

APPENDIX P: TOOL KIT FOR IMPLEMENTING AND OPTIMISING CCO / CDO

KEY MESSAGE

The CCO / CDO Tool Kit comprises:

- 1) The European CCO / CDO Action Plan;
- 2) The CCO / CDO performance dashboard for all airports / airlines in Europe; and,
- 3) The resources detailed on the web pages of the Task Force.

The European CCO / CDO Task Force recommends using the resources of the CCO / CDO Tool Kit for implementing and delivering the performance benefits of CCO and CDO in Europe. The CCO / CDO Tool Kit consists of:

- 1) The European CCO / CDO Action Plan;
- 2) The CCO / CDO performance dashboard for all airports / airlines in Europe; and,
- 3) The resources, guidance and good practice material detailed on the European CCO / CDO Task Force webpages - <https://www.eurocontrol.int/concept/continuous-climb-and-descent-operations> These include:
 - a. The sharing of good practices on CCO / CDO implementation, case studies on implementation and industry developments on CCO / CDO;
 - b. Guidance material for implementation e.g. ICAO documentation on CCO / CDO and impact assessment guidelines for ATM changes;
 - c. The promotion of operational fora where CCO / CDO implementation can be discussed;
 - d. Support in stakeholder consultation;
 - e. Advice on aircraft energy and flight performance management;
 - f. Providing links to where support can be found for the implementation of advanced navigation capabilities (such as PBN) or other operational concepts and innovative solutions (such as Point Merge, Datalink, XMAN, T-bar procedures etc.);
 - g. Support in Airspace and Procedure Design;
 - h. Support in training initiatives on CCO / CDO;
 - i. Information on available support tools; and,
 - j. Resources to support CCO / CDO implementation, performance measurement, Environmental Impact Assessments etc.

These resources include, *inter alia*:

EUROCONTROL:

- 2009 CDA Action Plan - <https://www.eurocontrol.int/publication/european-joint-industry-cda-action-plan>
- European CCO / CDO Task Force web pages - <https://www.eurocontrol.int/concept/continuous-climb-and-descent-operations>
- EUROCONTROL CEM Specification - <https://www.eurocontrol.int/publication/euro-control-specification-collaborative-environmental-management-cem>
- ERNIP Part 1 - <https://www.eurocontrol.int/publication/european-route-network-improvement-plan-ernip-part-1>
- IANS Training Zone - <https://trainingzone.eurocontrol.int/ilp/pages/external-dashboard.jsf?faces-redirect=true&dashboardId=6>
- CCO / CDO animation - <https://www.youtube.com/watch?v=mUkMPb5eVJI>.
- Guidance for safety assessment of Continuous Descent Operations (CDO) implementation at aerodromes in the ECAC area

SESAR:

- SESAR Solutions catalogue - <https://www.sesarju.eu/index.php/newsroom/brochures-publications/sesar-solutions-catalogue>
- SESAR ODP Report - <https://www.sesarju.eu/newsroom/brochures-publications/optimised-descent-profiles-odp>
- AIRE reports - <https://www.sesarju.eu/news-press/documents/aire-2-reports-1034>
- SESAR project PJ.01-03b "Enhanced Arrivals and Departures" Validation report, section 5.2.3, available at <https://cordis.europa.eu/project/id/731864/results>
- SESAR solution PJ.01-03b "Dynamic E-TMA for advanced continuous climb and descent operations" - <https://www.sesarju.eu/sesar-solutions/dynamic-extended-tma-e-tma-advanced-continuous-climb-and-descent-operations>
- SESAR 2020 solution PJ.10-02b "Advanced Separation Management" - <https://www.sesarju.eu/sesar-solutions/advanced-separation-management>
- ATC Full Datalink Large Scale Demonstration - <https://www.sesarju.eu/node/1506>
- EUROCONTROL and FAA (2007). Communications Operating Concept and Requirements for the Future Radio System (COCR) version 2.0.
- SESAR 2020 solution PJ.14-02-04 "Future Communications Infrastructure (FCI) network technologies" and SESAR 2020 solution PJ.14-W2-77 "FCI services" - <https://www.sesarju.eu/index.php/sesar-solutions/fci-network-technologies>
- SESAR 1 solution 102 "Aeronautical mobile airport communication system (AeroMACS)" - <https://www.sesarju.eu/index.php/sesar-solutions/aeronautical-mobile-airport-communication-system-aeromacs>
- SESAR 2020 solution PJ.14-02-06 "AeroMACS integrated with ATN, Digital Voice and Multilink" - <https://www.sesarju.eu/index.php/sesar-solutions/aeromacs-integrated-atn-digital-voice-and-multilink>
- SESAR 2020 solution PJ.14-W2-60 "FCI Terrestrial Datalink and A-PNT Enabler (L-DACS)" (<https://www.sesarju.eu/index.php/sesar-solutions/future-communication-infrastructure-fci-terrestrial-datalink>)
- SESAR 2020 solution PJ.14-02-02 and SESAR 2020 solution PJ.14-W2-107 "Future Satellite Communications Datalink (FCI Datalink)" (<https://www.sesarju.eu/sesar-solutions/future-satellite-communications-datalink-fci-datalink>)
- SESAR solution PJ.01-02 "Use of arrival and departure management information for traffic optimisation within the TMA" (<https://www.sesarju.eu/sesar-solutions/use-arrival-and-departure-management-information-traffic-optimisation-within-tma>)
- SESAR Environmental Assessment Process – SESAR Deliverable D4.0.080 - available on the SESAR Stellar Portal: <https://stellar.sesarju.eu>
- SESAR PJ.18-02a and W2-PJ.18 – Soon to be available at the SESAR JU website: <https://www.sesarju.eu/>
- SESAR 2020 solution PJ.18-W2-56 "Improved Vertical Clearances through Enhanced Vertical Clearances" (https://www.atmmasterplan.eu/data/sesar_solutions/20431936)
- SESAR 2020 solution PJ.01-08B "Dynamic E-TMA for advanced continuous climb and descent operations and improved arrival and departure operations" – Soon to be available at the SESAR JU website: <https://www.sesarju.eu/>

ICAO:

- ICAO Doc. 4444 – PANS-ATM
- ICAO Doc. 8168 – PANS-OPS
- ICAO Doc. 9931 – ICAO CDO Manual - ICAO Doc 9931_en.pdf
- ICAO Doc. 9993 – ICAO CCO Manual - ICAO Doc 9993_en.pdf
- ICAO Annex 6: Operations of Aircraft
- ICAO Doc. 10031 - Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes - ICAO Doc 10031_en.pdf
- Training material to support Amendment 7A SID / STAR phraseology - https://www.icao.int/airnavigation/sidstar/Pages/SID_STAR-Toolkit.aspx
- ICAO 2019 ENV Report - <https://www.icao.int/environmental-protection/pages/envrep2019.aspx>
- ICAO SID / STAR Phraseology examples - <https://www.icao.int/airnavigation/sidstar/Documents/SID-STAR%20Scenarios%20Text.pdf#search=descend%20via%20STAR>
- ICAO Environment Report 2019 - <https://www.icao.int/environmental-protection/Pages/envrep2019.aspx>

Research Papers relevant to CCO / CDO:

- An Operator focussed metric for measuring predictability and efficiency of descent operations (<https://arc.aiaa.org/doi/abs/10.2514/6.2016-4219> - subscription required)
- Analysis of vertical flight efficiency during climb and descent (http://ansperformance.eu/references/library/vertical-flight-efficiency-during-climb-and-descent_consultation.pdf)
- Assessing vertical flight profiles during climb and descent in the US and Europe (<https://ieeexplore.ieee.org/document/8384857> - subscription required)
- Continuous Climb Operations with Minimum Fuel Burn (Continuous Climb Operations with minimum fuel burn)
- Efficient Climb and Descent Benefit Pool (<https://ieeexplore.ieee.org/document/6096003> - subscription required)
- Estimating ATM Efficiency Pools in the Descent Phase of Flight (Estimating ATM Efficiency Pools in the Descent Phase of Flight.pdf)
- Fuel and Emission Benefits for Continuous Descent Approaches at Schiphol (ICRAT_2019_Paper_91)
- Have Descents really become more Efficient (www.atmseminarus.org/seminarContent/seminar12/papers/12th_ATM_RD_Seminar_paper_17.pdf)
- Investigating Benefits from Continuous Climb Operating Concepts in the National Airspace System (www.atmseminarus.org/seminarContent/seminar11/papers/501-McConnachie_0126150628-Final-Paper-5-7-15.pdf)
- Fuel and Energy Benchmark Analysis of Continuous Descent Operations (www.atmseminarus.org/seminarContent/seminar11/papers/395-Fricke_0125150225-Final-Paper-5-7-15.pdf)
- Measuring vertical flight path efficiency in the National Airspace System (<http://arc.aiaa.org/doi/pdf/10.2514/6.2009-6959> - subscription required)
- Towards a common analysis of vertical flight efficiency (<https://ieeexplore.ieee.org/document/7486368> - subscription required)
- Vertical Efficiency in Descent Compared to Best Local Practices (www.atmseminarus.org/seminarContent/seminar13/papers/ATM_Seminar_2019_paper_42.pdf)

Stakeholder resources:

- <https://www.easa.europa.eu/document-library/acceptable-means-of-compliance-and-guidance-materials/reg/atco---air-traffic-controllers>
- European Aviation Environment Report (EAER) – <https://www.easa.europa.eu/eaer/>
- Fly Quiet and Green (FQG) - <https://www.heathrowflyquietandgreen.com/>
- Noise management at EFHK - <https://www.youtube.com/watch?v=uDI2g98o4Dk&t=48s>
- Sustainable Aviation - <https://www.sustainableaviation.co.uk/wp-content/uploads/2018/06/A-Guide-to-CDOs-Book-let1.pdf>
- DFS films including “New RNAV STARs with constraints in Germany” - https://www.dfs.de/dfs_homepage/de/Presse/Mediathek/
- Noise from Arriving Aircraft: An Industry Code of Practice - Noise from arriving aircraft: an industry code of practice)