4AirCRAFT

Air Carbon Recycling for Aviation Fuel Technology

Document for media and press

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Document history

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v0.1	2022-05-30	Marisa Martínez, FHa	Press Kit Manual Draft
v0.2	2022-06-21	Vanesa Gil, FHa Eduardo Bernad, FHa	Final document

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List of Acronyms

4AirCRAFT	Air Carbon Recycling for Aviation Fuel Technology
ATAG	Air Transport Action Group
CO_2	Carbon Dioxide
EC	European Commission
JST	Japan Science and Technology Agency
NOx	Nitrogen Oxides
SAF	Sustainable Avion Fuel

Executive Summary

This document serves to present the highlights of the 4AirCraft project to the media. It aims to provide journalists with everything they need to understand how the project works and its objectives

The main objectives are:

- ✓ Arouse journalists' curiosity.
- ✓ Convey a professional image to journalists.
- ✓ Provide rules for communication and general information useful for the media and press.
- ✓ Summarise the essence of the project clearly in a single document.

This document should answer the most obvious questions about the project that any journalist could ask. So in it we will find:

- ✓ General rules
- ✓ The project
- ✓ Key messages
- ✓ Partners
- ✓ Funding
- ✓ Visual material
- ✓ Contact details

This document shall be updated, translated, and included in the official press kit of 4AirCRAFT. The last version of the document will be uploaded to the project website.

1. General rules

4AirCRAFT communication and dissemination activities, under Grant Agreement 101022633, must follow the following general rules:

- Display the EU emblem (included in the press it and below)
- Display the JST logo (included in the press it and below)
- Include the following text:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022633. This work is supported by Japan Science and Technology Agency (JST) under Grant Agreement No JPMJSC2102. This project is developed in the frame of a Mission Innovation Challenge."

Figure 1. Funding entities logo

2. The project

Decarbonization is a major challenge for aviation. The aviation sector emits more than 900 million tons of carbon dioxide (CO_2) per year. Assuming industry growth of 3 to 4 percent per annum (p.a.) and efficiency improvement of 2 percent p.a., emissions would more than double by 2050. In the same period of time, the Air Transport Action Group (ATAG) committed to 50 percent CO_2 emission reduction (compared to 2005) and the European Union (EU) set with the Green Deal a target to become carbon neutral. Beyond CO_2, aircraft impact the climate through emissions of nitrogen oxides (NOx), soot, and water vapor, which create contrails and cirrus clouds.

Therefore, the “full” contribution to global warming is significantly higher than just CO_2 emissions alone. The commercial aviation sector is facing the ongoing challenge of reconciling increasingly stringent environmental regulations and emissions commitments with expected growth in passenger demand. Achieving meaningful emissions reduction will depend on innovative projects that follow the global market trend towards zero-emissions energy across all sectors, including sustainable transport.

4AirCRAFT project “Air Carbon Recycling for Aviation Fuel Technology” combines hybrid catalytic conversion and process intensification to bring out an efficient, precise, flexible and scalable unique technology to directly convert recycled CO_2 into sustainable and clean liquid fuels, thus making flying carbon neutral.

The ambitious goal of 4AirCRAFT is about reaction conditions. Currently these processes involve high pressure and temperature conditions and numerous product purification steps. It should be noted that so far jet fuel is obtained from crude oil. 4AirCRAFT aims to produce this fuel at mild conditions avoiding extensive purification steps. This would lead to a significant reduction in energy and cost and make this technology truly competitive.

The Figure 1 shows an indicative overview of where low- and zero-carbon energy could be deployed in commercial aviation. A simplified view of which kinds of energy options might be able to contribute to the reduction in CO_2 emissions from air transport in which time period. This generally indicates when the technology may be commercially available, but not widespread use throughout the fleet.

The roll-out of these technologies depends on research advances and the distribution and supply of energy, as well as the economic case to bring these new designs and energy sources into fleet.

New technologies evolve, these assumptions may change – denser batteries may allow greater range and larger aircraft to go electric; a strong governmental push towards a hydrogen economy may allow faster take up of that technology. Illustrative seating configuration shows general flight times and share of CO_2 emissions for context.

	2020	2025	2030	2035	2040	2045	2050
Commuter » 9-50 seats » < 60 minute flights » <1% of industry CO_2	SAF	Electric and/or SAF	Electric and/or SAF	Electric and/or SAF	Electric and/or SAF	Electric and/or SAF	Electric and/or SAF
Regional » 50-100 seats » 30-90 minute flights » ~3% of industry CO_2	SAF	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Short haul » 100-150 seats » 45-120 minute flights » ~24% of industry CO_2	SAF	SAF	SAF	SAF	Electric or Hydrogen combustion and/or SAF	Electric or Hydrogen combustion and/or SAF	Electric or Hydrogen combustion and/or SAF
Medium haul » 100-250 seats » 60-150 minute flights » ~43% of industry CO_2	SAF	SAF	SAF	SAF	SAF	SAF	SAF potentially some Hydrogen
Long haul » 250+ seats » 150 minute + flights » ~30% of industry CO_2	SAF	SAF	SAF	SAF	SAF	SAF	SAF

Figure 2. Overview about low and zero carbon energy in the commercial aviation. [1]

4AirCRAFT is providing a new solution for SAF technology. In this regard, 4AirCRAFT will establish a game-changer reactor technology to produce synthetic kerosene more efficient and cleaner in comparison with existing approaches.

Synthetic kerosene will be produced from recycled CO_2, green H_2 and renewable electricity to meet net-zero targets.

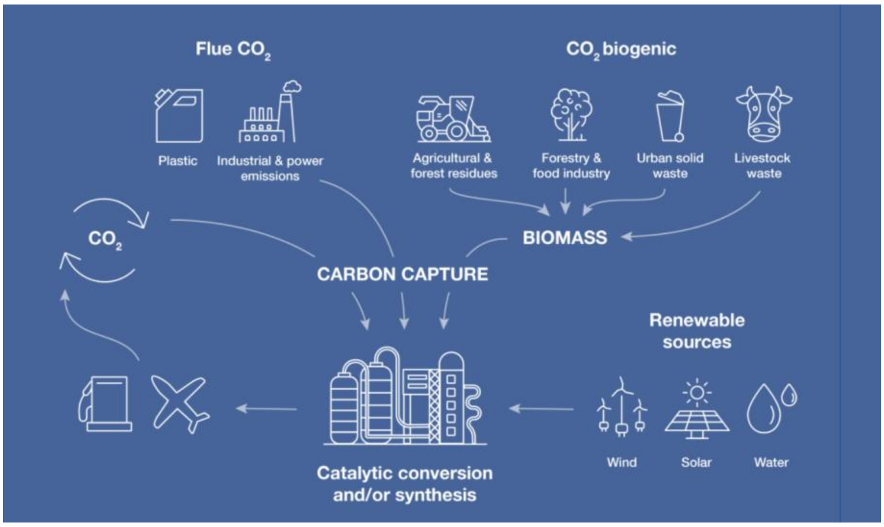

Figure 3. CO_2 conversion cycle for sustainable production of jet fuel

3. Key Messages

This project will address the challenge of combining several reactions into one cascade reactor with the aim of direct CO_2 conversion, very precise and efficient to obtain sustainable aviation fuel, making large recycling streams and purification steps redundant whereas reducing energy consumption contributing to a circular economy and leading to a decrease in greenhouse gases emissions and reduced dependence on fossil-fuels.

Innovative Technology

The project aims to develop innovative technology for the direct conversion of CO_2 to C_8-C_{16} under much milder and greener conditions as compared to conventional synthesis routes. This will be achieved through the cooperative development, validation and exploitation of the rational design of catalytic materials and its environment tunning.

Energy challenges

The 4AirCRAFT technology will reduce overall CO_2 emissions by creating a closed carbon fuel cycle contributing to a circular economy and the replacement of fossil fuels, which will strengthen the EU energy security and allow creation of a sustainable transportation sector while helping to solve worldwide energy challenges. The main goal is the process intensification by a single cascade reactor and the effective low temperature synthesis of alternative long-chain hydrocarbons from residue materials/streams and renewable feedstocks.

The project addresses the European Green Deal as well as the 2030 Agenda for Sustainable Development Goals (SDGs)

Figure 4. SDGs related to 4AirCRAFT

4. Partners

It is important for the journalist and the media to know in detail which partners belong to the project, to request the corresponding content, to prepare their articles and interviews. 4AirCRAFT project is carried out by a multi-disciplinary consortium, well-balanced and with complementary expertise, which aim at achieving the project objectives.

Aragon Hydrogen Foundation (FHa, Spain)

The 4AirCRAFT project is coordinated by FHA. Its prime mission is to carry out the organisation, planning, management and execution of the project. Additionally, FHA research team lead by Dr. Gil is in charge of the proof-of-concept of the novel technology solution under different environment conditions. Life Cycle Assessment and dissemination and exploitation activities are also part of FHa activities.

Hokkaido University (HOKUDAI, Japan)

Prof. Dr. Kiyoharu Tadanaga, head of HOKAIDO research teams from the laboratory of Inorganic Synthesis Chemistry of Hokkaido University, leads work package focused on the development and characterization of novel inorganic electrocatalyst for the CO_2 reduction. Prof. Dr. Tadanaga group focuses on the development of inorganic anion exchange membranes and electrocatalysts.

BCM MATERIALS (BCMaterials, Spain)

Prof. Dr. Wuttke, head of BCMaterials research team, leads the work package focused on the development of advanced catalyst carriers. His group will deal with the development of MOFs as advanced catalyst carriers. MOFs will be encoded with diverse catalytic activities and will be used to encapsulate inorganic and biocatalysts in order to increase their catalytic robustness under harsh conditions.

Bielefeld University (UBI, Germany)

Prof. Dr. Gröger, heads of UBI research team, leads work package dealing with the development of suitable biocatalysts and their use in efficient biotransformation processes as well as the combination of such enzymes with chemocatalytic reactions towards an efficient conversion of carbon dioxide into air fuels.

Consejo Superior de Investigaciones Científicas (CSIC, Spain)

CSIC’s participation in this project will be through two institutions: Instituto de Nanociencia y Materiales de Aragón (INMA) and the Instituto de Cerámica y Vidrio (ICV).

Dr. Jonas Gurauskis ARAID Senior Researcher at Instituto de Nanociencia y Materiales de Aragón (INMA) is the principal investigator from CSIC. Dr. Gurauskis leads work package focused on the validation of the novel technology, including the rational design and assembly of the game-changer cascade reactor. Advanced porous structures as catalysts supports will be designed and developed by Gurauskis' group with the most promising electro-, bio- and chemo-catalyst and sized to form continuous cascade reactor.

Dr. Aparicio's group will contribute in 4AirCRAFT to the development by wet-soft chemistry of advanced electrocatalyst.

Helsinki University (UH, Finland)

Prof. Dr. Camargo, heads of UH research group, leads the research activities dealing with the design-driven development of nano chemo-catalysts with controlled physical and chemical features such as size, shape, surface composition enabling the optimization of performance, but also unravel structure-performance relationships.

The University of Antwerp (UANTWERPEN, Belgium)

Prof. Dr. Joke Hadermann, member of the EMAT (Electron Microscopy for Materials Science), is the responsible of revealing crystallographic, morphological and compositional information on the materials synthetized in the project using ex situ and in situ transmission electron microscopy (TEM).

Università degli Studi di Torino (UniTO, Italy)

Dr. Francesca Carla Bonino, head of UniTO research group, is responsible of the characterization and study of the catalytic active sites of the inorganic nano-catalysts, heterogenized biocatalysts and functionalized catalyst carriers.

Universidade de São Paulo (USP, Brazil)

Prof. Dr. Giudici's research group, from the Universidade de São Paulo, as a member of Research Centre for Gas innovation (RCGI) leads the characterization and performance evaluation of catalysts as well as kinetic modelling of the processes and simulation of integrated/intensified processes.

5. Funding

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European Union's Horizon 2020

Horizon 2020 was the EU's research and innovation funding programme from 2014-2020 with a budget of nearly €80 billion. The programme has been succeeded by Horizon Europe. It tackles climate change, helps to achieve the UN's Sustainable Development Goals and boosts the EU's competitiveness and growth.

The programme facilitates collaboration and strengthens the impact of research and innovation in developing, supporting and implementing EU policies while tackling global challenges. It supports creating and better dispersing of excellent knowledge and technologies.

JST plays a central role in Japan's Science and Technology Basic Plan.

Based on science and technology targets issued by the government we fund basic research, commercialization of new technologies, distribution of science and technology information, and in recent years promote international joint research and the fostering of next generation human resources. Their comprehensive contribution stimulates real progress in science and technology and helps tackle a variety of social issues.

6. Visual material

In order to facilitate information about the project, a visual press kit (Figure 5) has been created where journalists and interested media can access the information, as well as the use of the images necessary to write their news.

Figure 5. Press Kit Dossier

This dossier is available in the project website in the presentations area of the publication section (https://4aircraft-project.eu/publications/).

7. Contact Details

The Consortium believe that the success of our project will enable a paradigm-shift in the field of alternative renewable fuels, where the 4AirCRAFT technology will allow lower costs and pollution, while leading to a positive economic and environmental impact worldwide. If the journalist needs any further information, or if the media would like to interview a member of the consortium, they can contact us through the following channels:

WEB

https://4aircraft-project.eu/

e-mail

4aircraft @hidrogenoaragon.org

References

[1] Hydrogen-powered aviation. A fact-based study of hydrogen technology, economics, and climate impact by 2050, Clean Sky, Belgium, 2020.

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