

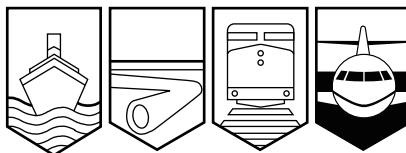
Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

## AVIATION INVESTIGATION REPORT

A02A0108



### WHEELS-UP LANDING

PRINCE EDWARD AIR INC.

PA-31-350 (NAVAJO CHIEFTAIN) C-GYYJ

HALIFAX INTERNATIONAL AIRPORT, NOVA SCOTIA

11 SEPTEMBER 2002

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

## Aviation Investigation Report

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### *Summary*

The aircraft, a PA-31-350 Navajo Chieftain, C-GYYJ, serial number 31-7652086, was on a scheduled courier flight from Moncton, New Brunswick, to Halifax, Nova Scotia. After completing an instrument landing system approach to Runway 15 at Halifax, the aircraft landed with the landing gear retracted. Neither of the two crew members nor the company passenger was injured. The aircraft sustained damage to its engines, propellers, and fuselage. The accident occurred at night at 2042, Atlantic daylight time.

*Ce rapport est également disponible en français.*

## *Other Factual Information*

The accident occurred on the final leg of a regularly scheduled cargo/courier route. The routing was Halifax, Nova Scotia, Moncton, New Brunswick, Miramachi, New Brunswick, Bathurst, New Brunswick, and Charlo, New Brunswick, returning that night to Halifax via the reverse route. Departure from Halifax was planned for 0600 Atlantic daylight time.<sup>1</sup>

The flight crew were certified and qualified for the flight in accordance with existing regulations. The captain held an airline transport pilot licence with a Group 1 instrument rating and had approximately 2800 hours total time of which about 1200 hours was on a PA-31. The first officer held a commercial pilot licence with a Group 1 instrument rating and had approximately 1050 hours total time with approximately 600 hours on the PA-31.

The aircraft was serviceable except that the lighting for the horizontal situation indicator (HSI), which is illuminated only by internal back lighting, had failed. There is only one HSI in the aircraft, and it is located on the lower portion of the captain's instrument panel. The HSI displays vital information necessary for navigation, including instrument landing system (ILS) glideslope information.

The operator's *Maintenance Control and Policy Manual* states that all aircraft defects shall be entered into the aircraft's journey logbook by a member of the flight crew, and that these must be rectified or deferred by a licenced engineer prior to further flight from the home terminal. There was no journey log entry made by the previous flight crew regarding the defective lighting in the HSI. Company maintenance had reportedly attached a written note to the journey log to advise crews of the lighting defect. The lighting had been unserviceable for at least one previous flight. The note could not be located after the accident.

The *Canadian Aviation Regulations* (CAR) 523.1381, Instrument Lights, describes the design standard for instrument lighting. The standard states that the instrument lights must make each instrument and control easily readable and discernible, and that a cabin dome light is not considered an instrument light. The operating rule for instrument lighting, CAR 605.16 (1) (I), states that, at night, there must be a means of illumination for all of the instruments used to operate the aircraft.

The aircraft departed Halifax at 0551, slightly ahead of schedule, and proceeded uneventfully on the outbound route, arriving in Charlo at 0803. Both crew then went to company accommodations for about eight hours of planned crew rest. There was no indication that either pilot was fatigued prior to departing Charlo. The aircraft departed Charlo on the reverse routing at 1745. There was moderate mechanical turbulence on the return route, and ceilings and visibilities were at or near minimums on all approaches. Approaches were hand-flown by the crew because the aircraft did not have an autopilot. During the ILS approach into Moncton, the first officer, who was flying cross-cockpit, had difficulty seeing the HSI because of darkness. In Moncton a company passenger was brought on board for the flight to Halifax, and the aircraft departed at 2002 with the first officer flying.

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<sup>1</sup> All times are Atlantic daylight time (Coordinated Universal Time [UTC] minus three hours).

The wind at Halifax on arrival was from 040° magnetic at 16 gusting to 24 knots, and the ceiling was 200 feet. Although the wind favoured Runway 06, the ILS approach to Runway 15 provided the best approach minimums, and inbound aircraft were landing on Runway 15. The occurrence aircraft was vectored into the traffic flow for a straight-in ILS approach to Runway 15. The crew briefed the approach, and it was decided that the first officer would continue flying.

In the initial stages of the approach the first officer could not read the darkened glideslope indicator and asked the captain to shine a flashlight, which had been in use since departure from Moncton, on the HSI. On initial interception of the glideslope, and in accordance with company standard operating procedures (SOPs), the captain called "glideslope alive" when the glideslope indicator moved from full deflection. The captain then diverted the flashlight beam away from the instrument panel to refer to the approach chart. This left the HSI in darkness, and the first officer unable to read the glideslope bar. While the beam from the flashlight was diverted, the glideslope bar passed through one dot above the null position.

Company SOPs for an IFR precision approach require that the landing gear be lowered when the glide slope indicator is one dot above the glide slope. This is commonly referred to by crews as the "Dot Above" call. Flaps 15° is selected on interception of the inbound track, and landing lights are selected "on" as part of the before-landing checklist. Checklist items are normally completed using the challenge and response method. Under this method the pilot flying would call for the check, and the pilot not flying would verbally challenge the pilot flying for the appropriate response. When the flashlight beam was directed back to the HSI, the aircraft was on the glideslope, but the airspeed was high. As the descent continued, the airspeed remained high, and the first officer called for a flap selection of 25° to slow the aircraft. The captain suggested reducing power rather than selecting 25° of flap in case an overshoot was necessary. However, after observing that the engine power was already substantially reduced, the captain selected 25° of flap.

At 100 feet above decision height, the captain called the runway lights in sight. Normally the first officer would continue flying the aircraft until landing; however, because water on the windscreen obscured his view of the runway, he passed control to the captain, whose windscreen was fitted with a wiper. The captain assumed control of the aircraft at decision height and continued with the landing.

Neither the crew nor the passenger heard the landing gear warning horn sound at any point during the approach to landing. The aircraft touched down smoothly with some engine power on. The gear was in the retracted position, and the aircraft stopped a short distance beyond the intersection of runways 15 and 24. After the aircraft came to a stop, the crew realized that the landing gear was not extended. The captain checked the gear handle position, noted it was "up", then secured the aircraft electrical power, engines, and firewall shut-off. While securing the aircraft, the captain noted that the landing light switch was in the "off" position. After assessing that there was no immediate danger, the crew re-powered the radio and informed the tower they required assistance.

After the occurrence the aircraft landing gear was found to function normally. The landing gear warning horn is activated by switches in the throttle quadrant that make contact when the throttle settings are reduced. The switch adjustment and landing gear warning horn were

checked after the accident and operated normally. The HSI interior lights, and the VOR/LOC/Glide slope indicator (Nav 2) were defective. On 29 May 2003, a TSB investigator revisited the accident aircraft and found that two post lights were missing from the instrument panel.

The SOPs for the PA-31 did not include a "final" landing gear check. Only one other aircraft type in the operator's fleet contained a short-final check. Part of the check is to confirm that the gear is down and locked.

## *Analysis*

The internal HSI lighting had failed, and the crew could not read the instrument easily. The intent of the design specification rule CAR 523.1381 is to make each instrument and control easily readable and discernible; however, the operating rule CAR 605.16 (1) (I) only requires "a means of illumination." The operating rule is not as stringent in its requirements and allows for operation of the aircraft with lighting deficiencies, yet it does not specify the minimum level of lighting required, or the means by which this can be met. In this case, the crew had a means to illuminate all of the instruments used to operate the aircraft, but the means chosen, a flashlight, degraded crew performance during the approach by increasing workload and causing a distraction.

Normal maintenance procedures for recording the lighting defects had not been followed; however, company maintenance personnel and flight crews were aware of the inoperative lighting. The inoperative lighting had been accepted as a minor defect that did not need to be recorded in the journey log or promptly rectified. Company personnel did not recognize the importance of complying with required maintenance procedures, and did not recognize the importance of adequate instrument lighting.

The HSI glide slope indicator is used as a memory aid to prompt the crew to lower the landing gear. When the captain diverted the flashlight, the first officer could not see the glide slope indicator pass through one dot above the null position because of the lack of sufficient illumination in the HSI. As a result, the "Dot Above" cue was missed, and the landing gear and flaps were not lowered and the landing lights were not selected on.

The crew did not recognize that the aircraft's configuration (gear up) was resulting in a low-drag profile. In an effort to maintain the descent profile the crew initially reduced power more than normal and finally applied 25° of flap. The higher-than-normal flap setting increased drag and helped the crew to maintain the descent profile. It also masked the fact that the landing gear had not been extended. The aircraft was landed with some engine power still being applied. It is likely that the gear warning horn did not sound because the throttle positions were above the gear warning horn activation range.

Flying IFR at night, with inoperative instrument lighting and in challenging weather conditions, placed the crew in a high-workload environment. Also, the crew switched control of the aircraft on short final. This would have directed the captain's attention outside the aircraft, decreasing the likelihood of detecting the gear-up configuration. The SOPs for the PA-31 did not include a short final check to alert the crew that the landing gear was not lowered. These factors combined to lessen the crew's awareness of the omitted check.

## *Findings as to Causes and Contributing Factors*

1. Known instrument lighting defects were not recorded, rectified, or deferred in accordance with the operator's *Maintenance Control and Policy Manual*.
2. The "Dot Above" call was missed when the flashlight beam was redirected during the approach.
3. The crew did not complete a before-landing check; the landing gear was not lowered and the landing lights were not selected on.
4. The crew did not detect that the landing gear was up because of the high workload, the landing gear warning horn not sounding, and the increased drag resulting from the high flap setting.

## *Findings as to Risk*

1. Company personnel did not recognize the importance of adequate instrument lighting.
2. Company SOPs for the PA-31 did not include a short-final check.
3. The operating rule CAR 605.16 (1) (I) allows for operation of aircraft with lighting deficiencies.
4. The operating rule CAR 605.16 (1) (I) does not specify the minimum level of lighting required, or the means by which the minimum level can be met.

## *Safety Action Taken*

The operator has added a short final memory check to the Piper Navajo Chieftain SOPs which confirms "three green, cleared to land and runway unobstructed."

The operator stresses the importance of proper defect recording procedures during the PA-31 initial and recurrent ground school training, and through a memo to company personnel emphasizing the importance of proper defect recording and rectification procedures.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 26 November 2003.*

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