

Evaluating Runway Designs

By Michael Gerardi

Having been in this business for over twenty years, we have seen roughness issues of all kinds. Roughness can come from sub-grade problems, from a pavement's age, or from poor quality construction. There is one kind of roughness though, that is most easily avoidable: roughness built into *the design*.

Roughness can creep into the design most often in areas of intersecting runways or when the design is being tied into existing grades. The following case explains the consequences of choosing not to perform a roughness analysis on a runway design.

The runway in question is at a major metropolitan airport in the southeast United States. This runway was designed, built, and opened before APR got the call. When we did get the call, the person explained that one of the first aircraft to operate on the newly opened runway nearly bottomed out the nose gear strut, causing the pilot to complain. As the days progressed, the airport quickly realized they had a serious problem, as several pilots had made their complaints known to the tower. The airport wanted to know two things from APR: What went wrong? Who is at fault?

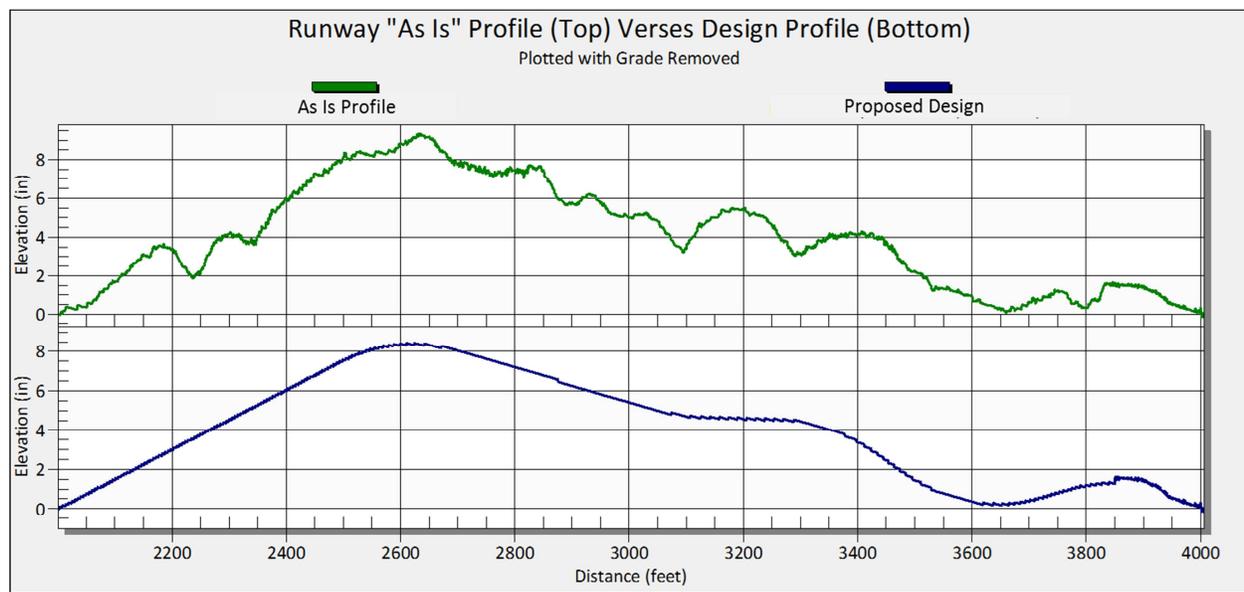


Figure 1. Here, the "as is" profile has some very dynamic profile changes associated with it. The design, in the lower portion of the plot, seeks to reduce those profile undulations into something more consistent.

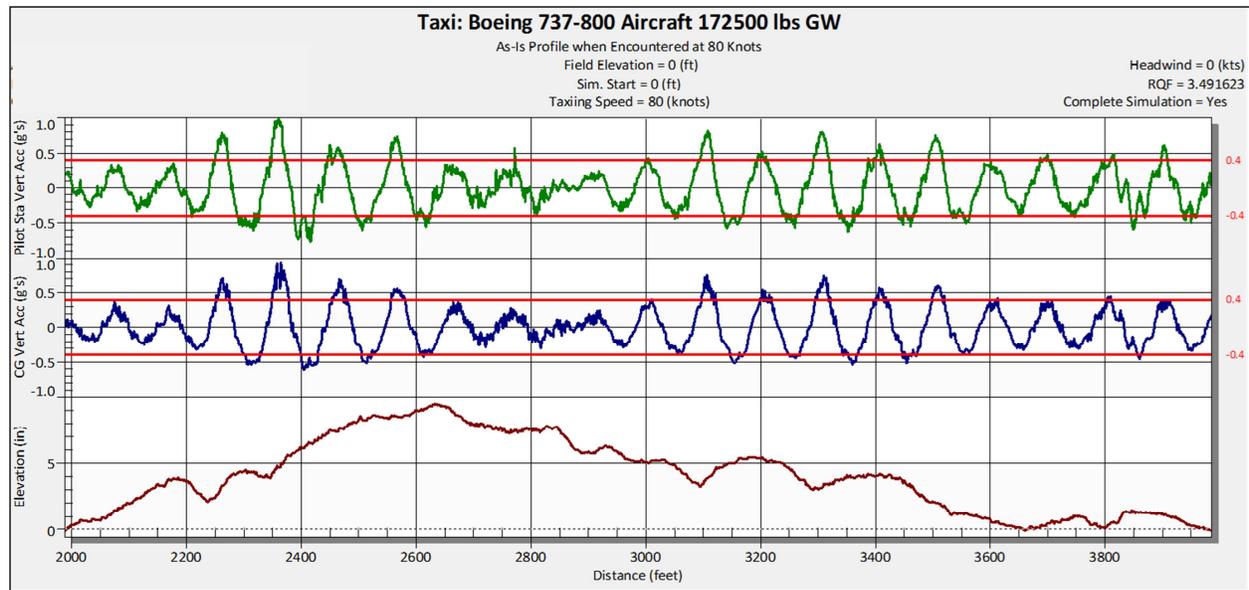


Figure 2. This "as is" profile doesn't produce very good ride quality. Here, a Boeing 737-800 is performing an 80-knot constant speed taxi simulation. This profile produces up to 1.0G of acceleration at the Pilot's Station.

After making profile measurements using the Auto Rod and Level, we went to work determining the exact location and severity of the roughness. Once we determined that, we entered the design data into our evaluation software, and began comparing the "as-is" pavement with the design.

In the end, we determined that while the contractor did not meet the design perfectly, the design itself was flawed. Even in a perfect construction situation the pavement would likely still have generated pilot complaints based on the design.

Had the design been sent to APR before construction, the entire situation would have been avoided. APR would have been able to work with the designer to achieve an acceptable design while maintaining non-smoothness related concerns.

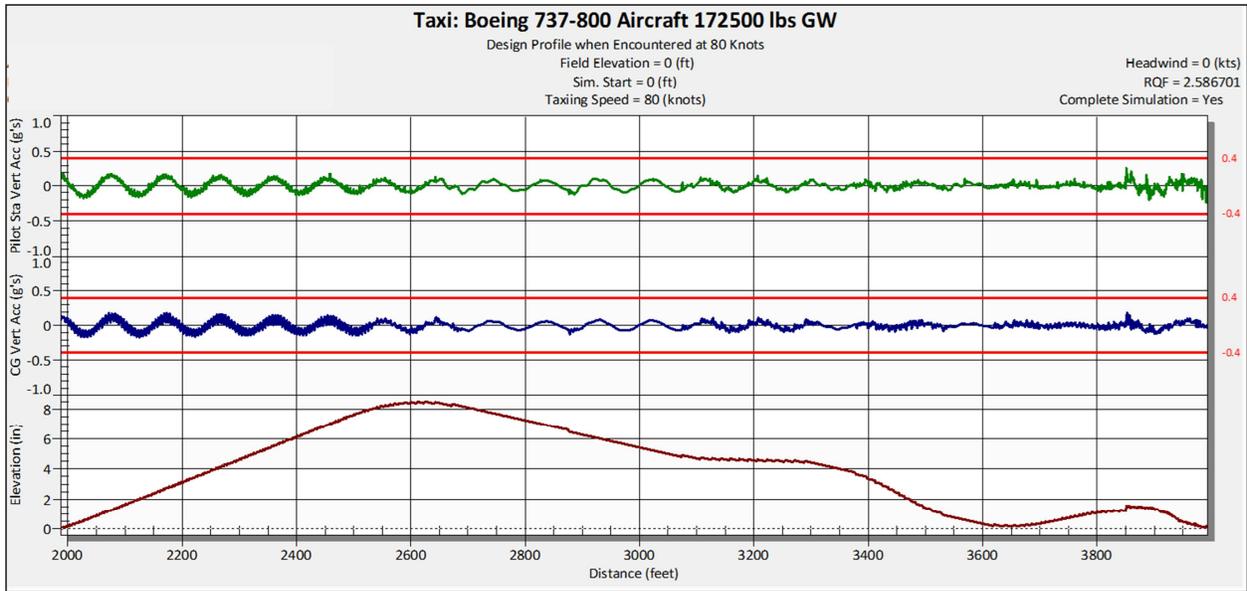


Figure 3. Here, APR evaluated the proposed design data of the new profile. Using the same simulation parameters, you can see that the aircraft will have a much improved response one the repairs are made.