连续下降与连续爬升运行在中国的应用

CDO and CCO Implementation in China

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Air Traffic Management Bureau, CAAC

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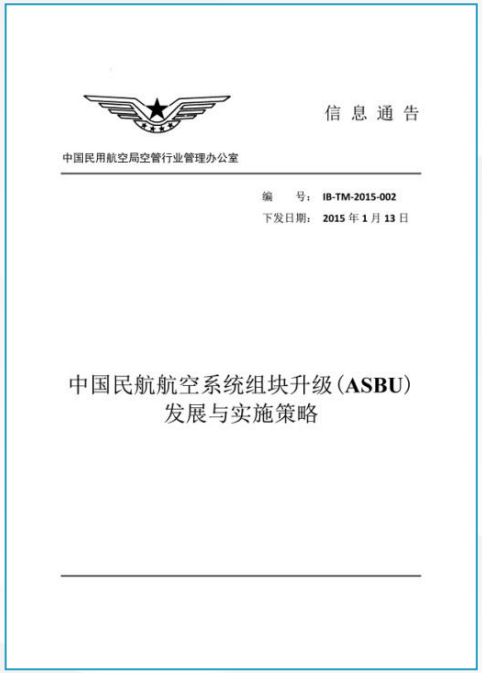
Working Background

工作背景



ICAO

全球空中航行计划
(Global Air Navigation Plan)
亚太无缝空管计划
(Asian Pacific Seamless Air Traffic Plan)

CAAC

中国民航航空系统组块升级
(ASBU)发展与实施策略
CAAC ASBU Development and Implementation Strategy

02

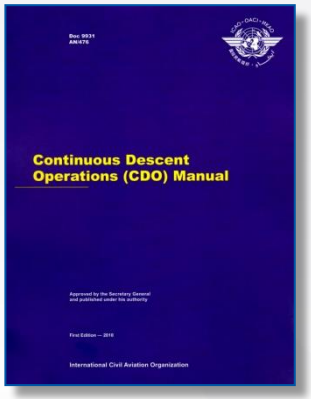
技术研究

Technical Research

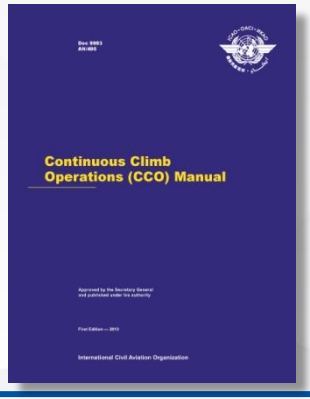
规范标准 Standards

ICAO Doc 9992/Doc 9613
PBN空域设计手册/PBN手册

ICAO Doc 9931
CDO手册



ICAO Doc 9993
CCO手册



CDO规划与实施
CDO Plan and Implementation

CCO规划与实施
CDO Plan and Implementation

概念研究 Concepts Research

效益 Benefits

提升飞行安全Safety Impovement

航空器在降落、起飞阶段，减少了改平频次和出错概率，提高了飞行稳定性与连贯性，从而提升安全性。

To reduce the level flight segment of aircraft during arrival and departure, so as to enhance the flying stability and continuity for a safer performance

促进绿色航行Green operation Improvement

有效节省飞行时间、燃油消耗和二氧化碳等温室气体排放数量,还可以部分缓解噪音的影响

To save flying time, decrease oil consumption and greenhouse gas emissions; moreover, partly reduce flying noise

降低机组负荷Release Cockpit Workload

更少的机舱操作和检查校对，大幅降低陆空通话和操作互检频次，从而降低工作负荷。

Less cockpit operation and checking for pilots and less air-ground communication and Cross-checking for ATCs

提升乘机舒适度Comfort Improvement

航班可以较长时间保持云层上方巡航飞行，缩短通过结冰区、湍流区等气象条件较为恶劣空域的时间，减少旅客压耳感，提升乘机舒适度。

Longer time to fly above cloud and less time to fly through turbulence or icing area during arrival and departure so as to improve the comfort for passengers

特殊性 Specialties

有别传统理念 Different from current concepts

实施CDO与CCO运行的飞行员应当严格遵守飞行程序的各项要求限制（尤其是高度限制），除非管制员明确取消相关程序限制

Aircraft on CDO/CCO need to strictly follow all the restrictions on STARs/SIDs unless ATC cancels it.

有别传统运行 Different from conventional ATC control

管制员发布CDO 运行许可后，应当主动告知飞行员“下降报”。飞行员应当根据航空器性能计算出适宜的下降顶点（TOD），并在下降顶点前至少1 分钟主动向管制员申请下降。

If ATC release the permission for a flight to conduct CDO, the pilot shall apply for descent 1 minute before the calculated TOD

有别传统操作 Different from traditional cockpit operation

为确保遵守所有CDO/CCO 程序限制，飞行员应当尽量利用管理模式（空客飞机）或垂直导航模式（波音飞机）进行下降或爬升。

In order to conduct a CDO/CCO, pilot shall utilizing the management mode (Airbus) or VNAV mode (Boeing) of FMS

03

应用步骤

Implementation Steps

地区选择标准 Considerations

进离场分离运行，且骨干衔接航路基本实现单向运行。
Airports with arrival and departure routes fully or partly separated.

管制员与飞行员熟练掌握基于性能导航（PBN)运行，接受新技术能力较强。
ATC and pilots are familiar with PBN operations and open to new concept.

试运行时间段具备一定的航班量，保证运行效益，具有参考借鉴意义。
Enough traffic during the trial operation period

以平原为主，除小范围山区外，受地形与障碍物限制较小。
Plain area with limited terrain is favorable.

随着城市与机场的发展，节能减排降噪需求日益突出。
Mandatory request of the city government to reduce noise around airport

时间段选择标准 Trial Period Selection

最佳时段 Best Time

高峰过后 After Peak Time

进出港大流量过后，航班量趋于平稳。
After peak air traffic when inbound and outbound flight volume is smoother.

地区空管局建议 Regional ATC Suggestion

地区空管局相应管制部门根据该地区航班流特点、开合扇面时间，以及天气影响等因素提出的时间段建议。 Regional ATC should propose optimal time for trial based on local traffic features, open and close timing of sectors, weather conditions and etc.

航班量原则 Flight Volume Principal

参照欧洲CDO/CCO运行的成熟经验，进近管制区内预期交通流量不得超过25架次/小时的原则。
With reference to the practices in Europe, the estimated traffic volume of TMA shall be no more than 25 flights/h for CDO/CCO.

应用步骤 Implementation Steps

第一阶段
First Phase

试点应用阶段
Trial

选择具有代表性的地区率先进行试点应用，形成以点带面的效应。
Initiated trial operations in several selected airports

第二阶段
Second Phase

扩大应用阶段
Expansion

在原有试点基础上，扩大并建全全国各地区CDO/CCO代表性机场。
Based on experience gained, increased the number of trial airports

第三阶段
Third Phase

全面推广阶段
Overall Implementation

以全国各地区CDO/CCO代表性机场辐射效应，开展全国推广应用。
To implement all over China

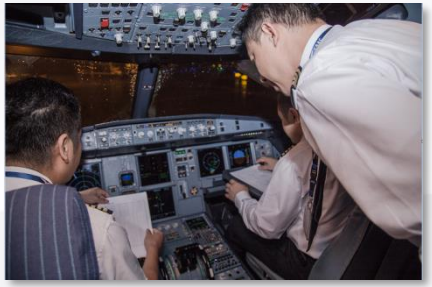
试点应用阶段 The Trial Phase

2016年，广州白云机场是我国首个应用CDO/CCO的机场
In 2016, the Guangzhou Baiyun Intl. airport , the first airport implements CDO & CCO in China.

2017年,北京首都机场是我国首个将CDO/CCO技术推广到区域阶段的机场
In 2017, the Beijing Intl. Capital Airport, the first airport implements CDO & CCO within ACC and APP.

2018年，昆明长水机场是我国首个应用CDO/CCO的高原机场
In 2018, Kunming Changshui Intl. airport, the first high-altitude airport implements CDO & CCO.

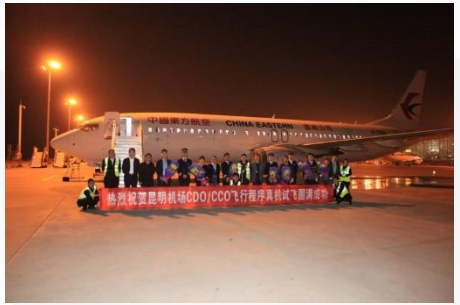
试点应用阶段 The Trial Phase









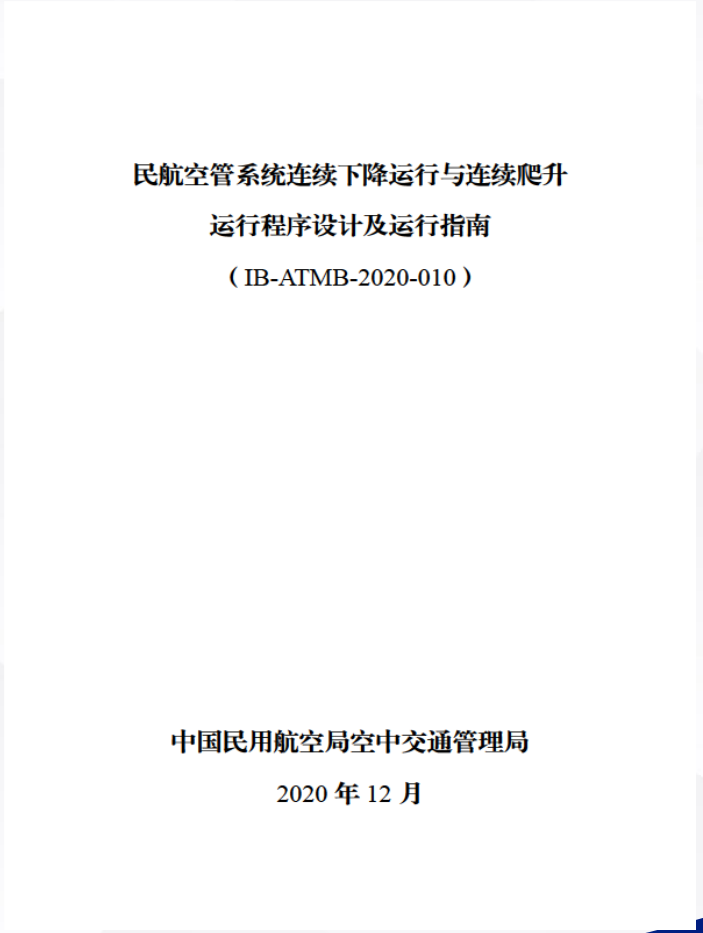


扩大应用阶段
The Expansion Phase

制定规范 Specification formulation

为指导CDOCCO新技术相关空域规划、程序设计及管制运行工作，推动CDOCCO在条件适合地区的安全实施和高效运行。
To guide the airspace planning, procedure design and ATC operation related to CDOCCO, and promote the safe implementation and efficient operation of CDOCCO in areas with suitable conditions

2020年12月，民航局空管局总结前期应用经验，制定《民航空管系统连续下降运行与连续爬升运行程序设计及运行指南》。
In December 2020, ATMB. CAAC summarized the early application experience and formulated *the design and operation guide of CDOCCO flight procedure of ATMB. CAAC*


民航空管系统连续下降运行与连续爬升
运行程序设计及运行指南
（IB-ATMB-2020-010）
中国民用航空局空中交通管理局
2020 年 12 月

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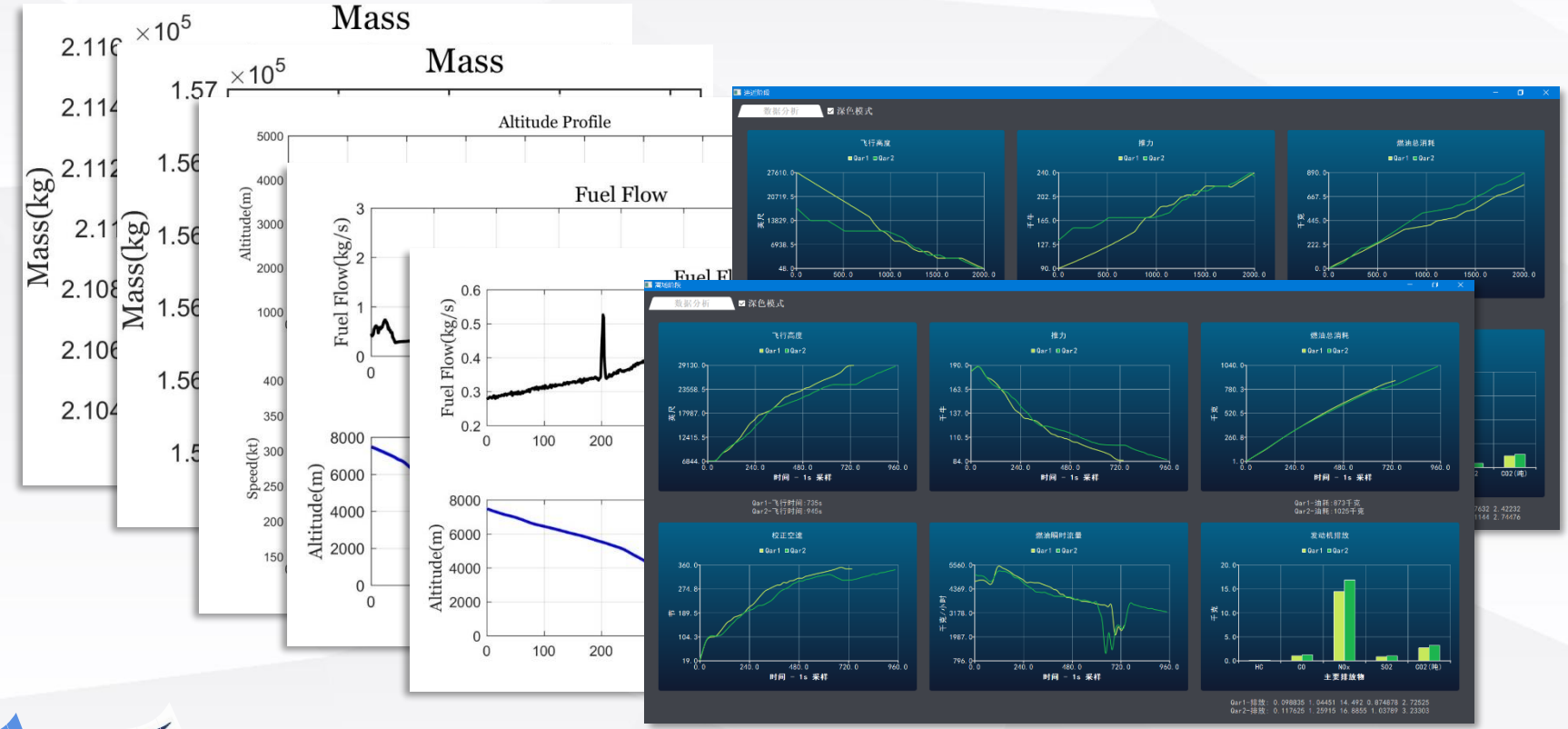
应用成效

Effects

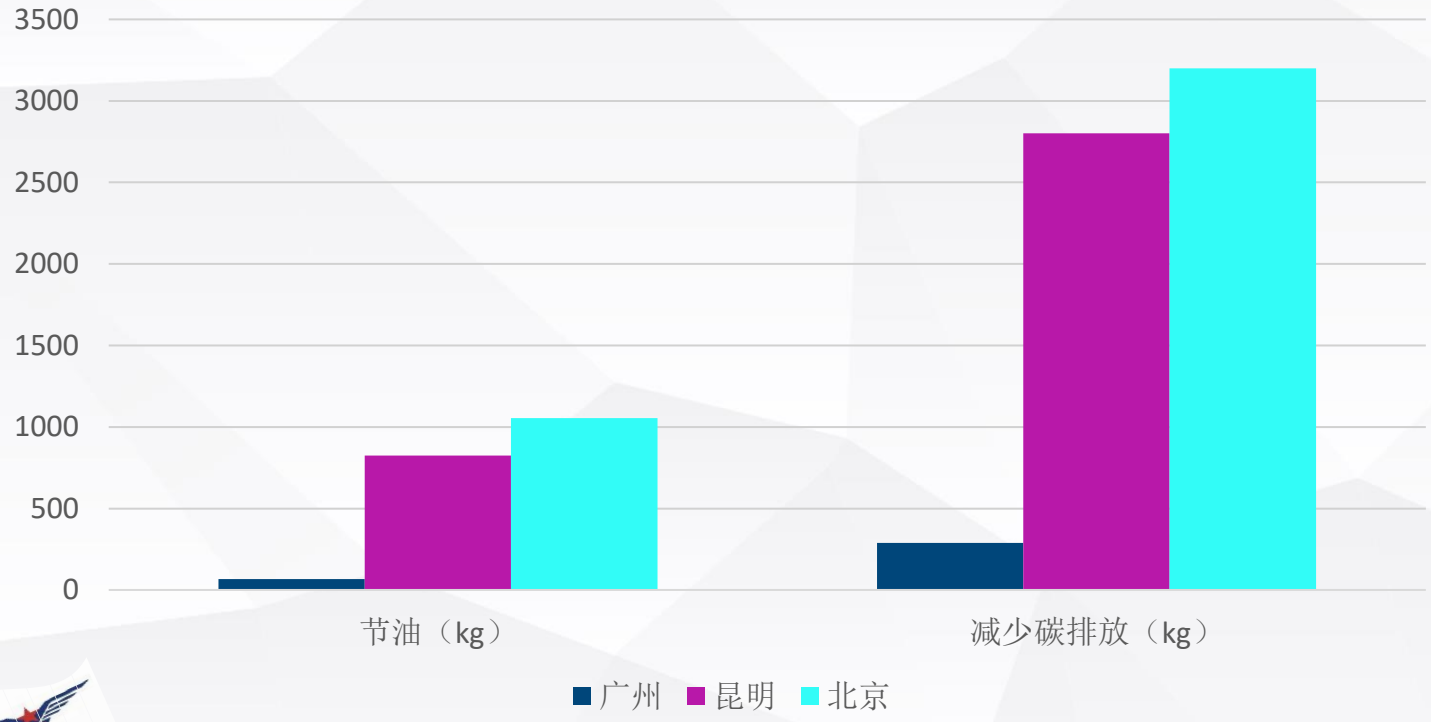
成效评估 Benefits Assessment



ATMB

试点应用成效 Trial Results

单次CDO运行成效对比 Benefits of Single CDO



实施成效 Overall Benefits

COVID-19在全球蔓延，严重影响航空运输业，前半年全球民航航班量骤减。Due to the Covid-19 impacts to the civil aviation industry, the air traffic decrease sharply all over the world.

2021年前三季度在我国已实施CDO/CCO运行地区，共计执行CDO/CCO 2329架次。In the first three quarter of 2021, 2329 flights operated on CDO/CCO in mainland China .

共计减少燃油消耗约342.46吨。

Fuel consumption decrease 42.46 ton.

共计减少碳排放约1175.81吨。

Carbon emission decrease 1175.81ton.

感谢您的聆听
Thank you

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