



ICAO MID



CCO-CDO Workshop

ICAO MID Workshop on the Continuous Climb Operations (CCO) /
Continuous Descent Operations (CDO) Implementation

Abu Dhabi, UAE

13 – 14 June 2022

NATS

MEASURING ENVIRONMENTAL INEFFICIENCY TO DRIVE PERFORMANCE (CCO / CDO)

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WHO WE ARE

NATS



UK AIR NAVIGATION SERVICE PROVIDER

- > 2.4 million flights each year
- > 250 million passengers



PRIVATISED IN 2001 AS A PUBLIC / PRIVATE PARTNERSHIP

- > 49% Government
- > 42% Airline Group
- > 5% Staff
- > 4% Heathrow Airport



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WHAT WE DO

MODE A	7000
MODE C	029
SFL	
BPS	
G/SPEED	0106*
IAS	
H00	
RCC/R00	+0/MT
CAPABILITY	NON
A/C ID	
A/C ADDR	



PROVIDE EN-ROUTE AIR TRAFFIC CONTROL SERVICES

- › UK upper and Terminal airspace
- › Joint oceanic operation with Ireland



PROVIDE AIR TRAFFIC CONTROL SERVICES AT AIRPORT TOWERS

- › Commercially contested contracts in UK and Spain



PROVIDE AVIATION SERVICES IN OVER 30 COUNTRIES

- › Advice
- › Specialist services
- › Technology solutions

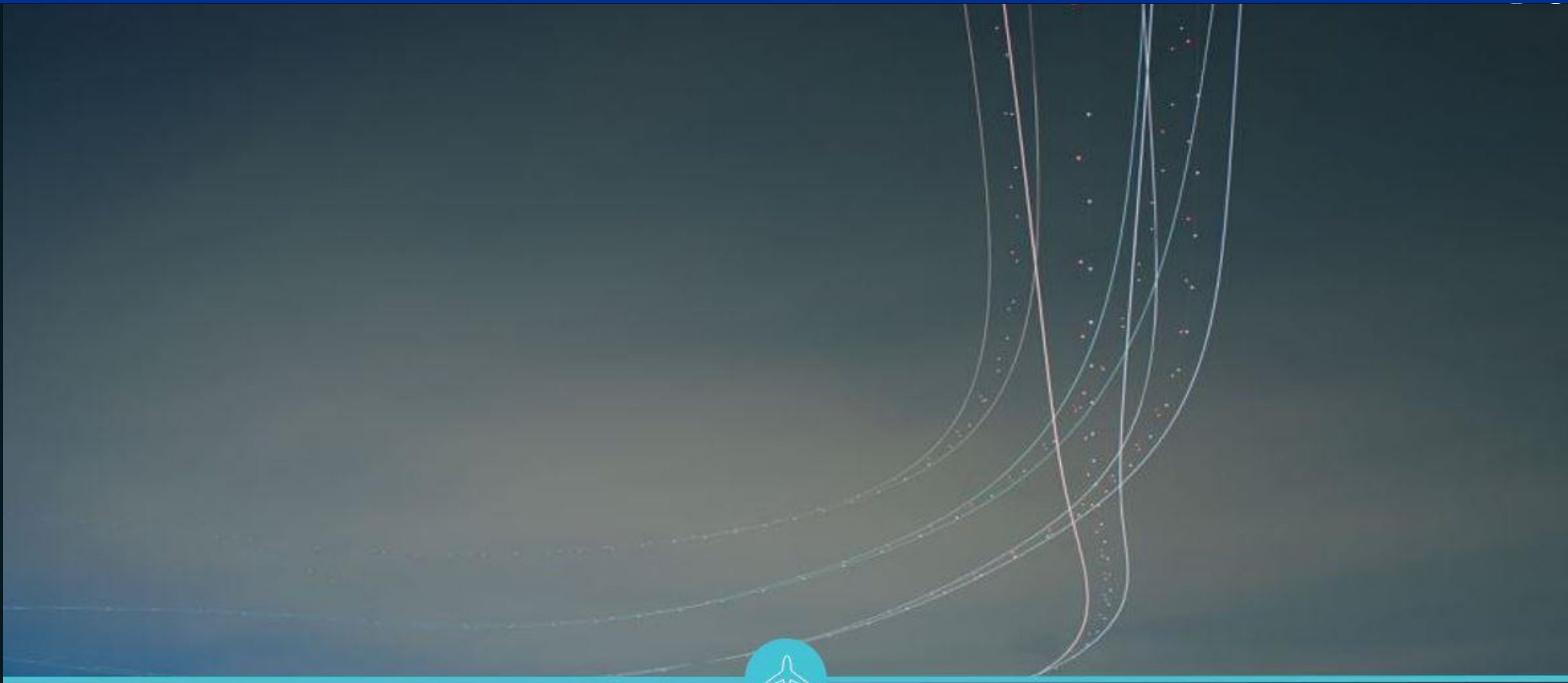
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CONTINUOUS CLIMB & DESCENT OPERATIONS

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BACKGROUND

- › 2008 – NATS committed to a long-term target to reduce ATM CO₂ emissions in UK airspace
- › UK Airspace remained largely unchanged for decades required a new Environment by Design approach.
- › 2009-10 – customers insisted that NATS be incentivised on our environmental performance as part of our licence
- › 2012 – after three years of development with airlines and regulator, 3Di entered service with financial incentives / disincentives based on our network environmental performance

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2002

2022

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NATS INDUSTRY INFLUENCE TIMELINE



NATS - Continuous Descent Campaign



Engaging Customers on Sustainability Award, Winner, 2015, Reaccredited 2016.

NATS' Continuous Descent Campaign has reduced aircraft noise, cut CO₂ emissions and helped the aviation industry save money on fuel and reduce its environmental impact.

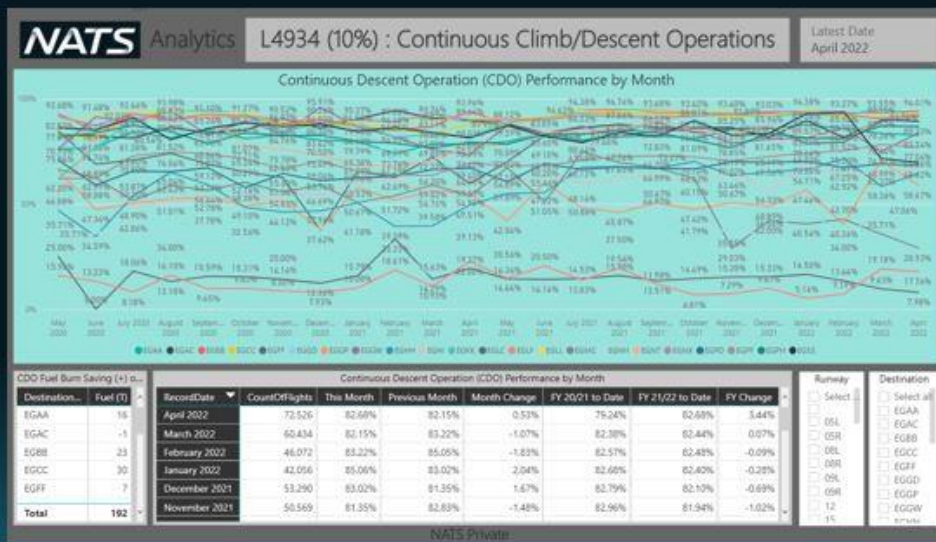


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CONTINUOUS PERFORMANCE IMPROVEMENT & ENGAGEMENT

- Commencing in 2016 and running ever since, NATS has engaged with airlines and airports on the continuation of the Sustainable Aviation CDA outreach programme. This work is managed and reported through the Sustainable Aviation Quieter Group (formally Ops Improvement Group) at the bi-monthly meetings.
- Educational campaign to pilots, airlines and airports based on what CDAs are, how they are measured, current and future work, plus reporting on current airline and airport performances.
- In addition a monthly report is sent to the 22 SA airlines and 15 SA Airports
- NATS representing SA in Eurocontrol CDO Forums





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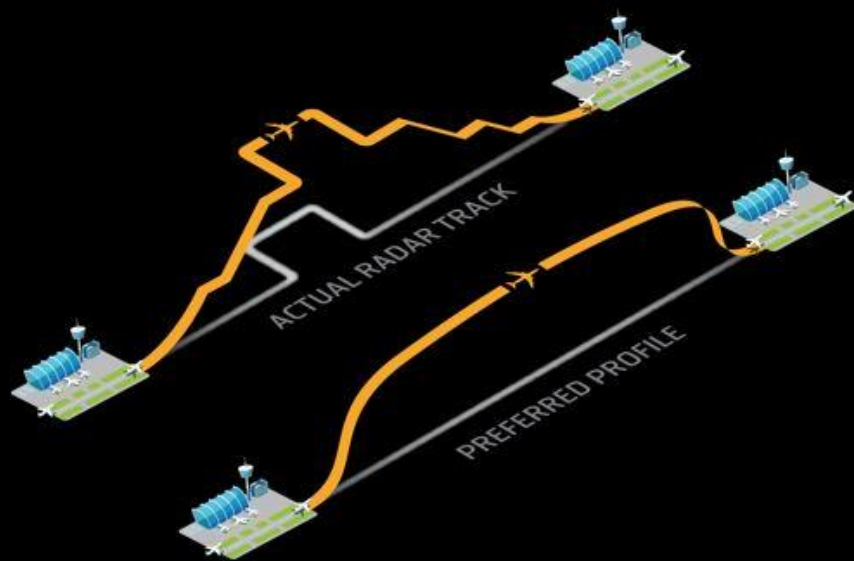
3Di

The industry-leading environmental performance metric



TOOLS FOR THE JOB

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WHAT IS 3Di?

- › A profile efficiency score and proxy for fuel burn, although originates from a fuel burn assessment
- › Uses radar data and does not consider flight plan (except in cruise)
- › It compares the actual trajectory that aircraft take with an airline preferred flight trajectory that minimises fuel burn and CO₂ emissions
- › Preferred: An unimpeded climb to the requested cruise level followed by an unimpeded descent, whilst following a most direct GCD horizontal track
- › Every commercial flight in UK domestic airspace, every day, has a 3Di score calculated
- › Scores are averaged annually and compared to targets set by our regulator (CAA) in consultation with airline customers
- › Scores run from 0, representing zero inefficiency (good), to over 100. In 2019 the average score from all flights was 29.0



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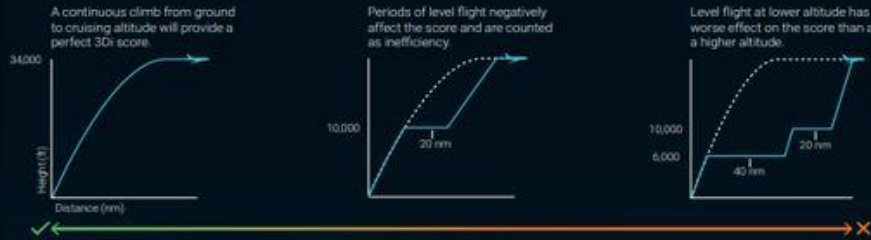
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Vertical component

1. Climb

An aircraft is departing from an airport and aiming to reach cruise level as quickly and efficiently as possible. Any level flight in this phase, particularly at low altitudes where aircraft are less efficient, has a negative impact on its 3Di score.



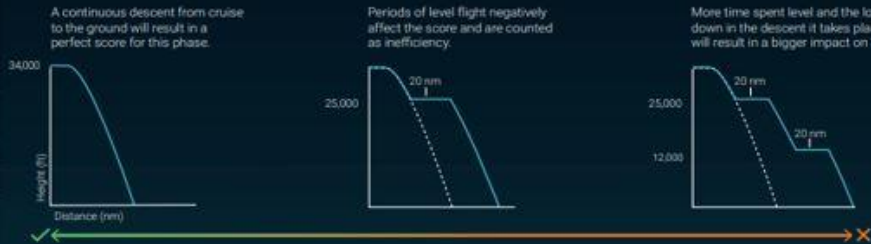
2. Cruise

Before an aircraft takes off the airline will submit a Filed Flight Level (FFL) for the flight during the cruise phase. Anything below the FFL results in a negative impact on its 3Di score. Exceeding the FFL does not improve the score, but will usually result in fuel savings.



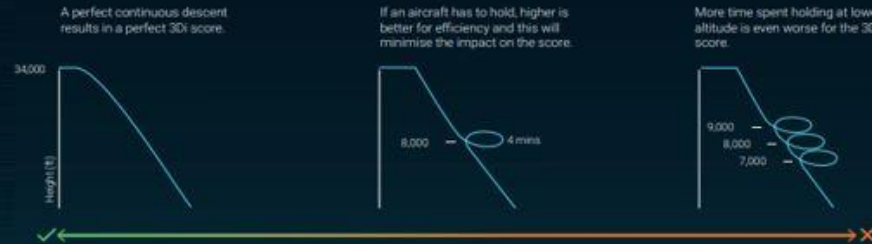
3. Descent

Similar to the climb phase but in reverse, a more continuous descent from cruise to landing will result in a better 3Di score. Keeping an aircraft higher for longer helps improve its efficiency and the gradient of descent does not affect the score, only periods of level flight.



4. Holding

Holding occurs when an aircraft has to wait for a landing slot to become available at an airport. Holding causes both vertical and horizontal inefficiency in flight so it has a big impact on the 3Di score. The more time spent in a hold, the worse the 3Di score.



Horizontal component

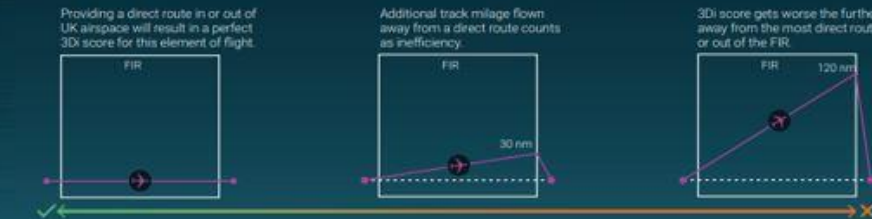
5. Horizontal track – flight information region (FIR)

Between airports aircraft have to manoeuvre through other air traffic to reach their destination. This usually means a 'great circle' route is taken in the safest and most direct way possible from airport to airport. Flight-plannable direct routes have the best effect on the 3Di score.



6. Horizontal track – whole flight

Aircraft entering or exiting airspace at the most direct point to their onward route can have a positive impact on the 3Di score. Aligning these entry/exit points with the overall 'great circle' route reduces track mileage incurred over the whole flight.





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HOW DO WE USE 3Di?

3Di is a management tool, part of our Environmental Management System (measure / monitor / control as a risk):

- › To cascade company compliance targets to units to drive local action
- › To identify opportunities for improvement by centre, unit, watch
- › To set targets on capital investment projects or constraints
- › Controller and customer engagement

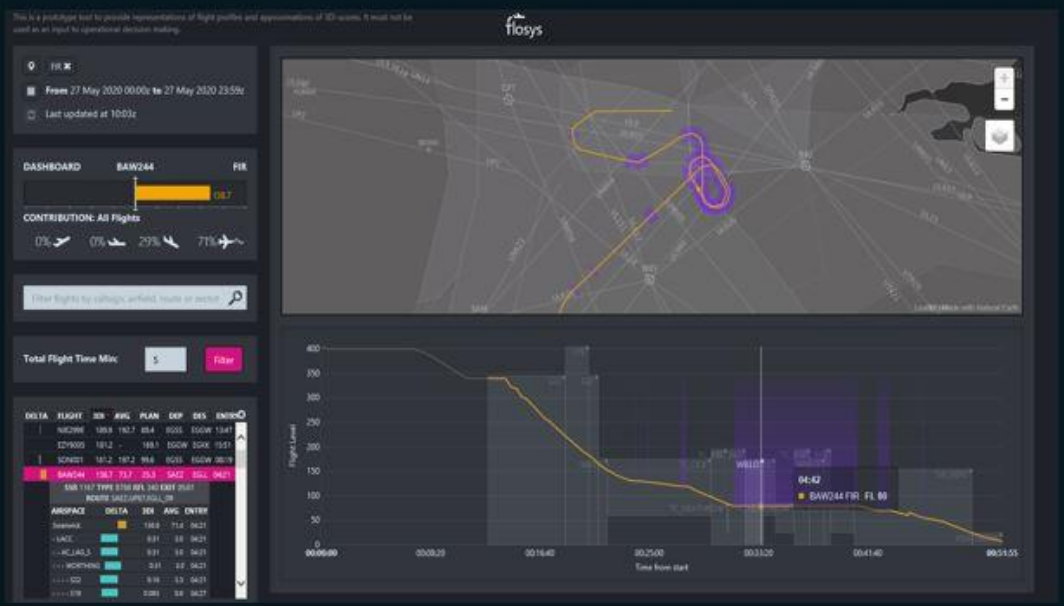
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VISUALISING 3Di?

3Di is a management tool, part of our Environmental Management System (measure / monitor / control as a risk):

- › To cascade company compliance targets to units to drive local action
- › To identify opportunities for improvement by centre, unit, watch
- › To set targets on capital investment projects or constraints

› [Flosys](#)



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CONTINUOUS IMPROVEMENT

- › Regular communications sharing best practice and raising awareness
- › Controller training and briefings (extra duty days)
- › 3Di training embedded in college – and working towards unit competency
- › Dedicated focal points – airspace efficiency groups
- › Unit and watch performance information regular promulgated

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FREE TO USE

“We made 3Di freely available earlier this year to open a conversation about how as an industry we best monitor our performance and drive improvements. We hope to encourage others to review what performance indicators will best drive their own performance improvements and contribute to aviation’s decarbonisation pathway.”

Ian Jopson, Head of Sustainable Operations

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Achieving Net Zero

An industry effort



NATS' BIGGER PICTURE TOWARDS ENVIRONMENTAL SUSTAINABILITY



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Airspace Modernisation

Modernising airspace is our most pressing priority.

Current aircraft capabilities would allow us to do so much better if we can remove some of the constraints within the UK's highly complex airspace. Airspace modernisation will generate significant carbon savings through more efficient flight profiles, fewer miles flown per aircraft, less airborne holding, and less fuel burn – quicker, quieter, and cleaner flights.



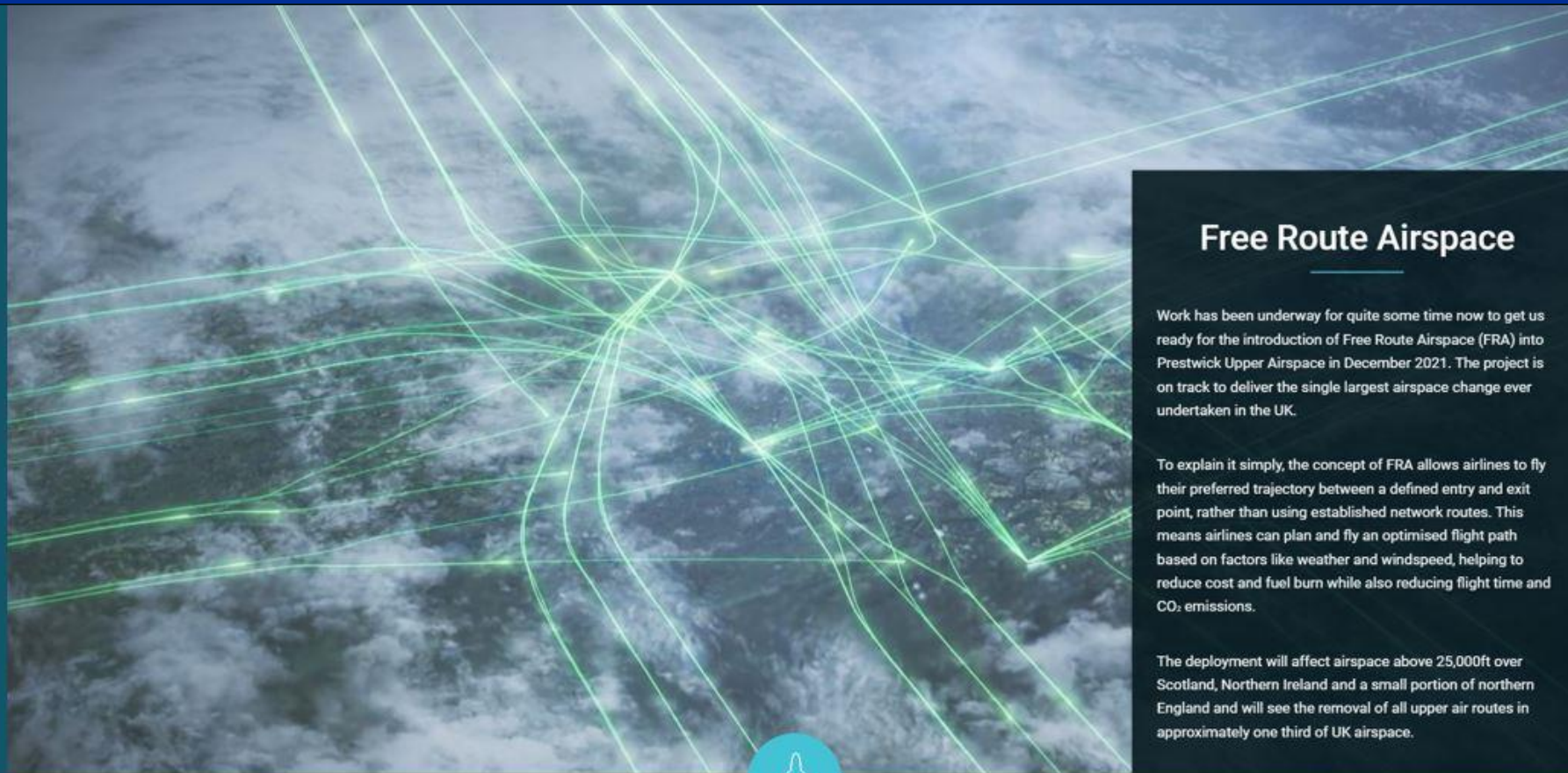
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Free Route Airspace

Work has been underway for quite some time now to get us ready for the introduction of Free Route Airspace (FRA) into Prestwick Upper Airspace in December 2021. The project is on track to deliver the single largest airspace change ever undertaken in the UK.

To explain it simply, the concept of FRA allows airlines to fly their preferred trajectory between a defined entry and exit point, rather than using established network routes. This means airlines can plan and fly an optimised flight path based on factors like weather and windspeed, helping to reduce cost and fuel burn while also reducing flight time and CO₂ emissions.

The deployment will affect airspace above 25,000ft over Scotland, Northern Ireland and a small portion of northern England and will see the removal of all upper air routes in approximately one third of UK airspace.



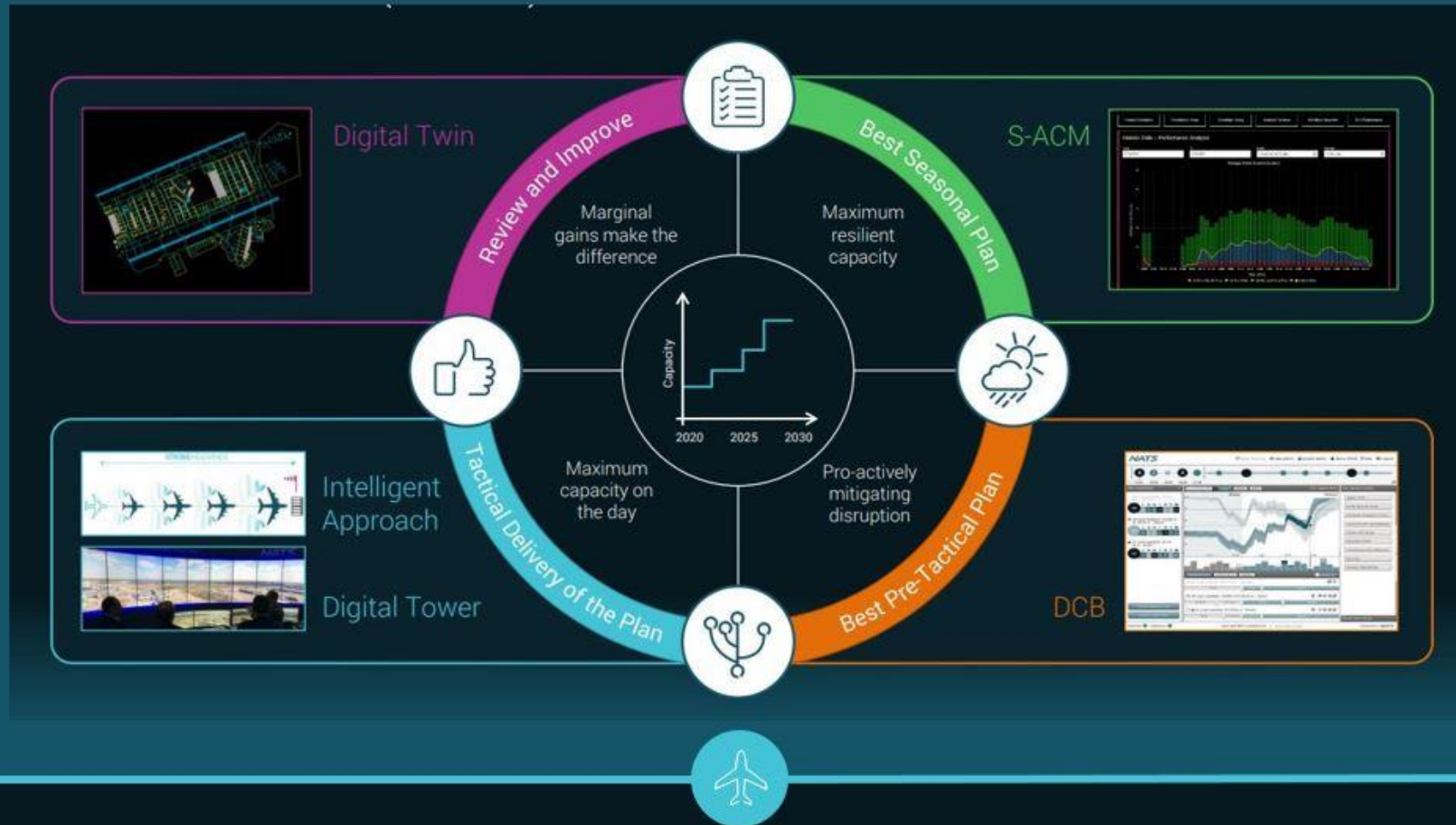
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PERFECT FLIGHTS

- › NATS has supported several "Perfect Flight" demonstrations where we try to operate specific flights as sustainably as possible
- › Most recently an A320neo operating as BA1476 from London Heathrow to Glasgow on 14 September
- › The aircraft was given a continuous climb to the optimal flight level, direct routing from London to Glasgow, and a continuous descent with no airborne holding
- › The aircraft was also operated using sustainable aviation fuel (SAF) and was given the most efficient taxi routings at both Heathrow and Glasgow
- › Overall the flight was a great success generating 62% less CO2 emissions than the first "perfect flight" between Heathrow and Edinburgh over a decade ago

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The Etihad Greenliner Programme

Answering the call to arms

There is a saying that in times of crisis, families can either pull themselves together, or pull themselves apart. It's a choice. And now, more than ever before, the aviation family needs to pull together.

Etihad views emission reductions as a whole-of-industry responsibility and has actively explored collaboration across the entire aviation ecosystem, including partnerships with government agencies, to address structural opportunities such as airspace management reform, which, even with small measures, could deliver seismic reductions in aviation's carbon footprint.

Supporting our conviction that reducing aviation's carbon emissions is an industry issue, and not specifically an airline issue, Etihad has extended an invitation to aviation suppliers, urging them to consider their own sustainability initiatives, and how they might dovetail with airline efforts to become more sustainable, whether by developing affordable, lightweight replacements for single-use plastic items in the cabin or reducing component or equipment weights to lower fuel burn and emissions.

Etihad also offered approved partners in the Etihad Greenliner Programme the opportunity to test their own sustainability initiatives aboard scheduled flights of the airline's Boeing 787 aircraft on any of the 40-plus international routes which they fly.

Two years after the Greenliner Programme was launched, and the call to the world went out, we are proud of all those partners who responded so proactively and loudly!



Airspace efficiency

In 2020 and 2021, on a range of ecoflights, Etihad worked with several air navigation service providers (ANSPs), including the FAA, the CCAA, based at UAE's Sheikh Zayed Centre, the UK's renowned National Air Traffic Services (NATS), and a number of EuroControl's Member States' ANSPs.



Targeting optimal flight paths and digitally aligning pilots, Air Traffic Controllers and the airline's operations centre, Etihad's ecoflights demonstrated the benefits of optimised routing (simplifying the process for course changes due to weather and traffic) and enhancing safety by reducing workload and radio frequency congestion for pilots and controllers. Tools included a text messaging system, flight path application and NASA's Tailored Arrival Manager. The testing included 17 re-routings during two transcontinental flights across the United States. Further benefits included reduced holding time before landing, saving time and fuel and therefore, lowering CO₂ emissions.

These efforts sought to confirm what is commonly known, that the most effective and urgently required initiative to reduce aviation's emissions is the reform of airspace and airspace management. Greater alignment of air navigation service providers, together with increased investment in traffic management infrastructure, and continuous development of efficient traffic management practices, would deliver seismic improvement to the airline industry's efforts to achieve carbon-neutral growth.




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Research and Development

We are also looking beyond the short and medium term.

Knowledge sharing and research collaborations with universities and industry partners are fundamental to achieving the industry's path to net zero by 2050.

Contrail avoidance – Exploring techniques for minimising contrail formation

The climate change impact of aviation is usually focused on CO₂ emissions. However, there is growing concern about the impact of non-CO₂ factors, such as NO_x emissions and contrails (and the cirrus cloud they form).

NATS is supporting a Royal Aeronautical Society group focusing on contrail avoidance and our Research & Development and Sustainable Operations teams are working with Imperial College London and the German Aerospace Centre (DLR) to investigate the link between where aircraft fly and contrail formation in North Atlantic airspace we manage (Shanwick).



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THANK YOU

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ATC SERVICE LOCATIONS



We provide ATC services to airports in the UK,
Gibraltar, and Spain

- Operated by NATS
- Operated by FerroNATS
- Operated by Aquila





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OUR PEOPLE





THE WORLD'S BUSIEST METROPOLITAN AIRPORT SYSTEM



Airport	Passengers	ATMs	Simultaneously Operated Runways
Heathrow	80,126,320	477,604	2
Gatwick	46,075,400	283,926	1
Stansted	27,996,116	189,919	1
Luton	16,581,850	136,270	1
London City	4,820,292	78,036	1
Southend	1,480,139	32,531	1
Total	177,080,117	1,198,286	



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HISTORIC CDO PERFORMANCE

- › Progress demonstrated by London airports was aided by the publication of the Arrivals Code of Practice and subsequent close monitoring of CDO.
- › Prior to 2016, NATS had enabled 6,176 tonnes of fuel savings through improved Continuous Descents across 14 airports, equating to around £2.3m.
- › CDO Campaign also enabled significant noise reductions to residents living around UK airports.

Average CDA of the 4 main London Airports	
2000	66%
2006	84%
2013	90%
2015	89%
2016	90%
2019	91%

*2019 dataset



DELIVERING RESULTS

NATS



Since 3Di was introduced, NATS has enabled average annual savings of 1.5 million tonnes of aircraft CO₂ per year

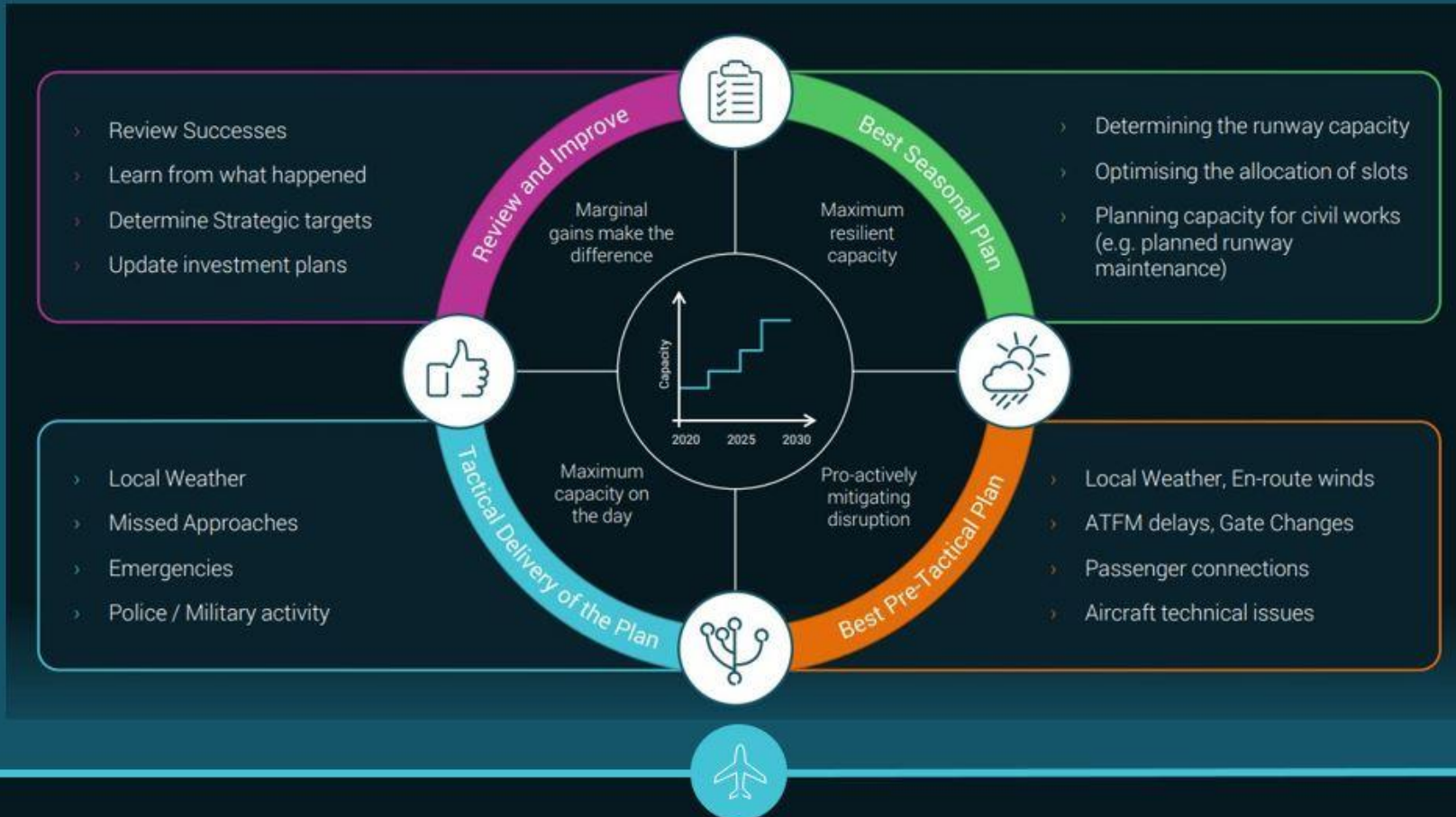
- › Continuous Climb achievement, Continuous Descent achievement, and KEA scores continue to improve
- › Airspace developments are now assessed on their environmental benefits as well as capacity and complexity
- › Controllers are regularly updated on how well their unit and watch are performing against the 3Di metric



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