

Economic Impact of Blended Wing Bodies in Transport Aircraft

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Introduction

The design of a blended wing body aircraft allows for more aerodynamic efficiency than the standard design of conventional jet aircraft. They are necessary for improving the standard transport aircraft which is reaching the end of its design lifespan. With rising fuel costs, the necessity of increasingly efficient aircraft is rising as airlines look to alternative methods of decreasing their fuel use. Blended wing bodies have the possibility of introducing upwards of 30% increases in efficiency, but the amount of time and money that must be put into their design does not currently outweigh the fuel cost savings that they can provide.

Purpose

The purpose of this project is to analyze the savings in fuel costs for aircraft through the implementation of blended wing bodies. Through this analysis, the effectiveness and possibility of their implementation can be seen.

Hypotheses

Alternative: The use of BWBs will provide a significant cost reduction through fuel savings allowing for their implementation

Null: The use of BWBs will not provide a significant enough cost reduction through fuel savings to allow for their implementation.



Figure 1. S. (n.d.). A Southwest Airlines Boeing 737-300 [Digital image]. Retrieved from <https://amp.businessinsider.com/images/5aabfcd51225bc2b008b4747-1334-1000.jpg>

Research Question

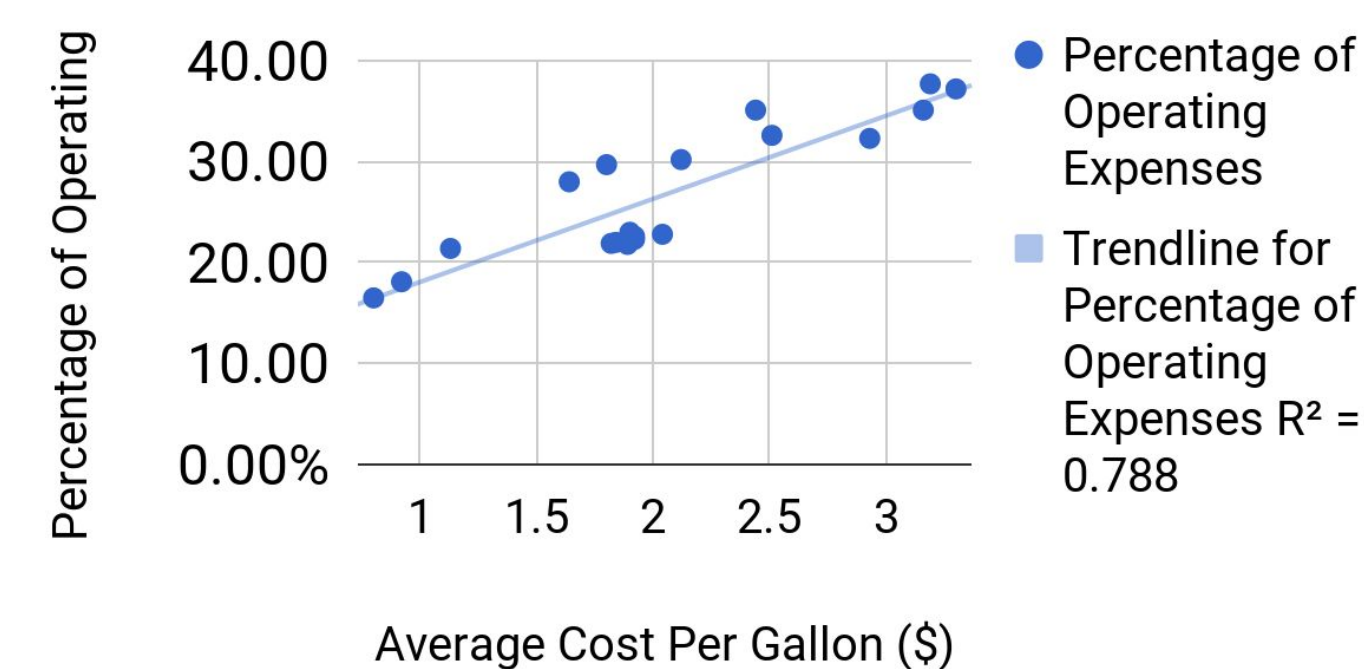
How much money through fuel savings can be saved through the implementation of blended wing bodies in regional transport aircraft?

Methods

All of the data was collected through secondary data analysis from the DZYNE Ascent 1000 aircraft and the 2017 Southwest Airlines financial report. The efficiencies of three aircraft were taken from the DZYNE Ascent 1000¹ aircraft and analyzed based on the fuel use, expenditure and distance traveled by Southwest Airlines to see how costs could be reduced through the implementation of the blended wing body.

Results

Percentage of Operating Expenses from fuel vs. Average Cost Per Gallon in Dollars



Comparative Fuel Costs for Southwest Airlines Between the BWB-165, Boeing 737-800 and the Boeing 737 MAX 8 Using 2017 Statistics



Figure 2. DZYNE Technologies. "Ascent 1000." DZYNE Technologies, www.dzynetech.com/ascent-1000/.

Discussion

With increased efficiency, aircraft can become more cost effective, but are the improvements enough to provide enough benefits to lead to their improvements. The rising prices have led to an increase in the percentage of operating expenses fuel costs make up. There has been a trend in the rise of commerce of about 5% per year that proposes the need for more efficiency over the market as its size increases. The largest factor holding back their development is the overall development cost, as the aircraft feature a design that has not faced more than 50 years of development.

Due to the data acquired for this study, some limitations impacted the accuracy of the study. The simplification of the aircraft efficiency data made it the costs to operate the aircraft are not as close to real life as possible. The data only accounting for fuel use over the maximum range does not account for the changing fuel efficiency of aircraft as they get lighter, as well as the differing fuel economy of shorter trips.

Conclusion

Overall, aircraft could greatly benefit from the implementation of blended wing bodies, with significant improvements in efficiency. With these improvements, aircraft companies could significantly reduce their bottom lines as fuel, one of their largest sources of expenditure.

Further Work

To continue this project, a more accurate analysis could be done with computer modeling that is able to account for all steps of the flight process, mainly taxi, takeoff and landing. Through this analysis the efficiency of the aircraft could be highlighted in a more realistic use case.

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References

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2. Southwest Airlines Co. (2018). 2017 annual report to shareholders. Retrieved from <http://investors.southwest.com/~media/Files/S/Southwest-IR/Bookmarked%20Annual%20no%20blanks.pdf>