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Slippery Slope

Glideslope deviation was the most frequent factor in unstabilized approaches in the latest C-FOQA analysis.

The rate of flight operations events — exceedances of predetermined parameters — for participants in Austin Digital’s corporate flight operational quality assurance (C-FOQA) program decreased in 2010, from 11.3 percent of the total flights in 2009 to 9.5 percent, a 15.9 percent drop (Figure 1). That rate was also lower than the five-year weighted average, 10.9, since the beginning of data collection in 2006. The program was created by Flight Safety Foundation (FSF) but is now administered by Austin Digital, with the data processed through the Austin Digital eFOQA event measurement system.

C-FOQA is designed to provide corporate flight departments with the advantages many airlines obtain from analogous programs. Flight data are recorded, downloaded from a quick access recorder and analyzed. The results are available to each operator for its own fleet, and publicly in an overall, de-identified form. Each operator also receives an annual report comparing its fleet to the aggregated fleet data.

The rates appear in the latest report from Austin Digital, which aggregates and analyzes the metrics for the program.¹ The aggregated data were derived from flights of 46 aircraft of 12 types. The full data set has continued to grow, making the data more statistically significant, as shown by the decreasing size of the error bars.^{2,3}

For 2010, the most frequent event in the unstabilized approach category was “above desired glide path on approach,” with 65 GPWS (ground-proximity warning system) cautions (Figure 2). That factor had been second-most frequent in 2009, when “high rate of descent on final approach” was at the top of the list. “Fast approach” — which had been fifth-most frequent in 2009 — was next highest in the number of

events, 62, of which 24 were GPWS warnings. The largest number of warnings, 30, were triggered by “late final flap extension.”

Among all flight operations events, “GPWS: unknown warning type” led the field, with 200 events, of which 45 were warnings (Figure 3). For these events, the recorded data were sufficient to distinguish between GPWS cautions and warnings but not to determine the cause of the caution or warning.

Nevertheless, the analysts inferred the relative frequency of GPWS events by type using “an emulation of the possible GPWS mode envelopes ... to estimate the most likely cause

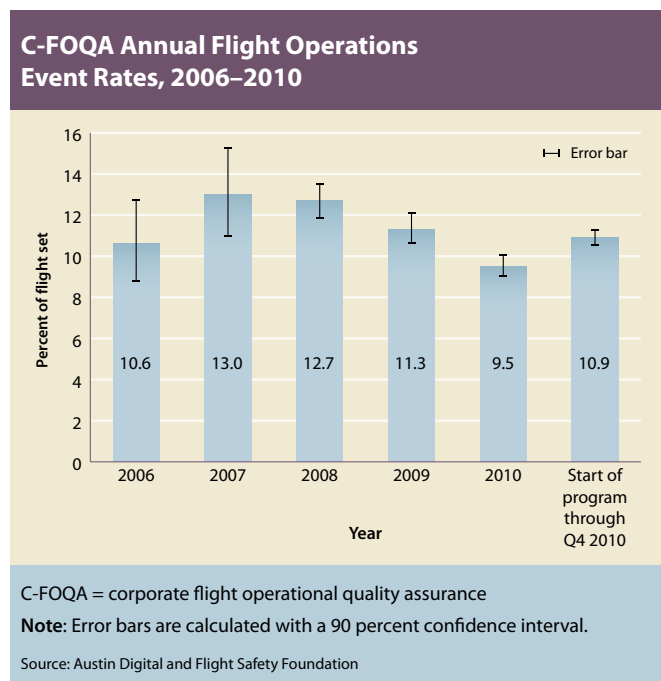


Figure 1

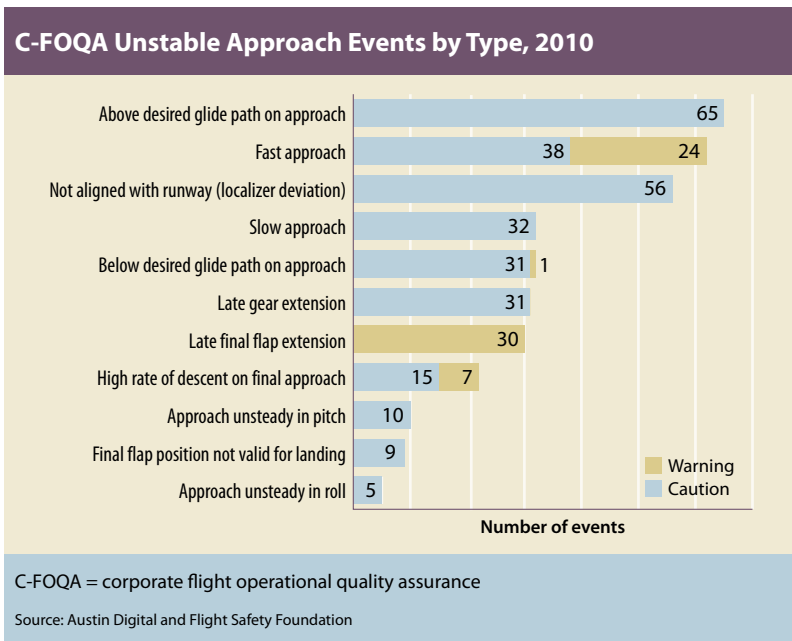


Figure 2

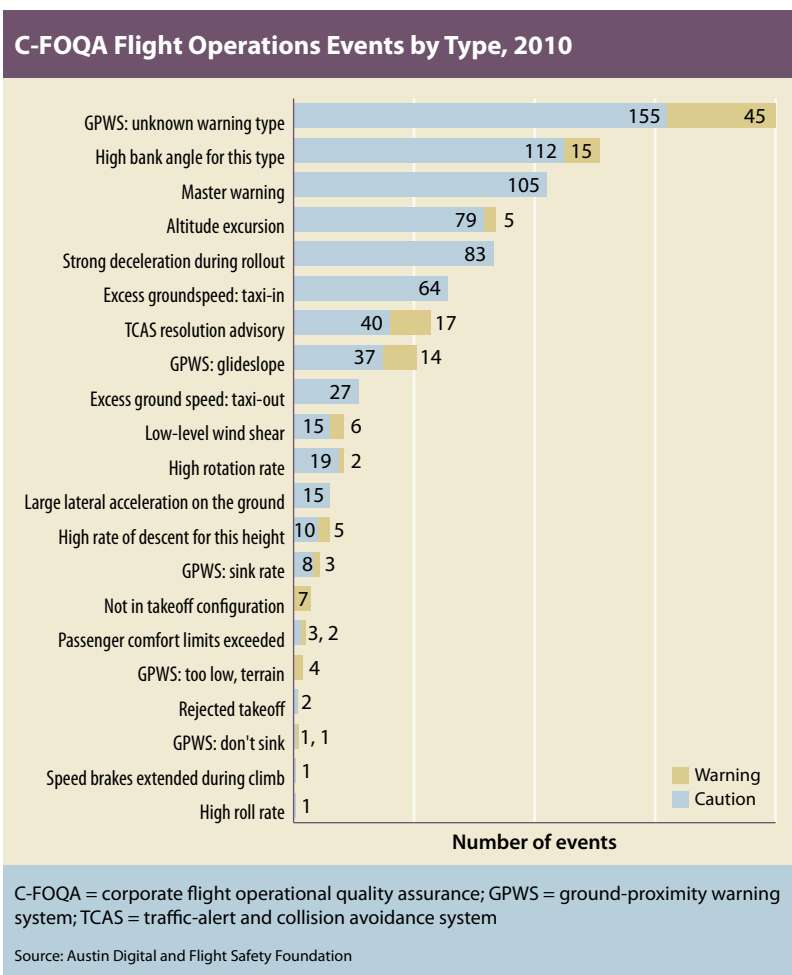


Figure 3

for the alert.” Glideslope deviations were found to be the most frequent by far, with 176 cautions and 53 warnings. Next most frequent were sink rate cautions and warnings, 24 in total.

Relative positions among the most common events shifted between 2009 and 2010. In 2009, “master warning” was in second place, “high bank angle for this height” in third place. The order was reversed in 2010. “Excess ground-speed: taxi-in” had been fourth most frequent in 2009, with “altitude excursion” occupying the same place in 2010.

Unstabilized approach events increased year-over-year. In 2010, the rate was 3.8 percent of total flights — the same rate as the five-year average — compared with 3.2 percent for 2009, a 19 percent increase (Figure 4, p. 52).

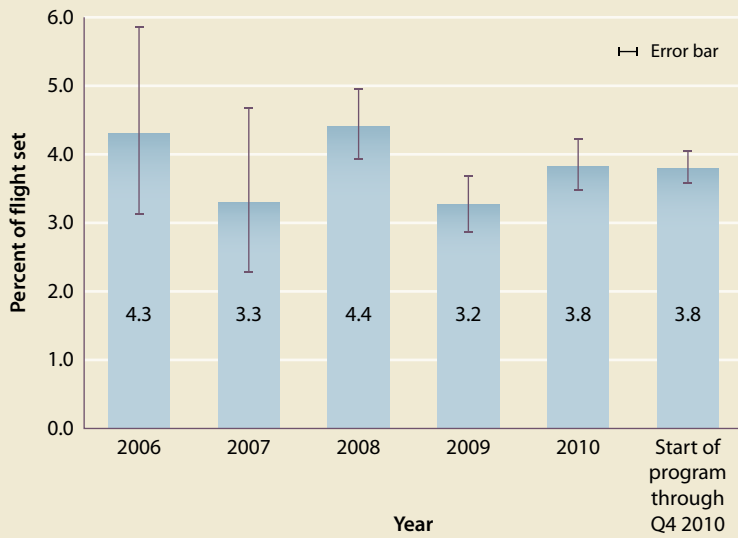
The analysts compared unstabilized approach event rates by the length of an operator’s participation in the C-FOQA program. The highest rate, with 4.7 percent of approaches unstabilized, occurred in the first year. In succeeding years, the comparable percentages were 3.0, 3.4, 3.6 and, in the fifth year of participation, 2.6. For the entire data set, 3.6 percent of approaches resulted in unstabilized approach caution alerts, with 0.1 percent resulting in warning alerts.

In 2010, unstabilized approaches were identified most often as “above desired glide path” — the desired glide path being, for practical purposes, the instrument landing system glideslope — and “fast approach,” each more than 0.7 percent of the data set (Figure 5, p. 52). “Below desired glide path,” “slow approach,” “late final flap extension” and “late gear extension” were about equally frequent, each at slightly under 0.4 percent of the data set.

The analysts found that more than 45 percent of flights were between 0.00 and 0.25 dots above the glideslope. About 0.75 percent of flights were between 1.50 and 1.75 dots above the glideslope; about 0.35 percent were between 1.75 and 2.00 dots above the glideslope.⁴

About 1.7 percent of flights were 0.80 to 1.05 dots below the glideslope, and 0.6 percent were 1.05 to 1.30 dots below the glideslope.

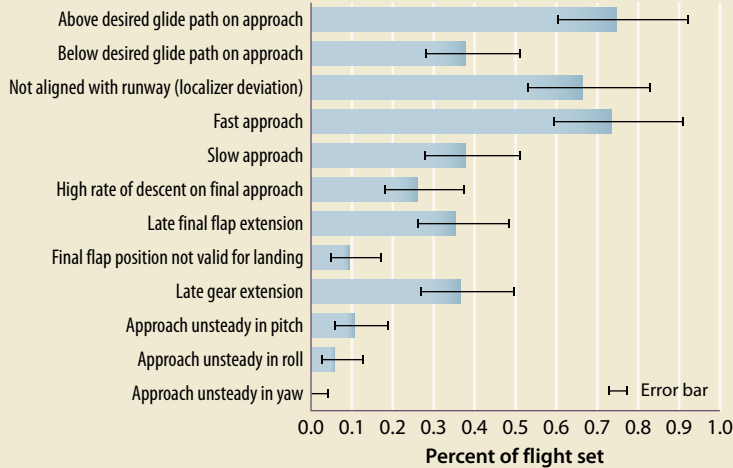
C-FOQA Unstable Approach Events Rates, 2006–2010



C-FOQA = corporate flight operational quality assurance
Note: Error bars are calculated with a 90 percent confidence interval.
 Source: Austin Digital and Flight Safety Foundation

Figure 4

C-FOQA Unstable Approach Rates, by Type, 2010



C-FOQA = corporate flight operational quality assurance
Note: Error bars are calculated with a 90 percent confidence interval.
 Source: Austin Digital and Flight Safety Foundation

Figure 5

The 2010 data showed that the recorded calibrated airspeed minus V_{app} at the landing threshold crossing — representing how closely

the actual airspeed matched the calculated approach speed — was between 0 and minus 2 kt for about 24 percent of the flights. For another 21 percent or so, it was between 0 and plus 2 kt.

A scatter plot of groundspeed versus airspeed at touchdown in 2010 showed a majority of landings with a headwind, the next highest proportion of landings with less than 10 kt tailwind, and very few landings with the tailwind greater than 10 kt.

More than 25 percent of the 2010 flights had 75 to 80 percent of the runway remaining at touchdown. About 24 percent of flights had 70 to 75 percent of the runway ahead, and about 16 percent of the flights had the luxury of 80 to 85 percent of the runway remaining.

Stabilized landing criteria included a groundspeed of 80 kt with 2,000 ft (610 m) of runway remaining. Of the flights in which the groundspeed could be computed from C-FOQA data, the great majority met the criterion. Slightly fewer than 2 percent had between 1,500 ft (457 m) and 2,000 ft remaining; fewer than 1 percent were looking ahead to between 1,000 ft (305 m) and 1,500 ft of runway. ➔

Notes

1. The report is available on the FSF Web site at <flightsafety.org/files/2010_C-FOQA_report.pdf>.
2. The error bars compensate for bias because of the sampling size. They indicate that there is a 90 percent probability that the rate for the C-FOQA operators would fall within the range shown if there were an infinite number of their flights available for analysis.
3. The report says, “Due to the evolving nature of the C-FOQA program, event definitions and triggering limits may have changed since [some operators enrolled in the program]. Because of this, it was deemed necessary to reprocess all of the data using the current (as of March 2011) configuration. The advantage of reprocessing all of the data ... is that it assures that all the trend numbers are compared to the same standard, which in turn allows you to have a normalized trending comparison.”
4. Percentages were based on all flights in which a valid instrument landing system glideslope signal was received.