InterFAB Expert Talk emphazise the role of non-CO2 emissions for global warming

19 May 2021: Transportation accounts for a quarter of EU greenhouse gas emissions[1], prompting aviation to seek ways of reducing its 5% contribution to current anthropogenic climate impact. Focus to date has been on decreasing carbon dioxide (CO2), however results presented within the IPCC comprising research by the German Aerospace Centre (DLR) suggests CO2 is responsible for less than the total aviation climate impact. Dr Sigrun Matthes presented analysis from DLR's Institute of Atmospheric Physics at the fourth InterFAB Expert Talk entitled *Climate Change and the role of ATM* on 11 May 2021 showing that exhaust gases contain non-CO2 emissions, and their impact on climate change varies significantly depending upon altitude, latitude and local weather conditions. The findings are leading to further research activity into climate-optimised alternative trajectories.

Combustion bi-products including nitrogen dioxide (NOx), sulphur dioxide (SO2), carbon monoxide (CO), water vapour and soot have a climate-changing impact which can be both negative and positive. The algorithmic climate change functions developed by DLR help to measure the quantify direct and indirect effects of these emissions and their impact on the radiative balance of the atmosphere. For example, NOx influences other components such as ozone which in turn may warm climate as greenhouse gas, while the interaction between aerosols and clouds potentially reduces warming effects. A climate impact metric also needs to take into account of different effects lifetimes.

Dr Sigrun Matthes said: "If aircraft fly alternative altitudes *CO2 emissions may decrease at higher altitudes. In contrast, the non-CO2 effects of water vapour, NOx and contrails may be reduced at lower altitudes. The strong vertical dependence of non-CO2 effects shows that changing flight altitude can help to mitigate climate impact, but many factors influence this non-linear relationship*."

DLR is part of SESAR research[2] to develop multi-dimensional algorithms with the ability to forecast climate impact with refence to meteorological data and aircraft trajectories. By linking synoptic scale weather patterns with predicted trajectories these algorithmic climate change functions can help manage climate impact, for example by identifying regions with lower sensitivity to aviation emission. Hence, these spatially and temporally resolved products can potentially identify trajectories with lower overall climate impact which, once they reach technological readiness, can be implemented in an expanded ATM environment. The results could add to resources already used by airspace users, such as the jet stream, to reduce climate impact.

"*The next step is ensuring robustness by using ensemble forecasts. It is important to reduce uncertainty to enable aviation to perform a risk analysis to assess better or at least similar fuel-optimum trajectories in a scientific way*," said Dr Sigrun Matthes.

InterFAB Expert Talks provide a platform where experiences can be shared and views exchanged on the key issues which relate to data and performance in ATM. For information visit: www.fabec.eu/registrations/ExpertTalks

[1] *Transport accounts for a quarter of EU greenhouse gas emissions, European Green*

https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

[2] *European research projects: SESAR: FLYATM4E; ALARM; DYNCAT; Aeronautics: ACACIA; ClimOP.* www.sesarju.eu

For more information please contact:
Roland Beran, FABEC: +49 171 2139896