

ACCIDENT

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| Aircraft Type and Registration: | Cessna 402C, Businessliner, VQ-TIN | |
| No & Type of Engines: | 2 TSIO-520-VB piston engines | |
| Year of Manufacture: | 1979 | |
| Date & Time (UTC): | 17 July 2021 at 1923 hrs | |
| Location: | Ambergris Cay International Airport, Turks and Caicos Islands | |
| Type of Flight: | Commercial air transport | |
| Persons on Board: | Crew - 1 | Passengers - 5 |
| Injuries: | Crew - None | Passengers - None |
| Nature of Damage: | Extensive damage to flaps, propellers and underside of fuselage. Both engines were shock-loaded | |
| Commander's Licence: | Airline Transport Pilot's Licence | |
| Commander's Age: | 33 years | |
| Commander's Flying Experience: | 10,500 hours (of which 400 were on type) Last 90 days - 90 hours Last 28 days - 45 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB | |

Synopsis

The aircraft landed without its landing gear being extended. The landing gear warning horn was found to be unserviceable after the accident. However, while it could not be determined when it failed, it was not tested prior to the flight, as prescribed in the operators' *Normal Procedures* checklist. In addition, the *Normal Procedures* checklist was not used during the flight. Had it been, the pilot may have noticed the landing gear was not down, despite the warning horn not being serviceable.

History of the flight

The pilot and five passengers were on a scheduled flight from Providenciales International Airport, Turks and Caicos Islands to Harold Charles International Airport, Ambergris Cay, Turks and Caicos Islands. This was the pilot's seventh flight of the day.

The pilot reported that after he and the passengers had boarded their assigned aircraft, its engines were "reluctant to start". As another Cessna 402C (C402C) was available, the pilot elected to change aircraft. The replacement aircraft had previously flown two sectors that day with another pilot.

After the pilot and passengers had changed aircraft, one of the passengers sat in the co-pilot's seat, after the pilot had offered it to him. The pilot reported that he did a visual check of the outside of the replacement aircraft but did not do a thorough internal pre-flight check. This meant that the landing gear warning horn¹ was not tested. The subsequent departure and cruise were uneventful. Runway 07 was in use at Harold Charles International Airport, the weather was good, and the wind was from 070° at 13 kt.

At about 3 nm to land, the pilot selected FLAPS 45 and stated subsequently that he believed he selected the landing gear down and saw three green lights, to indicate that the landing gear was down and locked. The approach continued without event until at the point of landing, when he felt that the landing gear touched down "gently". However, the aircraft then began to skid on its underside and the propellers made contact with the runway. The aircraft slid down the runway before coming to a stop (Figure 1). The pilot advised ATC of the situation and the airport's RFFS were quickly in attendance. Four passengers and the pilot exited through the pilot's/front left side window, while one exited through the window of the main cabin door. There were no injuries.

The aircraft sustained extensive damage to its flaps, propellers and underside, and both engines were shock-loaded.



Figure 1
VQ-TIN after landing

Aircraft information

The C402C's *Pilot's Operating Handbook* contains the following information:

'LANDING GEAR WARNING HORN

The landing gear warning horn is controlled by the throttles and the wing flap position. The warning horn will sound intermittently if either throttle is retarded

Footnote

¹ See *Aircraft information* section for more details on the landing gear warning horn.

below approximately 13.0 inches Hg manifold pressure with the landing gear retracted or if the wing flaps are lowered past the 15° position with the landing gear in any position except extended and locked. The warning horn can be activated by either the wing flap position switch or by throttle position as each functions independently of the other...The system can be checked by activating the PRESS-TO-TEST button...located near the annunciator panel while retarding one throttle at a time. Also, lowering the wing flaps past 15° position with the PRESS-TO-TEST button activated will cause the landing gear warning horn to sound.'

'ANNUNCIATOR PANEL

A press-to-test button is provided to the left of the annunciator panel. When the button is pressed, all annunciator panel lights, landing gear position and unlocked lights...will be tested and should illuminate. If the throttles are retarded or flaps are extended more than 15 degrees, the gear warning horn will sound when the button is pressed.'

The pilot that previously flew the aircraft stated that he successfully tested the landing gear warning horn on those flights.

Operator's Operations Manual

Part A, Chapter 8.3, *Flight Procedures*, of the operator's operations manual states:

'It is the responsibility of the reader of the checklist to ensure that the check item is correctly completed and any switch position or instrument setting is correctly set...as dictated by the checklist.'

An abbreviated version of the *Normal Procedures* checklist was carried on all aircraft. The '*BEFORE STARTING ENGINES*' section of the checklist includes:

'ANNUNCIATOR PANEL.....PRESS-TO-TEST'

The '*BEFORE TAXIING*' section includes:

'PASSENGER BRIEFING.....COMPLETE'

The '*BEFORE LANDING*' checklist includes:

'LANDING GEAR.....DOWN'

The operator issued a memo to all its pilots on 18 July 2021, reminding them of the importance of the *Normal Procedures* checklist and to reinforce that it should be used during all phases of flight.

Pilot's comments

The pilot commented that he usually tests the landing gear warning horn with the annunciator press-to-test button on every flight. He added that he “tries to use” the *Normal Procedures* checklist in the aircraft on every flight but “probably didn’t use it” on the accident flight.

The pilot believed he gave the passengers a safety briefing in the first aircraft but thought he also gave a briefing in the replacement aircraft.

Passengers' statements

All the passengers were contacted by the AAIB.

The passenger in the co-pilot's seat stated that he did not remember any sounds associated with any pre-flight testing of any systems while on the aircraft. He added that once the pilot boarded the aircraft, it was taxiing in under 2 minutes. He also did not recall seeing the pilot use any checklists, nor did the pilot do an engine run-up/test prior to takeoff. There was no pre-flight safety briefing.

Another passenger that was seated to the rear of the aircraft stated that she did not recall if the pilot provided a safety briefing but added that they were not shown a passenger safety card² at any time.

As with the departure, the passenger in the co-pilot's seat did not see the pilot perform any checklists during the approach and landing. Additionally, he did not recall any noise associated with the landing gear being lowered. He was attentive to this on the return flight, where the noise was noticeable. He added that the first indication of a problem was the aircraft's tail contacting the runway, followed by the propellers striking the runway. Once the aircraft came to a stop, he ordered his family members to exit immediately and did not recall the pilot offering any instructions. Smoke then entered the aircraft through an open window, creating fear of a possible fire or explosion. He then assisted his family out of the front left side window, before exiting himself.

The passenger in the rear of the cabin initially tried to open the main cabin door to evacuate the aircraft. While the upper portion opened, the lower stairs did not fully lower as the landing gear was not down. She added that the pilot helped the other passengers out of the aircraft before following them out of the front left side window. Having initially had some difficulty opening the side exit she climbed out of the window in the partially opened main cabin door and was the last person out of the aircraft.

Aircraft examination

The maintenance organisation inspected the aircraft soon after the accident.

In the cockpit, it was noted that the landing gear handle was in the down position. After subsequently lifting the aircraft and securing it on jacks, the main landing gear and the nose

Footnote

² Passenger safety cards were located in the rear of the passenger seat pockets.

wheel were found in the up and locked position. There was also no damage to the landing gear doors, indicating they were in the up and locked position.

When power was applied to the aircraft the landing gear indicator lights indicated landing gear up and locked. The unlocked light was not illuminated, nor was the landing gear in transit light. After the emergency blow down was activated the lights indicating transit/unlocked illuminated followed by three green (down and locked) lights.

It was subsequently discovered that landing gear warning horn was unserviceable. This was found to be due to a broken wire that routes close to the flap selector lever. This is an area that is in constant motion, as some of the horn's wires move as the lever is moved. It was not determined when the wire broke, but it was likely to have failed when the flaps were selected on the landing of the previous flight or that of the accident flight.

Analysis

The pilot commented that he usually tests the landing gear warning horn on every flight but did not do so on the accident flight. After the accident it was discovered that the landing gear warning horn was unserviceable. While it could not be determined when it failed, had it been found to be unserviceable by conducting a pre-departure annunciator test, the pilot would have had an opportunity to seek engineering assistance, and possibly get it rectified, prior to departure.

With the warning horn not working, there was no alarm available to the pilot on the approach when FLAPS 45 were selected to indicate that the landing gear was not down and locked. Had he heard the horn, he would have probably either lowered the landing gear while on the approach or initiated a go-around before making another approach with it selected down.

The pilot said that he probably did not use the *Normal Procedures* checklist on the accident flight, and this was noticed by the passenger in the co-pilot's seat. Checklists are there to assist pilots from forgetting to do essential actions during each phase of flight that, if not completed, could have had an adverse effect on the safety of the aircraft. It was likely that he was distracted and/or rushing due to the aircraft change, and this led to him not doing a thorough internal pre-flight check.

There were conflicting accounts between the pilot and some of the passengers as to whether a safety briefing had been given, or whether a safety card was shown. Had there been no safety briefing given to the passengers, they would have been ill equipped to deal with any evacuation. Had the pilot been incapacitated this could have led to unexpected delays to the evacuation that may have led to serious injuries had there been a fire, or the damage been more severe.

The pilot believed he lowered the landing gear prior to landing but did not use the checklist to confirm this. One passenger stated he did not feel or hear the sounds associated with the lowering of the landing gear, which he experienced on his next flight. While the landing gear handle was discovered in the down position it was more likely it was moved after the accident. However, it could not be determined when or by whom.

Given the physical evidence discovered by the maintenance organisation and the statements of a passenger it was concluded that the landing gear was not extended prior to the landing.

Conclusion

The aircraft landed without its landing gear being extended. This was principally due to the pilot not using the *Normal Procedures* checklist prior to landing, to confirm it was down and locked.

Checklists are an important tool that support a pilot's airmanship and memory and ensure that all required actions are performed without omission and in an orderly manner. Not using or following them can have serious consequences as was seen in this accident. If they are not used it can potentially put an aircraft and its occupants at risk of experiencing a critical, adverse event.