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DESIGN, FABRICATION & SYSTEMATIC APPROACH FOR PREDICTING AIRCRAFT FUEL QUANTITY AT VARIOUS MANEUVERING

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ABSTRACT

In general aerospace vehicle, aircraft or a wing body (even in automobile) the prediction of exact measure of the aircraft turbine fuel or the propellant is a difficult task. Normally we will go for an level indicator or a float with suitable volume transducer for measuring the volume of available fuel in automobile and aircraft, the indicator will be calibrated at ground run condition and at sea level parameters to set the display in desired form. but in practice because of fuel block at some cells or segments, set down at corners, various maneuverings (inverted flight, loop, roll, spin.etc.,), at various altitude the density differs, pressure block inside the tank, miss measurement by the float , all those parameters has to be taken in account for predicting exact level of fuel in volume pattern, at large range of fuel circulation within the fuel tank. The fluid parameters such as pressure, velocity, density, temperature distribution throughout the volume of fuel has to be considered at X, Y & Z plane. So it is mandatory to form optimum solutions to get desired value in volume format

It is necessary to design a formulated fuel indicator or a fuel tank or the combination of both which should be acceptable by practical testing and if needed can go for an Computational Analyses are carried out separately 2 dimensional and 3 dimensional approach. On the other hand, for problems , considering the previous analysis and the existing data by accounting all the possible aerodynamic and mechanical in stability of an aircraft a fuel tank and indicator can be designed for predicting the fuel level which should help the pilot in all form

I. INTRODUCTION

The objective of the present research is to have a new numerical and design approach to define a model of fuel tank and find the possibility of fuel scattering, then that fuel tank will be located over an suspension & load cell arrangement in side an wing section. The weight of the fuel will be sensed using the load cell and the weight can be converted in volume form by suitable transducer with respect to density. Thus the exact level of fuel can be displayed at the cockpit. And can be evaluated with the theoretical results

II. WEIGHT AND BALANCE

The amount of fuel that can be carried is often limited by weight and balance considerations. Determining the maximum permissible takeoff weight and the C of G position is an important part of the fuel management process. Some aircraft types have a maximum zero fuel weight (see the accompanying table for a definition). Takeoff and climb performance should be borne in mind here – particularly when operating off a short strip or over high terrain.

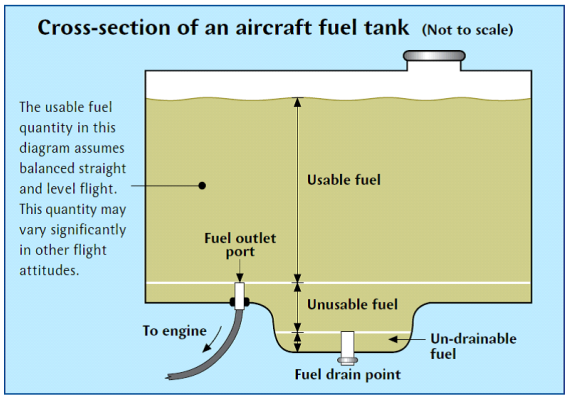
III. PRE FLIGHT FUEL CHECKS

3.1 Determining Fuel Available

Accurately determining what quantity of fuel you have on board is important. Assuming the fuel required for the flight has been calculated correctly, it should be a simple matter of uplifting it and completing the flight with a comfortable margin to spare.

It is good practice to check the fuel available before flight by at least **two separate methods** (in Australia, this is a legal requirement). We can do this by referring to the fuel gauge(s), loading a known quantity and, in many aircraft, by dipping the tanks. There are a number of considerations that should be borne in mind when determining the fuel available.

IV. USEABLE OR UNUSEABLE FUEL



Understanding the difference between the terms usable and unusable fuel is important in determining the fuel available for flight.

•The unusable fuel is the quantity of fuel that **cannot** be used in level flight

•Extreme care must be taken to ensure that the unusable fuel quantity is **not** included in the fuel available, as it can equate to as much as 20 minutes extra flying time that you don't actually have.

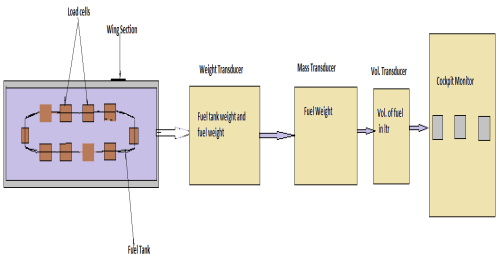
•It follows that the usable fuel is the quantity of fuel available for flight planning purposes.

Care must be taken when converting between liters, and US or imperial gallons. Calculations should always be double-checked

V. PROPOSED IDEA

To solve all the problems existing in fuel prediction of an aircraft by locating the fuel tank over the load cells. The weight of the fuel will be sensed using the load cell and the weight can be converted in volume form by suitable transducer with respect to density. Thus the exact level of fuel can be displayed at the cockpit. And can be evaluated with the theoretical results

5.1 Block diagram



- Locate the fuel tank on the load cells and measure the total load (fuel tank weight + fuel weight) by using a weight transducer.
- Reduce the fuel tank weight (constant) from the total weight to find the fuel weight.
- Convert the fuel weight into volume by dividing the density of the fuel and pass to the cockpit monitor by suitable manipulation.
- Converted fuel volume is monitored by the pilot from the cockpit monitor.

VI. CONCLUSION

I conclude that through this design thus implementing a new approach which will enable the pilot to receive the up to date fuel display in the cockpit continuously. Also this will prove the change in the fuel quantity at various maneuvering in both wings through which can conclude the distance which it can cover with this fuel