

Tipping Point: Utilization & Utility of High Frame Rate Projection in FAA Level D Flight Simulation

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ABSTRACT

Increasing simulator visual system frame rate from conventional 60Hz “Standard Frame Rate” (SFR) to a 120Hz “High Frame Rate” (HFR) provides a demonstrable benefit to the resolvability of rapidly moving objects, but it is still unclear how much performance is gained for the majority of flight simulation content. This paper relays the evolving utilization of HFR capable projection systems in FAA Level D certifiable visual systems and provides indicators of a near-term ‘tipping point’ whereupon a majority of FAA Level D flight simulation applications will likely employ HFR.

The paper further quantifies the performance benefit afforded by HFR for a selection of safety-critical fixed-wing aviation training tasks. Since resolution can be improved by increasing static resolution or by increasing frame rate, HFR performance benefits for each aviation task are conveyed through a comparison. The dynamic resolution capability of a system with double frame rate (HFR) is compared to a system with double the static resolution (4k). A graphical heatmap is presented for each task, indicating FOV regions where 2MP (HD) HFR outperforms 9MP (4k) SFR, in spite of the roughly doubling of image pipeline required for the 9MP static resolution system. Finally, the training impact of improving various FOV regions is discussed and a summary analysis is provided indicating limitations and areas for further study.

BIO

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David Emig has substantial experience in electro-optical systems design and optical system characterization. He has delivered innovative display designs and developed patented technologies for Motorola’s Display Design Center. David is currently a Staff Display Systems Engineer for FlightSafety International’s Visual Simulation Systems division and focuses on display systems design and new technology development.