



Research Network Quiet Traffic
Working Group on Aircraft Noise

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**FREQUENZ PART 3 – Investigation of noise reducing
retrofit measures for existing aircraft**

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Joint Research Project in the Framework of the
3. National Research Programme on Aeronautics
(2004 - 2007)

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Gerd Saueressig



Bundesministerium
für Wirtschaft
und Technologie

Co-financed by:

FREQUENZ: a joint project within the *Research Network Quiet Traffic*



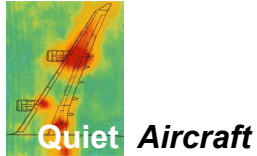
Focal Point 5000: <i>Quiet Commercial Aircraft 2004-2007</i>	
LEXMOS	5100 Quiet exhaust nozzles and modern sound source localisation - <i>Rolls-Royce Deutschland</i>
NASGeT	5300 New active / passive systems for noise reduction of aero engines - <i>EADS-Dornier</i>
FREQUENZ	5400 Computational Aero-Acoustics (CAA) methods for the design of low noise aircraft components - <i>DLR</i>
	5200 Aerodynamic noise - wind tunnel experiments and data for model validation - <i>EADS CRC</i>
	5500 Development of retrofit measures of existing aircraft - <i>Lufthansa</i>
LAnAb	1600 Noise optimized approach and departure procedures - <i>DLR</i>

Interconnected with other Joint Projects:

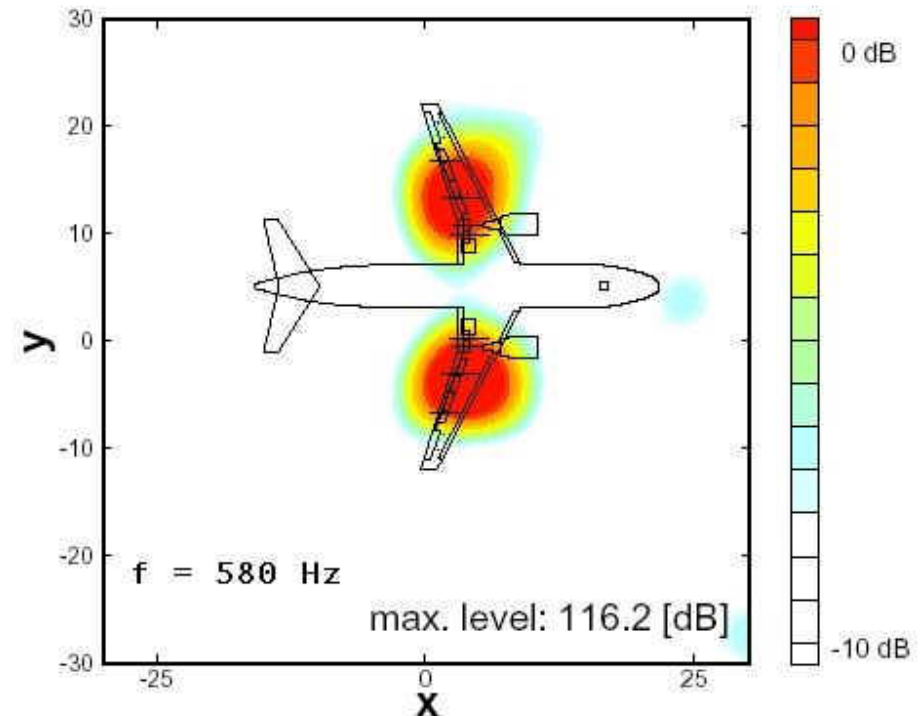
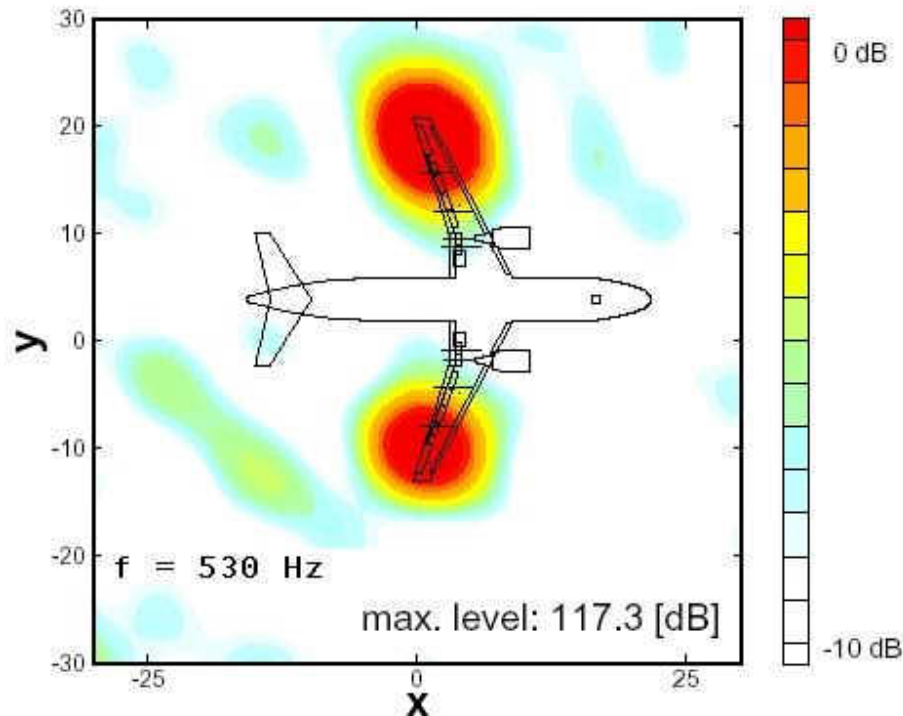
- Innovative high lift devices (*Airbus Germany*)
- *Quiet Air Traffic II* (*DLR*)



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Preceding Work of DLR and Lufthansa: *Quiet Aircraft* Initiative (Airbus A320)



- Two distinct strong tones at 530 und 580 Herz caused by overpressure relief outlets in the lower wing surface
- Elimination of both tones by using **vortex generators**
- 30-20 km before landing:

→ reduction of the overall sound pressure level up to 6 dB(A)





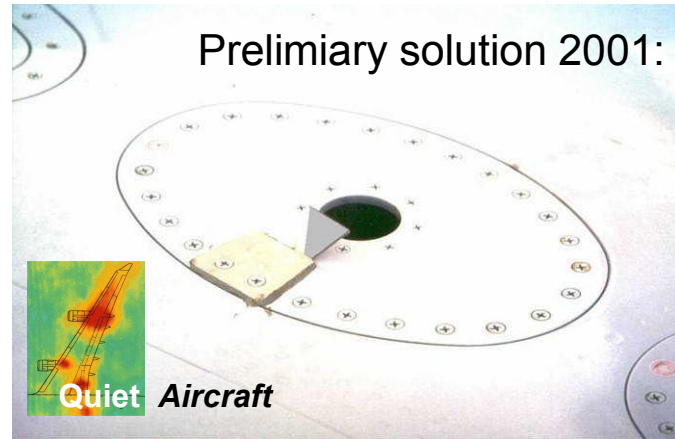
A320: Further Development of the Vortex Generators



Enhanced solutions 2004: FREQUENZ

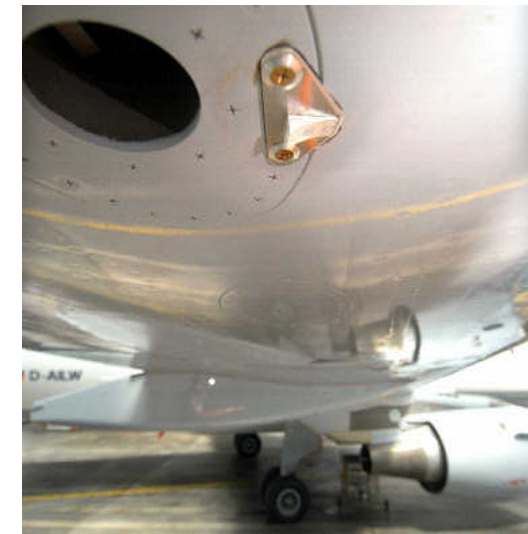
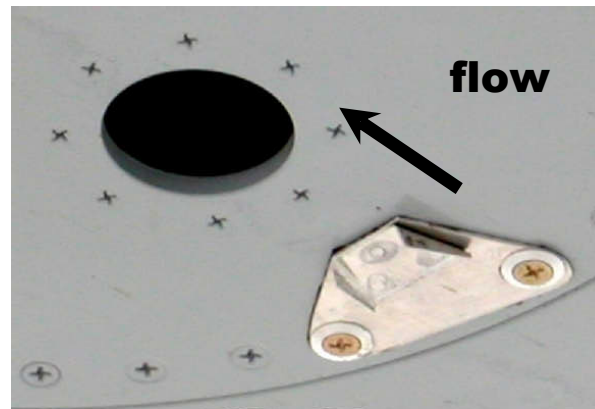
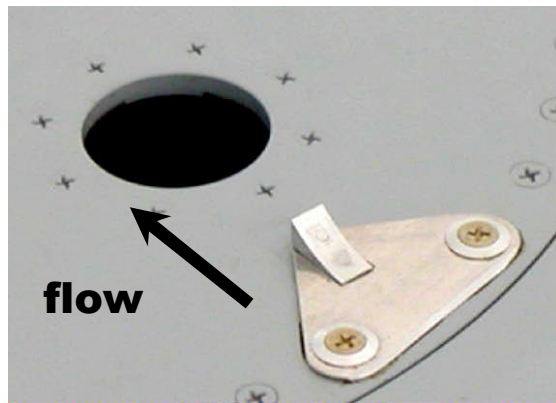


Wind tunnel tests of a ramp-profile

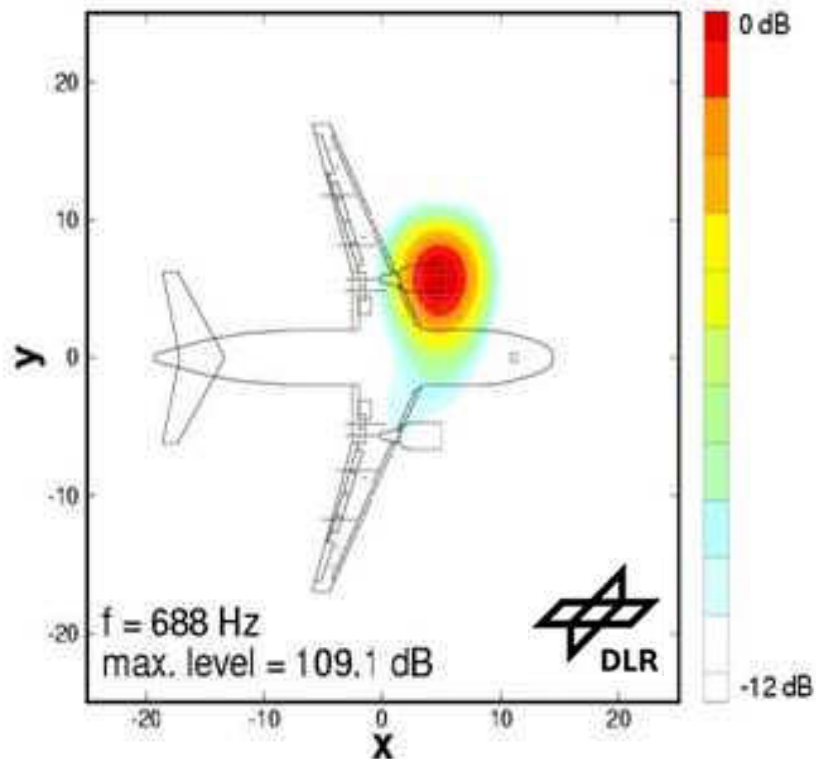


Preliminary solution 2001:

2 solutions manufactured and mounted in the lower wing surface:



- Investigation of a tonal source in the area of the engine inlet:



Hypothesis 1:



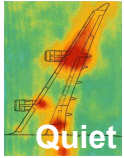
Sensor B:
tone

Sensor A:
no tone



Hypothesis 2:





Quiet Aircraft

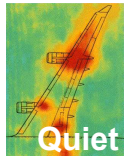
Preceding Work of DLR and Lufthansa: Flyover Noise Measurement of MD11-F



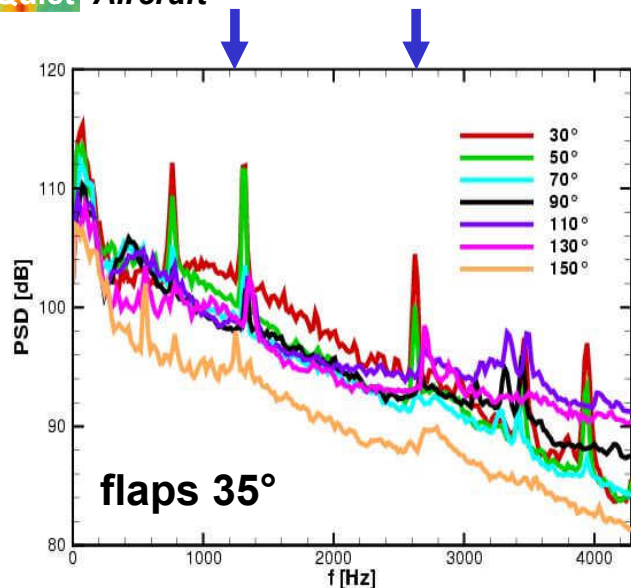
46 flyovers in ~ 5 hours
total flight time

A) Investigation of different landing procedures

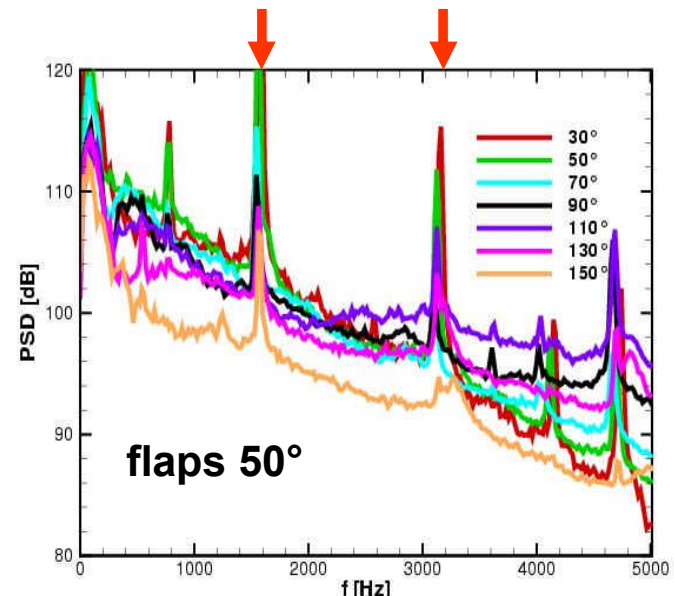
B) Analysis of single noise sources



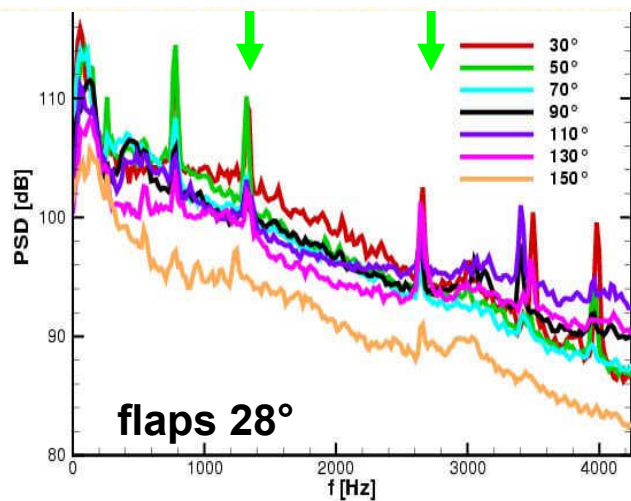
Preceding Work of DLR and Lufthansa: Different Landing-Procedures for MD11



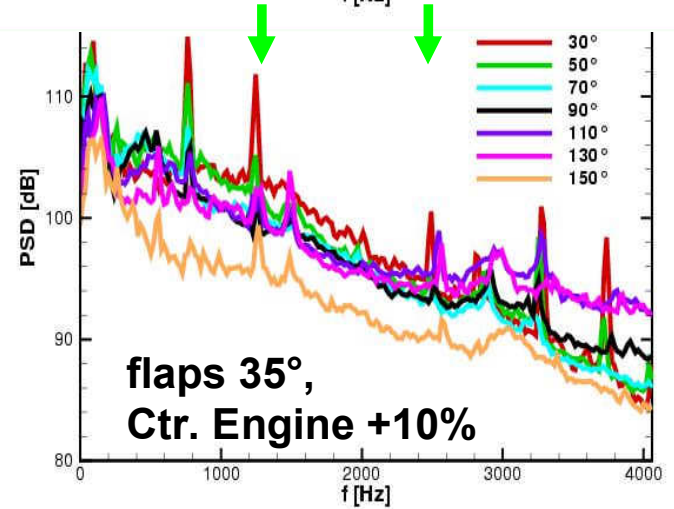
ref



+2 dB

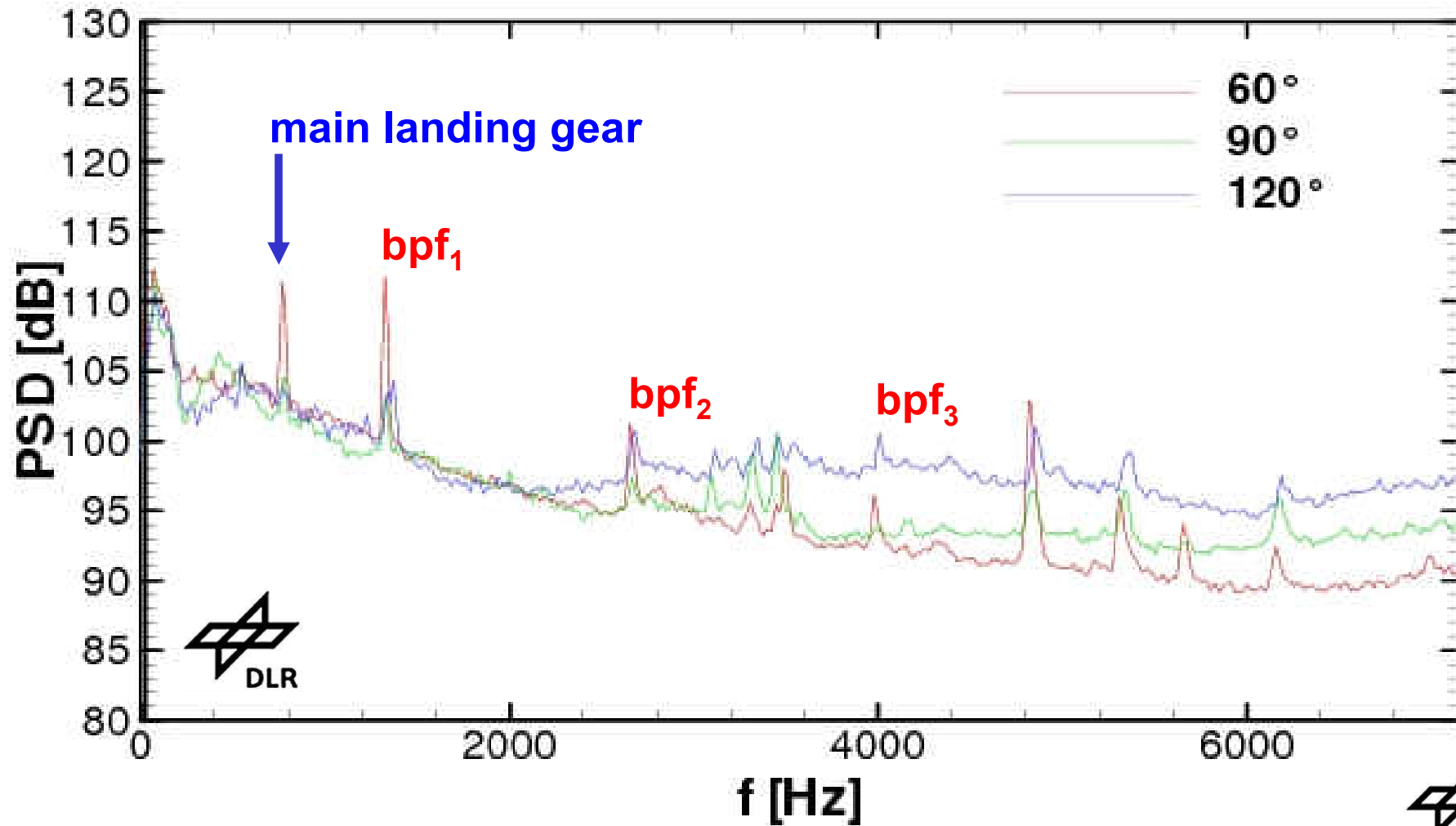


-2 dB



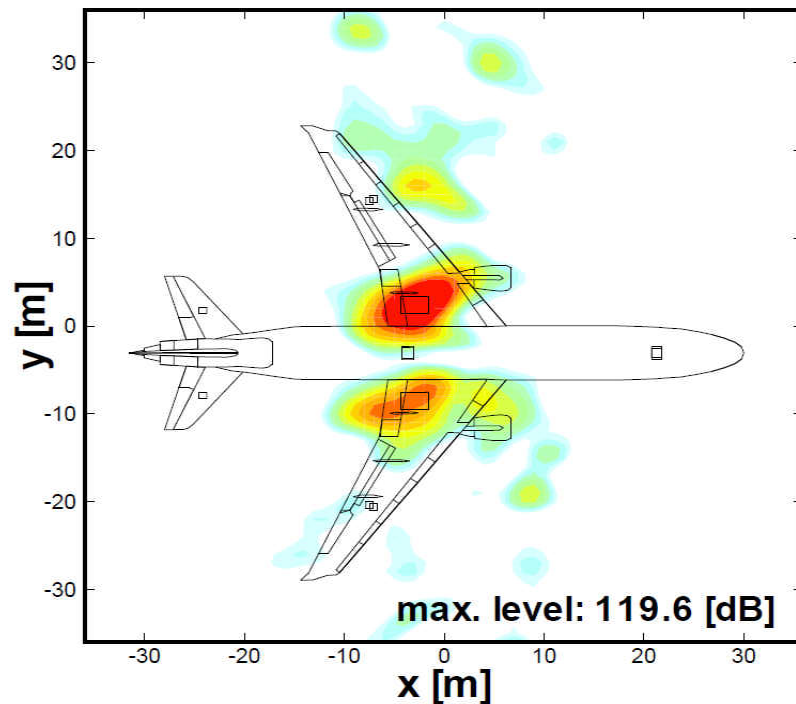
-2,5 dB





main landing gear: 768 Hz ..

.. -tone is most likely caused by:



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Euronoise 2006 – paper No. 192

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