

## **PANEL DISCUSSION I: Sustainability in air transport system**

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Sustainable aviation is a top priority in aviation – globally, and the importance of air transport for our modern society became clear also during the COVID-19 period where air travel was abruptly reduced. Significant R&I initiatives are ongoing to accelerate the advancements of new solutions, foremost to reduce emissions impacting greenhouse effects targeting net-zero carbon contribution in a couple of decades from now. At the same time, it is worth noting the successful achievements in this direction, where modern aviation solutions have successfully managed to improve efficiency by the order of 50% over the last decades in foremost CO<sub>2</sub> impact. It is also becoming evident that to complete the vision may require radical innovations but possible even disruptive innovations. Aviation has a proud history in dealing with difficult challenges, such as the safety dimension of flying where flying has transformed from a gamble of life to one of the safest means of transport over the last century. We are now in the middle of another major challenge in transforming into a sustainable aviation system.

Before going into this discussion, it is worth recalling some of underlying insights on sustainable development that have been brought forward over the last decades. In their famous report from 1987 the Brundtland commission defined sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs”. This later evolved into the triple bottom line notion by Elkinton expressing the tangled relationship between economic, social, and environmental dimensions. He states in brief that rates of use of renewable resources should not exceed their rates of regeneration; its rates of use of non-renewable resources should not exceed the rate at which sustainable renewable substitutes are developed; and its rates of pollution of emission should not exceed the assimilative capacity of the environment. On planetary level, the understanding of planetary boundaries has further increased, UN launched their influential Sustainable Development Goals, and many industries are signing up for the Science Based Targets, enforcing successively a more systemic responsibility. In Europe, the notion of a Circular Economy has escalated as a top-level priority in many manufacturing industries outside aviation. Circular Economy effectively means to do business through keeping the value of the material once extracted and used as high as possible for as long as possible. The actions underway in the Green Deal will also apply to aerospace manufacturers. In short, the understanding of the systemic nature of sustainable development becomes clear.

A key observation is the systemic nature of sustainability, i.e. if we make changes in one dimension, it will have implications for the others. A clear example observed is the challenges that face the aviation industry in scaling up production of sustainable aviation fuels to a magnitude that it can replace the current energy originating from fossil-based sources.

Returning to aviation and the challenges for a sustainable aviation and comparing this with the general understanding of sustainable development raises some critical questions and paradoxes.

1. **Sustainable Development is systemic in its character.** Focusing on a single topic – however relevant – risks driving sub optimal solutions. One example is that the increased efficiency in propulsive efficiency has been met by using more advanced alloys, some of which are critical from several perspectives. Either the alloy components are scarce and difficult to scale, they origin from areas of conflict (conflict minerals) or the geopolitical dynamics causes uncertainty in their availability. We see also the difficulty of focusing on sustainable economic development if there are crises ongoing.
2. **Is the future of aviation really an extrapolation of today?** We have seen that the prognosis of how air transport will look like has shifted over the years. 50 years ago, supersonic transport was introduced as an exciting future manifested by Concord. 25 years later the point-to-point capacity of very large aircraft, such as the A380 was projected as the way forward. What is our projection of the future in 25 years from now, and how accurate will this be. What impact will e.g. the multi-mode transport scenarios bring?
3. **What opportunities arise if transport behavior changes in society?** Most agree that the value of air transport has been instrumental for societal development and is likely to be so also in the future. What is less evident is what behavioral changes that may evolve in society, impacting travel patterns. Will there be an acceptance of slower and more inconvenient forms of air transport, opening for other modes of transport? Is there e.g. a market for slow, but 90% more efficient, air transport using airship type of solutions etc.

If nothing else for reflection, such questions open for innovative ways of thinking about a sustainable aviation future. What can aviation learn and benefit from other businesses, such as automotive or energy, being order of magnitude bigger as markets and engaging in sustainable transformation using e.g. hydrogen and other hybrid and electrical solutions.

The way forward is not evident, but a couple of topics can be worth addressing. One is to embrace a complete sustainable perspective to identify risks and opportunities for innovation. Another is to explore the synergies with other businesses, who in parallel invest in sustainable transformation. Finally, gaining a deeper knowledge of sustainability principles is likely to be rewarding for business-oriented people and subject matter experts alike. The sustainability transformation in aviation is likely to be rewarding for those ahead in understanding opportunities, as well as avoiding costly problems. In a couple of decades, we will be able to look back and realize what actions of 2025 were successful, and which were not.