SINGAPORE'S PLANS AND INITIATIVES FOR A SUSTAINABLE AIR HUB

CAAS
Civil Aviation Authority of Singapore

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Singapore is committed to the global climate ambition

- **Singapore's national emissions in 2019**: 52 million tonnes of CO2 (~0.1% of global emissions)
- **Enhanced Nationally Determined Contribution (NDC)**: Peak emissions at 65 million tonnes of CO2 by 2030
- In February 2022, Singapore announced that it will raise its ambition to achieve **net zero emissions by or around mid-century**

However, we face a key challenge of being **alternative energy disadvantaged**, due to our small land area and limited access to renewable sources

Low-carbon technologies and international collaboration are important solutions to address our challenges

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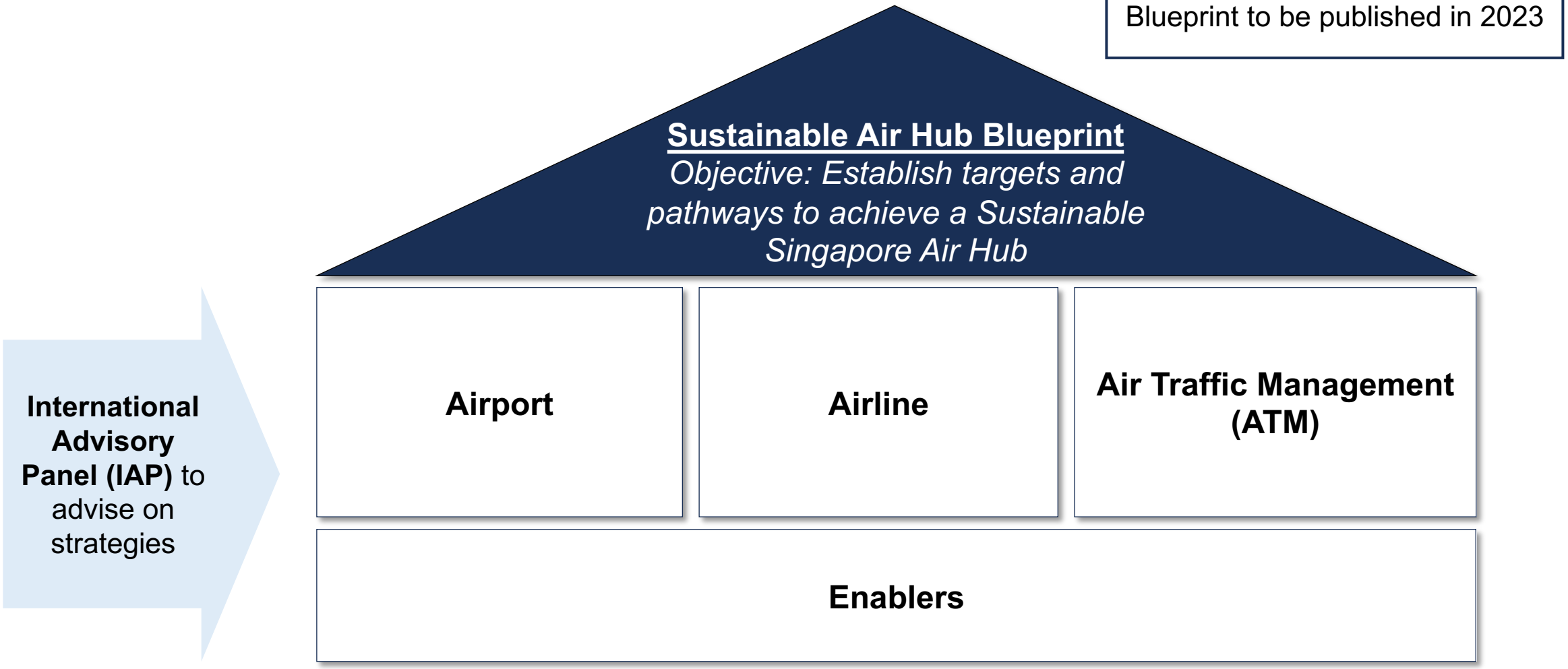
In line with our national efforts, we are working with industry partners to develop a Sustainable Air Hub Blueprint with concrete targets and pathways

Blueprint to be published in 2023



ICAO has set a long-term aspirational goal for international aviation and Singapore is actively contributing to this collective global effort

ICAO 41st Assembly adopted a long-term global aspirational goal for international aviation (LTAG) of net zero carbon emissions by 2050

Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

- Singapore is voluntarily taking part in the pilot phase of CORSIA
- 118 States will be participating in the CORSIA's 2023 pilot phase
- CORSIA underwent its first periodic review at the ICAO 41st Assembly

Assistance, Capacity-building and Training (ACT)

- Singapore is providing CORSIA related capacity-building support to other countries through the ICAO ACT-CORSIA programme
- Singapore recently joined the ACT-Sustainable Aviation Fuel (ACT-SAF) programme to provide and receive support to develop global capabilities in the development and deployment of SAF

Currently, we strive to reduce energy consumption at the existing airport terminals and switch to renewables

1. Solar deployment

- Solar panels deployed across rooftops of several buildings at Changi Airport
- Stakeholders keen to explore further areas for deployment, including airfield and other novel opportunities

Solar panels at Changi Airport

2. Airside electrification

- Substantial portion of tractors operating at the baggage handling area are electric
- CAAS is working with the industry towards a fully electric airside

Electric baggage tractors at Changi baggage handling area

3. Energy efficiency measures

- Stakeholders progressively installing more efficient aircon and lighting systems

4. National grid efficiency

- Ongoing discussions on how Changi Airport could access imported renewable energy

Sustainable building design considerations are being incorporated for Changi Airport's future Terminal 5, which will be completed in the mid-2030s

We are also adopting sustainable aviation fuels, using newer generation fuel-efficient aircraft, and studying future fuels

1. Sustainable aviation fuel (SAF)

- Aviation stakeholders and partners are working together to pilot the first-ever deployment of SAF in Singapore
- Singapore is a member of WEF Clean Skies for Tomorrow SAF Ambassadors Group
- In 2023, the expanded Neste SG facility will have up to 1Mt SAF production capacity
- CAAS exploring policies to stimulate longer term adoption

SIA uplifting SAF at San Francisco

2. Aircraft technology

- Singapore Airlines Group has been replacing its older fleet with newer, more fuel-efficient models, as part of its fleet renewal plans

3. Hydrogen

- CAAS and Airbus signed a MOU to collaborate on sustainable aviation
- CAAS, Airbus, CAG and Linde signed a Cooperation Agreement, to study the feasibility of an airport hydrogen hub

4. Participation in ICAO CORSIA

- CAAS is working closely with Singapore-based operators to implement CORSIA
- Singapore is providing capacity-building efforts to support States

CORSIA training workshop organised by CAAS

Singapore Sustainable Aviation Fuel Pilot

- CAAS formed a **public-private partnership** with SIA, Temasek, CAG, ExxonMobil and Neste to conduct SAF pilot at Changi Airport:
  - **Significant first step to validate Changi's supply chain readiness for SAF**
  - **Understand demand for SAF credits by customers**
  - **Understand end-to-end cost components of SAF deployment at Changi**

- SAF was first uplifted onto SIA flight at Changi Airport on 7 Jul 2022, via the airport's fuel hydrant system

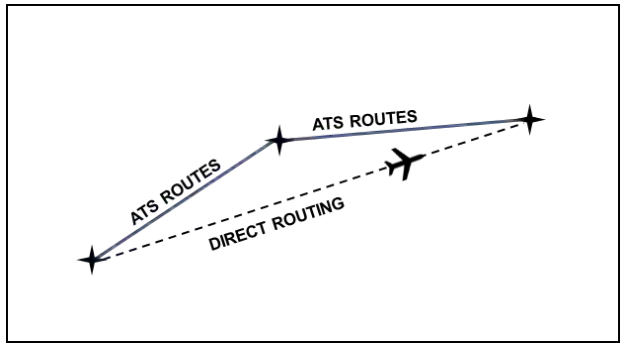
- Sale of SAF credits launched in Jul 2022
  - Provide customers including corporate and individual travellers an avenue to reduce their carbon footprint, stimulate demand for SAF, support the development of nascent SAF industry and advance the adoption of SAF for aviation sustainability

- Singapore is concurrently reviewing the policies and strategies to secure SAF supply chains and to sustain the demand for SAF

We are further enhancing ATM capabilities, pursuing new initiatives, and collaborating with partners to improve ATM operations

1. Free Route Airspace (FRA)

- Aircraft at optimal cruising flight levels
- Enhanced through coordination with partner Air Navigation Service Providers (ANSPs)

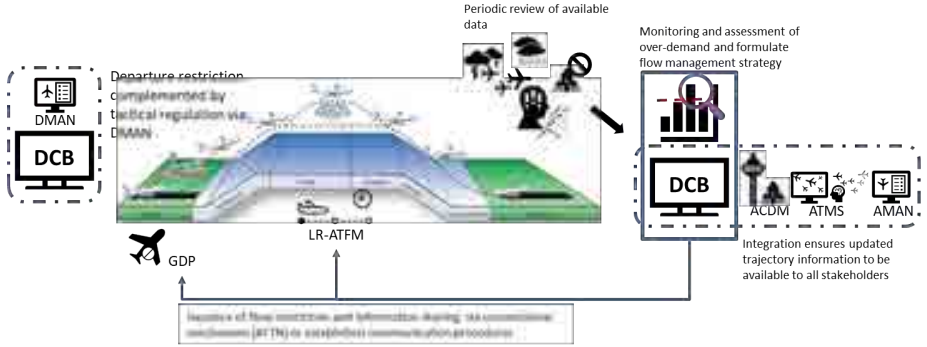


Elements of ICAO initiatives as grounding for more advanced FRA

- Direct routing
- Flexible use airspace
- User preferred route
- Mid-term conflict alert

2. Long Range Air Traffic Flow Management (ATFM)

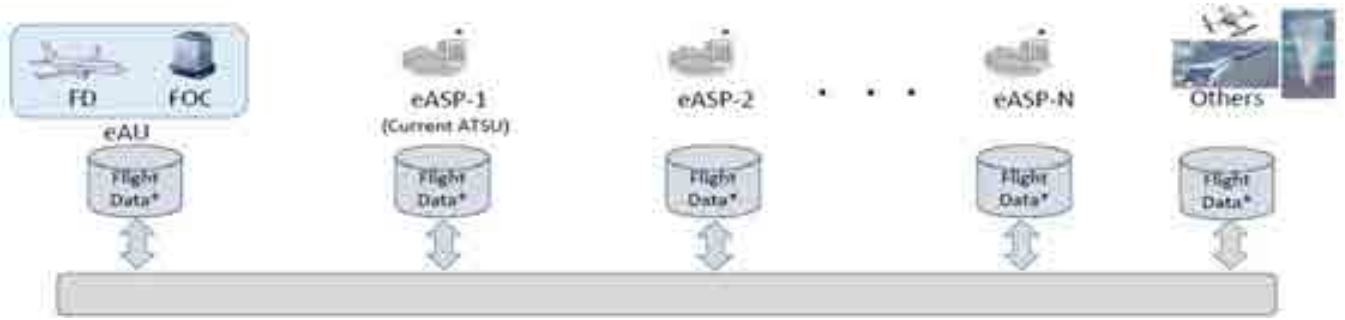
- Optimised pre-flight planning
- Reduces planned delays



3. FF-ICE* / Trajectory-Based Operations (TBO)

- Optimised flight planning
- Reduces planned and unexpected delays

** Flight & Flow Information for a Collaborative Environment*



We also need to set out key enablers

- **Policy and Regulation:** What policies and regulatory frameworks should Singapore put in place to drive sustainability and achieve targets set? How much time should we give for transition?

- **Industry Development**: How do we reinvent the aviation ecosystem to make sustainable aviation viable and build a sustainable air hub? Who are the key stakeholders? What partnerships should we catalyse?

- **Infrastructure Planning and Provision**: What are the key infrastructure requirements for a green airport terminal? What retrofitting works are needed for existing facilities? How do we provide flexibility to cater for future needs?

- **Workforce Transformation**: What are the new green jobs or skills for the aviation sector? Which are the existing aviation jobs and skills that need to be “greened”? How can we retrain and reskill existing aviation workers and excite new entrants with the possibilities of sustainable aviation?

We launched the International Advisory Panel on Sustainable Air Hub (IAP) to support the development of our Blueprint

- In Feb 2022, CAAS set up the IAP to support the development of the Singapore Sustainable Air Hub Blueprint
- Chaired by Prof Chong Tow Chong, President of Singapore University of Technology and Design, and brought together 20 industry, technology, and knowledge leaders from Singapore and around the world
- Discussed how international aviation can be made more sustainable and accessible for all, and how Singapore can contribute to this international effort
- Four meetings and six deep dives across three key domains were held from Feb to Jul 2022
- The IAP has completed its work and submitted its recommendations to MOT and CAAS

The IAP proposed 15 initiatives that Singapore can consider and incorporate in the Sustainable Air Hub Blueprint

Recommendations of the International Advisory Panel on Sustainable Air Hub

Airport

a. Airfield solar deployment
b. Renewable electricity
c. Building energy efficiency
d. Clean energy airside vehicles
e. System optimisation with digital twin project
f. Resource circularity through on-site waste-to-energy facility

Airline

a. Roadmap to create long-term secured SAF supply ecosystem
b. Corporate Buyers' Club
c. Structural offtake mechanism for SAF
d. Aviation vertical offerings in carbon markets, support ecosystem for and encourage uptake of aviation carbon offsets
e. Technical centre for capability-building in aircraft technology

ATM

Short-term (2022-2026)

a. Advanced demand-capacity balancing
b. Performance-based navigation
c. Gate-to-gate trajectory optimisation

Medium-term (2027-2032)

d. Trajectory-Based Operations and Free Route Airspace in collaboration with stakeholders and partner ANSPs

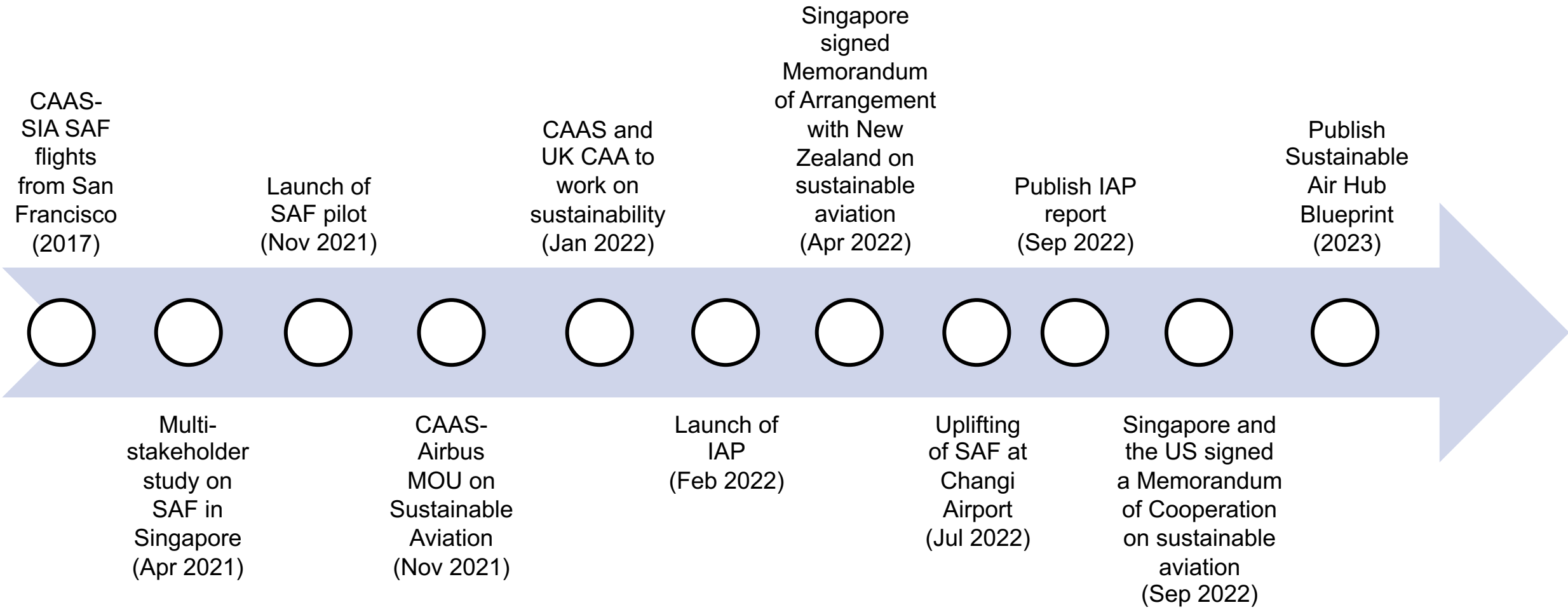
Enablers

a. Policy and regulation
b. Industry development
c. Infrastructure planning and provision
d. Workforce transformation

For the Airline Domain, explore 5 initiatives to improve sustainability of airlines operating to, from and through Singapore, including SAF

- Invest in SAF through setting up an entire ecosystem to make SAF viable
- On the supply side, this includes identifying and sourcing for feedstocks within the region to develop and implement a roadmap to create long-term secured SAF supply ecosystem
- On the demand side, look into establishing a Corporate Buyers' Club and design and introduce a structural offtake mechanism to create long-term demand signals
- Explore supporting mechanisms such as further developing the market for aviation carbon offsets and a potential technical centre for capability-building

We have been making more moves recently, and will continue to do so as we strive to develop a sustainable Singapore air hub



Thank you

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