

# SINGLE-PILOT JET ACCIDENT PATTERNS

Learning  
from the  
mistakes of  
others

BY NEIL SINGER

**FEWER THAN 10 YEARS AGO**, the promise of very light jets (VLJs) was bright, indeed. Existing aircraft manufacturers, as well as a slew of start-ups—well-funded and otherwise—planned to roll out small jets at production rates evocative of automobile manufacturing. Concerns about the sky being “blackened” with light jets emerged, as did fears of high accident rates for all the new nonprofessionally flown, single-pilot (SP) aircraft.

In a 2005 publication dealing with industry concerns about VLJ safety, the Flight Safety Foundation, a nonprofit organization dedicated to improvement of global aviation safety, examined nearly 40 years of accidents and incidents in jets flown by a single pilot. While the skies have far from darkened with VLJs, there are more SP jets available and flying than ever before, and the breakdown of the 43 events is instructive to any new jet pilot looking to avoid the proverbial repeat of history.

SP jet accidents aren’t so different from jet accidents in general. The majority of events fall into the category of approach and landing accidents (ALA), as is true for all jets, whether a SP light jet or the largest of airline equipment. After ALA, accidents caused by mechanical problems, loss of control (LOC), and controlled flight into terrain (CFIT) account for nearly all of the remaining events.



One fact of interest is that the percentage of accidents attributable to nonmechanical causes is roughly the same for SP-flown jets as it is for piston aircraft. What is different is the breakdown of accidents types; while ALA, LOC, and CFIT accidents are the lion's share of "pilot-error" events in jets, it's fuel exhaustion, VFR into IMC, and low-level maneuvering in pistons. So although the chance of having an accident in a SP-flown jet is significantly lower than in a piston, the chance that accident was caused by pilot error is the same. It seems that as aircraft



bells if landing with any of the mentioned risk factors present, and be prepared to execute plan B when they are combined.

Although many jet pilots know runway overruns are a common accident type, fewer are aware of the risk of runway underruns—four of the events in the survey. Particularly in low-visibility conditions, pilots have shown a surprising tendency to touch down short of pavement, which usually is not easy on the landing gear. The remainder of ALA incidents involve hard touchdowns leading to pilot-induced oscillations and gear collapse, failure to extend landing gear before touchdown, and stalling on final.

The next largest category of incidents are mechanical in nature, yet it's interesting how often the pilot could have affected a successful outcome with proper preflight or checklist discipline. It's true that some mechanical accidents were completely out of the pilot's hands—landing gear not extending, runaway pitch trim. Yet the pilot comes out less innocently in half of the events—landing gear doors that were

operations are free to start an approach with nearly no chance of completion. Looking at the accident record, it seems prudent for private operations to adopt the more stringent for-hire rule.

On the CFIT front, two of the three accidents occurred while the pilot attempted to maneuver visually to land after an IFR flight. Particularly at night and in low visibility, terrain between the aircraft and airport may not be apparent, and in marginal conditions full approaches may be warranted.

Finally, it's not surprising that two fuel exhaustion accidents occurred in the surveyed period. Although jets do have much more accurate fuel gauges than piston aircraft, the variability of fuel flow with altitude is much greater. A jet may burn twice as much fuel to cover the same distance when flying in the terminal environment as it would at its ceiling. This effect is much greater in jets than in piston aircraft, which experience less efficiency loss at low altitude because of the smaller altitude range possible for flight. A

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get more reliable, pilots simply find new ways to come to harm.

Looking deeper into the accident categories, there are interesting trends to be found. Just as ALAs represent half of overall events, runway overruns represent half of all ALAs. The largest subcategory of the largest category is logically an accident type to study well. Looking into the details of the surveyed events, three risk factors pop out as represented in nearly all the events—often in combination. Runways shorter than 3,500 feet, contaminated runways, and landing with a tailwind—any one of these hazards can lead to landings ending off-pavement, but add two or more together and it's not surprising the end isn't pretty. The prudent pilot should hear mental warning

taped shut and not seen on the preflight inspection, gear collapsing after the pilot did not follow the manufacturer's emergency extension procedure.

Also of interest is that all of the mechanical events involved a failure either of the gear and brake system, or of the pitch trim system. If only two systems represent a vast majority of mechanically caused accidents, knowing well those systems and associated abnormal procedures would seem of relatively high importance.

LOC, CFIT, and fuel exhaustion accidents make up nearly all the remaining events. Looking for actionable information from the reports, it is of note that three of four LOC incidents involved approaches in conditions right at or below ILS minimums. Airline operating rules specify that approaches cannot be commenced if the airport is below minimums, while Part 91

pilot planning fuel very tightly who is then brought down by ATC earlier than desired will quickly eat up planned reserves and find options short if a divert decision is delayed too long.

Given the patterns of four decades of SP jet accidents, it's no surprise to see where the newest light jets currently flying have come to harm. Runway overrun in heavy rain. Touchdown with landing gear not extended. Accident preventable by diligent preflight inspection. Improper following of abnormal checklists. These have all occurred in the past few years as new SP jet models have entered service in significant numbers—showing that, at least when it comes to accidents, too many pilots are, after all, repeating history. **AOPA**

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