG AUTO IGNITION switches.

RECOMMENDATION

The investigation revealed that the crew inadvertently selected the IGNITION AND ENGINE START switches while attempting to move the ENG IGNITION AUTO switches prior to takeoff. The crew did not detect the confusion, and the stop/start of the generators performed by the copilot had no effect since the IGNITION AND ENGINE START switches remained in the ON position. This caused the subsequent total loss of electrical power. The investigation also showed that:

- other similar cases had occurred in the past,
- these switches have a similar shape and appearance, are close to each other in the cockpit and their posted names are similar.

Consequently, the BEA recommends that EASA and the FAA:

Recommendation n°FRAN-2012-012

- ask the manufacturer to modify the ergonomics of the ENG AUTO IGNITION and IGNITION AND ENGINE START switches on Beech 200 aeroplanes in order to avoid any confusion in their use by flight crew.**