

Something Changed

BY MARK LACAGNINA

The short runway was familiar, but the big new bizjet was not.

The pilots had flown into Fox Harbour Aerodrome in Nova Scotia many times. The runway is short, and the customary procedure was to drop below the visual glide path indication on short final approach to maximize the available roll-out distance after touchdown.

In the afternoon of Nov. 11, 2007, the pilots employed this familiar procedure in an unfamiliar aircraft, a Bombardier Global 5000 that had been acquired by their company only three weeks earlier. Accustomed to flying smaller jets, they had not adjusted fully to the new aircraft,



Transportation Safety Board of Canada



This airplane veered off the runway and came to a stop near a housing complex.

according to the Transportation Safety Board of Canada (TSB).

The glide path was too shallow for the bigger aircraft, and the captain held an inordinate right-wing-low crosswind correction on short final approach. The aircraft began to sink, and the captain corrected by increasing angle-of-attack. He left the throttles at idle, however.

The aircraft continued to sink, and the right main landing gear collapsed when it struck the edge of the runway threshold. After traveling a short distance with the right wing dragging on the runway, the aircraft veered off the pavement, struck mounds of dirt and came to a stop near a housing complex.

The aircraft was substantially damaged, but there was no fire. The first officer and a passenger were seriously injured; the captain and the other seven passengers sustained minor injuries.

In its final report on the accident, the TSB goes beyond accounting the contributing factors and explores other issues revealed by the investigation, such as a general lack of knowledge about the safety margins provided by visual glide path indicators and how these margins are affected by the sheer size of an aircraft.

The report also presents the board's concerns about maintaining adequate oversight of Canadian business aircraft operators as they transition from the traditional regulatory scheme to the modern concept of the safety management system (see "Red Flags on SMS," p. 22).

Stepping Up

Although the Global 5000 was new to them, the pilots had extensive experience in a variety of business aircraft. The captain had 9,188 flight hours, including 3,196 hours in jets. He had flown into Fox Harbour 75 times in the company's Challenger 604 and Gulfstream G100.

The captain and the first officer had completed Global 5000 ground and simulator instruction at the manufacturer's training center. The captain also had flown the aircraft for 43 hours accompanied by a Bombardier pilot.

After the transition training and familiarization flights, the captain had logged about 20

more hours in the aircraft. He had conducted two approaches to Fox Harbour in the Global 5000 — one with the Bombardier pilot on Oct. 21 and one with the first officer four days before the accident.

The first officer had 6,426 flight hours, including 2,540 hours as captain of the company's 604 and G100. After transition training for the Global 5000, he had flown the Challenger exclusively for more than three months. He had flown three segments in the new aircraft during the five days preceding the accident.

"Had the crewmembers operated more flights and been exposed to more landings, they would have had the opportunity to become more familiar with the aircraft size, its handling characteristics and performance," the report said.

New Plane, Old SOPs

The company, Jetport, had an operations reference manual (ORM) for the Global 5000 but did not use it to develop standard operating procedures (SOPs) for the new aircraft.

Instead, the company adapted its Challenger 604 SOPs to the new aircraft. "The Jetport Global 5000 SOPs contained a lot of good information," the report said. "They also contained some procedures applicable to the CL604 which were not suitable for the Global 5000."

For example, the SOPs required pilots to use visual glide slope indicator (VGSI) guidance on approach and to plan to touch down about 1,000 ft (305 m) from the runway threshold. A note advised that descending below the VGSI glide path "is not a recommended technique and is not normally an accepted practice."

Nevertheless, the SOPs included this exception: "When operating on short runways or when braking action is reduced by contamination on the runway, landing as early as conditions permit is generally considered to be good airmanship."

Short and Damp

The pilots, who were conducting a corporate flight from Jetport's home base in Hamilton, Ontario, did indeed plan to "land early" at Fox Harbour. The runway, 15/33, was 4,885 ft (1,489 m) long and 75 ft (23 m) wide, and it was damp.

“Using performance charts, the captain had estimated that, for the conditions, 4,300 ft [1,310 m] of runway was required for landing,” the report said.

The airport did not have weather-reporting services. “Aside from the wind sock located near the threshold of Runway 33, there is no equipment available to give accurate wind speed and direction information,” the report said.

The nearest station, 28 nm (52 km) north-east, was reporting winds from 360 degrees at 21

kt, gusting to 33 kt; 7 mi (11 km) visibility with light rain; and a 900-ft overcast.

As they neared Fox Harbour, the pilots decided that their reference landing speed (V_{REF}) would be 113 kt, with 5 kt added for gusts during the approach.

They conducted the global positioning system approach to Runway 33. The captain disengaged the autopilot about 1.4 nm (2.6 km) from the runway and used right aileron and left rudder for crosswind correction. The crosswind component was 18 kt at this point but decreased as the aircraft descended.

Bombardier Global 5000



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The Global 5000 was introduced in 2004 as a slightly smaller version of the Global Express, which predated it by six years. The fuselage is 6 ft (2 m) shorter, and fuel capacity and operating weights are lower, allowing better takeoff and landing performance, and operation on shorter runways.¹

Compared with the Global Express, the Global 5000 has a balanced field length of 5,000 ft (1,524 m), more than 800 ft (244 m) shorter. Its maximum range, however, is 4,800 nm, nearly 1,200 nm less than the larger aircraft.

Both airplanes have accommodations for up to 19 passengers and are powered by Rolls-Royce Deutschland BR710A2-20 engines rated at 65.6 kN (14,751 lb thrust). The Global 5000 has a maximum takeoff weight of 87,700 lb (39,781 kg) and a maximum landing weight of 78,600 lb (35,653 kg). Maximum cruising speed is 0.89 Mach; normal cruising speed is 0.85 Mach. Maximum altitude is 51,000 ft.

Note

1. Operating weights were increased in 2008, two years after the accident aircraft was manufactured.

Source: *Jane's All the World's Aircraft*

Wrong Technique

The captain's use of the wing-low, or sideslip, technique for crosswind correction was contrary to the ORM's recommendation of a wings-level, crabbed approach.

“This [recommended] technique requires that, on approach, the pilot apply a drift correction to track the runway centerline and, as the flare is commenced, gentle application of rudder is used to align the fuselage parallel with the runway centerline,” the report said.

The crab technique is preferred because the Global 5000 has an automatic roll-assist feature that deploys the multifunction spoilers on the wing that is being held low.

The sideslip and the extra drag created by the spoilers “resulted in a decrease in lift, which made the aircraft more difficult to control, increasing [the captain's] workload, which was already high due to the combination of gusty winds and a low approach angle,” the report said.

From about 0.5 nm (0.9 km) out, the aircraft intentionally was flown below the on-path indication provided by the runway's abbreviated precision approach path indicator (APAPI). The captain began the flare about 50 ft above the ground. Although the crosswind component had dwindled to 8 kt, he was still using “considerable aileron and rudder input,” the report said.

The autothrottles reduced power to idle, and airspeed decreased to 102 kt — 11 kt below V_{REF} . The captain felt the aircraft sinking and rapidly increased the pitch attitude to 10.6 degrees.

The aircraft touched down 7.5 ft (2.3 m) from — and 18 in (46 cm) below — the runway. The right main gear collapsed, and “the aircraft continued down the runway with the right wing dragging,” the report said. It veered off the runway about 640 ft (195 m) from the threshold and traveled about 360 ft (110 m) before coming to a stop about 200 ft (61 m) from a condominium.

Eye-to-Wheel Height

The report said that interviews during the investigation with several pilots holding airline transport pilot licenses revealed a general lack of knowledge about *eye-to-wheel height* (EWH) and how it applies to different types of VGSI.

EWH is “the vertical distance from a pilot’s eyes to the lowest portion of the aircraft in the landing attitude,” the report said. “This distance varies from less than 4 ft to 45 ft [1.2 to 13.7 m] for some wide-body aircraft, such as the Boeing 747.”

Nav Canada’s *Canada Air Pilot* shows that EWH is the differentiation among four types of PAPI installations. Those with the symbol P_1 are appropriate for aircraft with EWHs up to 10 ft (3 m). The symbols P_2 and P_3 designate installations appropriate for EWHs up to 25 ft (7.6 m) and 45 ft, respectively.

APAPI installations — which have two, rather than four, lamps in their light bars — are designated with the symbol A_p and, like P_1 installations, are appropriate for aircraft with EWHs up to 10 ft.

However, EWH information is not readily available to pilots. The Global 5000 aircraft flight manual, for example, does not include this information. “The manufacturer had to complete calculations to determine [the aircraft’s] EWH,” the report said.

Bombardier determined that the Global 5000’s EWH is 17.2 ft (5.2 m),

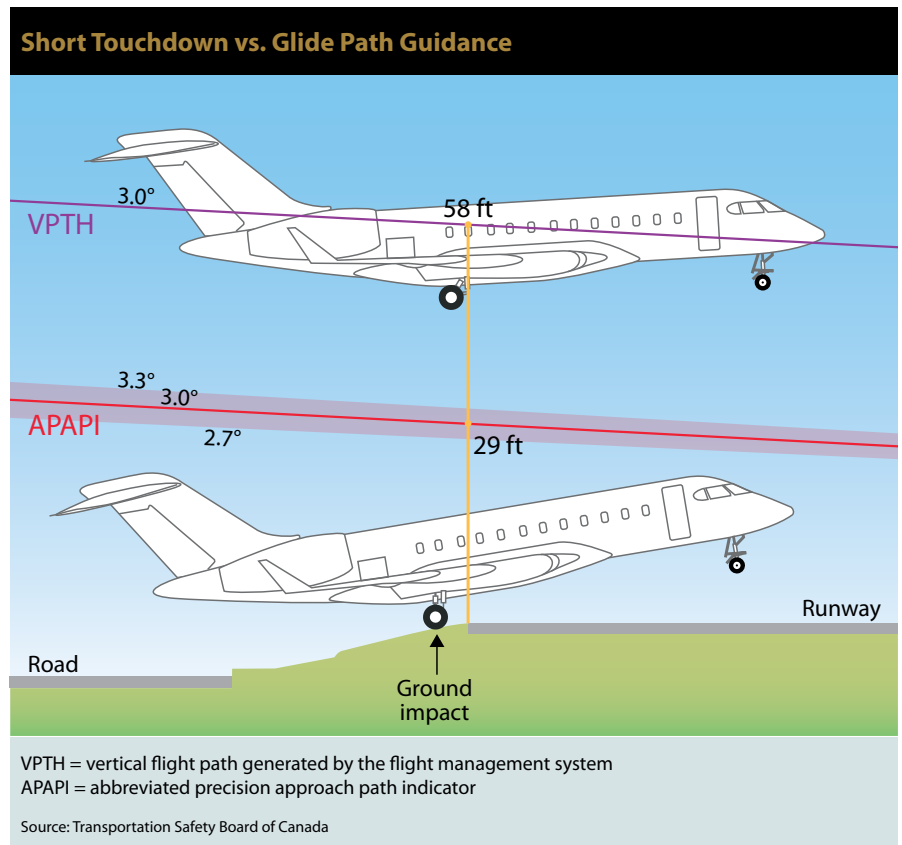


Figure 1

which is about 5 ft (1.5 m) greater than the height for the Challenger 604.

The report said that although the APAPI installation at Fox Harbour was not appropriate for the Global 5000, if the crew had followed its guidance to touchdown, the main gear would have cleared the runway threshold by about 8 ft and the aircraft would have touched down about 500 ft (152 m) from the threshold.

Moreover, if they had followed the vertical guidance provided by the on-board flight management system, the aircraft would have crossed the threshold at 58 ft and touched down 1,000 ft from the threshold (Figure 1).

‘False Assumption’

Based on the interviews conducted during the investigation, the report concluded that most pilots believe an on-path indication from a VGSI is

assurance that they are on a safe glide path.

“This false assumption can lead pilots to rely on VGSI guidance that is unsuitable for the aircraft type they are operating,” the report said. “Vertical guidance should only be used after confirmation that the VGSI type is appropriate for the aircraft type operated.”

Among the recommendations generated by the investigation, TSB called on Transport Canada to ensure that EWH information is available to transport aircraft pilots and that comprehensive training on VGSI is provided to pilots, “so they can determine if the system in use is appropriate for their aircraft.”

This article is based on TSB Aviation Investigation Report A07A0134, “Touchdown Short of Runway; Jetport Inc.; Bombardier BD-700-1A11 (Global 5000), C-GXPR; Fox Harbour Aerodrome, Nova Scotia; 11 November 2007.”