

ICAO Activities

ICAO advanced version of the Manual for Continuous Descent Operations

Presented to: JPDO, EWG, Ops SC Workshop
Georgia Tech Campus, Atlanta, GA

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**Federal Aviation
Administration**



ICAO Activities

- **In February 2010**
 - ICAO released an advanced edition of Doc 9931, Continuous Descent Operations (CDO) Manual
 - ICAO commenced briefings in their various regions beginning with Hong Kong and Bangkok in response to the overwhelming number of requests for information on CDOs.
 - The following brief has been provided courtesy of the ICAO PBN Program Office





Continuous Descent Operation (CDO) Doc 9331

****** Brief reproduced for the JPDO EWG Ops SC Workshop, Georgia Tech Campus, May 17-18, 2010

➤ Presented by Lynn Boniface, ISI, Support to FAA, AFS-420

PBN Programme Office
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Continuous Descent Operations (CDO)

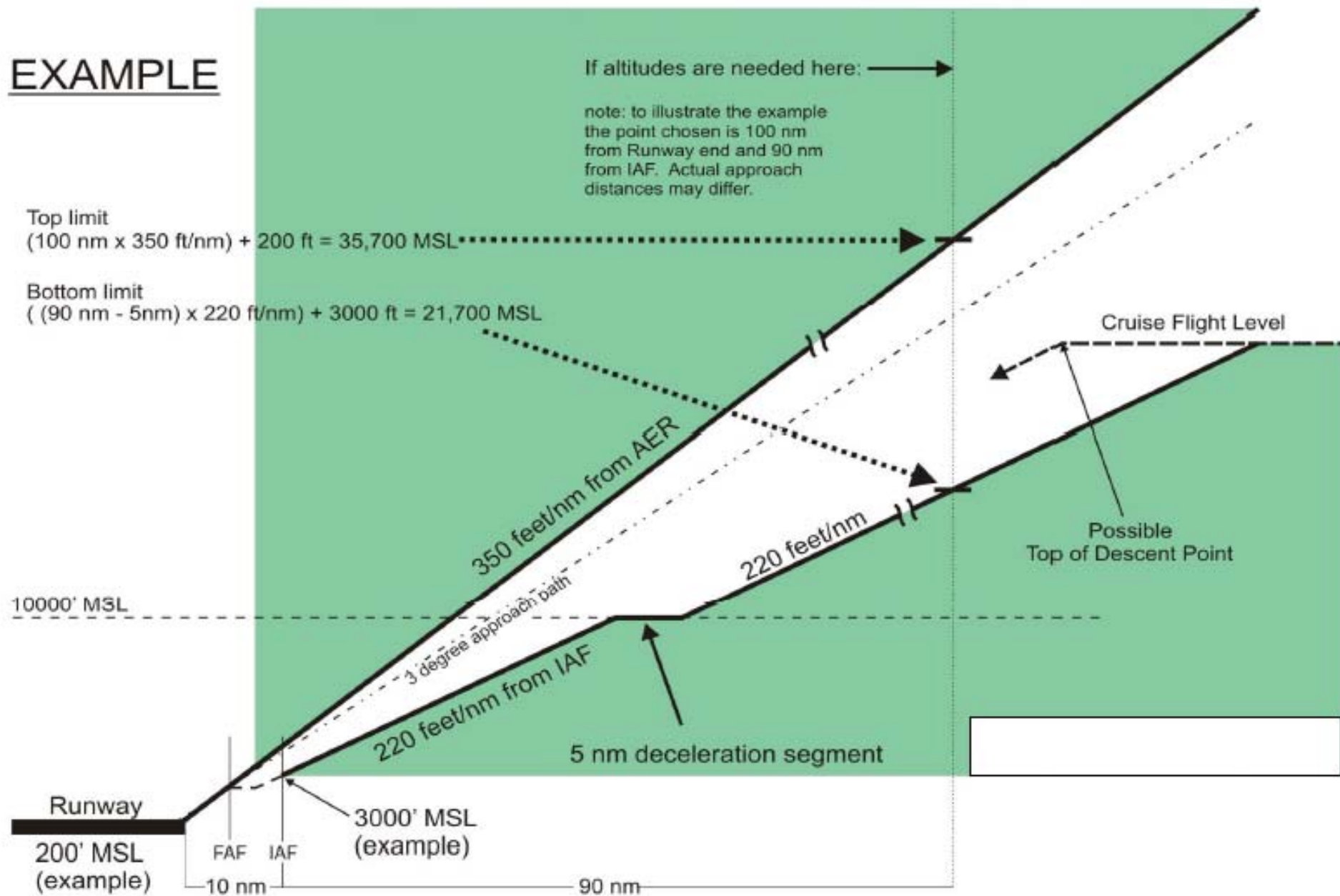
Continuous Descent Operations :

1. Are enabled by airspace design, procedure design and ATC facilitation
2. Where the aircraft descends continuously
3. Employing minimum engine thrust, in a low drag configuration

An optimum CD starts from the Top of Descent

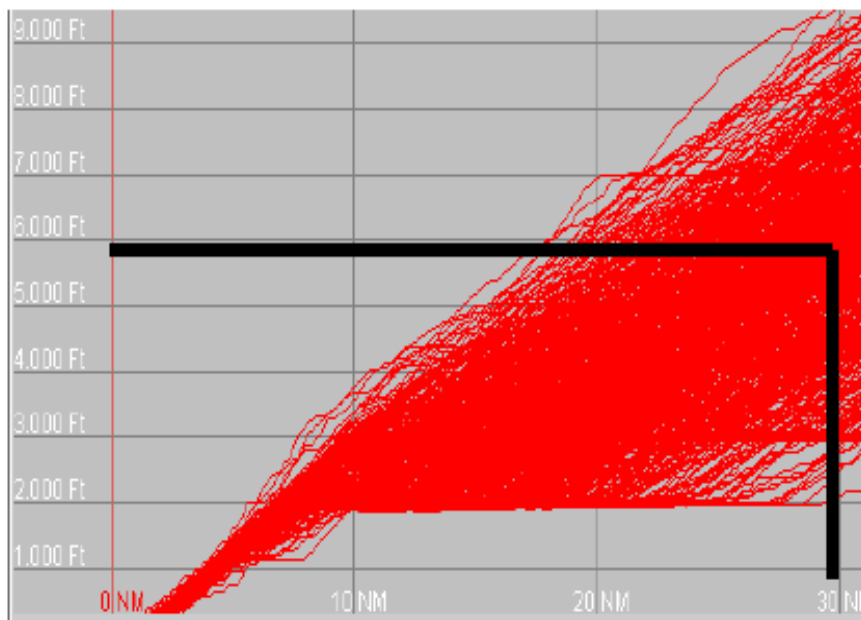
- reducing ATC/Pilot communication, segments of level flight, noise, fuel burn and emissions,
- while increasing predictability to ATC/Pilots and flight stability.

EXAMPLE

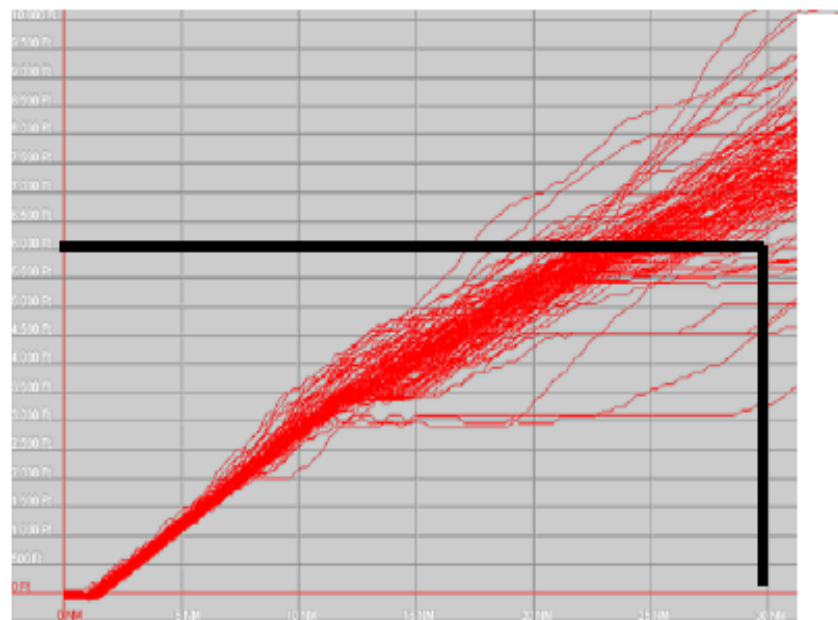




Actual CDO Operation



Flight tracks before CDO



Flight tracks after CDO



Optimum Vertical Path

The optimum vertical path angle will vary depending on:

- type of aircraft
- its actual weight
- the wind
- air temperature
- atmospheric pressure
- icing conditions
- and other dynamic considerations

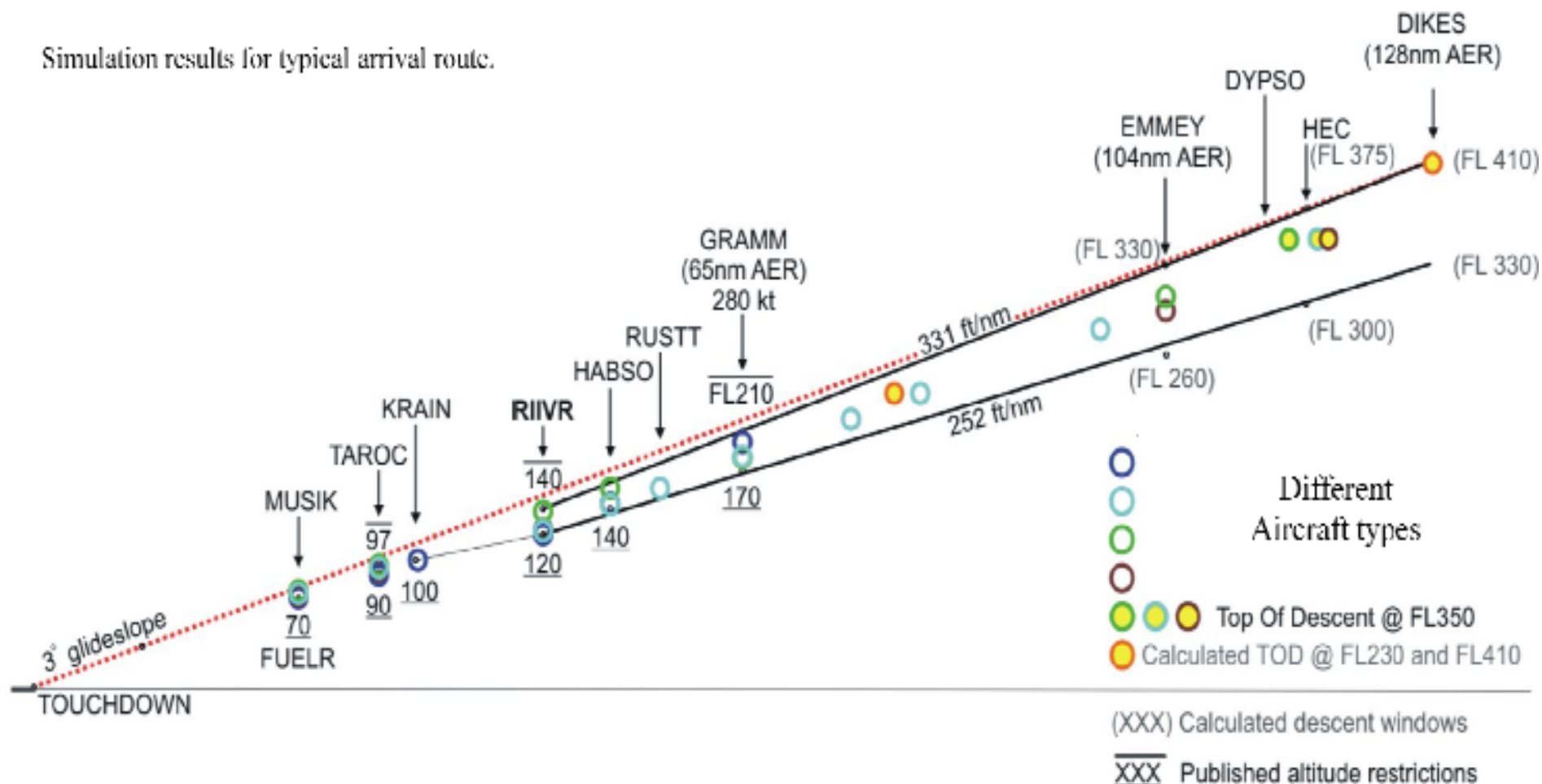
The maximum benefit is achieved by keeping the aircraft as high as possible until it reaches the optimum descent point determined by the onboard flight management computer.





Consider the Fleet Mix

Simulation results for typical arrival route.





CDO Closed Path Design

Closed path designs:

- are procedural designs
- the lateral flight track is pre-defined up to and including the Final Approach Fix
- the exact distance to runway is precisely known.

An example of a closed path procedure is a STAR terminating at a point that defines a part of an instrument approach and is thus directly linked to an approach procedure



CDO Open Path Design

Open path designs are designs where the procedure does finish before the final approach Fix.

Two main types of open paths exist:

- The first ending in a downwind leg leaving the controller to clear the aircraft to final.
- The second option is where the approach sequencing is undertaken by radar vectors, here the CDO can only be planned to the metering Fix and the air traffic controller will need to communicate, to the extent possible, an estimate of Distance To Go (DTG) to end of runway to the pilot. The pilot uses ATC distance estimates to determine the optimum descent rate to achieve the CD to the FAF.



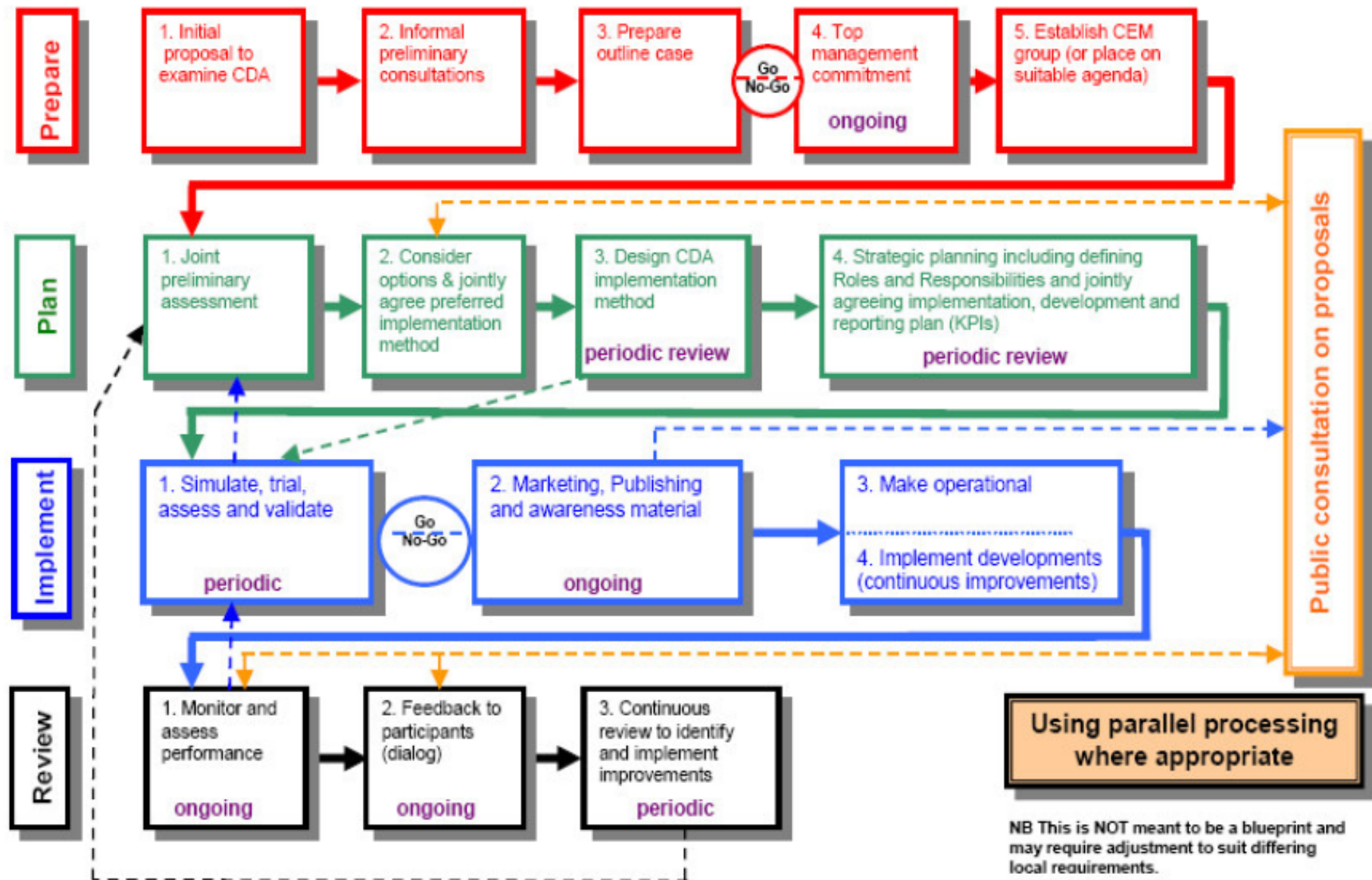
Closed Path CDO Phraseology Example

- “Descend via” clearance may be issued on procedures with defined altitude crossing points and/or defined speeds.
- A descend via clearance is an instruction to the pilot to descend in a manner that complies with the published lateral flight path and also comply with all published altitudes/speeds.
- Because lateral and vertical flight paths are known, a “Descend via” clearance may be given well in advance of the actual descent point.

TERMINAL: “Descend via the RIIVR2 Arrival, after RIIVR cleared ES.”



CDO Implementation Road Map





Continuous Descent Operation (CDO)

Doc 9331

Available on ICAO-NET

<http://www.icao.int/icaonet/>

Questions?

PBN Programme Office
ICAO



ICAO Activities

- **New tasking proposed at IFPP/6 held in Bangkok, March 2010**
 - The ATM WG, a sub group of the Instrument Flight Procedures Panel (IFPP) is tasked to develop a manual on Continuous Climb Operations (CCO).
 - A CCO WG is forming and is expected to have a draft outline for IFPP/7, October 2010. All sources are welcome to participate.
 - IFPP to ensure cross panel coordination (IFPP, OPSP, CAEP, ATMRPP, RNPSORG, SASP)
 - Initial draft is foreseen in the first quarter of 2012



CCO Manual (proposed) : Initial Concepts

- The application of CDO must be part of an operational concept that comprises both phases of flight: arrival and departure.
- The most optimum flight path of a departing aircraft is one with a continuous climb. The aircraft clean-up process, where lift and drag are balanced, is part of a take-off technique to be applied.
- The actual climb profile depends on many factors and varies between 5 % up to more than 20%.
 - Aircraft climb gradient is influenced by:
 - number of engines (2 engine aircraft climbing faster than 3 or 4 engine aircraft)
 - aircraft weight
 - wind direction and force
 - runway length
 - ambient temperature, air pressure
 - runway condition and slope
 - power setting
- The climb profile is not a straight line . . . but is based on segments

CCO Manual (proposed): How to participate

- **Avenues available to access the ICAO process**
 - IFPP, U.S. Member: Mike Webb, FAA AFS-420, mike.webb@faa.gov
 - » Lynn Boniface, (202) 385-4566, lynn.ctr.boniface@faa.gov
 - IFPP, ICCAIA Member: Dave Nakamura (Boeing)
 - IFPP, IFALPA Member: Steve Roseli (Swiss Air)
 - OPSP, U.S Member, Coby Johnson (FAA, AFS-410) and other members of the OPSP.
- **Questions?**

