The Next Logical Step: Integrated ICAO Environmental Standards

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Introduction

With the adoption of the Committee on Aviation Environmental Protection (CAEP/11) nvPM mass and nvPM number engine emission standards in 2019, the full range of the International Civil Aviation Organization (ICAO) environmental standards are complete. However, the challenge now is keeping this range of regulations up to date within the CAEP programme of work, taking into account high pace of technology progress. Furthermore, the integrated nature of the technological improvements required to meet more and more stringent regulatory levels, across noise, fuel efficiency/CO_2 emissions and engine emissions is clear. The most recent ICAO Independent Expert review of technology goals was undertaken as an integrated review in acknowledgement of the growing significance of interdependencies between noise and the various emissions regulations[2].

One solution to the timing of updating regulations is to conduct stringency analysis work for more than one regulation at a time within a single triennial CAEP cycle in the traditional manner. However, this approach does not address the technology integration question and a more elegant solution proposed is to conduct a stringency analysis for technology improvements for example, at an aeroplane level and then at an engine level, in an integrated manner. In view of these challenges, at the CAEP/12 meeting, the CAEP agreed to the following new task: "Conduct an integrated standard setting process for subsonic Aeroplane CO_2 Emissions and LTO Noise with the outcome being more stringent regulatory levels of CO_2 emissions and LTO noise". This is a new task for the technical Working Groups of the Committee and requires the development of new approaches whilst adhering to the CAEP Terms of Reference, including CO_2 and noise stringency interdependencies.

ICAO Aeroplane CO_2 Standard

The standard governing subsonic aeroplane CO_2 emissions adopted by ICAO in 2017 was the first of its kind, a global design certification standard and is contained in the Volume III[3] to Annex 16 (Environmental Protection) of the Chicago Convention. This standard applies to new aeroplane type designs from 2020, and to aeroplane type designs already in-production as of 2023. Those in-production aeroplanes, which by January 1, 2028, do not meet the CO_2 standard, will no longer be able to be produced unless their designs are sufficiently modified, and the modified designs demonstrate compliance with the regulatory requirements of Annex 16, Volume III.

The CO_2 standard covers a broad range of aeroplane Maximum Take-off Masses (MTOMs) and types and is

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2 ICAO Independent Expert Review process: https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg24-38.pdf

3 ICAO Climate Change Technology Standards: https://www.icao.int/environmental-protection/Pages/ClimateChange_TechnologyStandards.aspx

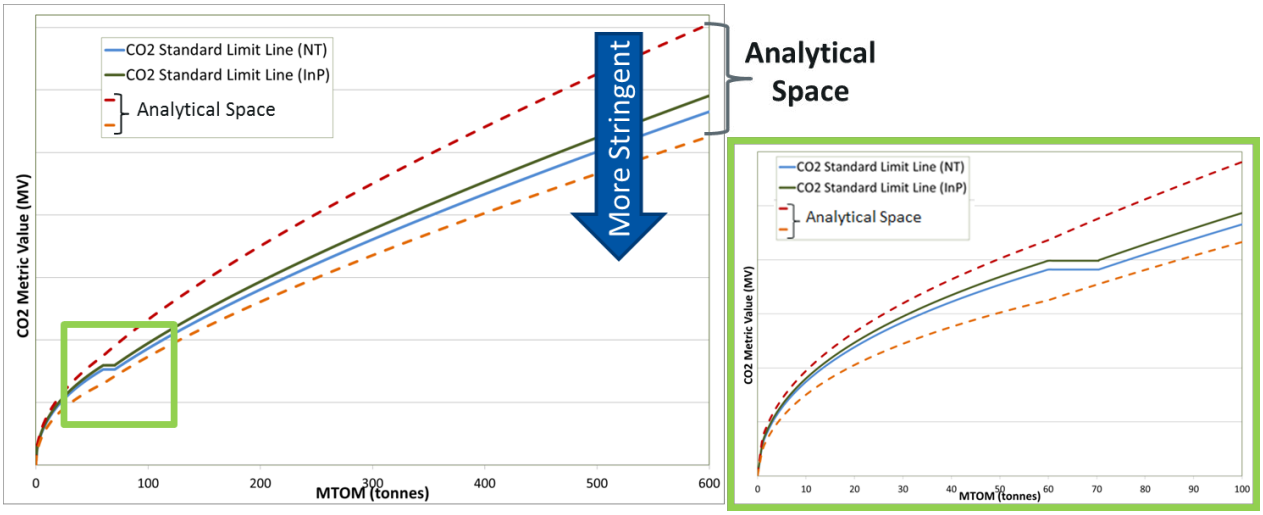

FIGURE 1: Aeroplane CO_2 standard regulatory limits and the analytical space used for CAEP/10 standard setting process.

especially stringent where it will have the greatest impact: for larger aeroplane types with an MTOM of greater than 60 tonnes, since the larger aeroplane designs have access to the broadest range of CO_2 emissions reduction technologies. Figure 1 shows an overview of the CO_2 standard regulatory limit lines for both new type (NT) and in-production (InP) CO_2 standards. With a major support from the civil aviation authorities the corresponding aeroplane CO_2 certification database is being developed and more data entry submissions are expected in the coming years with the new aeroplane types entering the market.

ICAO Aircraft Noise Standard

The first meeting of the ICAO Committee on Aircraft Noise (CAN,1971), developed a noise standard which aimed at ensuring that any new aeroplane entering service would use the best available noise reduction technologies and measures. That standard became applicable in 1973, setting noise limits as a direct function of MTOM in order to recognise that heavier aeroplanes, which were of greater transport capability, produce more noise than lighter aeroplane types. This was the Chapter 2 noise standard contained in the Annex 16, Volume I[4].

Over the years that followed the introduction of Chapter 2, further noise reduction technologies were incorporated into engine and airframe designs which led to incremental improvements units' noise performance, as well as in aeroplane fuel efficiency. This resulted in a gradual noise standard stringency (Figure 2), with the latest adoption of Chapter 14 in 2014. This new standard is applicable to new aeroplane types submitted for certification on or after 31 December 2017, and on or after 31 December 2020 for aeroplane with MTOM less than 55 tonnes. The latter was also included to recognise that the smaller jet aeroplanes have not to date seen the same noise reduction technologies as the larger aeroplanes.

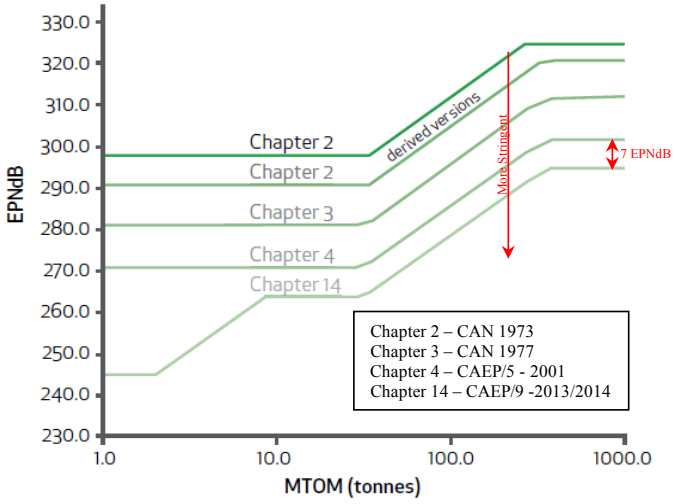

FIGURE 2: ICAO noise standard stringency progression over the last 50 years.

4 ICAO Aircraft Noise Standards : https://www.icao.int/environmental-protection/Pages/Reduction-of-Noise-at-Source.aspx

The extensive data on noise levels and associated characteristics for the aeroplane types certified in accordance with Annex 16, Volume I is collected in the Noise dB database[5]. This data is publicly available and would serve as a firm and transparent basis for the new stringency analysis.

Approach to the Dual Standard Setting

ICAO environmental standards are designed to be environmentally effective, technically feasible, and economically reasonable, while considering environmental interdependencies. These four pillars of CAEP analysis will guide CAEP in carrying out a comprehensive assessment of the costs and benefits of all the options which could be selected to form the new stringencies for noise and CO_2 standards. Such dual standard setting process requires deep coordination across CAEP technical Working Groups and other pertinent technical representatives to guide the technical steps of this integrated standard setting process.

The various elements of the analysis, such as, for example, the applicability to new types of aeroplanes, the options for the regulatory limits, the associated cost elements and the applicability dates, will be developed in a consistent and data-driven environment. The interdependency factor in this analysis will play a key role and will require thorough investigation to ensure the analytical space is complete to support an informed decision-making on the dual standard stringency by ICAO.

The preparations for this crucial, comprehensive and timely work are well underway and with broad support from the Member States and stakeholders, involving the best subject matter experts, with the aim that this analysis will be conducted during this triennium.

5 ICAO NoisedB certification database: https://noisedb.stac.aviation-civile.gouv.fr/