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**Title**

# Investigation of weight estimation in conceptual design for composite aircraft development

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## Abstract

Although the Coronavirus pandemic temporarily reduced demand for air travel, it is anticipated that demand will increase going forward, driving up the need for new aircraft development. The airline sector is become more concerned about minimizing its environmental impact, and the ICAO has set a target for lowering CO2 emissions from air travel [1]. The A350, which was initially delivered in 2015, makes a substantial contribution to low-impact air travel by using composite materials for up to 54% of its airframe structure, which reduces $CO_2$ emissions and fuel burn by 25% per seat [2].
The success or failure of the entire ensuing development flow is largely dependent on the aircraft weight that is determined from the conceptual design throughout the design stages of an aircraft. In certain situations, it can cause delays and unforeseen extra expenditures to the development process, and in the worst scenario, it might even result in the development being abandoned. Therefore, it is crucial to correctly estimate the desired aircraft's weight from the conceptual design stage on. The weight of airplanes has already been determined using statistical techniques. Most of these aircraft feature metal and aluminum alloy airframe structures. As a result, there is currently few methods for estimating aircraft weight that accounts for the usage of composite materials; rather, standard variables like the "Fudge Factor" are employed to alter known procedures.
The objective of the research is to develop a novel weight estimation methodology based on composite materials for components in conceptual design sizing. This method will be developed using the research results of a fluid-structure interaction analysis that was used to estimate the weight of the main wing among the airframe components.

## References

[1] https://www.icao.int/environmental-protection/Pages/LTAG.aspx
[2] https://aircraft.airbus.com/en/aircraft/a350/a350-less-weight-less-fuel-more-sustainable#airframe