

SURVEY ON BACKGROUND INFORMATION OF AIRCRAFT NOISE CALCULATION METHODOLOGIES AND PRACTICES IN NORDIC COUNTRIES
 N-ALM Noise sub-group meeting, date 10 May 2016, Copenhagen (date of the table:2016-09-28, assembled by Eva Nielsen)

1. Country	Norway	Denmark	Sweden	Finland	Iceland
2. Name and contact information	Jan Anders Marheim AVINOR / OSL Jan.Anders.Marheim@osl.no	Peer Borglund / CPH Peer.borglund@cph.dk	Gustav Grundfelt, Swedavia Gustav.Grundfelt@swedavia.se	Mikko Viinikainen, Finavia Oyj mikko.viinikainen@finavia.fi	Anna Margret Bjornsdottir Icelandic Transport Authority annamb@icetra.is
3. Noise calculation method for main airports. Define the main airports.	Methods: NORTIM and GMTIM. Main airports require EU noise reports: Oslo Airport, Gardermoen (GMTIM) Bergen Airport, Flesland (NORTIM) Stavanger Airport Sola (NORTIM) Trondheim Airport Værnes (NORTIM)	Noise from airports (Støj fra flyvepladser). Guidance material from the Danish Environmental Protection Agency 5/94. Reference: Air Traffic Noise Calculations – Nordic Guidelines. Nord 1993:38. Second edition of ECAC Doc. 29 (1997) Main airports: Copenhagen, Kastrup (EKCH) Billund (EKBI) Roskilde (EKRK)	ECAC Doc 29 3rd edition Main airports: Stockholm-Arlanda, Gothenburg-Landvetter	Doc 29 3rd edition EFHK Helsinki-Airport, only main airport	
3.1 Name and version of the s/w program	NORTIM 3.3 GMTIM 2.0 REGTIM 3.2	Dansim, INM 6, other software fulfilling the mini test in the Guidance material from the Danish EPA	INM 7.0d	INM 7.0d	
3.2 Method for calculation of lateral attenuation	Modified, based on SAE AIR 1751 because ECAC Doc.29R lateral attenuation is wrong (can comply with Doc29R, if necessary)	According to SAE AIR 1751	According to Doc 29 3rd ed. as introduced in INM7.0d	According to Doc 29 3rd ed. as introduced in INM7.0d	
3.3 Is terrain height incl.?	Yes (=topography)	If requested	Yes (=topography)	Not at main airport. The terrain is pretty flat there.	
3.4 Is	Yes	Generally no, but major	No	No	

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variations in ground impedance included?		water surfaces are considered to be fully reflective			
3.5 Is flight track information (in historic surveys) based on monitoring?	GMTIM use radar tracks. For other airports where NORTIM or REGTIM is used, flight tracks are modelled from AIP-published procedures and aircraft performance.	Generally no, but it is allowed to do this.	Yes	Yes. Averaged horizontal track bundles are analysed from year long sample of radar data.	
3.6 Are dispersions defined automatically /manually?	NORTIM and REGTIM has automatic track dispersion according to ECAC Doc.29. GMTIM uses radar tracks for all flights, therefore further dispersion is not relevant.	Defined according to Noise from airports (Støj fra flyvepladser) or by studies at actual airport. Guidance material from the Danish Environmental Agency 5/94. In respect of general aviation the use of flight sectors are possible in stead of strictly defined tracks. LDEN: Dispersion is included relative to nominal tracks. LMAX: No dispersion is included relative to nominal tracks.	Yes – Tracks are created from radar tracks using the Scenario Builder and ANOMS	Detection of dispersed track bundles is automatic. Still there is significantly manual operations in the modelling process.	
3.7 Source of a/c noise data?	INM and HNM databases, + INM substitutions Adjusted data for MD80 and B73NG families based on measurements at OSL. We have measured NPD for some helicopters (Lynx, S92, B412).	INM and HNM databases, Nordic noise and performance database (hosted by CAA-Sweden) Database covering propeller aircraft with MTOM<5700 kg included in the Guidance material from the Danish Environmental Agency 5/94.	INM database + substitutions (some from INM, some from measurement experiences)	ANP and INM database. Some significant NPD-adjustments are done for few major a/c types based into comparison of noise measurement at EFHK and footprint calculations of tailored profiles. ESDU90023 is used for noise speed distance NSD-sourcedata	

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		Measured data (DELTA)		calculations.	
3.8 Is the noise data adjusted in any way according to atmospheric attenuation?	Yes, impedance due to air pressure, as INM.	Yes, as INM.	No	No – but the profile fitting is made based to whole year averaged measurement. Footprint calculations are then made on INM ref-conditions.	
3.9 Is the noise data adjusted in any way according to perception height?	Yes, adjustments for 4 m receiver height.	Generally no, but possible	No	No	
3.10 Source of a/c profile data (speed, height, power setting). How are the power settings calculated/determined?	NORTIM and REGTIM uses INM database. GMTIM uses speed and height from radar, but power settings according to best fit to INM standard profiles for different weights (stage lengths).	INM database and the Nordic noise and performance database. Information received from operator or manufacture.	INM database. Power settings according to INM standard profiles for different weights (stage lengths).	Departures: for most significant aircrafts average speed and altitude profiles are analysed based into year long sample of radar data. Then it is matched with Doc 29 / ANP procedure steps. The NPD:s, flap- and engine-coefficients are modified if needed. Approaches: for most significant aircrafts average speed and altitude profiles are analysed based into year long sample of radar data. Then it is modelled using real drag polars and so called MeSi-simulator (one second time step simplified point mass theory simulator). The profiles are then discretized into prof_pts.dbf format	

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				separetly for engine and all aerodynamic configurations. The noise-footprint results are checked and sourcedata is edited if needed.	
3.11 Calculated noise metrics	EFN, MFNday, MFNnight, Leq, LDEN, LDN, LD, LE, LN, Lmax-night, TA, NA, and Noise Zones according to Norwegian regulations.	LDEN, Lmax,night (22:00 – 07:00) for departure, arrivals and taxiing.	LDEN, Lmax ,FBN	Lden, LAeq(07-22), LAeq(22-07), LASmax, LAeq(24h)	
3.12 How often are the contours updated?	According to regulations, every 4 to 8 year, or more often if needed.	When nescessary, according to decision by the environmental authorities	According to the environmental permit for each airport.	Annually	
4. Which organization carries out the surveys for main airports – list contact persons	Every airport is responsible, work is expected to be done at OSL. Contact person Jan Anders Marheim.	Every airport is responsible.	Swedavia flygakustik: Gustav Grundfelt Mikael Liljergren Christer Heed Martin Wall Alborz Tari (Mathieu Boué)	Finavia. Tuomo Leskelä, Tuomo Linnanto, Mikko Viinikainen	
5. Noise calculation methods for other airports. Define "other".	Noise around regional airports is calculated by REGTIM, a simplified version of NORTIM. All other airports are calculated by NORTIM. Other airports are Avinor-managed airports, with yearly traffic less than 50000 movements.	Calculation methods and applied software used by the different consultants do not differ depending on the size of the airport/airfield. Other airports: All airports/airfields (EKCH and EKBI excepted) open to public service (see AIP Denmark, and VFG Denmark). Private airfields, heliports, and helipads. Note: Military air bases are subject to environmental regulation,	In Sweden, we strive to use the same methods for all airports. Adaptation due to lack of data coverage is needed for some airports.	Two categories of 'other' airports exist: 1. Mixed military and civil airport 2. Civil only airport 1. The horizontal tracks are analysed based into radar-track-density plots made by GIS-software. The horizontal tracks are then drawn manually based into information from GIS-analyses. Profiles-, noise- and aircraft information are based into analyses made at EFHK (civil) for major ac-types. Military noise, profile and aircraft data are based into separate processes not specified here.	

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		and thus included too.		<p>2. If radar coverage exist down to significant altitudes, radar data is used as background information for generalized horizontal tracks. Profiles and aircraft information are based into analyses made at EFHK (civil).</p> <p>Then we have a GA-airport with significant number of operations. The noise assessment is quite old. The airport will be closed maybe in the end of year 2016. And also an airport with high number of operations of military helicopters. INM:s HNM model with self measured NPD:s are used..</p>	
5.1 Define if any answers for 3.1. – 3.11 are different	<p>Flight track information is based on AIP information and aircraft performance.</p> <p>Comparable aircraft are grouped by performance and noise</p>	<p>3.7: Defined according to Noise from airports (Støj fra flyvepladser). Guidance material from the Danish Environmental Agency 5/94. In respect of general aviation grouping into four noise classes (4) are possible in stead of calculations based on specific types.</p> <p>3.10: Take-off and landing profiles are tabulated for most of the types on the Danish national register in Noise from airports (Støj fra flyvepladser). Guidance material from the Danish Environmental Agency 5/94.</p>	The same	<p>3.3 for two airports the terrain height is included</p> <p>3.10 military simulators are used to determine the average profiles for military aircrafts.</p> <p>3.11 in some specific cases Lden, LAeq(07-22), LAeq(22-07) for 3 or 4 months. And also Lden, LAeq(07-22), LAeq(22-07) on weekdays (mon-fri around the year)</p> <p>3.12 typically once in 5-10 years</p>	
5.2 How often are contours updated?	According to regulations, every 4 to 8 year	When nescessary, according to decision by the environmental authorities.	According to the environmental permit for each airport.	When needed	

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6. Which organization carries out the surveys for airports – list contact persons	CAA Norway has the responsibility to carry out surveys for all civil airports. In practice this will be done at OSL Kåre H. Liasjø	DELTA COWI Grontmij Carl Bro Noise calculations have to be carried out by approved person or company.	Swedavia flygakustik: Gustav Grundfelt Mikael Liljergren Christer Heed Martin Wall Alborz Tari (Mathieu Boué)	Finavia Finland, Satu Routama, Tuomo Leskelä, Mikko Viinikainen	
7. Last update			<i>Gustav Grundfelt 2016-06-23</i>		