

Continuous Climb Operations (CCO)

Continuous Climb Operations (CCO) operations allow departing aircraft to climb continuously from takeoff to their cruising altitude, to the greatest extent possible. Continuous descent operation (CDO) enables an arriving aircraft to descend continuously, to the greatest possible extent. The text below develops this.

In 2013, ICAO published Document 9993, *Continuous Climb Operations (CCO) Manual*, with guidance on harmonized implementation of departures using continuous climb. The document defines CCO as:

“Continuous Climb Operation (CCO). An operation, enabled by airspace design, procedure design and ATC, in which a departing aircraft climbs without interruption, to the greatest extent, by employing optimum climb engine thrust, at climb speeds until reaching the cruise level.”

The Swedish definition ¹of “green departures” agreed upon amongst industrial partners is based on ICAO’s definition of CCO, but clarifies that as soon as operationally feasible, the aircraft will start navigating directly towards its destination airport.

CCO operations allow departing aircraft to climb continuously from takeoff to their cruising altitude, to the greatest extent possible. Aircraft applying CCO employ optimum climb engine thrust and climb speed until reaching cruise level. Practically, this means that the pilot is provided with optimal conditions during the climb phase. This is true from a number of different perspectives:

1. The pilot flies a departure procedure with a minimal number of restrictions, both horizontally and vertically.
2. When traffic allows; the pilot is offered a continuous climb.
3. When traffic and environmental requirements allow; the pilot is offered to fly with a fuel-efficient speed.
4. The ANSP gives the aircraft the possibility to, as soon as possible, navigate directly towards its destination airport.

¹ Definition by Swedavia, LfV and airlines participating in Airline and ATM Forum

Continuous Descent Operations (CDO)

Continuous Descent Operations (CDO) is a technique for arriving aircraft which reduces fuel burn, carbon dioxide emissions, aircraft noise in communities surrounding airports and increases predictability for pilots. When ATC provides the pilot with descent clearance below Top of Descent (ToD), the pilot will descend at the rate he or she judges best suited to achieve a continuous descent, whilst meeting ATC speed control requirements. The objective is to join the approach procedure at the appropriate altitude for the distance while requiring as little level flight as possible. The text below develops this.

There is no agreed upon definition for the “green approach” concept that has been used consequently over the years. In 2010, ICAO published document 9931, *Continuous Descent Operations (CDO) Manual*, with guidance surrounding harmonized implementation of arrivals with continuous descent which provides the following definition of CDO:

“Continuous descent operation (CDO). An operation, enabled by airspace design, procedure design and ATC facilitation, in which an arriving aircraft descends continuously, to the greatest possible extent, by employing minimum engine thrust, ideally in a low drag configuration, prior to the final approach fix/final approach point.

Note 1. — An optimum CDO starts from the top of descent and uses descent profiles that reduce, segments of level flight, noise, fuel burn, emissions and controller/pilot communications, while increasing predictability to pilots and controllers and flight stability.

Note 2. — A CDO initiated from the highest possible level in the enroute or arrival phases of flight will achieve the maximum reduction in fuel burn, noise, and emissions.”

CDO allows a smooth continuous descent instead of a series of steps which results in quieter, more fuel-efficient arrivals. However, can does require extra effort from pilots and air traffic controllers in terms of ‘Distance to go’ information being passed to the pilot by ATC to facilitate cockpit management of descent.

The concept should be based on ICAO’s CDO definition which practically means that the pilot is provided optimal conditions prior to the approach phase from a number of different perspectives:

1. ATC provides the pilot the opportunity to leave top of descent (ToD) at the right time and offers a predetermined continuous descent path with pre-known restrictions on speed and altitude.
2. The pilot descends with a fuel optimal speed.
3. The pilot does not have to avoid level flight, especially at lower altitudes. This also means that the pilot might actively need to contribute to obtain the greatest benefit.
4. The pilot flies the shortest distance possible from the ToD to the runway end.

