Report by FOCA on fostering the development and uptake of sustainable aviation fuels

Executive Summary

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The deployment of sustainable aviation fuels is one of the most promising approaches to significantly reduce the climate impact of air transport. This FOCA report addresses the promotion of the development and uptake of sustainable aviation fuels (SAFs) in Switzerland. It is based on the 2021-2023 action plan of the "Sustainable Development Strategy 2030", which mandates the FOCA to prepare such a report (measure 5). This report should also serve as an expert guide for the discussions on the introduction of sustainable aviation fuels in the revision process of the CO_2 Act. The report includes the background of climate impacts of aviation, analyses options for taking action and thus breaks down the importance of sustainable aviation fuels for achieving climate targets in air transport: As the most important, but not the only measure. In order to fulfil this potential, specific targets are set and measures identified.

For all flights from airports in Switzerland, a total of around 5.7 million tonnes of greenhouse gases (CO_2 equivalents) were emitted annually in 2018 and 2019. According to the principle of point of sale location, these emissions account for around 11 % of the greenhouse gases emitted in Switzerland by all sources in CO_2 equivalents. In order to prevent further warming of the climate, a reduction of fossil CO_2 emissions to zero is necessary in aviation as well. In addition, there are the climate impacts of substances that are not recorded as greenhouse gases, the so-called non-CO_2 emissions. These must also be included when considering measures to reduce the climate impact of air transport.

Switzerland's Long-Term Climate Strategy envisages that Switzerland's air transport "should no longer generate climate-impacting emissions in net terms by 2050 as far as possible ". Similar goals have been set by various players in the aviation sector. An overview of the conceivable approaches is provided in particular by the Swiss "Road Map Sustainable Aviation". According to it, efficiency improvements through innovations in aircraft as well as in operations can play an important role, but cannot sufficiently reduce emissions on their own. The same applies to market-based measures, such as those already in use in Switzerland with the ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and the emissions trading system.

Negative emission technologies could contribute to offsetting the use of fossil fuel in aviation in the future. According to a Federal Council's report on CO_2 Capture and Storage (CCS) and Negative Emission Technologies (NET) from May 2022, these technologies should not be used instead of measures to directly reduce fossil emissions, but should complement them. Rather, renewable energy should be used primarily and efficiently in all sectors, and the depletion of finite resources should be avoided.

Battery-electric or hydrogen-powered aircraft may enable certain emission savings in the long term. However, these can only be achieved in a few decades at the earliest, after the construction and certification of appropriate aircraft, the replacement of significant parts of the current fleet and the provision of the necessary infrastructure. First, challenges in storing sufficient energy on board have to be overcome and questions about the climate impact of these technologies have to be answered.

Sustainable Aviation Fuels (SAFs), on the other hand, can already be used with today's fleet of aircraft and refuelling infrastructure. To be considered sustainable, their use must result in significant reductions of greenhouse gas emissions over their life cycle and the overall impact on the environment must be acceptable. Relevant for Switzerland are the criteria of the Mineral Oil Tax Act and Article 35*d* of the Environmental Protection Act (EPA) as well as the criteria of the EU and ICAO. Through their composition, they also help to reduce the climate effects of non-CO_2 emissions and air pollution at airports. Accordingly, national and international roadmaps consistently assign SAF a central role in achieving emission reduction targets.

SAFs from biogenic sources are already available on the market. These can be produced either from biogenic waste materials (used cooking oil, animal fats) or from specially cultivated biomass. However, the environmental balance of the latter is often critical. In addition, they can cause competition with food and animal feed production. Accordingly, only fuels made from biogenic waste can be considered for use in Switzerland. However, these are limited by the availability of the underlying raw materials and can therefore only cover a small part of the jet fuel demand.

Production paths for synthetic SAF based on CO_2 and hydrogen are currently still under development. In order for these to be sustainable, no fossil resources may be used for their production, but only energy from renewable sources. This is realised either via electricity (Power-to-Liquid, PtL) or directly from solar energy (Sun-to-Liquid, StL). Both production methods have only been implemented globally in comparatively small demonstration plants. Consequently, there are still questions regarding the efficiency and costs of these processes. The planned upscaling should decisively improve these points. With the appropriate choice of location and primary energy, these two solutions are very promising in the medium to long term in terms of sustainability and economic viability. However, Switzerland is hardly suitable as a production location, since renewable energies (from the sun, wind or hydropower) are available in larger quantities and are significantly cheaper elsewhere. Overall, synthetic SAFs have the greatest potential to reduce the climate impact of aviation by 2050, as the Federal Council already points out in Switzerland's Long-Term Climate Strategy.

In this context, three objectives for the deployment of SAF are formulated in this report:

1. **Take advantage of the potential of SAF in reducing the climate impact of aviation**
2. **Support the upscaling of sustainable, cost-efficient SAF production paths**
3. **Facilitate the framework conditions for the use of SAF**

The first objective involves a reduction of fossil CO_2 emissions from aviation through the use of SAF in Switzerland by at least 60 % by 2050 (compared to a development without any measures). The remaining emissions must be reduced through further measures, including efficiency improvements, alternative forms of propulsion and, possibly, NET. This means that by 2050, the demand for fossil aviation fuels must be replaced by SAF or offset with NET. In order to establish a SAF market in Switzerland, which has not been achieved with previous measures, a blending obligation is to be set down in legislation. It should oblige suppliers of aviation fuels in Switzerland to add SAF to jet fuel. The Federal Council shall determine the concrete quotas for this as well as the sustainability criteria for the blended SAF. A central aspect here is the alignment with corresponding international regulations, in particular those of the EU, which is also planning the introduction of a blending obligation.

The second objective concerns the development of SAF production pathways: these should be able to quickly provide large quantities of sustainable and low-cost aviation fuels. Science and industry agree that in addition to fostering the market for SAF, development must also be supported in order for the upscaling of SAF production to succeed. Swiss players are in some cases world leaders in the development of synthetic fuels and can make a significant contribution to this. In order to take advantage of this opportunity, decisive support is needed in the near future. In the medium term, the focus should be on promoting pilot and demonstration plants with Swiss participation, which would also close a gap in the existing funding instruments. Failure to do so would mean that achieving climate targets would be largely dependent on foreign countries. In addition, access to a strong growth market would be jeopardised.

The third objective aims to overcome the obstacles to the uptake of SAF in Switzerland. Administrative barriers to trade that exist for the import of SAF into Switzerland as well as for the provision of sustainability certificates are to be swiftly removed. The Federal Office for Civil Aviation, together with its partner offices, continues to optimise the collaboration among Swiss stakeholders. Moreover, the Federal Office of Civil Aviation advocates on the international level for an ambitious worldwide use of SAF.