ANP database version 2.3

Release notes – 14/10/2020

1. Release overview

This new release of the ANP database features both a new aircraft dataset entry and updates or corrections of existing data from the previous version.

Both the new aircraft dataset entry and updates of existing aircraft data were developed by the manufacturers and collaboratively reviewed by the US DOT Volpe Center, US FAA, EASA and EUROCONTROL.

2. New ANP dataset entry

2.1 - Avions de Transport Regional ATR72-212A / Pratt & Whitney PW127F

Data for the ATR72-212A with Pratt & Whitney PW127F engines were added to the ANP database. Both the aircraft identifier and the noise identifier (i.e. NPD_ID) for this aircraft are **ATR72**. This aircraft is assigned two new spectral classes labelled **240** (for approach) and **140** (for departure), which are included in the *Spectral classes* table.

For the departure power ratings, the turboprop engines of this aircraft are modelled as jet engines in order to improve the estimation of the corrected net thrust and the associated aircraft performance. Indeed, the thrust equation for jet engines (Eq. B-1 of ECAC Doc. 29 4th Ed. Volume 2, Eq. C-1 of ICAO Doc 9911 2nd Ed.) is based on a set of regression coefficients, which allow to better match the thrust of this aircraft as a function of altitude and speed. The engine coefficients of this aircraft are therefore provided in the form of jet coefficients, available in the *Jet engine coefficients* table, both for MaxTakeoff and MaxClimb power ratings.

This aircraft includes a single set of departure procedural step profiles (in the *Default departure procedural steps* table) labelled as **DEFAULT**, for stage lengths 1, 2 and 3.

The acceleration steps of these procedural step profiles include values for both the *Rate-of-Climb (ft/min)* parameter and the *Accel Percentage (%)* parameter. The second parameter represents the energy share factor, e.g. the amount of available thrust - in % - dedicated to the acceleration of the aircraft, whereas the rest is used for continuing to climb. The *Rate-of-Climb (ft/min)* values are consistent with the *Accel Percentage (%)* values for an airport at MSL and under ISA conditions. For airports at higher altitudes and/or for atmospheric conditions which differ from the ISA conditions, it is recommended to use the *Accel Percentage (%)* value(s) to calculate revised *Rate-of-Climb* values, which properly account for the actual conditions.

This aircraft includes a single approach procedural step profile (in the *Default approach procedural steps* table), labelled as **DEFAULT**. The procedure includes a level-off at an altitude of 3,000 feet Above Field Elevation (AFE), followed with a standard 3-degree descent on the ILS part, with full configuration on the last descent segments before landing.

Aerodynamic coefficients are available in the *Aerodynamic coefficients* table for the different aircraft configurations (flap settings) used in both the approach and departure procedural step profiles mentioned above.

The Noise Power Distance (NPD) data of this aircraft is provided for both approach and departure modes, and for four noise metrics (SEL, EPNL, LA_{max} and PNLTM). The noise-related power parameter in the NPD data is the Corrected Net Thrust (CNT) per engine.

As the acoustic characteristics of turboprop engines during departures depend not only on the engine thrust but also – for a given delivered thrust - on the propeller speed, the departure NPD curves have been split into two distinct parts with different propeller speed assumptions. The thrust range [4,900 5,310] lbf, representative of thrust levels associated to the MaxTakeoff rating, take into account a high propeller speed, which is typical of normal departure procedures during the MaxTakeoff phase. The thrust range [3,000 4,800] lbf , representative of thrust levels associated to the MaxClimb rating, take into account a reduced propeller speed, which is also typical of normal departure procedures after the thrust cutback to the MaxClimb rating.

Under the constraints imposed by the current formalism of ECAC Doc.29 and ICAO Doc 9911 guidance material, where NPDs use a single input noise surrogate parameter – the engine thrust – to characterize the aircraft noise source along the trajectory, the above-mentioned assumptions to derive the NPDs allow to properly model – in conjunction with the engine and aerodynamic coefficients - the noise footprints of standard departure procedures of this aircraft, for both sea-level and high-altitude airfields.

However, using the departure NPDs of this aircraft above ISA+10 (airfield temperature) is not recommended from an acoustic modelling standpoint: for these temperatures, the calculated CNT values during the MaxTakeoff phase are likely to fall within the range of the tabulated CNT values corresponding to the MaxClimb phase in the NPDs. Therefore, the noise level predictions during MaxTakeoff will be underestimated, as noise level interpolations will be based on reference NPD data incorporating a lower propeller speed assumption (MaxClimb instead of MaxTakeoff).

The approach NPDs feature a duplicate of the 900 lbf thrust NPDs at 890 lbf thrust (e.g. the same noise values as the 900 lbf NPDs are duplicated for a tabulated 890 lbf NPD). The rationale of this duplicate is to prevent upward extrapolations at lower thrust levels, since these NPDs follow an atypical pattern (noise level reduction when moving from 900 lbf to 1250 lbf tabulated thrust).

The departure NPDs feature a duplicate of the highest tabulated thrust value (5,300 lbf) at 5,310 lbf (e.g. the same noise values as the 5,300 lbf NPDs are duplicated for a tabulated 5,310 lbf NPD). The rationale of this duplicate is to prevent upward extrapolations at higher thrust levels that would result in unrealistically over-predicted noise levels for observer locations behind and to the side of the start-of-roll with engines at static thrust.

3. Updated ANP datasets

3.1 - Updated Airbus A350-941 / RR Trent XWB-84

The ANP dataset of the Airbus A350-941, equipped with Rolls Royce Trent XWB-84 engines and labelled as **A350-941** in the ANP database, has been updated.

The overall performance data generation process was entirely inspected and reviewed by the manufacturer in order to increase performance data accuracy in high altitude and various temperature conditions.

Consequently, the aerodynamic coefficients of this aircraft (available in in the *Aerodynamic coefficients* table) have been updated. Additionally, the configuration labelled as “D_1+F” - used during takeoff and initial climb – is now replaced by two configuration identifiers, which both correspond to “1+F”, but distinct between two different gear positions. The configuration labelled as “D_1+F_D” corresponds to the gear down position and should be the selected configuration for the takeoff (rolling) and initial climb steps. “D_1+F_U” corresponds to the same configuration, but with the gear retracted, so for use in airborne steps.

The engine coefficients of this aircraft (provided in *the Jet engine coefficients* table) have also been revised and improved by the manufacturer for all the thrust ratings. It should be noted that the **IdleApproachHighTemp** coefficients are now identical to the **IdleApproach** ones, which means that there is no thrust reduction beyond the temperature breakpoint when this aircraft is in idle thrust mode.

The existing **ICAO_A** and **ICAO_B** departure procedural step profiles (in the *Default departure procedural steps* table) have been updated to reflect the new takeoff and initial climb configuration identifiers mentioned above, and hence make now a distinction between the two gear positions (up or down). All the other parameters remain unchanged. Additionally, in order to ease the work of the noise modellers, this aircraft now includes procedural step profiles labelled as **DEFAULT**, which are actually duplicates of the updated **ICAO_B** procedural step profiles.

The approach procedural step profiles of this aircraft, labelled as **DEFAULT1** and **DEFAULT2** (in the *Default approach procedural steps* table), have both been updated to reflect earlier slat/flap and landing gear extensions (e.g. at a higher altitude).

The NPD data of this aircraft (labelled as **A350-941**) have been revised by the manufacturer to reflect the installation – in the standard production of this aircraft – of vortex generators in front of the fuel over pressure protectors (FOPP) cavities under the wings, as well as main landing gears (MLG) caps. This NPD revision reflects also an update of the noise sources in flight transposition options based on the manufacturer’s best knowledge at present on the matter, including the removing of high frequencies attenuation.

The departure and approach spectral classes of this aircraft have also been revised to be consistent with the updated NPD data. It should be noted that their identifiers have also been renamed as **239** (for approach) and **139** (for departure). The former spectral classes labelled as **217** (for approach) and **114** (for departure), which were specific to that aircraft, have been removed from the *Spectral classes* table.

3.2 - Updated Boeing 737-8 Max / CFM Leap1B-27

The ANP dataset of the Boeing 737-8 Max equipped with CFM Leap1B-27 engines, and labelled as **7378MAX,** has been updated by the manufacturer.

The value of the Maximum Sea Level Static Thrust of this aircraft (in the *Aircraft* table) has been updated (with a slight reduction). This has a marginal effect on the calculated CNT values along the rolling portion of the arrival procedural steps (for steps where the power setting is defined as a percentage of that parameter).

The existing **ICAO_A** and **ICAO_B** procedural step profiles have been updated to reflect a lower energy share factor assumption during the acceleration steps, resulting in higher rate of climb values. This aircraft includes also new departure procedural step profiles labelled as **DEFAULT**. Although belonging to the same "NADP2" family as the **ICAO_B** procedures, these are not strictly identical to the **ICAO_B** procedural steps, especially because they feature a thrust cutback at the start of the first acceleration step (at 1,000ft), whereas the thrust cutback of the **ICAO_B** procedures occurs at higher altitudes, when the aircraft has achieved its clean configuration.

The aerodynamic coefficients of this aircraft – both for approach and departure configurations – have been updated, based on the latest reference performance data hold by the manufacturer for this aircraft. These include also a removal of the "A_40" landing configuration, replaced with a configuration with a lower deflection angle flap setting (labelled as "A_30"). Additionally, configuration "A_15" being not supposed to be used for landing steps, the previously provided value for coefficient *D* (used to calculate the land speed) has been removed for that configuration.

The jet engine coefficients of this aircraft (available in the *Jet engine coefficients* table) have been updated by the manufacturer, on the basis of the latest reference performance data available for this aircraft. Additionally, a set of jet engine coefficients is now available for the rating labelled as **IdleApproach**, for use in conjunction with the procedural steps flown with idle thrust rating in the updated default approach procedural step profile of this aircraft (see below).

The approach procedural step profile of this aircraft, labelled as **DEFAULT** (in the *Default approach procedural steps* table), has been updated to include Descend-Idle and Level-Idle steps flown with idle thrust rating, in replacement of the previous Descend-Decel and Level-Decel steps flown with adapted thrust. This updated profile reflects also the use of the "A_30" landing configuration in replacement of the former "A_40" configuration.

The approach NPD data of this aircraft (labelled as **7378MAX**) have been updated to be consistent with the landing configuration "A_30", which is used in the updated approach procedural step profile of this aircraft (see above). The previous approach NPD data were indeed assuming a higher deflection angle flap setting ("A_40"), which is less representative of standard final approach and landing configuration for this aircraft.

3.3 - Updated Boeing 737-800

The ANP dataset of the Boeing 737-800 equipped with CFM56-7B26 engines, and labelled as **737800**, has been updated by the manufacturer. It includes updates to both aircraft performance and noise data.

This aircraft now includes an approach profile defined in the form of procedural steps, available in the *Default approach procedural steps* table and labelled as **DEFAULT**. It replaces the former

approach fixed-point profile, which has been removed from the *Default fixed-point profiles* table for this aircraft.

The engine coefficients of this aircraft (available in the *Jet engine coefficients* table) feature a new set of coefficients for the thrust rating labelled as **IdleApproach.** These are required to model the portions of the newly provided approach procedural step profile, which are flown with idle thrust rating.

This aircraft now includes aerodynamic coefficients (available in the *Aerodynamic coefficients* table) for the different approach configurations (flap settings) used in the approach procedural step profile mentioned above.

The approach NPD data of this aircraft (labelled as **CF567B**) have been updated to be consistent with the final approach and landing configuration “A_30” used in the newly developed approach procedural step profile for this aircraft (see above). The previous approach NPD data were assuming a flap setting with higher deflection angle (“A_40”).

The approach spectral class assignment of this aircraft has also been updated to be consistent with its updated approach NPD data. The approach spectral class of this aircraft is now **206** (instead of **203** previously).

4. Error corrections

4.1 - Description correction for the Boeing 767-300

The description of the Boeing 767-300 with the aircraft identifier **767300** was erroneous. It was referring to the PW4060 engines, whereas its associated noise data actually correspond to the CF6-80A engines. The description field for that aircraft (in the *Aircraft* table) has therefore been corrected to refer to the CF6-80A engines.

4.2 - Spectral Class correction

Data for Spectral Class **110**, a departure spectral class applicable to the **DC3**, **DC6**, **DO228**, **HS748A** and **SF340** aircraft, have been updated to correct an error. The level at 6300 Hz has changed from 51.4 dB to 62.3 dB and the level at 8000 Hz has changed from 40.4 dB to 55.4 dB. This correction has actually consisted in coming back to the initial values of ANP v1.0, which have proven to be the correct ones.