

Research method and professional Development

Assessment: Presentation

Course: MSc Industry 4.0 Advanced Manufacturing

Module Code: ACPA7004

Supervisor: Graham Hove

***“Sustainable approach in aircraft seating
system for less CO2 emission”***

Prepared by

Rahul Bhosale (2116970)

University of Wales Trinity Saint David

Email: 2116970@student.uwtsd.ac.uk

Date: 16th Oct 2022

Introduction



The level of greenhouse gases in the environment has been increased which is causing the earth temperature to rise.

One greenhouse gas in particular, carbon dioxide (CO_2) has steadily increased over the past century largely due to human activity .

This research understand that gap and introduce different ways to control the emission. Premium seating system is one of those (first class and business class) This may leads to bigger part of fuel burn as they required more floor area on the aircraft thus more CO_2 intensive per RPK as compare to other type of seating like economy.

Research Analysis

The purpose of this research proposal will covers,

- Importance of this research
- Current Literature in the Co2 emission .
- Research analysis and different emission modes.
- Research methodology used and plan.
- Successful outcome for organisational benefits.

CO₂ Level in air can be reduced in the following areas.

- Transportation – Aerospace / Automotive.
- Heating and Cooling Buildings.
- Industry Carbon Output.
- Electricity Use.

Observations :

- A vehicle which gets around 30 mpg releases 1 ton of carbon into the atmosphere when its drive for 10,000 miles . Increasing the fuel efficiency will leads to reduce Co2 emission in air .
- Reducing the number of vehicle.
- Increasing the use of public transportation.

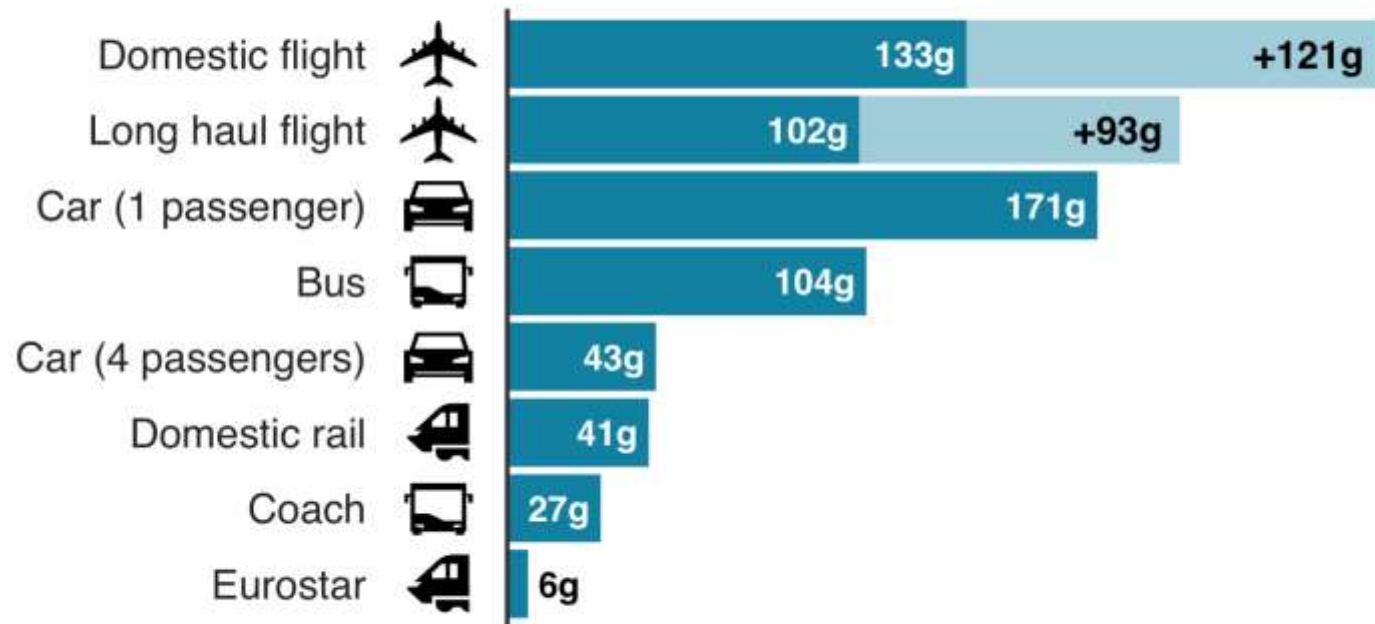


Current Literature in the Co2 emission .

Emissions from different modes of transport

Emissions per passenger per km travelled

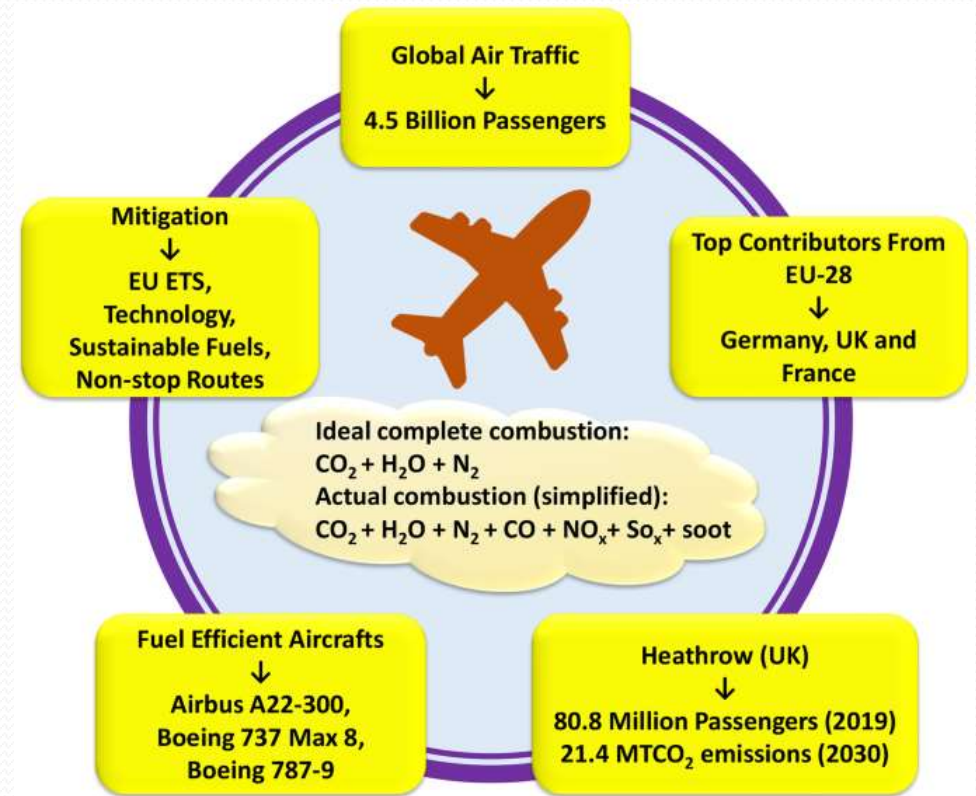
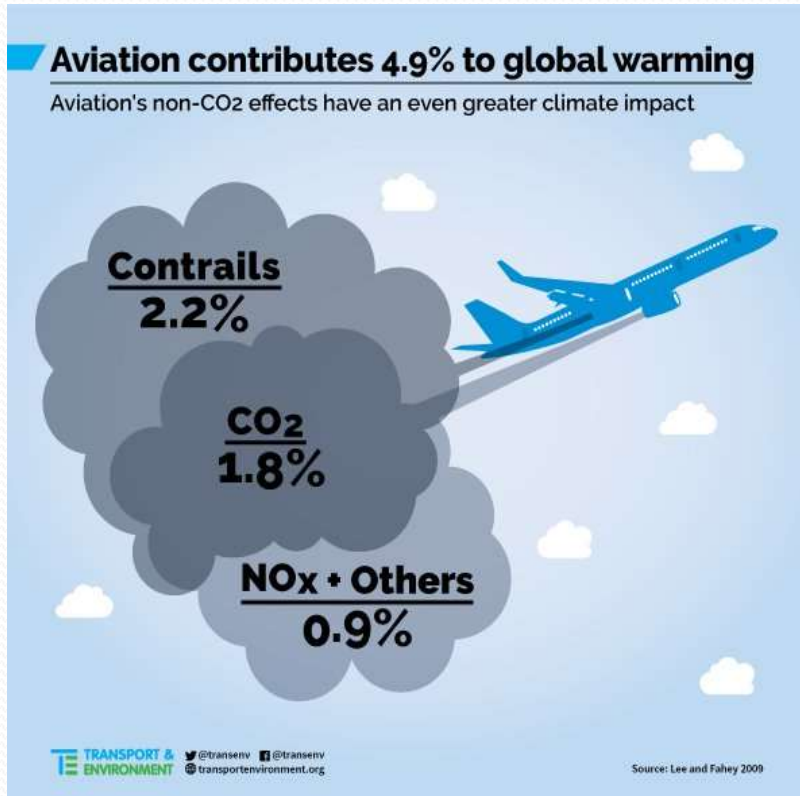
■ CO2 emissions ■ Secondary effects from high altitude, non-CO2 emissions



Note: Car refers to average diesel car

Source: BEIS/Defra Greenhouse Gas Conversion Factors 2019

Current Literature in the Co2 emission .



Aviation Industry contributes to global warming and can be controlled by fuel efficient aircrafts.

Solutions on challenges - CO₂ Analysis



The aircraft cabin design plays an very important role in fuel efficiency . By controlling / reducing the weight of the interior product like up gradation in seating system leads to fuel efficiency . The following factors are the solutions.

Weight optimisation

Circular economy of seating system.

Lighter Material implementation.

New manufacturing techniques (AM)

Re-use of existing parts .

Recycle material to use on other parts.

Research Methodology - Quantitative

No.	Organization / Dept	Interviewed / Feedback Members
1	First class seating Project	Engineering project lead / Program manager
2	Business class seating Project	Senior manager, Experience passenger
3	ITCM Team	Senior program manager
4	Engineering design - Cabin	Design Engineer / Design head
5	Industrialization	Industrialization engineer
6	Assembly line	Production Manager
10	R&D institution	Research and development team
14	Component supplier	Research and development manager

Circularity in Cabin

Circularity is a widely recognized model which helps in the reduction of material and re-use or recycling of the seating parts. Some parts are reused and fitted into another aircraft, Analysis done to capture the material changes and feedback form different department captured.

Component Development Analysis

<i>Cabin item</i>	<i>Problematic component</i>	<i>Development goal</i>
Seats	CFRP back structure	Replacement or more sustainable life cycle
	Aluminum primary structure	Reduction of virgin aluminum
	Seat covers	Wool sustainability enhancement or replacement
	Seat cushions	Replacement for melamine and PU Foams
Fasteners and brackets	Inconel and steels	Lighter weight alternatives such as bonding

This material application gives an idea where sustainability should be taken into account . The problematic component and its development goal with specified material shown in table above for reference.

Development in Technology

The development in technology is main part in greener cabin interiors.

- Bio inspired design (Central technology) This is the approach in designing by drawing the inspiration (process / functionality) with medium cost and high benefits.
- Amorphous metals (Enabling technology) This is the having metallic property but are moldable as plastic. complex design possible with minimum cost and its highly beneficial.
- 3D printing Metals (Enabling technology) This is new method to produce any part of irregular shape. This process is little bit costly & highly beneficial.
- High pressure die casting (Enabling technology) Possible to use secondary as circular process of aluminum which had come to end. Parts can be topologically optimized , min lead time and low RC process. This process is little bit costly & highly beneficial.

Organizational benefits



This research analysis helps my organisation to design and develop there seating components from following points.

- Light weight seating system.
- Advance material implementation for circularity.
- Cost reduction AM processes

Innovative Ideas development for organisational growth

- Manufacturing drawing will include CO₂ % Colum which will help Airliner / Air framer for business development with my organisation.
- Circularity of seating system – Rent out the specific seat and maintain in-service issues for ongoing business for further growth.

Conclusion

Depending on aircraft class, premium seating was found to emit between 2.6 and 4.3 times more CO₂ per RPK than economy seating. Travelling in wide body economy class was found to have the lowest average carbon intensity at about 65 g CO₂ per RPK (Revenue passenger kilometre). RPK represent a measure of the volume of passengers carried by an airline

The research indicates that modification in seating system with adaption of new material, innovation strategies and collaboration within the cabins community will bring the whole product lifecycle in well positioned. The analysis shows that the premium passengers on commercial aircraft show 2.6 times more Co₂ as compared with the passenger in the aircraft the economy. It's higher in terms of the type of aircraft body like narrow and wide body . Higher passenger load factors in a seating class lower the emissions per passenger in that section.

The analysis identifies that the aircraft cabin can reduce aviation's environmental impact by becoming more lighter and increasing the reuse of its component (Circularity) in the product lifecycle and reducing their use of harmful materials.

Recommendations for developing these designs and material choices have been made.

Thank you

