

BY RICK DARBY

# Unsafe Acts

A study of accidents in Alaska provides evidence that it's best to follow the rules.

Skill-based error accidents were the most prevalent, followed by decision error accidents, in an analysis of accidents in Alaska, U.S., involving fatality or serious injury.<sup>1</sup> But those that involved rule violations were the most deadly.

The accidents — which involved airplanes and helicopters — were categorized by researchers according to the Human Factors Analysis and Classification System (HFACS) devised by Douglas Wiegmann and Scott Shapell. The full HFACS taxonomy includes a hierarchy of four levels, but for this study only the lowest level, “unsafe acts,” was used. That in turn was subdivided into skill-based error, perceptual error, decision error and violations.

The study analyzed 97 accidents occurring from 2004 to 2009. Of those, 55 involved aircraft flown under U.S. Federal Aviation Regulations Part 91, *General Operating and Flight Rules*; 18 involved Part 91 flights in business use, designated by the researchers as Part 91c; and 24 involved flights under Part 135, which covers commuter and on-demand operations. Of the accident total, 56 were fatal; 41 resulted in serious injury only. The report on the study noted that “general aviation activity in Alaska has always been extremely vital to that state’s economy and industry.”

More than 70 percent of Part 91c accidents and 60 percent of Part 91 accidents were fatal. Only in Part

135 accidents were the majority, 58.3 percent, non-fatal. Pilots in the Part 135 accidents had an average 8,330 flight hours, compared with 4,168 for Part 91 pilots and 6,396 for Part 91c pilots.

The takeoff and en route phases of flight accounted for the largest percentages of accidents, 23.7 percent and 35.1 percent respectively. “Maneuvering,” such as instructional flights, hovering helicopters and flying other than between two points, was the third most frequent phase at 19.6 percent. Landing was the least frequent, including 5.2 percent of the accident total.

“There were no accidents during the landing phase for Part 135 operations,” the report says. “In addition, there were more accidents during the approach phase than during the maneuvering phase.” En route accidents

represented the highest percentage for Parts 91, 91c and 135 (Figure 1).

Some differences in severity — fatality versus serious injury — were also noted (Figure 2, p. 52). The report says, “If the accident occurred during takeoff or landing, it was more likely to involve a serious injury, but no fatality. Most likely this was because of the lower energies associated with those phases of flight. However, if the accident occurred during the en route phase, it was more likely to involve a fatality. Approach accidents were divided equally, while maneuvering accidents slightly favored fatalities.”

Only 10 of the 97 accidents, or slightly more than 10 percent, were not associated with flight crew error.<sup>2</sup> The researchers categorized each of the remaining accidents according to HFACS categories:

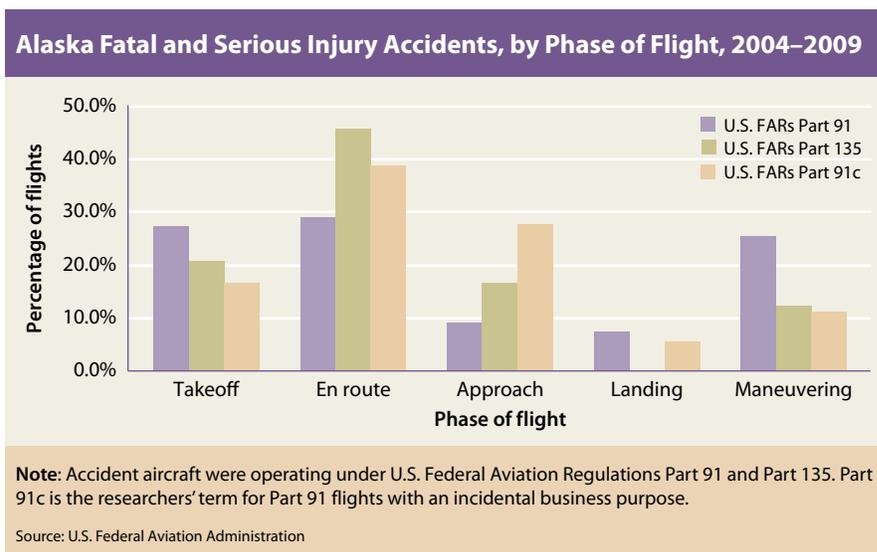


Figure 1

- A *skill-based error* “occurs with little or no conscious thought and is particularly susceptible to attention and/or memory failures.”
- A *perceptual error* “occurs when sensory input is degraded or ‘unusual,’ as is often the case when flying at night, in the weather or in other visually impoverished environments.”
- A *decision error* “represents conscious, goal-intended behavior that proceeds as designed, yet the plan proves inadequate or inappropriate for the situation.”
- A *routine violation* “tends to be habitual by nature and is often enabled by a system of supervision that tolerates such departures from the rules.” An *exceptional violation* is “an isolated departure from authority, neither typical of the individual nor condoned by management.” In this study, both types of violations were conflated into a single category, “violations.”

Skill-based errors were found to be a causal factor in slightly more than half of the accidents. Decision errors were a causal factor in about one-third of the accidents. A single accident could have more than one HFACS category of causal factor.

“Thirty-two accidents ... involved a decision error on the part of the pilot,” the report says. “Twenty-five of these decision errors were faulty judgments regarding the weather.”

Violation accidents — numbering 24 in the data set — most commonly included overloading the aircraft. Five accidents were associated with illegal drug use, four involved medical certification of the pilot and two involved unreported cases of diabetes.

Alaska Fatal and Serious Injury Accidents, by Severity, 2004–2009

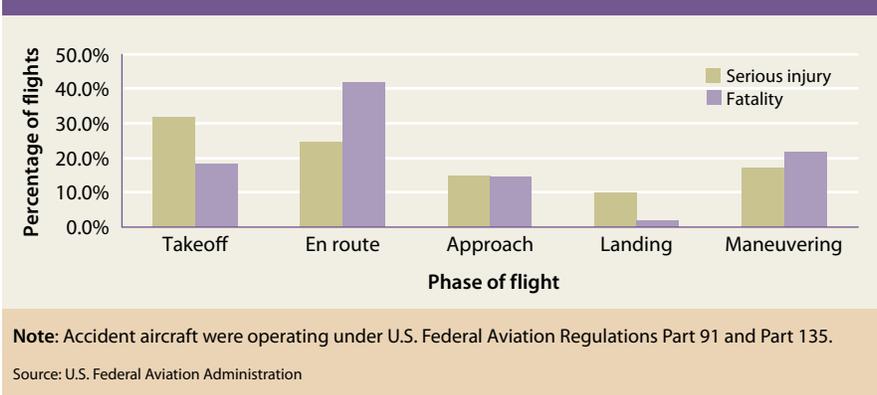


Figure 2

Alaska Fatal and Serious Injury Accidents, by HFACS Category, 2004–2009

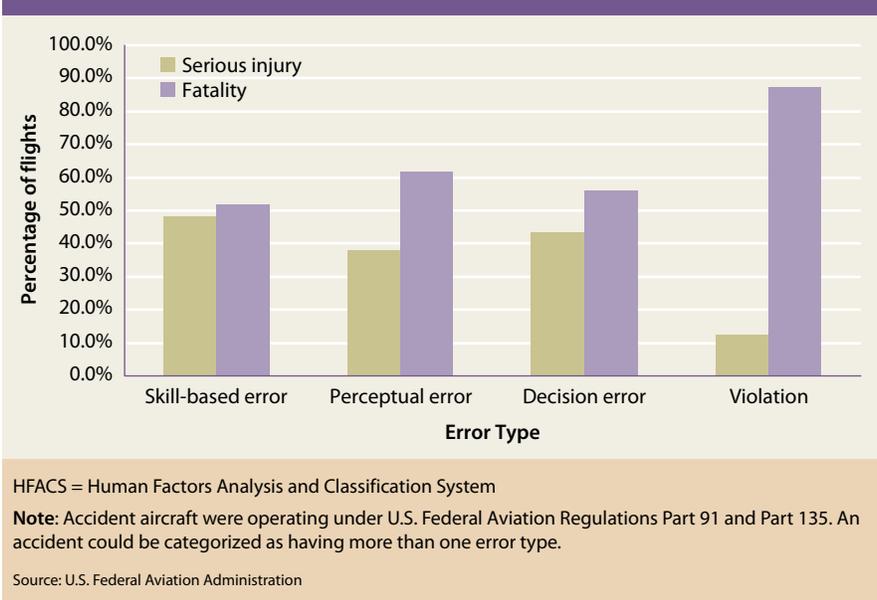


Figure 3

For every HFACS category of error type, fatal accidents outnumbered those with only serious injuries (Figure 3). “This reflects that there are more fatality accidents in the database,” the report says. “However, for skill-based error and decision-error accidents, the number of fatal accidents and serious-injury accidents was nearly identical. We see a larger ratio of fatal accidents for those associated with perceptual errors. But the ratio of fatal to serious injury accidents among the violation accidents was seven to one.”

Notes

1. Williams, Kevin W. *A Human Factors Analysis of Fatal and Serious Injury Accidents in Alaska, 2004–2009*. FAA Civil Aerospace Medical Institute. DOT/FAA/AM-11/20. December 2011. <[www.faa.gov/library/reports/medical/oamtechreports/2010s/media/201120.pdf](http://www.faa.gov/library/reports/medical/oamtechreports/2010s/media/201120.pdf)>.
2. Several of the 10 accidents not involving flight crew error included errors in maintenance or inspection, but those were not examined for their human factors components.