

## Why Inertial Profilers Are Replacing the California Profilograph: A Technical and Practical Case

By Michael Gerardi

Remember the grainy charm of a Polaroid photo? It captured the moment, but only just. Now compare that to a modern 4K camera that sees every detail, from the glint of sunlight to the texture on your skin.

In pavement profiling, the California profilograph is the Polaroid. Inertial profilers? They're the 4K cameras of the industry.

### Outdated Technology with Real Limitations

The California profilograph, once the industry standard for measuring pavement smoothness, is being replaced by faster, more capable tools. Originally designed for highways, this mechanical device is slow, subjective, and ill-suited to today's demands, especially for airports.



Key limitations include:

- Slow operation requiring lane closures and added labor
- Short 25-foot base length that misses longer wavelength roughness
- Limited vertical resolution, underreporting dips and bumps
- Manual interpretation of analog traces, prone to inconsistency

## Why Modern Profilers Are Gaining in Popularity

Today's profiling systems are digital, repeatable, and far more precise. The FAA's 2019 evaluation confirmed that inertial can:

- Match or exceed profilograph PI results
- Detect longer-wavelength roughness events
- Simulate 12-foot straightedge deviation with high accuracy
- Provide input for aircraft simulation models
- Inertial profilers collect longitudinal data at faster speeds



## Real-World Impact: Aircraft Response Matters

Profilograph shortcomings are most evident on runways. At one FAA test site, a 1.3-inch dip over 50 feet at a PCC/HMA transition was recorded as only 0.8 inches by the profilograph. Yet aircraft simulation showed a 0.56g acceleration at the pilot's station, well above Boeing's discomfort threshold (APR Consultants, 2019; Appendix A).

## The Bottom Line

The California profilograph served its era, but modern profiling demands better. Today's inertial aren't just more efficient; they offer a viable way to assess roughness from the aircraft's point of view.

With FAA validation, simulation-ready data, and compatibility with tools like ProVAL and ProFAA, inertial and rolling profilers have become the new standard in airfield smoothness evaluation.

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## References

- APR Consultants, Inc. (2019). *Evaluation of Alternate Profiler Types for Use on Airport Pavements*. FAA William J. Hughes Tech Center.
- ASTM E950: Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Inertial Profiler

- FAA Advisory Circular AC 150/5370-10H, Item P-401
- FAA Advisory Circular AC 150/5380-9
- Boeing Document D6-81746: *Runway Roughness Measurement – The Boeing Method*
- ProVAL ([www.roadprofile.com](http://www.roadprofile.com)), ProFAA ([airporttech.tc.faa.gov](http://airporttech.tc.faa.gov))