iMMI

Newsletter Edition 2018 – Q2

Wölfel

IMMI – What's new?

Dear IMMI users,

For years, aircraft noise has been one of the most annoying types of noise to the population - in Germany and throughout Europe. The EU addressed this issue and introduced assessment methods in the EU Environmental Noise Directive 2015, which will be mandatory for all member states from December 31, 2018. With regards to Germany, this means that the regulations must be transposed into German law and published as an administrative ruling by the end of 2018. With this newsletter we have dedicated ourselves to this topic and would like to inform you about it in detail - of course, also with regard to the IMMI software.

We would like to close this newsletter with 3 tips & tricks - a fixed section in our quarterly newsletters - and with information on our diverse seminar and event program.

We look forward to hearing from you. I hope you'll enjoy this read!

Your

Denise Müller and the whole IMMI team

Aircraft noise in Germany and Europe – Or: What is CNOSSOS-DE anyway?

Aircraft noise remains one of the most annoying types of noise to the population (cf. Figure 1). This is all the more true because aircraft noise does not affect the population as a whole in Germany as does, for example, traffic noise. Wherever aircraft noise does occur, the impact therefore is even greater.

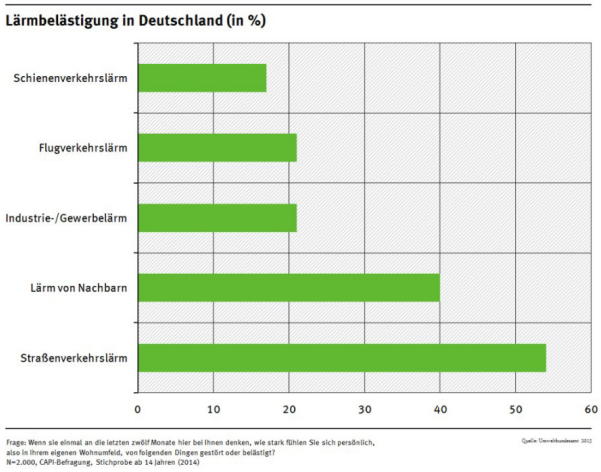


Figure 1: Noise exposure in Germany (in % of population); source: German Federal Environment Agency (UBA) – only in German available

In Germany, a fundamental distinction must be made between two approaches in dealing with aircraft noise: On the one hand, approval procedures and noise protection requirements are regulated on the basis of the Aircraft Noise Act and, on the other hand, the medium-term improvement of the noise situation on the basis of European legislation in the form of periodic noise mapping and noise action planning.

The application of the Aircraft Noise Act in Germany and the implementation of the European Environmental Noise Directive as well as the necessary and required steps for the quality assurance of calculation programs are explained below. And as should be expected, IMMI has gone through all steps of quality assurance and can be used without restriction for the various tasks of aircraft noise calculation - if required also as a service by our in-house aircraft noise experts.

This section is supplemented by a description of a self-sufficient aircraft noise monitoring system in which aircraft noise monitoring is used by combining available aircraft transponder data with aircraft noise calculation for aircraft noise monitoring.

Aircraft noise in Germany - licensing procedures and the Aircraft Noise Act

After long discussions, the amended Aircraft Noise Act and the „new" AzB (calculation instructions) were published in 2007 in the Act to Improve the Protection against Aircraft Noise in the vicinity of Airfields (BGB - German Federal Code). 2007, No. 24, Part I, p. 986-992).
The main features and objectives of the Aircraft Noise Act are the

- designation of noise protection areas (day protection zone 1, day protection zone 2, night protection zone)
- establishment of construction and usage restrictions
- reimbursement of the costs of structural noise protection measures in day protection zone 1 and the night protection zone, and
- regulation of compensation measures for the impact on the outdoor living area in day protection zone 1 (only for new buildings or major expansion projects).

The details are regulated in 3 legal regulations (Figure 2).

Figure 2: The Aircraft Noise Act and the subordinate regulations - only in German available

Among other things, corresponding limit values are assigned to the protection zones. Table 1 shows these limits for existing airfields, corresponding limits are defined for airports that are to be expanded or for new airfields.

Flugplatzart	Tag-Schutzzone 1	Tag-Schutzzone 2	Nacht-Schutzzone	
	$L_{Aeq,\ Tag}$	$L_{Aeq,\ Tag}$	$L_{Aeq,\ Nacht}$	n x L_{Amax}
Verkehrsflughafen oder großer Verkehrslandeplatz	65 dB(A)	60 dB(A)	55 dB(A)	6 x 72 dB(A)
militärischer Flugplatz oder Luft/Boden-Schießplatz	68 dB(A)	63 dB(A)	55 dB(A)	6 x 72 dB(A)

Table 1: Limit values for protection zones at existing airports according to the Aircraft Noise Act - only in German available

Which airports and airfields are affected? The scope of application of the Aircraft Noise Act refers to

- commercial airports with regular scheduled or tour package air traffic
- airfields with scheduled or tour package air traffic and more than 25,000 flights per year
- military airfields with jet aircraft operation and
- military airfields with aircraft with MTOM > 20 t and more than 25,000 flights per year

This means that most - smaller - landing sites, which nevertheless do not escape (noise) criticism, are not affected by the Air Traffic Noise Act. In the case of approval or complaints, the calculation procedure of DIN 45684[4] essentially applies to them.
The detailed and complex procedure for calculating the protection zones - even for experienced acousti-

cians - is regulated in detail in the 1st Aircraft Noise Protection Ordinance (1st Flight MLSV) and there in the AzB (calculation instructions) [5]. Figure 3 shows an example of the procedure for the construction of the night protection zone, after the immission levels were elaborately determined from the available aircraft movements, the aircraft types with their operating situations, the (statistical) distribution of take-offs and landings, etc.

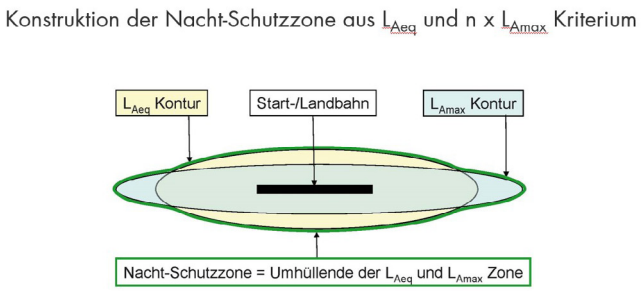


Figure 3: Construction of the night protection zone from L_{Aeq} and the n x L_{Amax} criterion – only in German available

It goes without saying that such a complex calculation procedure with very far reaching consequences (for example with regard to compensation claims) should place special demands on the quality assurance of calculation programs. In this case, the German Federal Environment Agency (UBA) has taken over the review of AzB (calculation instructions) calculation programs and confirmed compliance with the quality requirements. The precise calculation of a test airfield ensures that results are achieved with the following quality criteria:

- calculated isolines lie within a range of ± 5 m
- single point calculations are determined with a maximum deviation of 0.1 dB

Figure 4 shows the test airport with the corresponding approach and departure routes and the explicit immission points at which the immission levels must be indicated.

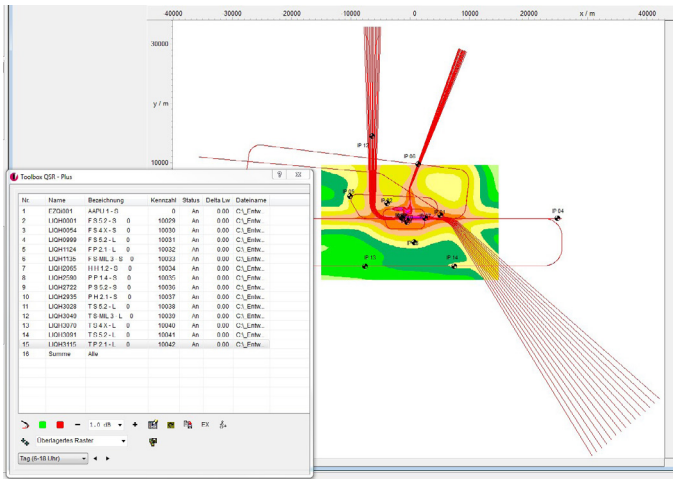


Figure 4: AzB (calculation instructions) test airfield for quality assurance of the calculation programs (calculated with IMMI AzB module)

On the basis of the Aircraft Noise Act in conjunction with the subordinate calculation regulations AzB (calculation instructions) /AzD (data acquisition instructions), the aircraft noise protection zones are calculated at existing, to be expanded or new airports (cf. exemplary Figure 5).

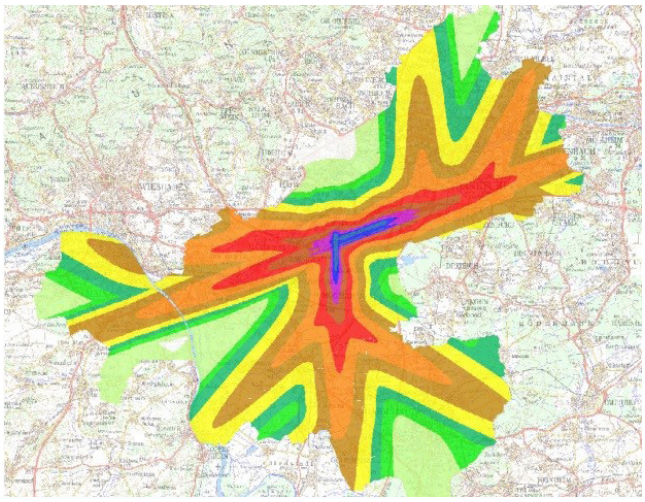


Figure 5: Exemplary designation of aircraft noise protection zones based on the Aircraft Noise Act at an airport (calculated with IMMI AzB module)

Aircraft noise in Europe - The national implementation of CNOSSOS

To improve the noise situation in Europe, the EU issued the Environmental Noise Directive (2002/49/EC) in 2002. It was transposed into German law in 2005. The aim is to reduce environmental noise and to prevent an increase in noise in previously quiet areas. To this end, the exposure is to be recorded in noise maps using uniform evaluation methods for noise indicators in Europe and then reduced by concrete measures. In recent years, the EU, with the participation of the member states, has developed these methods under the acronym CNOSSOS-EU (Common Noise Assessment Methods for Europe).

The new assessment methods have been introduced by an amendment to Annex II of the EU Environmental Noise Directive 2015 and are mandatory for all member states as of December 31, 2018.

In other words, these regulations must be transposed into German law and published in an administrative ruling by the end of 2018.
In corresponding coordination meetings between aircraft noise experts (software manufacturers, experts) - on behalf of the German Federal Environment Agency - the scope for interpretation of the regulations in connection with the application was discussed intensively and was largely conclusive - the result is the German adaptation as CNOSSOS-DE. For quality assurance a test airfield was selected and the calculation results at the receiver points of the test airfield, including the relevant parameters of the flight path segments, were compared and deviations clarified. The selected reference cases of the test airfield represent a comprehensive set of input data which can be used for checking and comparing the results of the calculations of implemented software of different providers or developers. They include combinations of three real reference aircraft, on curved and rectilinear routes, for approach and take-off operations, as well as a round course. A total of 15 reference cases were formed from the combinations of routes and aircrafts and these results have been made available for comparison.

The three real aircraft types selected were

- jet propulsion aircraft with turbofan engines at the tail (type CRJ9)
- jet propulsion aircraft with turbofan engines on the wings (type A320)
- propeller-driven aircraft (type DH8C)

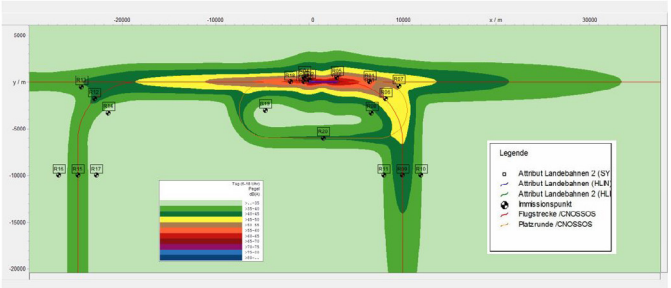


Figure 6: CNOSSOS test airfield for quality assurance of calculation programs (calculated with IMMI CNOSSOS module)

By defining the test airfield in combination with the national implementation of the CNOSSOS guideline for aircraft noise, it is to be ensured that the implementation of the regulation in calculation programs can take place while maintaining quality-assurance and that the users hold proof of this quality test in their hands in accordance with DIN 45687 [2].

Aircraft noise monitoring - virtual measuring stations for those affected

The procedures described above for calculating aircraft noise all have one crucial shortcoming, especially in the eyes of those affected: they are based on planning specifications for flight routes, traffic volumes and statistical frequency distributions of take-offs and landings. Real flight operations may - and will - differ from this. „They don't fly the way they are supposed to in the licensing procedures" is one of the most frequent complaints of those affected who attend citizen initiatives related to aircraft noise.

Now that it is possible to evaluate the transponder signals of most aircraft individually, in addition to complex radar tracking, it makes sense to develop aircraft noise monitoring on the basis of these observations. On this basis we are working successfully with a prototype with a partner of Wölfel since some years.

We has developed an aircraft noise monitoring system which, by combining transponder signals from aircraft taking off, landing or overflying, with qualified aircraft noise calculations, can provide current aircraft noise information for airport operators or those affected. And all without a complex interface to airport infrastructure or measurement technology (Figure 7).

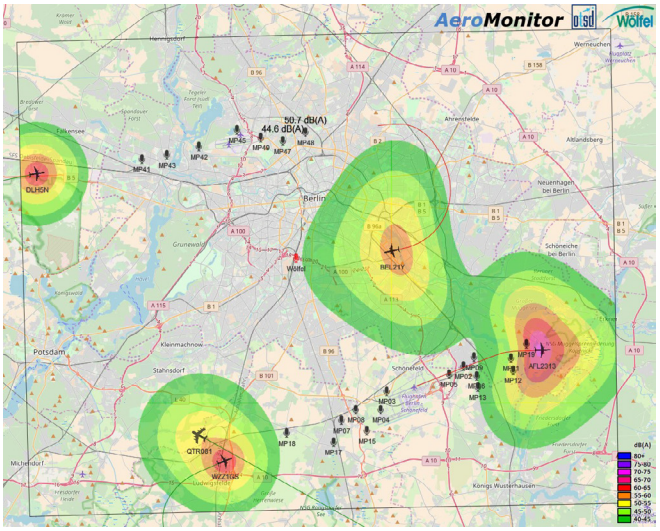


Figure 7: „Footprints" of approaching and departing aircraft near an airfield

Measuring points can be included in the monitoring, but are not absolutely necessary for the statement. More importantly, it is possible to define „virtual measurement positions" that can be installed - or better defined - at the location of a „complainant" and provide essential information on the individual aircraft noise situation.

If you are interested in this technology do not hesitate to contact our colleague Mr. Ibbeken:
ibbeken@woelfel.de

Bottom line

Aircraft noise calculations in Germany concern, on the one hand, the application of the Aircraft Noise Act with its subordinate regulations in licensing procedures and, on the other hand, the implementation of the European Environmental Noise Directive. Due to the considerable consequences of the regulations, steps for quality assurance of calculation programs are necessary and required. The IMMI software is intensively involved in this process and goes through all steps of quality assurance. It can therefore be used without restriction for the diverse tasks of aircraft noise calculation - if required also as a service by our in-house aircraft noise experts.

Modern and self-sufficient aircraft noise monitoring systems supplement aircraft noise calculations based on planning data with the possibility of assessing real situations. They can help reduce the nuisance to residents by making the noise situation at the complainant's individual location transparent and allowing realistic checks to be carried out. In conjunction with an open communication between the airport operator and local residents, this approach can also help to reduce the concrete impact of aircraft noise.

Bibliography

[1] Gesetz zur Verbesserung des Schutzes vor Fluglärm in der Umgebung von Flugplätzen (BGBl. 2007, Nr. 24, Teil I, S. 986- 992) (Law to improve protection against aircraft noise in the vicinity of airports)

[2] DIN 45687, Akustik - Software-Erzeugnisse zur Berechnung der Schallimmissionen im Freien – Qualitätsanforderungen und Prüfbestimmungen, Ausgabe Mai 2006 (Acoustics - Software products for the calculation of noise immissions outdoors - Quality requirements and test regulations , May 2006 edition)
(Acoustics - Software products for the calculation of noise immissions outdoors - Quality requirements and test regulations, May 2006 edition
(Acoustics - Software products for the calculation of noise immissions outdoors - Quality requirements and test regulations, May 2006 edition)

[3] CNOSSOS-EU, Richtlinie (EU) 2015/996 der Kommission vom 19. Mai 2015 (CNOSSOS-EU, Commission Directive (EU) 2015/996 of May 19, 2015)

[4] DIN 45684, Akustik - Ermittlung von Fluggeräuschimmissionen an Landeplätzen
DIN 45684, Acoustics - Determination of flight noise immissions at landing sites

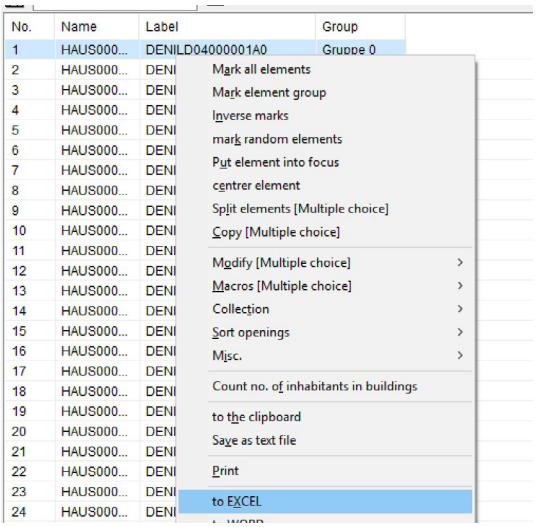
[5] AzB – Anleitung zur Berechnung von Lärmschutzbereichen an Flugplätzen vom 19.11.2008 (AzB - Guideline for the calculation of noise protection areas at airports of November 19, 2008)

Tips and Tricks

There are questions that come up again and again, and there are features that are not very remarkable, but increase your efficiency significantly. As in any field of work, there are also tips and tricks for IMMI that we would like to share with you. And if you should have a tip for us, we would be glad to include it in this collection.

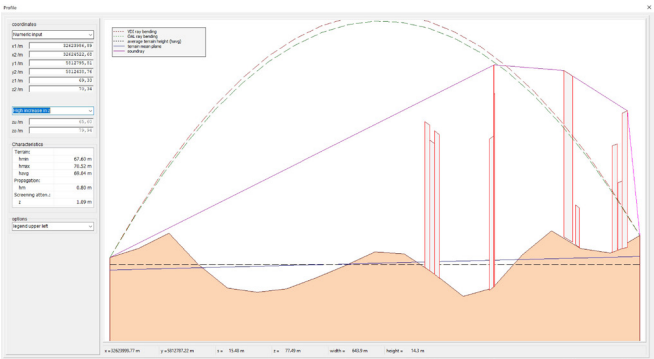
Tip 1: Export lists of input data to Excel

For the fast and efficient output of data, clicking the right mouse button the function **to Excel** can be selected in the menu <Project | Elements>.



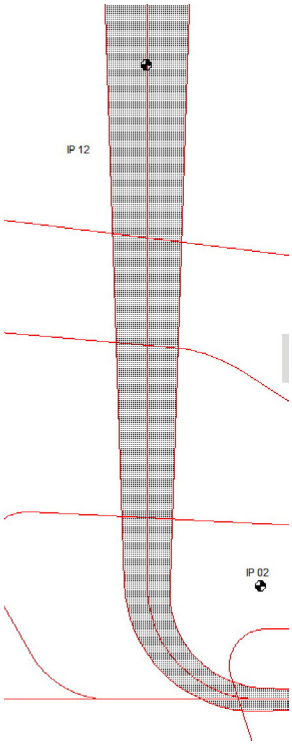
Tip 2: Profile section

With the function **Profile section** - top left in the toolbox - a section between 2 points in the site plan can be displayed. Just click on the map and draw a line. Then a window will open and show the cut. This image can be exported as an image file by clicking the right mouse button on the image.



Tip 3: Show flight corridor

In the upper speed button bar the corridor width for all elements can be displayed in the site plan with a click of the function - Show flight corridor



Here you will find special offers for our customers

Element libraries for aircraft noise

The following element libraries for calculating aircraft noise are available for IMMI and can be purchased separately:

- DIN 45684-1/VBUF
  (Preliminary calculation method for operating noise at airports)
- AzB 2008 (calculation instructions)
- ECAC. CEAC. Doc 29 2nd edition
- CNOSSOS-DE Aircraft noise

Please contact us for the conditions to extend your IMMI equipment or to rent for a limited period of time!

Rental conditions for IMMI software for a limited period of time

You have the possibility to rent the software! Depending on the equipment required, we will charge you an adjusted rental price.

In general: The rent is 15% of the package price in the 1st month and then 7% monthly. The rental period is at minimum of 1 month. And from a continuous rental of 3 months, 80% of the rental costs will be deducted from the package price should the program be purchased.

Performance – knowledge – experience – expertise

Our seminar program:

We are pleased to present our seminar program for the coming year. You can find an overview of all seminar dates on our website

- Seminar IMMI – Basics, Höchberg, October 16 -17, 2018
- Seminar IMMI – Application Air Pollutants, Höchberg, October 18, 2018
- Seminar IMMI – Basics (English), Höchberg, November 13 -14, 2018

Our trade fair and event program:

In 2018 we will be present at numerous trade fairs and events. We look forward to welcoming you and your colleagues there.

- Internoise, Chicago, August 26 – 29, 2018
- Euroregio und Tecniacustica, Cadiz, October 24 – 26, 2018

Wölfel group of companies

The Wölfel Group consists of three companies which have more than 80 employees who are engaged in challenging solutions in the field of vibrations and acoustics.

- Wölfel Engineering focuses on engineering solutions in our central spheres of competence, i.e., vibrations, structural mechanics and acoustics. Our service offer comprises professional opinions by a consulting engineer and turnkey supply of a system for the solution of vibration problems.
- Wölfel Monitoring Systems is the company for the development, production and sale of customized measuring and monitoring systems for oscillations, vibrations as well as sound and noise impact protection, including the associated services. In addition, Wölfel Monitoring Systems is a system house which provides technical support, training courses and application advisory service.
- Wölfel Wind Systems focuses on serial production and delivery as well as installation of SHM and CMS systems and systems reducing vibrations and structure-borne noise for both onshore and offshore wind turbines.

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