



SUSTAINABLE AVIATION: ONLY TOGETHER WE CAN!

Imagine yourself going from Australia to Europe, a 17 hours' journey covering more than 8700 miles. While sipping a cup of coffee or having luxurious Airline dinner, are you aware that the airplane has exhausted more than 2 tons of carbon during the entire flight? These carbon compounds along with the other greenhouse gases are the major culprits, causing global warming and Ocean

Acidification which leads to the devastated effects to the entire Ecosystem.

The industry which is consuming about 5 million barrels of fossil fuel every day has the moral obligation to become sustainable. The whole civil aviation collectively emitted around 814 million tons of CO₂, in 2016. It is not only about the environmental impacts, the direct exposure of cosmic radiation at 39000 feet

height is 10 times higher than at the sea level.

In a nutshell, these environmental issues directly or indirectly related to the aviation industry asks the burning question: 'What are we doing to make it sustainable for the future, as the global fleet is expected to grow by 20,930 aircraft and will reach 40,000 in total (By 2032)?'



Let's look at some of the important solution levers to archive sustainable aviation:

Efficient aircraft and engines:

As the global fleet is increasing, the aviation fuel demands will also increase by 1.9% to 2.6% each year until 2025. Recent finding suggested that latest technology can help to build aircrafts that are, around 1520% more fuel-efficient than the earlier models.

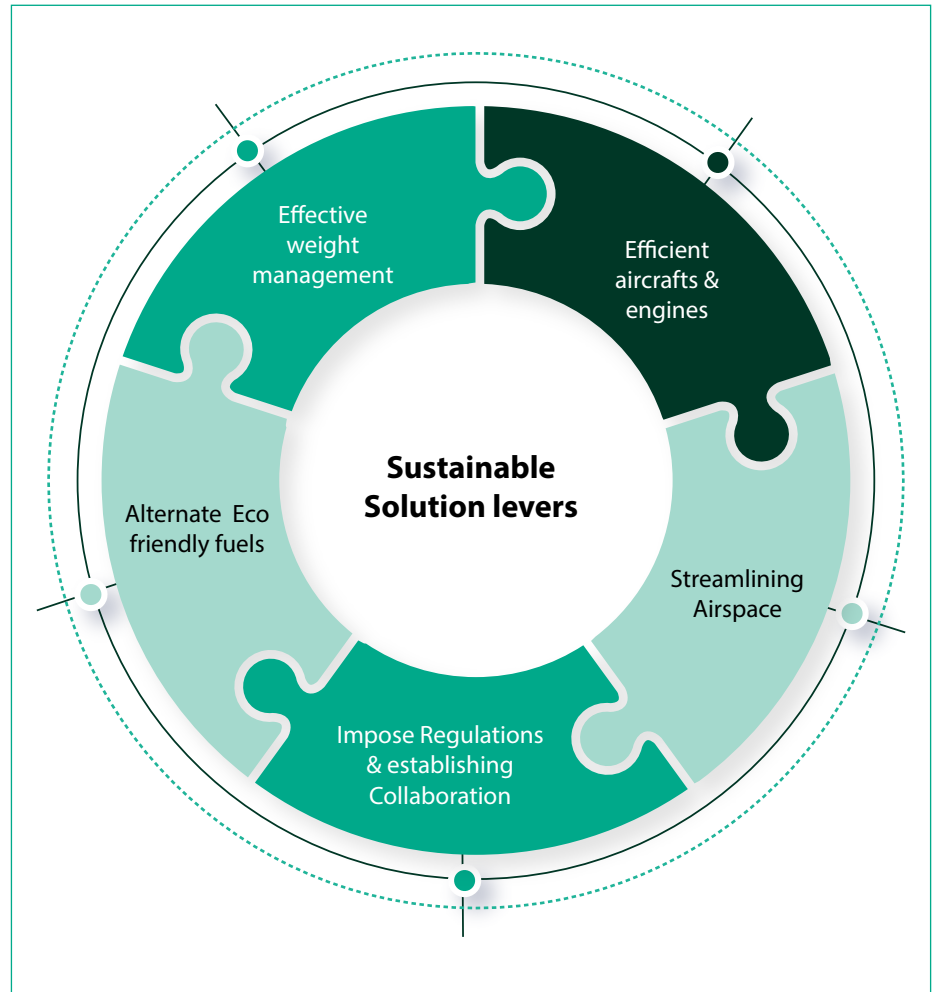
Composite materials for the aircraft manufacturing is the future, where the Materials scientists have developed composite metals with ceramic fibers and other materials to improve ductility & reduce weight of the components. With the usage of modern computational fluid dynamics, extra drag caused by struts can be minimized, which can lead to create longer, lighter, and higher wings.

Some of the latest innovations in this category:

- CFM International's has built a new LEAP 1-B engine having light-weight carbon fiber fan, which is up to 15 percent more fuel efficient than current models.
- Pratt & Whitney has developed a line of engines called PurePower. Using which, they have claimed to cut carrier operating costs by 20 percent, dampen noise levels by half, and reduce CO2 emissions by 3,600 metric tons a year.

- Over a £10 billion in a year is spent on new generation aircraft such as the Airbus A350 and Boeing 737-MAX

which has a 30% to 50% lower noise footprint as compared to the current aircrafts in use.



Streamlining airspace

Airspace streamlining plays a crucial role in reducing delays, emission & fuel usage.

- The advanced **global navigation satellite systems (GNSS)** can provide the most fuel-efficient routes using advance route planning & live tracking. It will enable aircrafts to navigate complicated terrain at low altitude. Aircraft to Aircraft communication &

Satellite navigation will reduce the proximity between the aircrafts & enable them to fly closer together to increase the arrival and departure rates and fly continuous climbs.

- State of the art weather forecasting systems in collaboration with Air traffic control will be used to design the most efficient route & minimize delays, e.g. FAA has started NextGen modernization program called **Metroplex**, which

will incorporate 21 metropolitan area starting from major Airports in Northern California to reduce air traffic & airport delays.

- Studies show that 1.4 tons of CO2 per flight can be reduced using real-time flexible navigation systems, aircraft can avoid unfavorable weather conditions such as storms, high winds, etc. and take advantage of favorable weather conditions. Studies show that 1.4 tons of CO2 per flight can be saved by using such systems.



Effective weight management

For every dollar spent by airlines, more than 21 cents are spent on the fuel. Reducing weight can decrease considerable amount of **Block Fuel** for an aircraft flight. The Aircraft weight is the combination of the aircraft itself, crew, passengers, food & catering items, fuel, manuals etc. And according to a recent finding it is estimated that 53,000 liters of fuel a year can be saved by losing a pound (0.45kg) of weight from every plane in its fleet.

Some of the recent counter measures taken by the industry leaders to reduce the Aircraft weight:

- Boeing has started to use lithium-ion battery-powered electronic components replacing some of the heavy mechanical components.
- Aircraft carriers have started using electronic manuals & Airlines like British Airways and United has reduced the weights of the catering components & started using lighter paper to print their in-flight magazine. American carrier United has claimed to save up to \$300,000 USD by reducing 28 grams per copy.
- Aerospace manufacturers are carrying large scale research work to build more aerodynamic & light weight parts, like Russian scientists and engineers from NUST MISIS have claimed to cut the weight of aircraft engine parts by 20% using bionic brackets made of Russian titanium alloy.

Alternate Eco-friendly fuels

Aviation sector is one of the largest consumer of fossil fuels. In 2018, the global fuel consumption by commercial airlines was 95 billion gallons and predicted to reach 97 billion gallons in 2019. Many initiatives have been taken place since the beginning of the 21st century to replace fossil fuels with the alternate ones.

- In December, 2009, a MOU led by Air Transport Association (ATA) & Seattle-based AltAir Fuels incorporated 14 major airlines from the United States, Mexico, Canada and Germany, to purchase up to 750 million gallons of renewable jet fuel and diesel every year.
- Under the ambitious emission reduction mission IATA & member airlines are collectively committed to improve the Fuel efficiency by 1.5% p.a. on average between 2009 & 2020, which will also

cut net emissions by 50% till 2050 as compared to 2005.

- Considerable research is being done on Synthetic fuels, Bio-derived fuels, methanol, ethanol, liquid natural gas etc. to find out the most efficient & the least harmful alternative. NASA is also working on some biofuels & claimed to reduce particle emissions in the Jet engine exhaust by 50 to 70 percent in the field test.
 - In a new research. It has been found that ketones extracted from sugarcane can be used to make compounds that could potentially be used as aviation fuel & can cut the greenhouse gas emission by 80 %.
 - Camelina seed oil is used to make jet fuel that can produce 84 percent lower carbon emissions than petroleum fuel.
- Path breaking researches & flight testing

are going on in the field of Electrical & Solar commercial aircrafts.

- In March, 2014 Airbus Group's Electric aircraft called E-Fan has successfully completed its first public test flight using 120 lithium polymer cells to fly for 45 minutes.
- Boeing has largely invested in the program called SUGAR (Subsonic Ultra Green Aircraft Research) to combine traditional fuels with the electric power in building hybrid aircrafts till 2030 to 2050.
- Huge investments are done in Solar powered vehicle after the success of the Solar Impulse 2, which is the largest electric aircraft with a wingspan of 72 meters covered with 17248 photovoltaic cells. It proved that even sky is not the limit by continuously flying around the world without even landing once.



Impose Regulations & establishing Collaboration

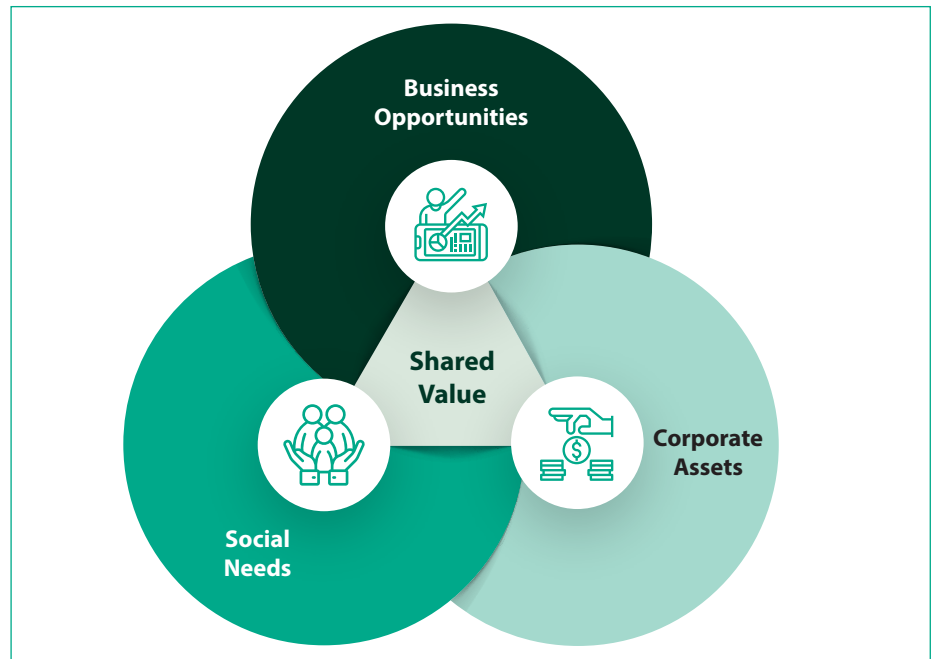
To meet the goal of sustainable & eco-friendly Air transport, collaborated efforts are required from all the major stakeholders. The theory of **Shared value** by Michael E. Porter and Mark R. Kramer will play a crucial role, as it talks about the purpose of the corporation, that is to create shared value through collaboration, not just creating profit & economical gains.

Let's look at such efforts in detail:

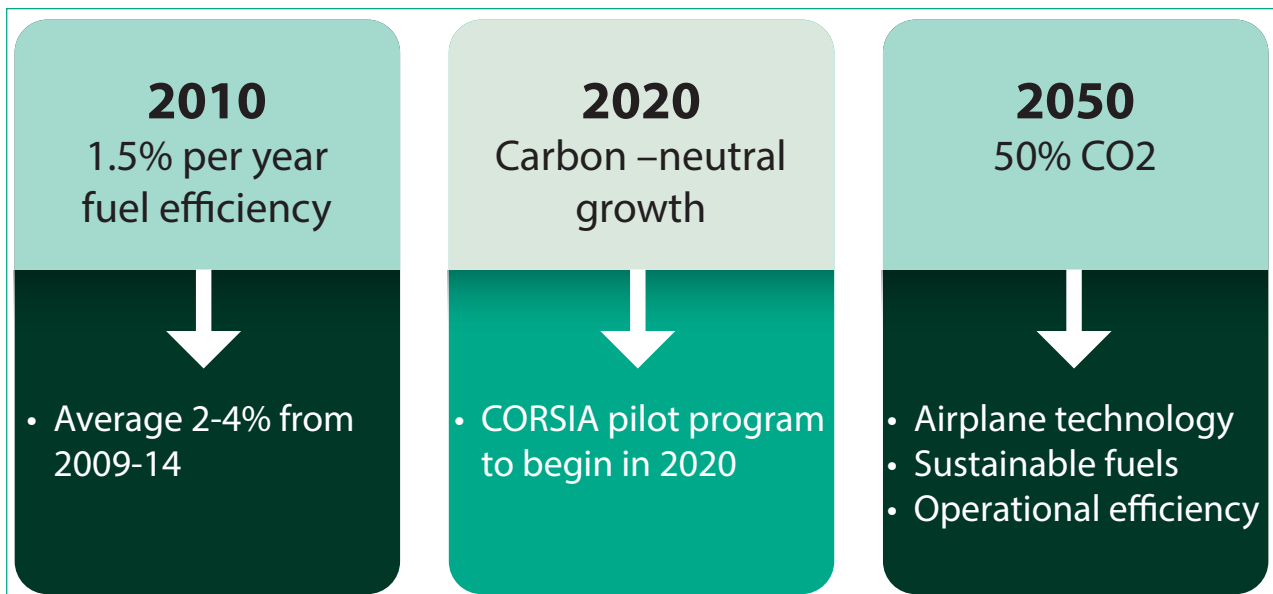
- **CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation)** is a global scheme adopted by International Civil Aviation Organization (ICAO) to mitigate CO2 emission & carbon offsetting, under which, from 1 January 2019, it is required for all the carriers to report their CO2 emissions annually. As per its forecast CORSIA will help to reduce about 2.5 billion tons of CO2 as well as generate over USD 40 billion between 2021 and 2035 as climate finance.
- In March, 2019 a global meet of 250 experts associated with ICAO's **Committee on Aviation**

Environmental Protection (CAEP) was held to policy new standards that would lower & limit the emissions of non-volatile Particulate Matter (nvPM) from aircraft engines. Under the Paris agreement, the **Committee on Climate Change (CCC)** has set an ambitious goal to end UH's contribution to global warming within 30 years by reducing its greenhouse gas emissions to zero by 2050.

- World Economic forum has suggested in their sustainable aviation report to take global sectoral Market-based measures (MbM) approach through partnership with carbon finance communities like CIMA to support carbon offsetting projects in development countries



Global Aviation Commitments



* Air Transport Action Group

Challenges on the way forward:

- **Lack of awareness:** It is rightly said 'Awareness is like sun, when it shines on things, they are transformed'. As the eco-friendly solutions might not always be the most economical and it required to have a long-term vision to see the benefits of it. The challenge is to inculcate the awareness in the entire value chain starting from the manufactures till the end customers. Greater supply chain transparency as well as integrity will be required to achieve this goal.
- **Lack of collaboration:** If awareness is the first challenge, then the execution is the second. The dilemma of the Collaboration v/s competition have spread across the industry. Competition pushes the Aircraft manufacturers & airlines to cut the cost, which leads to the usage of the low-cost and non-recyclable material. Most of the end customers are also not enthusiastic to pay a premium on the products and services which is environment friendly. Collaboration can definitely cultivate the fruits for sustainable development, but a consistent long-term effort and shared value understanding will be required for all.
- **Lack of infrastructure development:** As, rightly said in the Brundtland report, 'The only way for the humanity to cop up with the increasing environmental problems is to build a vital linkage between environmental improvement and economic development'. The socio-economic inequalities, increasing population in the development countries, bureaucracy & corruption in the government sectors etc., have created barriers and prioritized other issues like poverty, health and other locale agenda over Sustainable development. This has narrowed down the global vision of sustainability and conflicts have aroused between immediate profit and investment towards sustainable technologies. The situation is worse in the underdeveloped and developing countries.
- **Limitation of the alternatives:** Bio fuels like Bio diesels can oxidize & turn to gel, if stored for the long time at low temperatures. In a recent case harmful bacteria and fungi has been found in the bio-fueled aircraft by the US Air Force. The size & weight of the electronic batteries is still a bigger question as the power-to-weight ratios for battery technology is still very low for the aviation sector. Such limitations also raised a serious question on the usage of sustainable products over conventional ones.

Call to action:

Only together we can: Being sustainable is not just an option, rather it has become a necessity in today's era. Stakeholder awareness, engagement and commitment is the key across the aviation value chain to foster the eco system that can build a sustainable and ecofriendly aviation industry. Technological innovations can be the driving force & the International regulatory bodies must act as a beacon of light to guide the industry towards the right path.

Together we can clear the clouds of darkness, to lead the aviation industry towards a brighter & sustainable future.



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Zishan has 4.3 years of work experience in plant operations and maintenance in manufacturing domain. He has worked on plant automation, qualification, machine validation as well as manpower & inventory management.

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