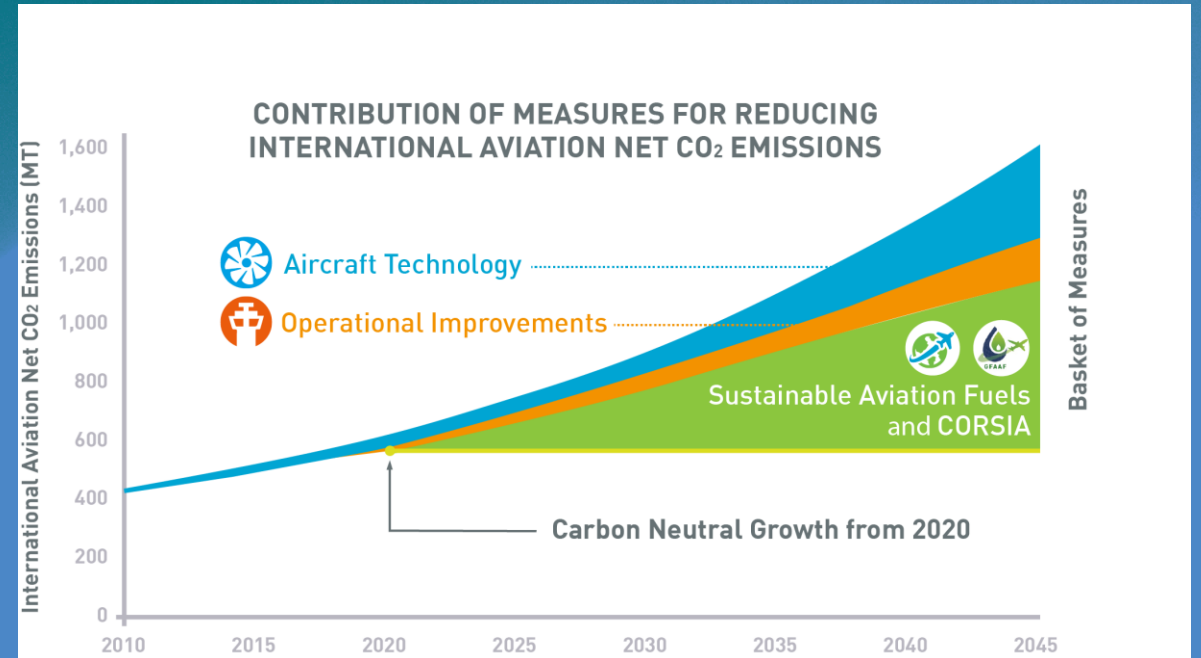


- ICAO established in 2022 the Long-term Aspirational Goal for International Aviation Net-Zero Carbon Emissions by 2050
- Roadmap proposes a basket of measures
 - Aircraft Technology
 - Operational Improvements
 - Sustainable Aviation Fuels
- Near term opportunity with Operational Improvements which includes



Session 4 - Airspace Modernization & Carbon strategies in Aviation

Air Traffic Management Enhancements

- **Performance-Based Navigation (PBN):** PBN allows aircraft to fly more direct, fuel-efficient routes by using satellite and on-board navigation systems. This reduces flight distances and the need for traditional ground-based navigation aids.
- **Continuous Climb and Descent Operations (CCO/CDO):** Instead of flying in stepped, level segments, CCO allows an aircraft to climb continuously after takeoff and CDO enables a continuous descent before landing. These smooth, uninterrupted flight paths reduce fuel burn and noise by minimizing the need for engine thrust changes.
- **Free-Route Airspace (FRA):** FRA allows pilots to plan and fly the most optimal route between two points, rather than being restricted to a fixed, predetermined air traffic network. This can significantly shorten flight paths, saving both time and fuel.

Ground Operations and Airport Efficiency

- **Reduced Engine Taxiing:** Instead of using all engines to taxi to the runway, aircraft can use one or a reduced number of engines, saving fuel during the time on the ground.
- **Airport Collaborative Decision Making (A-CDM):** A-CDM involves all airport partners—airlines, ground handlers, and air traffic control—sharing information to improve operational efficiency. By optimizing turnaround times and minimizing delays on the ground, A-CDM helps reduce fuel consumption.
- **Fixed Electrical Ground Power (FEGP):** At the gate, aircraft can connect to a fixed electrical power source instead of running their Auxiliary Power Unit (APU), a small jet engine used to power the aircraft's systems. The APU is a significant source of on-ground emissions, so using FEGP is a major step toward decarbonization.

Airline Fleet and Flight Planning

- **Flight Plan Optimization:** Airlines are using advanced software to create more efficient flight plans that account for factors like wind, temperature, and atmospheric pressure. This helps to optimize altitudes and speeds for fuel savings.
- **Improved Load Factors:** Optimizing aircraft load factors (the percentage of seats filled) reduces emissions per passenger. While this has improved significantly, there is still room for continued optimization.