

Low noise emission rolling and take-off procedures: monitoring of courier carriers for the Orio al Serio airport

A.C. Bertetti ^a, R. Martelli ^b and M. Masoero ^c

^aStudio Progetto Ambiente s.r.l., Corso Rosselli 44, 10128 Torino, Italy

^bS.A.C.B.O. S.p.A., Aeroporto di Orio al Serio, Via Aeroporto 13, 24050 Orio al Serio (BG), Italy

^cDipartimento di Energetica Politecnico di Torino, C.so Duca degli Abruzzi 24, 10129 Torino, Italy

The verification of the acoustic impact determined by the introduction of alternative take-off procedures, with respect to the ones presently adopted, with reference to the city of Orio al Serio (Bergamo, Italy) and to the municipalities along the Eastward exit routes that are most exposed to noise, falls in the frame of studies aimed at the planning of night flights and at the optimisation of the “noise budget” of the airport. The results allow a comparison of the acoustic performance of alternative take-off procedures, and of the noise reducing strategies applicable to the Orio al Serio airport. Furthermore, the adoption of a “slot allocation” policy, i.e. the priority assignment to flights of silent carriers aimed at optimising the loading capacity of the environment (available annual noise load), can be based on the experimental results.

INTRODUCTION

The bill of law 72280 art. 28, presently under examination by the Environment Commission of the Italian House of Parliament, re-proposing the contents of D.P.R. (Decree of the President of the Republic) 9 November 1999 n. 476 [1], suspended by the TAR (Regional Administrative Tribunal) of Lazio, introduces the banning or the limitation of night flights, a fact that induces very severe operative constraints for national airports specialised in courier and all-cargo traffic. SACBO, the company that manages the Orio al Serio (situated near Bergamo, about 50 km east of Milano) airport, has therefore decided to evaluate the effects determined by the adoption of alternative take-off procedures, aimed at reducing the night-time noise annoyance for the residential areas near the airport. The experimental activities have been co-ordinated with DHL, in order to achieve a more effective involvement of the pilots in the tests, and to obtain a higher level of information about the carriers. The experimental data in the municipalities situated Eastward of the airfield (Cassinone, Bagnatica) have been provided by the monitoring network of the Province of Bergamo.

POSITION OF THE MICROPHONES

The positioning of the microphones reflects the goals of the acoustic inquiry, which is aimed at acquiring information on the noise impact on the southern urban area of the Orio al Serio and, at the same time, at verifying the consequences on the territory situated

east of the Serio river. The map of Figure 1 shows the position of the five microphones:

- RM-AE-H5/7: 2 microphones 189 m from the runway axis, height +5 m and +7 m with respect of the present noise abating hill;
- RM-08: 1 microphone at the first floor of residential building “Casa 1”;
- RM-11: 1 microphone at the second floor of residential building “Casa 3”;
- RM-12: 1 microphone at the first floor of residential building “Casa 2”.

Measurements have been performed simultaneously in all points: A-weighted SPL (fast) were recorded every 0.5 seconds; the clocks of the data acquisition units were previously synchronised.

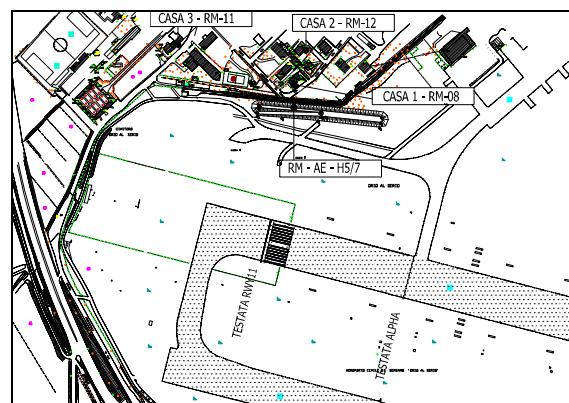


FIGURE 1. Position of the microphones.

TAKE-OFF PROCEDURES AND TYPE OF CARRIERS CONSIDERED

All night take-offs presently take place from RWY11, from west towards east. Three types of take-off procedures have been examined:

- TEST1, take-off from a stand still, at position Alpha (east of RWY11), applying the appropriate take-off thrust;
- TEST2, rolling take off from the beginning of the runway: gradual thrust is applied to reach the appropriate take off thrust at position Alpha;
- TEST3, take off from a stand still at the full length position (RWY11), applying the appropriate take off thrust.

The carriers utilised by DHL include 1 B757, 2 A300 and 4 B727. Totally 14 TEST3, 5 TEST2 and 8 TEST1 take-offs have been examined, partially including some flights by operators other than DHL.

RESULTS

The results of the monitoring activities (A-weighted SEL values for selected take-offs are given in Table 1) provide valuable results, both in terms of performance comparison of different take-off procedures, and in terms of noise reduction strategies applicable to the Orio al Serio territory.

- a) Independently from the take-off procedure and type of carrier, the maximum impact occurs at receptor RM-08, which is closest to the beginning of the runway, and the minimum impact at receptor RM-12, situated on the second row of buildings. Rolling take-offs and take-offs from Alpha always penalise, at different degrees depending on carrier type, the eastward territory.
- b) For the B727 the procedure determining the maximum impact in all positions is that with gradual acceleration (TEST2), while the best results are given by TEST1 with take-off from

Alpha for receptor RM-11, and TEST3 (traditional procedure) for receptor RM-12.

- c) For the A300 the procedure determining the maximum impact is the rolling take-off (TEST2), while the best performer is the take-off from Alpha (TEST 1) for all receptors.
- d) For the B757 no significant differences occur at point RM-08, located in front of RWY11, with a slight impact increase for the traditional take-off. Similarly to the B727, the best results are given by TEST1 for westerly point RM-11 and by TEST2 for easterly point RM-12. The difference between running and traditional take-off at points RM-11 and RM-12 is negligible.

In order to improve the situation in the most critical residential area of Orio al Serio, presently characterised by $L_{va} > 75$ dB(A) (zone C), the following short- and medium-term strategies may be adopted:

Short-term scenario (until April 1st, 2002): before phasing-out of Chapter 2 carriers, maintain for the B727 the take-off from RWY11. For the A300 and B757, albeit their contribution to L_{van} is marginal in presence of the B727, a take-off from position Alpha is preferable.

Mid-term scenario (after April 1st, 2002): after phasing-out of the B727, the adoption of take-off from position Alpha, furthermore reducing the impact on the south-west residential area of Orio al Serio, is advisable.

REFERENCES

1. DPR 9 novembre 1999, n. 476 "Regolamento recante modificazioni al decreto del Presidente della Repubblica 11 dicembre 1997, n. 496, concernente il divieto di voli notturni".

Table 1. Summary of the results (SEL [dB(A)])

RECEPTOR POINT	CARRIER TYPE	TEST 1 (Alpha)	TEST 2 (Rolling take-off)	TEST 3 (RWY11)
RM-08 CASA 1	B727	108.0	109.3	105.4
	A300	100.8	104.5	101.1
	B757	95.2	95.0	96.1
RM-12 CASA 2	B727	98.6	99.1	95.3
	A300	89.0	90.3	89.6
	B757	87.1	84.3	85.3
RM-11 CASA 3	B727	100.2	103.9	102.9
	A300	91.7	98.0	94.4
	B757	85.5	89.5	90.0

