AVIATION OCCURRENCE REPORT

WHEELS-UP LANDING - UNINTENTIONAL

NORTH AMERICAN AIRLINES LTD
SWEARINGEN SA226-TC C-FEPW
OTTAWA/MACDONALD-CARTIER INTERNATIONAL AIRPORT,
ONTARIO
13 JUNE 1997

REPORT NUMBER A97Ø0100

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## *Summary*

The aircraft was transporting express mail from Hamilton to Ottawa, Ontario. The flight was uneventful to Ottawa; however, the aircraft landed on runway 25 with the landing gear retracted. After the aircraft skidded to a stop, a fire erupted in the area of the right engine. The two flight crew members, the only persons on board, quickly exited the aircraft via the main door, and the fire was extinguished by airport firefighters. Neither flight crew member was injured, and the aircraft was substantially damaged.

*Ce rapport est également disponible en français.*

# *Other Factual Information*

The flight crew were properly licenced and certified to conduct the flight. The pilot had a total flying time of approximately 2,240 hours, of which 1,930 were on the occurrence aircraft type. The co-pilot received his commercial pilots licence in 1988 and had approximately 500 hours total flying time. He completed his instrument rating on 15 December 1996 and his initial training on the SA226-TC was completed in March 1997 in British Columbia with a different company. He had not flown for 44 days at the time his recurrent training was completed on 09 June 1997. This was the co-pilot's third day of operational flying for the company; he had accumulated approximately 55 hours total time on the aircraft type.

The co-pilot was flying the aircraft for a radar-vectored, localizer/back-course approach to runway 25 of the Ottawa/Macdonald-Cartier airport. Descending out of 10,000 feet above sea level, the crew completed a briefing for the approach. The weather conditions at the time did not necessitate a full instrument approach briefing because the crew expected to fly the approach in visual conditions. Air traffic control requested that the crew fly the aircraft at a speed of 180 knots or better to the Ottawa non-directional beacon (NDB), which is also the final approach fix (FAF) for the approach to runway 25. At approximately eight nautical miles from the airport the aircraft was clear of cloud and the crew could see the runway. In order to conduct some instrument approach practice, the pilot, who was also the company training pilot, placed a map against the co-pilot's windscreen to temporarily restrict his forward view outside the aircraft. The approach briefing was not amended to reflect the simulated instrument conditions for the approach. The co-pilot accurately flew the aircraft on the localizer to the FAF, at which point, he began to slow the aircraft to approximately 140 knots and requested that the pilot set ½ flap, which he did. Once past the FAF, the copilot's workload increased, and he had difficulty flying the simulated approach. On short final to runway 25, the pilot removed the map from the co-pilot's windscreen. The co-pilot noted that the aircraft was faster and higher than normal and he tried to regain the proper approach profile. By the time the aircraft reached the threshold of the runway 25, it was approximately 500 feet above ground, and at a relatively high speed, so the pilot took control of the aircraft for the landing. The pilot attempted to descend and slow the aircraft as it proceeded down the length of the runway and stated that he had just initiated an overshoot when he heard the first sounds of impact.

Runway 25 is 8,000 feet long. The first signs of impact on the runway were made by the propellers, with propeller marks beginning about 4,590 feet from the threshold of runway 25. The aircraft came to rest about 6,770 feet from the threshold, and a fire broke out in the area of the right engine. The co-pilot opened the main door of the aircraft while the pilot shut down the aircraft systems, and both exited the aircraft uninjured.

The maximum speed for extending the landing gear on this aircraft is 176 knots, and the company standard operating procedures (SOPs) for a normal instrument approach stipulate that the aircraft should cross the final approach fix at a speed of 140 knots, with a ½-flap setting, and with the landing gear lowered.

The company SOPs require that all checklist items, from the after start checks through to the after landing checks inclusive, be actioned through a challenge and response method with each item called individually. The first item of the before landing checks is "Landing gear .....Down/3 greens". The co-pilot did not recall being challenged for the landing gear check, and the pilot could not remember selecting the landing gear switch

to the down position. Neither pilot checked for the three green lights prior to the occurrence. The pilot stated that it was his habit to check if the landing lights were on prior to landing because it was his habit to turn them on only after the landing gear had been extended. He remembered checking to see that the landing lights were on and so was satisfied that the gear was down. The co-pilot assumed that, because the aircraft had passed the NDB, the before landing checks had been completed; they are normally completed before or at that point during an approach. Neither pilot recalled hearing a gear warning horn prior to the impact.

When the aircraft systems were inspected, the landing gear selector was found in the up position. Tests were conducted on the landing gear warning system which revealed that the gear warning horn did not function. A closer examination of the system revealed a faulty diode. The diode was replaced and when the warning system was checked again, it functioned properly. The pilot stated that the gear warning horn on the aircraft had functioned properly during the training for the co-pilot one week earlier.

## *Analysis*

New flight crew members take time to adjust to operating procedures and the flow of task completion. Therefore, the experienced crew member must be rigid in adherence to procedures and vigilant to all operations in the cockpit, all of which increase the workload on the experienced member. In this occurrence, the combination of the co-pilot's low flying experience, his lack of experience in instrument conditions, and the relatively high speed to the Ottawa NDB resulted in a high workload situation. This is supported by the co-pilot's statement that the operation became busy after the aircraft crossed the NDB. Concurrently, by simulating an instrument approach, the pilot was not only required to carry out routine duties but also had to concentrate on the actions of the co-pilot. When the co-pilot became overwhelmed, the pilot's already demanding workload was unexpectedly increased as he was required to take control of the aircraft.

Typically, the before landing check is carried out prior to or at the FAF. However, for this crew, the focus prior to the NDB was on the simulated instrument approach, and, immediately after, on the need to reduce speed and altitude. In attending to those immediate demands, the crew forgot to complete the before landing check. Each crew member recalled considering some elements of the checklist, but neither can recall carrying out the checklist in a challenge and response manner, and the aircraft was landed with the landing gear retracted.

Several factors point to the possibility that neither crew member had a full appreciation of the developing situation: the pilot did not take control until the aircraft was over the threshold of the runway; neither crew member related the excess aircraft speed to the fact that the landing gear had not been lowered; the pilot continued with the landing, despite the aircraft's altitude and speed over the threshold; and the pilot was surprised when the aircraft hit the runway just as he was about to initiate an overshoot.

The addition of impromptu instrument training exacerbated the co-pilot's workload and subsequently that of the pilot. The increased workload contributed to the breakdown in coordination and communication and resulted in the before landing check not being completed. While practising approaches during favourable weather

conditions on operational flights provides the opportunity to develop and maintain proficiency, appropriate planning is necessary to ensure all contingencies have been considered.
The pilot's habit of checking for landing light activation to connote completion of the before landing check is an unsafe practice; checking the landing lights does not ensure that all items on the checklist list have been completed. The final link in the chain of events which led to the occurrence was the failure of the landing gear warning horn to warn the pilots that the landing gear was not locked down.

## *Findings*

1. The flight crew were certified and qualified for the flight in accordance with existing regulations.

2. The simulated instrument approach training was not planned nor discussed prior to its undertaking, and resulted in an increased workload for both crew members.

3. The company standard operating procedures were not followed.

4. The before landing checklist was not completed, and the aircraft's landing gear was not selected down for landing.

5. The landing gear warning horn did not function because of the failed electric diode.

6. The aircraft contacted the runway with the landing gear in the retracted position.

## *Causes and Contributing Factors*

The aircraft was landed with the landing gear retracted because the flight crew did not follow the standard operating procedures and extend the landing gear. Contributing to the occurrence were the lack of planning, coordination, and communication on the part of the crew; and the failure of the landing gear warning system.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 21 May 1998.*