Lessons Learned and Murphy's Corollary

on one page

Anything that did not go wrong could not have gone wrong. We don't believe Murphy's Law, but we are surprisingly susceptible to its corollary: we take a positive outcome as evidence that it was inevitable.

1. Two premises

1. **The primary determinant of safety is the quality of decision making.**
2. **When a negative outcome could be catastrophic, make the go decision only with a very high degree of confidence in a positive outcome.**

Followed faithfully, this produces long strings of successes. Each success seems to prove the decision sound, and our standards drift lower, even when the success was partly luck.

2. Three factors that hide the danger

1. **Deceptive mathematics.** At 99 percent, eighteen go decisions carry a 17 percent chance that at least one fails: one chance in six.
2. **Murphy's Corollary.** We take a positive outcome as evidence that it was inevitable, and a long run of them quiets the doubts we had along the way.
3. **The pressure to go.** A go relieves it and a no-go adds to it; in either case, reinforcement can operate in the wrong direction.

Chance that at least one go decision fails

Decisions	At 99%	At 99.9%
1	1.0%	0.10%
10	9.6%	1.0%
18	17% (1 in 6)	1.8%
50	39%	4.9%
100	63%	9.5%
500	99%	39%

3. The remedy

1. **Stay aware** of our tendency to succumb to Murphy's Corollary and to the pressure to go.
2. **Analyze successes, not only failures.** Before the operation, set a quantitative safety metric and a target with a margin. Measure every outcome against it. A success that misses the target may be wholly or partly the result of good fortune, and should not, perhaps, be considered a success.

4. Five questions for your program

Q1	Which routine operation has a long record of success but has never been measured against a safety margin?
Q2	When did you last think "this may not end well" during an operation, and "what could go wrong?" after it?
Q3	Which limit has been widened after a run of successes, and on what evidence?
Q4	What would a no-go cost you, and what do you tell yourself it would cost?
Q5	What metric and target, set beforehand, would tell you that a success was really luck?

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