FABEC

AVIATION FACTS

N°07

CONTINUOUS CLIMB AND DESCENT OPERATIONS

What are continuous climb and descent operations?

An arrival is classified as a CDO if it contains, at or below an altitude of 6000 ft no level flight, or one phase of level flight not longer than 2.5 NM.

Small fuel-saving procedures when applied across a continent can often result in major environmental benefits.

In a continuous descent operation (CDO) an aircraft flies down a constant, smooth glide path to the airport with minimum engine thrust levels and in a low drag configuration, reducing emissions throughout the descent. Some CDO approaches can be flown as soon as the aircraft leaves its cruise level, but many are operated to reduce noise and emission levels around airports, with the CDO starting at or below 6,000ft. A continuous climb operation (CCO) saves fuel through flying a continuous climb from take-off to cruise level, avoiding level flight wherever possible. Both operations result in fuel savings but CDOs have the potential to save more fuel than CCOs; together they provide major environmental benefits.

Until CDO approaches were introduced an aircraft descending from its cruising level towards its destination airport had to fly a series of steps – descending a few thousand feet then levelling off, then another descent and another levelling off – until it intercepted the automatic instrument landing system (ILS) glideslope signal and made final preparation to land. Each step required the pilot to increase engine thrust levels and extend the moveable surfaces on the wing, increasing fuel consumption, drag and noise.

It sounds easy enough – why can't it be done for every flight?

The ideal CDO starts at the top of descent and ends when the aircraft starts the final approach into the airport. It involves a set of carefully choreographed procedures between the aircraft cockpit – the pilot and the aircraft's flight management system (FMS) which automatically flies the aircraft along a pre-arranged path – and air traffic controllers responsible for managing airport arrivals and departures. Not all aircraft are equipped with the most up-to-date avionics to enable CDOs, so these approaches are not possible all the time. Each aircraft type has unique performance characteristics; the airspeed and the flight level at which the descent commences can be different – which means the length of the optimal arrival route varies.

At a busy airport with several runways and variable weather conditions the air traffic controller has to make sure that long, smooth approaches can be accommodated into the traffic mix without impacting safety or reducing capacity in the air or on the ground. For example, extreme head winds make it impossible to calculate the "normal" length of the arrival route with idle power and will require trajectory calculations to be changed.

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What are the benefits?

In Europe, CCO/CDO procedures offer airlines an opportunity to save over 340,000 tonnes of fuel per year – worth around EUR 150 million – while reducing carbon dioxide (CO_2) emissions by almost 1.1 million tonnes per year and noise impact on the ground by around 1-5 dB per flight. But CCO/CDO operational benefits vary depending on environmental conditions and the length of the trajectory. The environmental benefits have to be balanced with other imperatives such as safety and airspace capacity – which means that enabling a CDO for one aircraft will not lead to multiple delays for other flights.

Fuel: 340,000 tons

EUR: 150 million

CO2: 1.1 million tons

Noise: 1-5 dB/flight

> **“Almost 98% of aircraft departing from FABEC's main airports perform a noise-reducing CCO while 40% of arriving aircraft perform noise-reducing CDOs”**

What's the next step?

New CDO/CCO procedures are being pioneered in Europe. In France, multiple CDO approaches into Paris Charles de Gaulle airport use a procedure called “Point Merge” – where aircraft are sequenced and spaced on approach at a merge point approximately 40 NM from the airport – and this has resulted in reduced controller workload and improved flight efficiency.

In Switzerland, innovative arrival management procedures into Zurich airport are cutting aircraft holding times by 90%, resulting in substantial fuel burn and environmental improvements. For each flight, a 4D “control point” is assigned between 20 and 120 NM from the airport. The locations of these points are carefully calculated to take into account flying time to the landing runway and taxiing times to the terminal, to maximise airport efficiency. This project targets the whole aviation eco-system instead of just focusing on the efficiency of each flight.

Working together, FABEC States are developing new procedures so airlines can take the shortest and most environmentally responsible routes through the sky, at all flight levels. FABEC air navigation service providers (ANSPs) are taking leading roles in pioneering Single European Sky ATM Research (SESAR) work to improve flight efficiency. Germany's DFS Deutsche Flugsicherung GmbH (DFS).

DFS led and skyguide participated in the SESAR Optimised Descent Profile programme which demonstrated how airlines could achieve an optimal descent – in terms of improved fuel burn and emissions performance – in complex airspace controlled by multiple States and which received a special mention in the 2017 Single European Sky Award for environmental performance from the European Commission.