United Technologies Aerospace Challenge

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Efficiency

-Change the shape of the aircraft

-Use renewable energy sources (hydrogen fuel, solar panels) within the aircraft

-Hybrid engines using liquid hydrogen

Passenger Comfort

-More leg room

-Greater luggage capacity

-Stable WIFI and Bluetooth

Terrorism

-Implement facial recognition

-Use a ‘smart satellite’ system using big data to track progress of planes on a global scale

Security

-Greater autopilot responsibility

-Transmission of planes vital signs to a server

-Emergency Systems

Hypothesis

“Will a blended fuselage and delta wing design improve the aerodynamics and durability of an aircraft compared to that of a standard design?”

We will aim to alter the body shape of the aircraft to improve its efficiency. Moreover, add other features to the craft to make it more sustainable and viable for future generations.

Method

1) Design the body of the aircraft. This must include the blended fuselage and delta wing designs to ensure we meet the hypothesis criteria.

2) Consider other components that may improve the aircrafts overall efficiency and add these to the design.

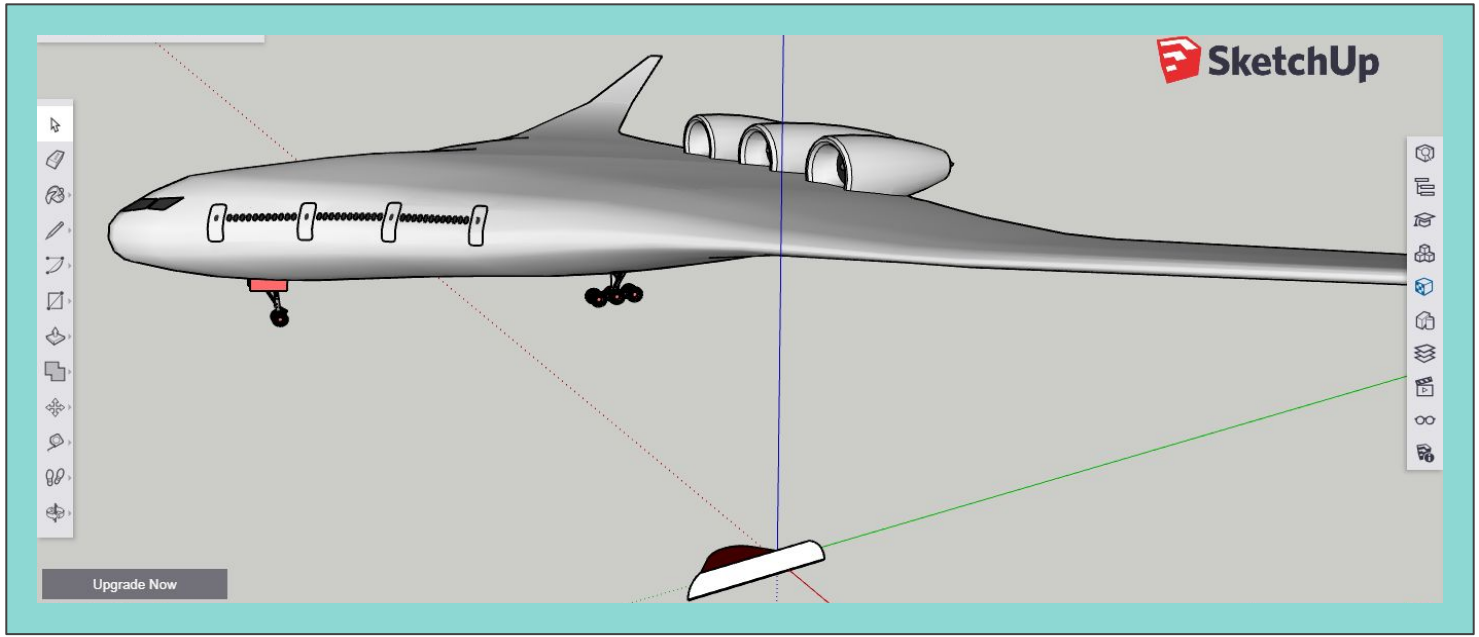
3) Test the shape of the aircraft against that of a standard design in a wind tunnel.

4) Compare and contrast the data and analyse which design is more efficient.

5) Summarise what changes could be made to improve efficiency.

Initial design

We initially developed a design that just incorporated the blended fuselage and delta wing design.

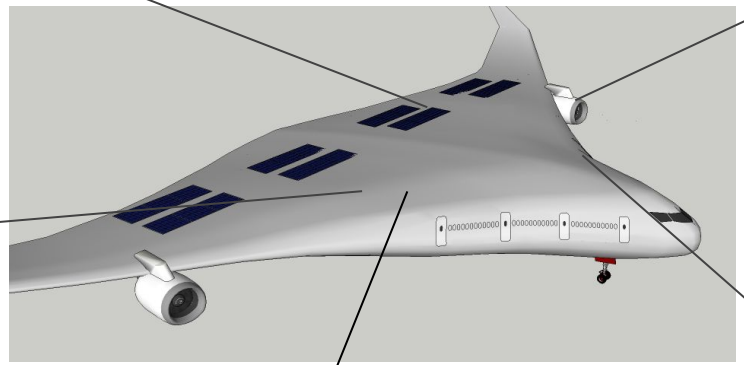


Final design

Solar panels
These panels will be used to power electrical components within the cabin or solely for take off as the process requires a great amount of energy. They are a renewable energy source thus making the aircraft more sustainable. They could produce up to 30% of the energy for the flight.

Engines
The engines could be compiled of hydrogen fuel cells. This would be more sustainable than using kerosene as it is 3 times more energetic and 11 times lighter than the oil. Water is its only waste product so it will have a positive environmental impact.

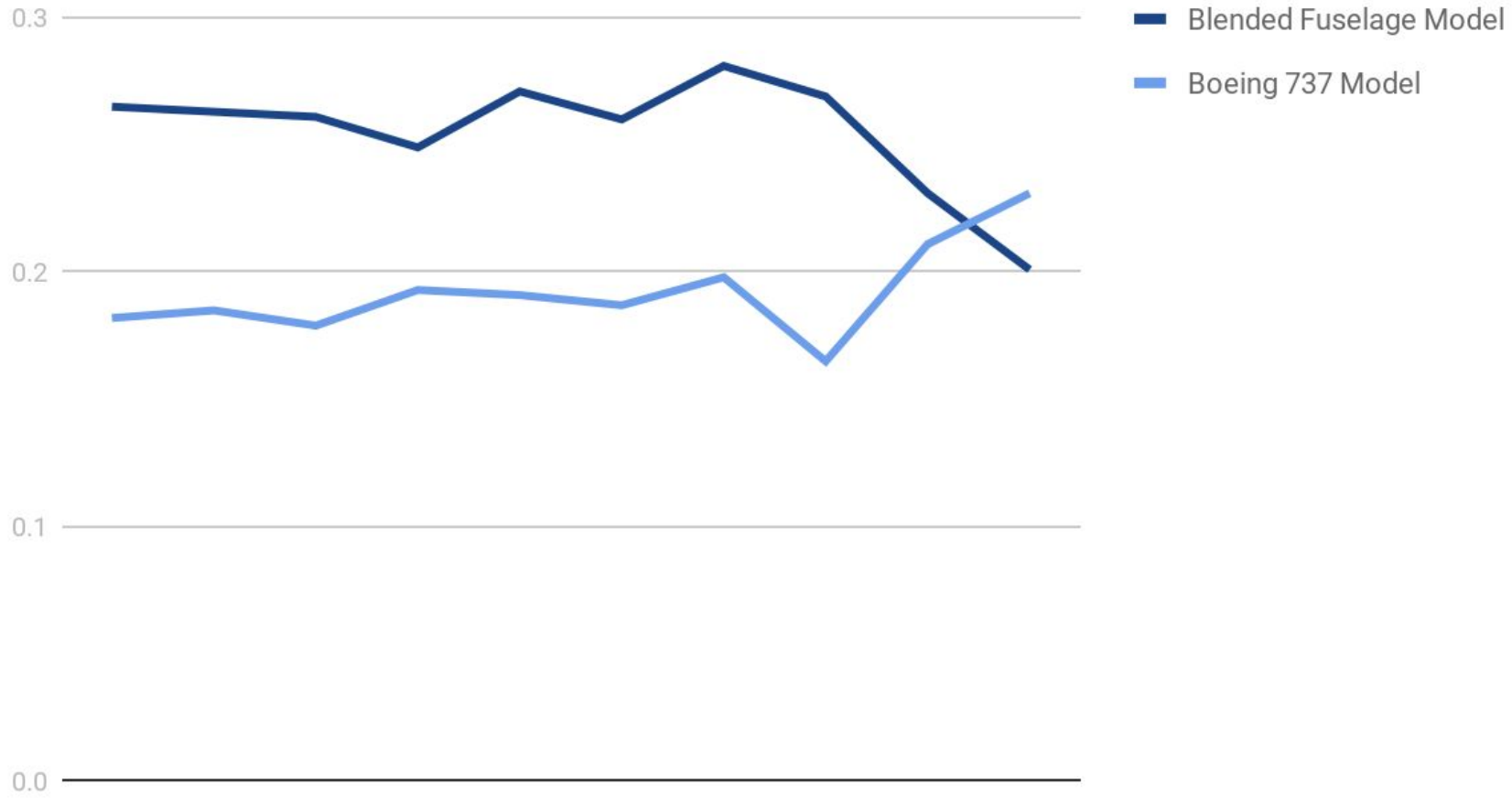
Cavities
Using cavities within the plane to redirect air flow could reduce noise pollution by 30%. This will not only improve passenger experience experience and the lives of those living near runways, but also reduce energy dissipation.



Coating
The use of polymer composites with carbon fiber based components will withstand hot temperatures generated through friction of a supersonic flight at the speed of Mach 2. And those building materials are lighter than aluminium and will increase the life expectancy of the aircraft

Blended fuselage design
This design should make the aircraft more efficient than that of a standardized design.

Newtons of Lift (N)



Collected Data

	Blended Fuselage	Boeing 737 Wing
Number of Trials (n)	10	10
Average Lifting Force	.255N	.192N
Standard Deviation (sample)	.023N	.018N
Minimum Lifting Force	.201N	.165N
Maximum Lifting Force	.269N	.231N

Statistical Results Supporting Conclusion:

95% Confidence Interval= .0275- .2085 Newtons

- T-Distribution Bell Curve:
- Average N of Boeing 737 Model= -2.217 Standard Deviations
- Falls outside 95% Confidence Interval

According to samples, there is a 95% chance that the Blended Fuselage Model will perform better than the Boeing 737 Model

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Passenger Comfort:

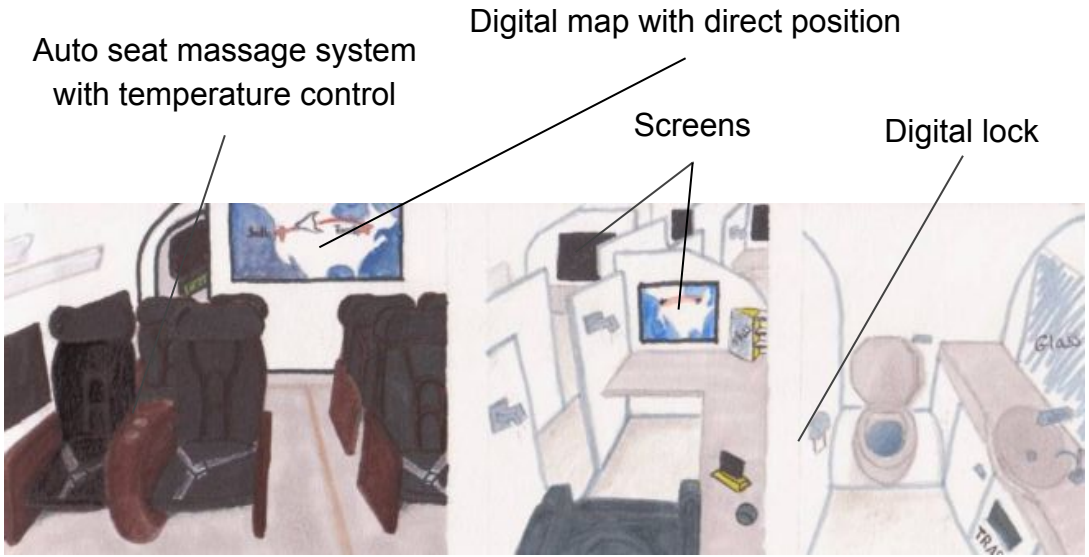
For the entertainment, the plane will have a room with couch and a bar in order to distract passengers and especially those on long flights.

First Class is in the front, just after the Cockpit and a Flight attendant Station.

Create two Flight attendant Stations and endure their welfare is maintained through strict regulation. Main Flight Attendant station will be between First and Economy Class.

Economy Class is in middle of aircraft (greatest passenger capacity).

Widespread use of stable and reliable WIFI and Bluetooth.



Economy Class | First Class | Restroom

Interior design by Maëla Legroux

Security:

In order to guarantee the security of the passengers we have include in our plane emergency systems.

A bmp180 pressure sensor
- To warn the crew if cabin pressure has not been maintained (which is activated by an observed change in pressure).

An autopilot system
- If a malfunction is detected by our smart system, it will be solved using a series of automatic algorithms.

Airliner Positioning System
- Pair all the airliners with an APS, it's a new GPS system specific to planes.

Atmospheric sensor
- Senses temperature and humidity outside the aircraft and predicts harmful conditions like thunderstorms by checking for low levels of moisture and stability.

Terrorism:

Facial recognition and Biometric System :

- Can help identify criminals easily and quickly with the uses of algorithms.

The smart satellite system :

A system relying on the fast satellite transmission of big data such as vital signs of the plane, the information from the different sensors to a secured database common to each aircraft. This system is relying on a satellite entirely dedicated to air traffic.

- Used if an unusual movement of an airplane is observed.
- The surrounding area will be identified and evacuated if necessary.
- Could be used to redirect the aircraft to a less densely populated area.

Conclusion

In conclusion, it is evident from our statistical data that the delta and blended fuselage design will perform better than that of a standardized plane like the Boeing 737. Our changes to body shape meaning that our model is 95% more likely to perform better than a standard plane model. This means that this plane is sustainable and durable and will be able to perform despite growing concerns over energy deficit.

Moreover, it has a great capacity and it is greener than current designs. Thus it would prove to be a viable design in a world where there's an increasing amount of people flying commercially. Also, be viable in a scientific climate where global warming and climate change are leading concerns within commercial technology companies. This means our plane design, or aspects of it, will prove useful to them.

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NASA-improving aircraft efficiency article
NASA-significantly reducing aircraft noise

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