



AEROSPACE INFORMATION REPORT

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Superseding AIR5691A

Guidance for the Design and Installation
of Fuel Quantity Indicating Systems (FQIS)

RATIONALE

Errors have been identified with one of the equations within the document, and updates are needed to reflect latest regulatory changes and changes to approved additives (as part of Five-Year Review activity). Various typographical errors have also been corrected.

FOREWORD

Fuel gauging systems on modern aircraft are large, complex systems, consisting of multiple sensors located in the hostile environment of the fuel tanks. The measurement of those sensors is complicated due to strict regulations around the amounts of in-tank energy and current that can be applied, in order to maintain intrinsically safe systems.

Standards of acceptability of FQIS error, especially for large airplanes, have evolved to meet market expectations. Error magnitudes which were considered satisfactory in the era of low fuel costs, when many systems were designed, are no longer acceptable. "Normal" variations in fuel characteristics such as permittivity/dielectric constant (K) and density (D) can cause unacceptable errors if these characteristics are not measured directly. Measurement of these characteristics has also been made more important by the introduction of new sources of crude oil in the past decade, and the recent introduction of alternate fuels ("bio-fuels" and "synthetic fuels": fuels created from non-petroleum sources). This need for reduced error magnitudes also increases the complexity of the fuel gauging system, driving up both the number and variety of sensors.

Despite the improvements in the systems, the majority of systems still use a variation of capacitance technology, which was first introduced in the late 1940s.

This document is intended to give an overview of all the factors which should be considered in the design of a modern fuel gauging system. It concentrates on system design for large commercial aircraft (Part 25 aircraft), but many of the items are equally applicable to small aircraft (Part 23) and rotorcraft (Part 27 and Part 29).

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