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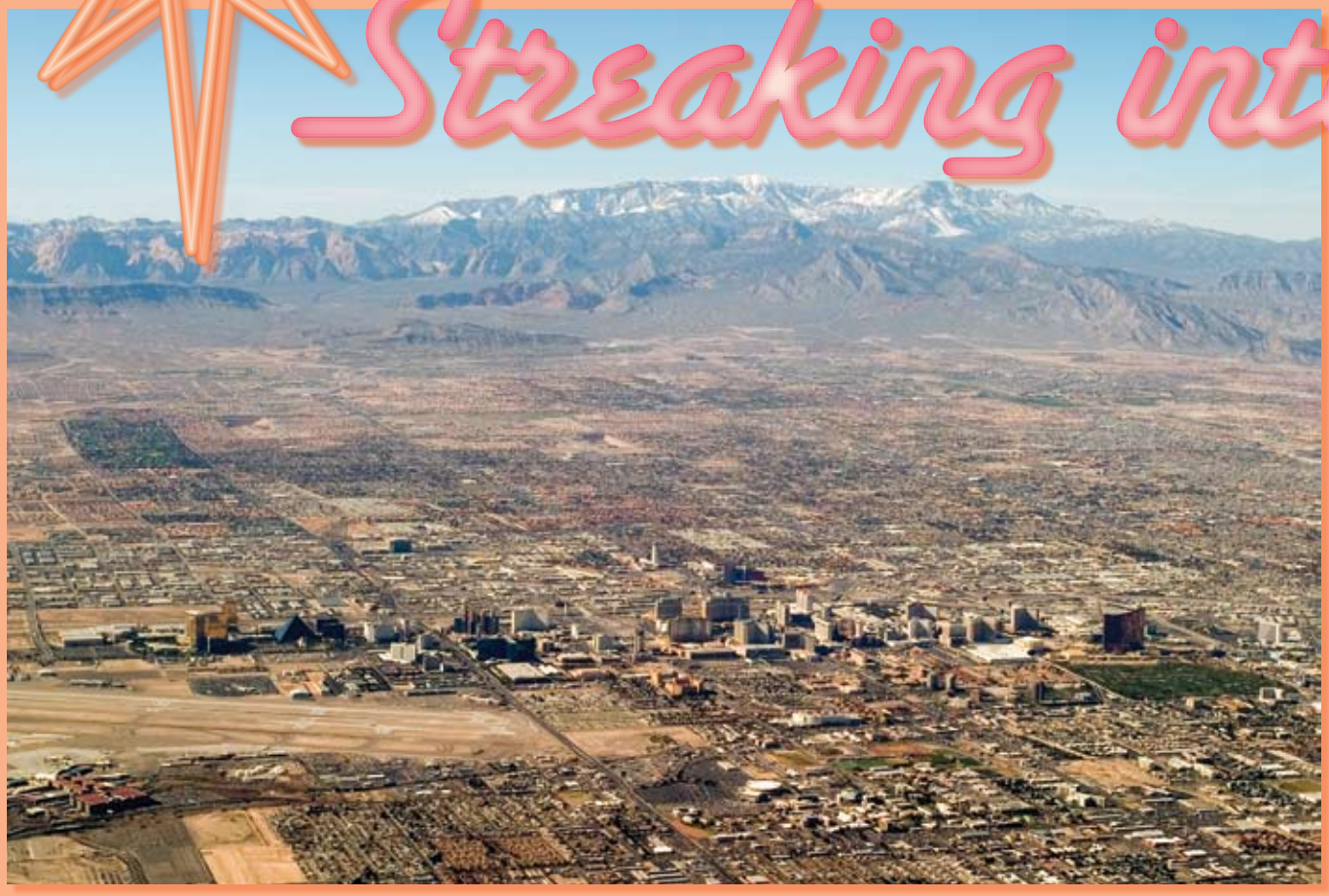
Streaking into

Failure of a business jet's lift-dump system was the last ingredient in a spoiled landing.

BY MARK LACAGNINA



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An unstabilized approach and excessive airspeed on touchdown were the probable causes of an overrun that resulted in substantial damage to a Raytheon Premier 1, said the U.S. National Transportation Safety Board (NTSB) in a recent report. A tail wind resulting from a last-minute wind shift was listed as a contributing factor.

The pilot and passenger were not injured in the accident, which occurred during a corporate flight on May 27, 2004, at North Las Vegas (Nevada, U.S.) Airport. The pilot held an airline transport pilot (ATP) certificate and type ratings for the Cessna Citation 500 and Learjet, as well as for the Premier, which is certificated for single-pilot operation under the normal category airplane airworthiness standards of U.S. Federal Aviation Regulations (FARs) Part 23. He had about 9,200 flight hours, including 62 flight hours in type. "Before his job flying the Premier jet, the pilot flew as a first officer of [Boeing] MD-80 and 757 airplanes," the report said.

The passenger also was a pilot, an A320 captain and check airman for an airline. He held an ATP certificate and a type rating for the Citation 500, which he had previously flown in charter operations. The passenger had received no training in the Premier. The report said that he frequently flew in the right cockpit seats of

business jets operated by several companies. He had made 14 previous flights with the Premier pilot. On the morning of the accident, they had flown the airplane from North Las Vegas to Palm Springs, California, with passengers who required two pilots aboard their flights.

Wind Shift

The return flight was conducted in visual meteorological conditions and under the general operating and flight rules of Part 91. The report said that the pilot had previously flown to North Las Vegas Airport about 30 times.

At 1546 local time, 11 minutes before the accident, the pilot and passenger listened to the automatic terminal information service (ATIS) radio broadcast, which said that the winds at the airport were variable from 100 degrees to 160 degrees at 10 kt to 12 kt and that the temperature was 35 degrees C (95 degrees F). A few minutes later, the passenger, who handled most

radio communications during the flight, established radio communication with the approach controller, who told him to expect clearance for an approach to Runway 12L, which is 4,202 ft (1,282 m) long and has an instrument landing system (ILS) approach procedure.

The report said that the pilot and passenger discussed the reported surface winds and decided to request Runway 07, which is 5,004 ft (1,526 m) long and has precision approach path indicator (PAPI) lights but no straight-in instrument approach procedure. The approach controller cleared the pilot to conduct a visual approach to Runway 07. The quick reference handbook (QRH) indicated that at the airplane's landing weight, 10,200 lb (4,627 kg), landing distance was 3,900 ft (1,190 m).

When the passenger established radio communication with the tower controller, the controller told him that there was a "dust devil crossing the approach end of Runway 07." A dust devil is a whirlwind made visible by the dust, sand or debris that it picks up. About a minute later, the controller told the passenger that the dust devil had moved north of the airport and that the winds now were variable from 140 degrees to 200 degrees at 12 kt, gusting to 18 kt. The wind shift occurred about four minutes before the accident.

The pilot asked the passenger, "What do you think?" The passenger quipped, "Well, we are a little high … but we are fast." The sound of laughter then was recorded by the airplane's cockpit voice recorder (CVR). The passenger said, "I think you're going to be OK if you're happy with the crosswind."

Raytheon Premier 1

The Raytheon Model 390 Premier 1 light business jet was certified under U.S. Federal Aviation Regulations Part 23 for single-pilot operation in 2001. The airplane has seating for a pilot and seven passengers. The Williams FJ44-2A turbofan engines, each producing 2,300 lb (1,043 kg) thrust, are mounted on the rear of the fuselage, which is constructed of graphite/epoxy laminate and honeycomb composites. The wings, which are swept back 20 degrees, are made of aluminum alloy.

Maximum takeoff weight is 12,500 lb (5,670 kg). Maximum landing weight is 11,600 lb (5,262 kg). Maximum operating altitude is 41,000 ft. Maximum operating speed is 0.8 Mach. Range with maximum payload is 826 nm (1,530 km); range with maximum fuel is 1,460 nm (2,704 km).

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


Raytheon Company

Slam Dunk

The pilot told investigators that air traffic control had not issued a descent clearance until the airplane was relatively close to the airport. He described the descent as a "slam dunk," requiring a significant change in altitude over a relatively short distance. The pilot said, however, that the approach was stabilized by the time the airplane was 500 ft above ground level (AGL) and that he maintained 112 kt, the landing reference speed (VREF), from 500 ft AGL to touchdown.

The passenger said that because of the high minimum en route altitudes in the area, such arrivals are typical and the pilot had to "hustle down" during the descent.

The airplane was descending at nearly 2,000 fpm through about 350 ft AGL when the terrain awareness and warning system (TAWS) generated a "SINK RATE, PULL UP" warning (Figure 1). The CVR did not record a discussion of the warning.

Figure 2, which was derived from TAWS data, shows that the airplane's flight path was above the three-degree glide path indicated by the PAPI until the airplane was about 0.2 nm (0.4 km) from the runway. "The flight's unstabilized approach and excessive speed should have prompted the pilot to initiate a missed approach," the report said.

About 15 seconds before touchdown, the passenger said "Ref and twenty," indicating that airspeed was 20 kt above VREF. The pilot replied, "Slowing." A TAWS "SINK RATE, SINK RATE" warning then was generated. TAWS data indicated that the airplane was about 75 ft AGL and descending at about 1,100 fpm.

About five seconds later, the airplane touched down about 900 ft (275 m) beyond the approach threshold of the runway. The report said that analysis of performance data and other information indicated that airspeed was about 17 kt above the prescribed speed on touchdown.

According to Raytheon Aircraft Co., landing-distance data provided in the airplane flight manual (AFM) and QRH are based, in part, on touchdown speeds 6–7 kt below VREF. TAWS data indicated that the airplane was landed with a tail wind component of 7.5 kt. Maximum tail wind component for the Premier is 10 kt.

The report said that under the conditions that existed, the required landing distance was about 5,500 ft (1,678 m), nearly 500 ft (153 m) greater than the runway length.

Spoilers Did Not Deploy

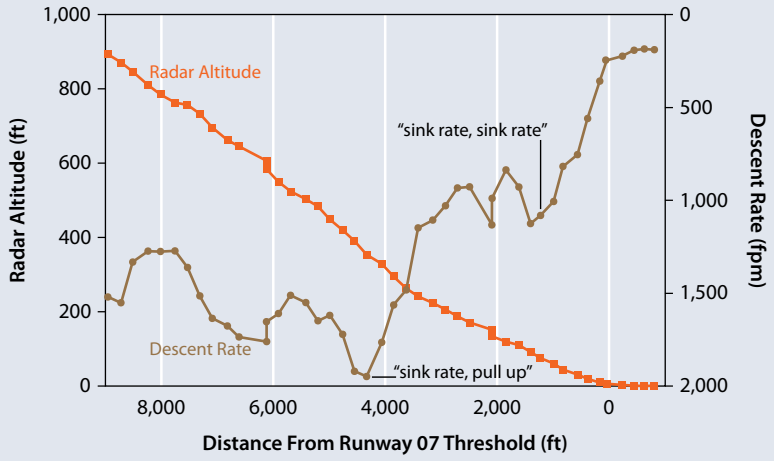
Investigators concluded that the lift-dump (spoiler) panels did not deploy. There are three panels on each wing; the outer panels also serve as speed brakes and for roll augmentation when the airplane is in the air.

"The pilot stated that he activated the lift-dump switch, but he could not recall if he heard the lift-dump devices extend or if he felt the deceleration he was accustomed to as the devices extend," the report said. "He stated that he did not recycle the lift-dump switch but 'held it back' throughout the rollout. He stated he was not initially concerned about the lift-dump devices because his training had shown that the brakes would stop the airplane even if the lift-dump devices did not extend."

The passenger did not feel any deceleration after touchdown and called out, "Brakes." The pilot responded, "Yeah, I'm standing on them." The passenger said, "You've got to be kidding me. … I'd go around." The pilot said, "I can't." Several seconds later, the CVR recorded sounds similar to increasing then decreasing engine noise.

The airplane overran the runway, struck an airport-perimeter fence and

Descent Rate and TAWS Warnings



TAWS = Terrain awareness and warning system

Source: U.S. National Transportation Safety Board

Figure 1

stopped about 735 ft (224 m) beyond the end of the runway at 1557. Portions of the nose landing gear had separated from the fuselage, and the main landing gear struts had been forced through the top of the wings. "The lift-dump panels had mostly separated from their inboard wing attachments," the report said. "However, examination of available wreckage indicated that the spoilers were still locked in placed by the down-lock hook."

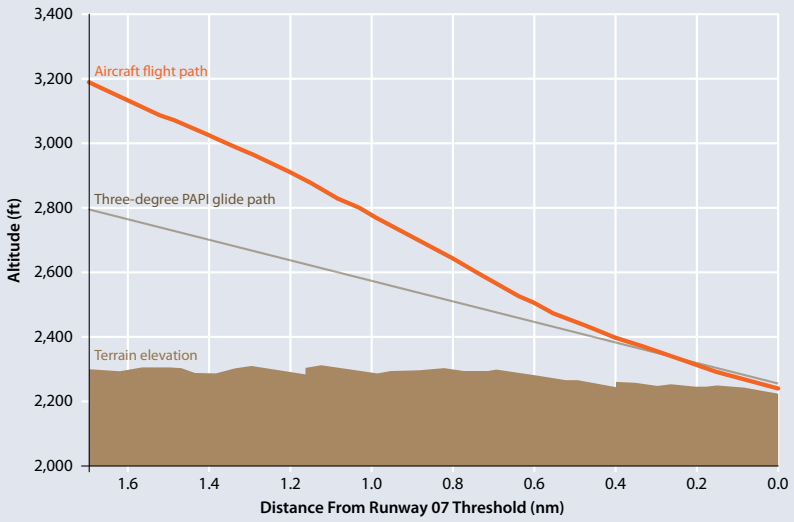
Original System

The accident airplane was equipped with the lift-dump activation system that originally was certified for the Premier. The system includes a switch on the center console that is spring-loaded to the neutral position and must be held in the "EXTEND" position until the lift-dump panels deploy.

"Deployment of the lift-dump [panels] requires that the engine thrust levers be in the idle position and that the weight-on-wheels switches on the nose landing gear and main landing gear be in the 'ground' position," the report said. "There is no indication in the cockpit of lift-dump [panel] extension."

As a result of two previous Premier accidents in which the lift-dump panels failed to deploy, the U.S. Federal Aviation Administration (FAA) in April 2003 issued Airworthiness Directive (AD) 2003-07-09 and AD 2003-10-05, requiring operators of about 57 Premiers to incorporate revised AFM/QRH data that increased landing distances by 53 percent. "[This] represents the airplane's landing performance without the benefits of lift-dump activation," the report said. The pilot had used the revised data for calculating the required landing distance at North Las Vegas Airport.

Flight Path



PAPI = Precision approach path indicator

Source: U.S. National Transportation Safety Board

Figure 2

Raytheon Aircraft Co. subsequently issued Service Bulletin (SB) 27-3608, which announced modifications of the original lift-dump system. The modifications included removal of the weight-on-wheels switch on the nose landing gear, installation of redesigned weight-on-wheels switches on the main landing gear and installation of a lift-dump system lock/unlock switch and engagement handle in front of the center console. The modified system also includes an aural warning if the lift-dump panels fail to deploy.

The FAA accepted compliance with the SB as an alternate means of complying with the ADs — thus eliminating the requirement for use of the increased landing-distance data. The SB modifications had not been incorporated in the accident airplane. NTSB was unable to determine why the lift-dump panels failed to deploy. "No evidence was found of any failures affecting the lift-dump or braking systems," the report said.

During postaccident interviews by investigators, Premier instructors and pilots indicated that activation of the original lift-dump system required a firm landing to compress the nose landing gear and main landing gear and open the weight-on-wheels switches. They said that touching down at speeds above VREF or holding the nose up to make a smooth landing can result in the panels not deploying. One pilot who experienced a failure of the lift-dump panels to deploy "thought his weight-on-wheels was too light, [which] could happen if you were at a light weight and were too fast and the nose was not held forward," the report said. ●

This article is based on NTSB accident report no. DCA04MA049, which comprises five pages, and NTSB public docket 59345, which comprises 95 pages and includes illustrations.