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MOD Position and Policy on Aircraft Environmental Noise

Introduction

1. This paper reports a swift study of the legal, policy and practical implications for the MOD of aircraft environmental noise, identifying risks and proposing work to mitigate them. The formal TOR are at Annex A. The study, which fulfils a remit from 2nd PUS[1], was initiated following a court case (the *Dennis* case)[2] in which some £950k damages were awarded against MOD for nuisance from the noise of aircraft taking off and landing at RAF Wittering. For coherency the paper also considers wider issues, including noise from low flying aircraft and other sources. It takes account of the possible health hazards of noise, as well as nuisance or annoyance.

2. The paper considers the social and policy environment, land-use and development planning, the current MOD policy and position, relevant law, and noise insulation. The recommendations include further policy, legal and technical analysis as appropriate.

3. Noise is a complex technical subject. Those unfamiliar with it may find the simplified description of concepts and terminology at Annex B useful.

Social and Policy Environment

Environmental Impact

4. Environmental awareness has increased considerably since the current Service airfields and ranges were established. It is now Government policy for Departments to produce and publish environmental assessments for all new policies and programmes[3]. Recent comments by the Parliamentary Environmental Audit Committee will increase the attention paid to this policy. These assessments are almost certain to be available to the public. The noise impact of flying and of ranges both generally and on "tranquil areas", especially the National Parks, will be scrutinised by pressure groups. Proper consideration of environmental impact, including the concept of "environmental capacity", must be built into MOD planning processes. This would ensure that all the environmental angles are addressed, including the emission of exhaust gases and unburnt fuel from aircraft, which is sometimes mentioned in letters from the public. The potential for environmental constraints is illustrated by environmental pressure in Germany leading to a ban on flying below 1000 feet, and a US court banning the US Navy from using certain sonar systems because of their impact on sea mammals[4].

[1] 2nd PUS E-Mail of 1719 hrs 16 May 2003
[2] Dennis and another v Ministry of Defence, 2003 ALL ER(D) 300 Apr; 2003 EWHC 793 (QB)
[3] DOE Circular 15/88. The Legal Adviser is investigating a possible legal obligation.
[4] Reported on CNN on Monday, October 13, 2003 at 1826 GMT - see http://www.cnn.com/2003/TECH/science/10/13/whales.sonar.ap/index.html

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Noise generally

5. Noise can cause annoyance at quite low levels. Our intuitive acceptance of that is supported by sociological research correlating levels of annoyance with acoustic measures of noise. Very loud noise can cause hearing or other health damage, which is an important consideration for health and safety at work. Not least because their separation from the noise source is usually greater, there is rarely noise danger to non-employees, but MOD range and aircraft noise is loud enough for potential injury to the public to have to be considered.

6. The overriding public attitude is of decreasing tolerance of noise annoyance, and an expectation of improvements. The difficulty over Heathrow Terminal 5, and over new civil runway capacity, despite the relative quietness of modern civil aircraft, illustrates the point. Night flying is particularly unpopular.

7. European interest in environmental noise has led to a Directive[5] under which member states are to conduct some environmental noise mapping, although noise "due to military activities in military areas" is excluded[6]. Member states are required to draw up action plans to reduce noise around major roads, airports and railways, and around settlements with more than 250 000 people – none of this would immediately affect MOD. However, DEFRA's domestic ambient noise strategy would extend noise mapping to the whole country, including the areas around MOD airfields [redacted] with no mention of MOD being exempt.[7] DEFRA officials are ready to work with MOD to make the impact of the strategy on us as po [redacted]

8. A set of aspirational standards for environmental noise has been published with a World Health Organisation (WHO) imprint (although apparently without formal WHO endorsement). The EU estimates that 40% of its citizens experience noise above the "WHO" levels; MOD aircraft noise is considerably above those levels near many airfields during flying hours, although the number of people affected is only a very small percentage of the population.

Civil Aircraft Noise

9. The Government (DTLR, now DfT) conducted public consultation on measures to increase the controls on civil aircraft noise in 2000. There was further consultation in 2002/3 on regional airport strategy, mainly concerning new runway capacity. The latest Government position is in the Aviation White Paper published on 16 December 2003; there has not been time to analyse it fully for this report, but its main noise provisions are reflected below.

10. There have been statutory noise insulation schemes at Heathrow and Gatwick airports, but now BAA establishes non-statutory schemes, as the operators of regional airports have done. The provisions vary, but BAA's latest scheme, at Stansted, offers an insulation package

[5] Directive 2002/49/EC of 25 June 2002
[6] Art 2.2. D S&C have proposed a definition of "military areas" to DEFRA for the UK implementation.
[7] DEFRA News Release 306/01 dated 20 December 2001

[redacted]

to properties within a contour of $L_{Aeq,16h}$ [8] = 66 dB(A), with a separate night noise criterion. The Aviation White Paper expects that in future airport operators will: provide relocation assistance for households subject to $L_{Aeq,16h}$ = 69 dB(A); offer to purchase properties newly exposed to that level of noise; and set a lower qualifying level of 63 dB(A) for insulation for houses affected by increased[9] aircraft noise as the result of the construction of new runways. An option of cash payments for householders has been dropped, but there is a requirement to extend insulation to noise-sensitive non-residential buildings (eg schools) or, where insulation is impracticable, to offer alternative mitigation [redacted] [Redacted under s.35].

Public Attitudes to MOD Noise

11. The volume of complaints shows a continuing public concern about current levels of MOD noise. However, it appears[11] that around many MOD airfields complainants are far outnumbered by those who see the economic benefits of the Service presence as outweighing the annoyance of aircraft noise. And since noise from MOD airfields, ranges and low flying generally does not affect urban areas, it is likely that the vast majority of the public has no view on the subject. [redacted] [Redacted under s.35].

12. Away from airfields (that is, around air bombing ranges and in the low flying system) the noise is separated from the economic benefits. Continued efforts to explain the national benefits of low flying are therefore particularly important here. The Test & Evaluation Ranges appear to bridge these categories – at the more remote, many of the neighbours are employees, while Shoeburyness attracts complaints from a very wide area.

13. **Conclusion 1: Environmental awareness has increased significantly since MOD's airfields and ranges were established, and proper consideration of environmental impact must now be built into MOD plans. Effective engagement with DEFRA's ambient noise strategy will be necessary if its impact on MOD is to be positive. General public acceptance of MOD noise rests on its lack of impact on urban areas and the economic benefits of Service activity near airfields and ranges in rural areas – those who experience the noise but not the economic benefit complain most, and the wider defence benefits must be promoted to them.**

Land-Use & Development Planning

14. The Crown is exempt from planning control[13]. However, under a procedure outlined in Circular 18/84, Crown bodies, including MOD, must consult the local planning authority on proposed developments. As part of the process, planning authorities may require an

[8] See Annex B for a brief explanation of the terminology.
[9] Probably increased by 3 dB(A).
[redacted] [Redacted under s.35].
[11] This is reported by stakeholders, and supported specifically by comments at a public meeting at RAF Coltishall on 24 November 2003.
[redacted] [Redacted under s.35].
[13] The Planning and Compulsory Purchase Bill, currently before Parliament, would remove that exemption. It will not be in force before mid-2005. In practice, its effect will be to formalise the existing practice; this may make the planning authorities feel more empowered to raise objections to Crown development.

[redacted]

[redacted]

Environmental Impact Assessment[14], which should always cover noise at least in outline, and should treat it in depth for aircraft-related or range developments. DEFRA are developing guidelines for noise impact assessments. Planning authorities will often consult non-Governmental organisations (NGOs), which may raise wider issues: for example, a development at Brecon (in a National Park) was challenged by an NGO interested in National Parks that had identified that the Environmental Impact Assessment produced by a contractor failed to justify the requirement for the development.

15. The attitude of planning authorities will be influenced both by the local economic impact of the development and by the attitude of local residents to MOD noise. Where noise annoyance is an issue, it will be necessary to show that the benefits (defence, economic and other) and mitigation together make the noise justifiable. Even if the noise will be no worse than currently, simply saying so will be insufficient.

16. **Conclusion 2: The planning control system will require strong and careful justification of the environmental impact, including noise, of MOD developments.**

17. The Government seeks not only to restrict the impact of new noisy activities on existing housing etc, but also to restrict noise-sensitive development in noisy areas[15]. This is expressed in "Planning Policy Guidance 24 – Noise" (PPG24), whose annexes cite the WHO noise levels (see para 8. above). Around airfields, the presumption is that planning permission for new building should be refused where the daytime $L_{Aeq,16h}$ exceeds 72 dB(A), and normally refused where the value is between 66 and 72 dB(A). For civil airfields, authorities are required to use appropriate longer-term forecasts of air traffic in plotting noise contours. Around military airfields, they simply have the Noise Insulation Grant Scheme[16] contours, which are based on current activity levels, and are for different noise values. Given that more housing near an airfield translates into more people exposed to noise, and thus more pressure to reduce noise, MOD should use the PPG24 system to influence planning authorities to restrict development as far as possible. As plans for the introduction of new aircraft or the rebasing of old ones develop, we should provide planning authorities with maps showing the predicted noise contours for all the PPG24 noise levels when the change is implemented. It would be feasible to go beyond that, to identify the implications of all the feasible future options [redacted]
[Redacted under s.35].

18. Simply lodging maps for PPG24 purposes is insufficient, however – it is necessary to identify planning applications of interest, and to enter an objection where appropriate. Monitoring applications may be quite onerous, and some have been missed (notably at Shawbury). Defence Estates, whose responsibility it is, should review the priority and resources attached to this work.

[14] See also para 4. above.
[15] Note that this is different from the "safeguarding" procedures, which seek to restrict development that would jeopardise flight safety.
[16] See para 88. below.

[redacted]

[redacted]

19. PPG 24 is being revised: MOD has been represented on the DEFRA working group, and has been invited to draft the passages relating to defence noise. This work requires a high MOD priority and adequate expert input, but the current (non-specialist) desk officer retires in March with no arrangements yet made for his replacement.

20. **Conclusion 3** [redacted] [Redacted under s.35]. **MOD should provide planning authorities with maps showing the predicted contours resulting from planned developments, and consider doing so for selected possible options. Public relations activity should explain the rationale. Defence Estates should allocate appropriate resources to monitoring planning applications around MOD sites** [redacted] [Redacted under s.35].

MOD Policy

Noise Policy

21. The Department's principal formal noise policy statement, as set out in the Environmental Manual (JSP 418) is:

> "Every effort will be made to keep the disturbance to the public unavoidably caused by the noise generated by military activity to a minimum. Where possible, activities generating substantial noise will be kept at a distance from residential areas, and night time activity will be limited to achieving training objectives which cannot be met during the day. The amount of military training necessary is constantly reviewed as the world security situation changes.[17]…The control of environmental noise will be managed at the local level[18]."

22. JSP 418 mentions the defence exemption for noise from premises in section 79(2) of the Environmental Protection Act 1990[19], and records a Ministerial commitment to exploit the exemption only for operational and training reasons.

23. JSP 418 does not include any reference to specific noise levels. In particular, it does not mention the Government policy (set by the Cabinet Home Affairs Committee in 1970[20]) that houses and land exposed to aircraft noise levels of 125 dB(A) max[21] or more should be compulsorily purchased. This apparently followed advice from the RAF Environmental Noise Committee, reported to be in the public domain in 1990, that a single exposure at 125 dB(A) max had the potential to damage hearing. The policy of compulsory purchase at 125 dB(A) L_{Amax} is maintained in connection with the Noise Insulation Grant Scheme, but there is no accessible record of its being applied[22]. A parallel policy restricts aircraft noise in

[17] JSP 418 Para 7702
[18] JSP 418 Para 7707
[19] EPA90 is discussed further in para 77. below – note that JSP 418 does not give a full picture of the defence position under the Act, and that noise from aircraft is entirely excluded.
[20] It has not proved possible to recover the paper before the end of the study. It is described in some detail in D/Sec(AS)/33/7/4 of 20 Oct 89 (copy on D/PL(LS)/24/2 Part E).
[21] Without the original papers, the precise terminology remains unclear.

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the Low Flying Areas to 125 dB(A) L_{Amax}. Current work by the Aircraft Noise and Health Committee is reviewing the scientific basis for this limit – it is expected to show that there is a significant safety margin, and that in any event field monitoring indicates that most flights generate rather lower noise levels.

24. The Test and Evaluation air, explosives and gunnery ranges have a similar policy, although its origin is not clear[23] [redacted] [Redacted under s.43]. These provisions do not apply to Service ranges, and apparently the tank range at Lulworth Cove regularly generates 140 dB(C) peak on a public road.

25. The practical application of the requirement to control noise locally did not become apparent during the review. Certainly, apart from noise abatement practices at airfields (see para 36. below) the TLBs consulted did not proactively offer examples of effective plans.

26. **Conclusion 4: The MOD environmental noise policy statement in JSP 418 does not record in full the endorsed MOD policy, and does not specify any noise levels. The noise restrictions applied to Test and Evaluation and Service ranges are unclear, as is the general operation of the requirement for local control of noise.**

Sustainable Development and Environmental Policy

27. The Secretary of State set out MOD's overarching policy on sustainable development and the environment on 7 July 2000. He said the Department:

> "…will carry out environmental policy appraisals of all new or revised policies and equipment acquisition programmes, and environmental impact assessments of all new projects and training activities".

28. Until Department-wide guidance is in place, there is scope for varying interpretations of this – as one stakeholder asked, does it apply when an airfield's role or use, or the type of aircraft based there, is changed?[25]. Defence Estates and the DLO are perhaps the furthest advanced in implementation, with comprehensive processes for projects, and guidance that has just been updated for reissue in December 2003 and January 2004 respectively. The appraisal of policies is more problematic but a number of pilots have led to the development of a policy appraisal tool, which should be generally available before April 2004.

29. The DPA's environmental policy is at a rather earlier stage. The principal relevant components of the current draft are:

> Policy statement: The DPA will comply with MOD [and Safety Board] policy … All equipment and systems procured…will comply with all statutory…environmental requirements and regulations.
>
> Aim: …all precautions are taken to prevent harm to…the environment consistent with achieving the operational capability set by [DPA's] customers.

[23] Apparently first adopted voluntarily by the range operators, and perhaps principally to minimise complaints [redacted] [Redacted under s.43].

[25] E-mail from ACFT TGDA of 1621 hrs 4 December 2003

[redacted]

[redacted]

Performance Target: No restrictions or limitations on equipment…procured and managed by DPA.

30. It is clear that this will interface most effectively with a very specific noise policy. How, for example, will DPA identify that aircraft noise may limit the maximum speed and minimum height of low flying if that element of the noise policy is not accessible to them?

31. **Conclusion 5: The existing MOD policy on environmental appraisal and the best supporting guidance are comprehensive and prompt identification of noise issues at an early stage. Adoption of effective guidance across the Department needs to be progressed urgently, while MOD noise policy must emphasise the increasing significance of noise as an issue and provide clear guidance as to what levels are acceptable.**

MOD Position

General

32. [redacted] [Redacted under s.35].

33. The MOD's principal noisy activities are flying from airfields, ground-running and testing of engines, low flying, and the use of air, gunnery and explosives ranges. Various initiatives (eg the increased use of simulators in flying training) have reduced noise, but they result principally from financial rather than environmental considerations. There is no central analysis of MOD sources of environmental noise.

34. In the UK, military aircraft are deemed to be low-flying when they are operating below 2000 ft, or 500 ft for helicopters and light propeller-driven aircraft. Fixed wing aircraft are required to keep a strict 250 ft minimum separation distance between any part of the aircraft and the ground or any other object (trees, electricity pylons, etc). A small amount of 'operational low flying' between 250 and 100 ft is permitted in specific areas. Helicopters may generally operate down to 50 ft, although under certain circumstances – when disembarking troops for example – they may be permitted to operate down to ground level[26]. Speed, and sometimes height, restrictions are placed on different aircraft types to ensure that they do not exceed the mandated noise levels.

35. There are no set routes in the low flying system. Instead, with the aim of spreading activity, crews choose their own routes, subject to restrictions such as avoiding towns with more than 10,000 inhabitants. Other temporary or permanent "avoids" are agreed for noise-sensitive locations, although there is a strong presumption against doing so, because the effect is simply to move the noise elsewhere, and perhaps concentrate it. The criteria for avoids are not published. Since the low flying system extends only up to 2000 feet, aircraft may still fly over avoids at what seems to the public to be low altitude.

36. Local arrangements around airfields seek to adjust flying routes and times to meet local sensitivities as far as possible (eg avoiding noise during funerals or school exams, or

[26] Fuller details of the Low Flying System may be found in *The Pattern of Low Flying across the United Kingdom 2002/2003,* available from DAS.

[redacted]

[redacted]

imposing a local curfew on night flights). Again the criteria are not published, and even knowledge of the existence of the arrangements seems limited[27]. Notice of planned night and weekend flying activity is routinely published in local newspapers and on websites; lists of residents also receive e-mails at some stations.

37. In the *Dennis* case, the MOD witnesses were unable to explain how much the volume of flying or the noise experienced at the property might have changed since Harriers were introduced in 1968/69[28]. More generally, the systems for recording airfield movements and low-flying sorties were not designed with the information required for noise assessment or prediction in mind. Further historic information can apparently be extracted from aircraft logbooks, but this is a time-consuming activity. There is, however, no way of anticipating concentrations of low-flying activity by collating aircrew plans, and there is no systematic method of identifying how much low-flying activity has affected any particular place, although an improved computer system is planned. Specific complaints are currently investigated by manual methods.

38. **Conclusion 6: The MOD's systems for recording airfield activity and low flying were not designed with noise assessment in mind. The arrangements for locations to be avoided, temporarily or permanently, both in the low flying system and around airfields, are not published.**

Organisation

39. The MOD organisational position is complicated by the fact that noise has both health and safety and environmental impacts. The technical synergy can lead to noise issues being considered wholly within a health and safety cell, and divorced from immediate responsibility for wider environmental concerns (this is, for example, the case in D S&C). Following a recommendation of a 1985 study[29], the post of Departmental Environmental Noise Officer was announced in Parliament[30], established and filled, but it has now effectively lapsed[31].

40. Another factor is the functional structure of the principal safety (including environmental) boards, which means there is no focus for noise below the top-level Defence Environment and Safety Board. And there is no direct link between the boards and the budgets and activities of the TLBs. An MOD safety review is to consider all this in 2004.

41. TLBs, agencies and IPTs employ noise specialists or buy in expertise and advice from QinetiQ, other consultants and the universities according to their perceived needs, with no oversight mechanism. The principal in-house noise expertise is in the Noise & Vibration Division (NVD) at RAF Henlow which, amongst other things, carries out environmental noise surveys at MOD airfields. It is tasked with providing support across the Department, but its organisational position (within the RAF Centre of Aviation Medicine, under the Air Officer

[27] One example in the files is of a RAF NCO relaying concerns from other parents that aircraft from his station had disrupted the sports day at his child's school, to be told by the station authorities that "if we had been informed in advance, we could have made it an avoid".
[28] *Dennis* judgement paras 7 & 53
[29] "Noise from Military Aircraft", May 1985; by AM Boardman, PL(Lands)4, para 167
[30] House of Lords Official Record, 14 November 1985, col 482.
[31] The post was held by a Grade 7 (now Band B2) from 1991-97. The duties were then combined with others in a Band C1 post in a Health and Safety branch, and the ENO duties will cease to be identifiable when the incumbent retires in March 2004.

[redacted]

[redacted]

Administration (AOA) at RAF PTC, and even then far separated from the RAF's Chief Environment and Safety Officer even though he is also under AOA) militates against this. There is no direct link between NVD's resources and its customers needs, so that NVD's capacity may well constrain the rate at which work can be carried out, while the informality of the customer link may result in misunderstandings over tasking. The Occupational & Environmental Science Division of the Institute of Naval Medicine (INM) also has specialist expertise in environmental noise. Its position is analogous to that of NVD, although its availability is if anything less well known[32].

42. Some of the key players (NVD, DSEF Pol, DAS) come together in the Aircraft Noise and Health Committee. However, other stakeholders are absent; the relation of the committee to the main safety board structure is unclear; and its work appears to proceed slowly.

43. This study has found several instances where the formal corporate memory on noise is weak. Sometimes this is rectified by individual recollection, but there is a clear risk of further important aspects being lost from sight as experienced staff are posted or retire, and as archived files reach their review dates and are destroyed.

44. **Conclusion 7: The MOD organisational structure does not deal coherently with environmental noise. The safety/environmental committees are separated from business decision making and funding. The principal in-house noise resource is not funded to meet the demands of its customers, and the customer-supplier relationship is informal. The Department's corporate memory on noise is weak.**

Aircraft Procurement

45. The 1985 noise study recommended[33] that when equipment was being purchased, MOD should say that it wished:

> "to be informed of measures which could be taken to reduce the noise footprint of the aircraft during peacetime training without significantly affecting its wartime performance".

46. This appears not to have been put into effect. Indeed, noise appears not to have been a factor in user requirements for aircraft, thus effectively ruling out any opportunity of the most effective mitigation, which is to reduce the noise at source[34]. This also means that there has been no justification for systematic research into noise reduction. ***Box 1*** summarises the current position on a selection of aircraft procurement projects. It shows that, with the exception of A400M, environmental noise has been very much an afterthought. This is reported as a fact, with no implication of blame: any failing is systemic rather than individual, and of long standing – the then ACAS was advised in 1990 that noise had not been a factor in the Typhoon specification, and that it was even then too late to take action[35]. However, the consequence is that, on Typhoon and JCA alone, the Department is committed

[32] The question whether it is appropriate to have two such specialist groupings involves many factors outside the scope of this study, and is not considered further here.
[33] "Noise from Military Aircraft", May 1985; by AM Boardman, PL(Lands)4, para 150
[34] This is not suggesting that noise should be an overriding factor, but rather that it ought to be considered with proper weighting. An airframe of great intrinsic combat power that pilots could not use effectively for training in the UK because of its noise might not prove a worthwhile weapon system.
[35] D/DAFSD/35/8 dated 19 Jan 90, page 2. (The project was called EFA then.)

[redacted]

[redacted]

to the purchase and deployment of platforms whose noise impact is not quantified, which may well prove noisier than current aircraft in important respects, and which will probably remain in service for 30 years. There is now very little prospect of reducing the noise output of these aircraft through timely and cost-effective design changes[36]. Moreover, the late availability of noise data makes it impossible to take full account of noise in basing decisions.

JCA

Full STOVL noise data was not captured during concept demonstration. Despite use of engine tests, full information will not be obtained until flight-testing begins in 2006 – which is after basing decisions must be made. Other variants have been recorded at 148 dB [sic][37] at 50 feet altitude.

The IPT is investigating whether noise modelling would yield an early indication of the noise impact on maintainers and on local communities, but recognises the difficulty when vital underlying data is lacking. It is looking at options for reducing noise eg if STOVL training requires hovering over airfields, how much of that could be undertaken in a simulator? But those ideas need to be generated early in a project to be effective.

Typhoon

Aircraft noise trials were not originally included in the prototype testing. They were later planned for early 2004, but have been delayed by the suspension of the flight test programme in late 2003.

A400M

The contractor is required to meet an 85 dB(A) max standard at specified distances from the airframe for health and safety reasons, and also to meet the current civil take-off noise requirements. Operating in formation would (naturally) generate higher noise levels. No noise mapping has yet been undertaken. It remains to be seen how noisy big propellers will be - the experience with C-130J (noisier than the old C-130K) is not encouraging.

United Kingdom Military Flying Training System (UKMFTS)

The fast-jet trainer will be a Hawk variant, reported to have the same noise profile as the current aircraft. The rest of the system will be based on commercial aircraft, but the choice will be for the contractor and noise is not necessarily an important consideration for him.

A sustainability appraisal has been undertaken for UKMFTS. A Training Needs Analysis (TNA) is now being conducted, looking at the split of training across platforms. This will have significant noise implications, which the standard TNA framework will not recognise.

Apache

The bases have been chosen, the aircraft is in service, and the environmental impact assessment is only now being made. QinetiQ are involved in some noise modelling work: it was initially concerned with using noise for aircraft identification, but is now being used to inform environmental impact assessments.

[36] The reality of collaborative or Government-to-Government procurement arrangements is that it would first be necessary to persuade all the customers that noise reduction was a high priority.
[37] Without identification of noise weighting scale, range, speed and aircraft condition this figure is of little value.

[redacted]

Merlin

The Environmental Impact Screening Study for the Merlin helicopter[38] was conducted late in the project cycle. It identified the need for specific studies of marine environments, but for land simply said:

> "Low flying overland is adequately managed, so that there should be no impact on land-based receptors"

This is a simplistic approach, apparently[39] resting on the generality of the JSP 418 policy[40], and leaves significant risks unexamined.

Box 1 – Selected Aircraft Projects

47. **Conclusion 8: A low priority given to noise in equipment user requirements means that the Department's current procurement plans will result in the entry into service of aircraft which may well be noisier than their predecessors.**

48. There is no effective mechanism to share noise expertise across IPTs, or to co-ordinate work on, say, noise modelling. Shared activity with NVD would similarly be difficult to establish – indeed, some IPTs seemed not to be aware of the support NVD or INM could offer them. The Equipment Capability community is planning research into jet propulsion noise, but the sponsoring committee seems unaware of the extent of the problem and of previous, MOD-funded, work, despite the existence of the Defence Research Information Centre.

49. **Conclusion 9: Arrangements for sharing expertise across projects, and for coordinated work on topics such as noise modelling, are weak, and NVD involvement is limited. The links between planned research on jet propulsion noise and past and current activity are thin.**

Aircraft Basing

50. The Defence Estates core sites initiative has prompted a strategic review of all Service aircraft basing (the Defence Airfields Review), due to report in March 2004. It will take account of the sustainable development framework, but could not in the time map the noise impact of the options even if all the data were available (as discussed above, Typhoon data may be available; JCA data will not). This new approach represents a valuable improvement on recent practice – the paper that recommended the concentration of air transport assets at Brize Norton did not include a full coverage of noise issues, and that dealing with the move of SAR helicopters from Lossiemouth to Kinloss did not tackle environmental issues at all. Those decisions must therefore be seen as open to challenge.

51. Helicopters introduce a number of special noise factors. Their shorter range means sorties are carried out much nearer to base than for fixed-wing aircraft, and may all be at low altitude. Their slow speed and hover capability leads to longer continuous noise in one place, but equally activity can be dispersed – Shawbury uses some 60 practice sites. Operational flights in Northern Ireland have not been amenable to the usual mitigation measures – most notably, flying has been necessary at all night hours. The frequency characteristics of helicopter noise can add to annoyance: the beat of rotor noise is readily discernible; high-

[38] QinetiQ/S&E/MAC/CR030061/EISS dated 27 July 2001 (First Issue)
[39] The same, para 4.3.2
[40] This endorses the observation at para 30. above

[redacted]

energy low frequency noise causes vibration; and the low-frequency component propagates well. The full entry into service of Apache will bring new issues of practicing operational anti-tank profiles and mass formation flying, while the desirability of basing the aircraft near the land forces with which they will work reduces flexibility further. Sustainability assessments and environmental impact studies are now in hand on these aspects of Apache.

52. **Conclusion 10: The inclusion of sustainable development and environmental appraisal in aircraft basing decisions, and in the Defence Airfields Review, is to be welcomed. However, full application is impossible without noise data: basing decisions should since 1988 have included environmental appraisal, but they have been, and in the absence of information in many cases will unavoidably continue to be, made without full noise data. This makes them vulnerable to challenge. Helicopters pose a number of special problems.**

[redacted]

53 [redacted]

54. [redacted] [Redacted under s.42].

55. [redacted] [Redacted under s.42].

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[redacted]

57. [redacted]

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[42] Section [redacted] [Redacted under s.42].

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58. [Redacted under s.42].

59. [Redacted under s.42].

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63. [Redacted under s.42].

64. [Redacted under s.42].

Statutory Defences

65. [Redacted under s.42].

66. [Redacted under s.42].

67. [Redacted under s.42].

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73. [redacted]

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75. [redacted] [Redacted under s.42].

76. [redacted] [Redacted under s.42].

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77. [redacted] [Redacted under s.42].

78. [redacted] [Redacted under s.42].

Health and Safety legislation

79. This report is not concerned with health and safety issues in the usual sense of safeguarding the health and safety of employees. However, an effect of section 3 of the Health and Safety at Work etc Act 1974 is to require MOD to ensure that, so far as is

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[redacted] [Redacted under s.42]. [redacted] [Redacted under s.42]. [redacted] [Redacted under s.42]. [redacted]

[redacted]

[redacted]

reasonably practicable, its activities do not expose persons who are not in its employment to health and safety risks[59]. In addition, an employer is required to:

> "make a suitable and sufficient assessment of-
>
> (b) the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking, for the purpose of identifying the measures he needs to take to comply with the requirements and prohibitions imposed upon him by or under the relevant statutory provisions…"[60]

80. There is no provision in the Act for specific circumstances (eg noise levels) that would infringe section 3 for non-employees – everything would turn on the facts. However, the provision on noise made under the Act in respect of employees might well be used in evidence in any action by the HSE for breach of the section 3 duty (and equally in any individual action following alleged damage to health).

81. When the EU Physical Agents (Noise) Directive[61] is transposed into UK law (by 15 February 2006), there will be three sets of sound values to take into account[62]:

> a) exposure limit values, not to be exceeded within hearing protectors if worn: $L_{EX,8h}$ = 87 dB(A) and p_{peak} = 200 Pa (equivalent to 140 dB(C));
>
> b) upper exposure action value, at which hearing protectors must be provided and worn: $L_{EX,8h}$ = 85 dB(A) and p_{peak} = 140 Pa (equivalent to 137 dB(C));
>
> c) lower exposure action value, at which employers must provide hearing protectors: $L_{EX,8h}$ = 80 dB(A) and p_{peak} = 112 Pa (equivalent to 135 dB(C)).

82. Where the daily noise exposure is irregular, it may be averaged over a week. Even if the annual average is below one of the specified values, the noise during a "busy" week may well exceed it.

83. These levels should be taken into account in MOD policy and practice on environmental noise: the likelihood of their being cited in court proceedings means that there cannot be any serious argument that they should be ignored.

84. **Conclusion 17: The noise exposure limit and action values, both for impulsive noise and for noise over time, in the Physical Agents (Noise) Directive should be taken into account in MOD's environmental noise policy and practice. Assessments of noise risks to persons who are not MOD employees are required.**

[redacted] [Redacted under s.42].

[60] The Management of Health and Safety at Work Regulations 1999 (SI 1999/3242), Regulation 3

[61] Directive 2003/10/EC of 6 February 2003

[62] The current values are a little higher, but there is no point in building a forward-looking policy on them.

[redacted]

[redacted]

Land Compensation Act 1973

85. The Land Compensation Act provides for payments to householders[63], and to certain small businesses, to compensate them for loss of capital value resulting from the physical effects, including noise, of the opening of new construction works[64]. The technical term is "injurious affection", commonly known as "blight".

86. When the Act was passed, the Government said that it would not extend it to defence airfields[65], but that MOD would apply equivalent provisions administratively[66]. The scheme has been applied around a number of MOD airfields, including after the construction of hardened aircraft shelters. Payments are not directly related to noise, but where a noise insulation grant becomes payable the amount is deducted from the compensation. Necessarily cursory enquiries leave some doubt as to whether the scheme is well enough recorded in MOD procedures to prompt those responsible to allow for it in investment appraisals, or even for payments to be offered to those eligible.

87. **Conclusion 18: The Department's commitment to match the provisions of the Land Compensation Act should be more clearly recorded in relevant MOD publications, so that payments are included in relevant investment appraisals.**

Noise Insulation

Current MOD Noise Insulation Grant Scheme

88. The current MOD Noise Insulation Grant Scheme (NIGS) was introduced in 1985 with an announcement in the House of Lords[67], following an MOD study already mentioned[68]. Under the scheme as revised in 1993, the noise at an airfield is surveyed, and contours plotted for $L_{Aeq,16h}$ values of 70 dB(A) and 83 dB(A). Residential properties inside the 70 dB(A) contour are offered an insulation package (secondary glazing to two living rooms and all bedrooms; doubling of doors opening direct from outside to an insulated room; blocking of chimneys; and associated ventilation)[69]. As an alternative, an offer is made to purchase properties within the 83 dB(A) contour or above 117 dB(A) L_{Amax}, at the value that would apply if there were no noise. As already mentioned[70], there is a theoretical provision to purchase compulsorily properties subject to 125 dB(A) L_{Amax}.

89. Insulation is also provided if certain night noise criteria are met. They are either an $L_{Aeq,8h}$ value of 60 dB(A) (at rotary-wing stations only), or an $L_{A\ max}$ value of 82 dB(A) provided there are 20 or more night movements on each of three successive nights.

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[63] The Act applies in England and Wales; similar provision for Scotland is made in the Land Compensation (Scotland) Act 1973.
[64] Highways, aerodromes, and other works under statutory authority
[65] The MOD would rarely construct highways, or works under statutory powers, so this is almost equivalent to a defence exemption.
[redacted] [Redacted under s.42].
[67] Official Record, 14 November 1985, col 482.
[68] Noise from Military Aircraft", May 1985; by a working party chaired by AM Boardman, PL(Lands)4
[69] This package is the same as that offered under DfT-sponsored schemes for civil airports. Arrangements for roads and railways differ in providing insulation only on the affected side of the property.
[70] See para 23. above.

[redacted]

[redacted]

90. Administratively, the practice is that contours are published and a scheme for an airfield announced. Householders then have three years to apply for a grant, and a further two years are allowed for installation of the insulation. Airfields are reviewed after 5 years to see if any change of occupancy or activity warrants a fresh noise survey. ***Box 2*** gives some information about the scheme.

Sites covered	30 current GB airfields; 2 GB airfields now closed; helicopter landing sites in Northern Ireland; 1 bombing range.
Properties eligible	19 336
Grant applications approved	13 156
Total cost of insulation grants	£25.8m[71]
Expenditure on house purchases	£8.3 m

Box 2 – Noise Insulation Grant Scheme Facts[72]

91. Complaints from RAF Shawbury led to a concern that the NIGS noise levels were inappropriate for helicopter noise. This led in 1999 to a review of the NIGS criteria, which has yet to be concluded – this report is intended to move it towards completion. While the review was in train, the launch of new schemes at airfields creating additional noise was suspended. Suspension of payments in Northern Ireland had the additional justification that the lower operational tempo was leading to new flying patterns [redacted] [Redacted under s.35].

NIGS Issues

92. The most fundamental issue is whether there should be a scheme at all. We start from the premise that the nation as a whole benefits from the defence output generated from military flying and other activities. However, those living very near to airfields and ranges bear a very heavy noise burden, with those living further away and, to a varying extent, those living in the low flying areas, being subject to lesser noise. The question whether those suffering the worst noise should be compensated in some way is a political one – the answer, as articulated by the Government for MOD aircraft noise in 1985, and separately for the analogous position near civil airports, is that they should. Equally, though, the taxpayer's willingness to pay is not unlimited – we can see from first principles, and from the example of the existing arrangements, that some sort of boundary is needed.

93. [redacted]

[71] Costs are at historic in-year levels – there is insufficient information immediately available to reduce them to a constant price base.

[72] The accessible records of the scheme are not comprehensive, and these figures may be liable to revision.

[redacted]

[redacted]

[redacted] [Redacted under s.35].

94. [redacted]

[Redacted under s.35].

95. The review of NIGS can be concluded only when all the relevant issues have been settled. They include:

- Should the scheme continue to be based on insulation grants? Would one-off cash payments or recurring payments be preferable?
- What should be the daytime noise criteria for insulation? Should MOD match the latest civil proposals?
- What should be the night noise criteria? Is the current "20 flights for three nights" too onerous?
- Should there be lower criteria for helicopters, and if so, at what level? Should the same values apply to propeller-driven aircraft?
- What should be the purchase criteria? How would that interface with risk assessment?
- Should the calculations be based on an annual average over 365 days? An annual average over 220 flying days? The worst quarter, month or week (eg an exercise period, as used at Stornoway)?
- What insulation should be offered? Is there scope for a less expensive ventilation-only package for those at the outer edges of the scheme? Given that replacement windows with heavyweight double-gazed units might be more attractive to householders, are more effective than secondary glazing for helicopter noise (but less so for jet noise) and cost perhaps four times more, should we offer them at some or all sites?
- How can the scheme be brought up to modern administrative standards, with clearly-derived acoustic contours, transparent mechanisms for extensions to the area, and appeals against exclusion?
- How should we treat properties previously eligible but for which no application was made; properties incapable of insulation (notably mobile homes); newly-built property?
- How should we treat single living accommodation and married quarters within the contours, not least given that the 1985 launch statement promised that: "Sound insulation of a comparable standard will be provided for Service accommodation subject to similar noise levels" but little appears to have been done? How might work on them be funded?

[redacted]

[redacted]

- Should the scheme extend to any or all of schools, churches, village halls, care-homes and other businesses within the contours?
- Who should be responsible for the policy for and execution of the scheme?

96. Work in D S&C and NVD has covered many of these points, at least in part, while this study has generated some relevant ideas (a note of them will be circulated separately to those most directly interested). Nevertheless, significant further work is required to develop working level proposals and staff them through stakeholders to Ministers. This needs to be done carefully and thoroughly. It is arguable that the existing resources in D S&C are insufficient to achieve this in a reasonable time, given the level of other urgent work, which includes many MPs letters about NIGS.

97. A key consideration is that NIGS is essentially an administrative arrangement, and thus open to judicial review at the prompting of those who believe that the exclusion of their property is unfair or unreasonable. The criteria themselves and the methods for applying them must therefore be robust and well documented.

98. **Conclusion 20: Further development and staffing is required before revised NIGS criteria could be considered ready for Ministerial endorsement. It is arguable that the existing resource in D S&C is insufficient to achieve this in a reasonable time.**

NIGS – Steps Prior to Implementing a New Scheme

99. Even if revised scheme criteria were ready for submission to MOD Ministers now, a new scheme could not be launched immediately. As a minimum, it will be necessary to:

create robust cost estimates, and ensure financial provision is available[73];

ensure that the necessary administrative mechanisms are in place and up to date;

establish support from DfT and DEFRA Ministers;

publish the scheme in draft for consultation.

100. Consultation on criteria that affect members of the public so directly is consistent with the themes of open government. Cabinet Office guidance[74] requires a minimum twelve-week response period. Meeting all the public's expectations in one document (notably, residents will want to see a map showing the implications for their local airfield) will be difficult. We might therefore have to adopt a two-phase approach, consulting nationally on the criteria as a whole, and then locally on their application to particular airfields as new surveys were carried out.

101. Conclusion 21: Once work on the criteria is complete, it will be necessary to establish funding and administrative arrangements, and consult both publicly and within Government, before a scheme can be launched.

[73] While the scheme has been in suspension, the allocated funding has, very properly, been surrendered. Re-establishing the stream of funding may not be straightforward.
[74] Code of Practice on Written Consultation: http://www.cabinet-office.gov.uk/regulation/Consultation/Code.htm

[redacted]

[redacted]

List of Annexes

A: Terms of Reference for the study
B: Noise Science & Health;

[redacted]

Annex A

Terms of Reference for a Study of MOD Policy on Aircraft Environmental Noise

The objective of the work is to establish a policy on environmental noise from military aircraft that meets operational and training needs, meets legal obligations and Ministerial commitments to meet legal standards, deals reasonably with the public, and is affordable.

The study deliverable is to be a paper to DG S&S, by 19 December 2003[1], setting out the proposed policy and the rationale for it, identifying the principal risks and proposing risk-reduction work as appropriate, and indicating the views of stakeholders.

The study is to cover the following main areas:

Legal – the statute and common law position, with particular reference to the recent *Dennis* judgement.

Land use planning – MOD interface with the planning process (PPG24)

Relevant policies promoted by other Departments

Low-flying and airfield operations, including the extent to which current arrangements take account of noise, the impact of new equipment, and the noise assessment included in basing decisions.

Other MOD sources of noise – mainly ranges?

Noise science, annoyance and health effects – the basis for noise levels to be adopted, and for remedial measures proposed. The impact of different types of aircraft and operating patterns.

Practical noise insulation methods, and how an MOD scheme might be administered.

Interface with other environmental issues – notably emissions

Public perception and Public Relations – handling a new policy, and maximising the positive public impact.

Stakeholders in MOD HQ, TLBs, other Government Departments and elsewhere are to be consulted during the study.

[1] This revised date was agreed by DG S&S on 20 Nov 03.

[redacted]

[redacted]

[redacted]

ANNEX B

Noise Science & Health

B1. This Annex is intended to provide the necessary minimum background on noise science and health to enable those unfamiliar with the topic to understand the main paper. It is not a comprehensive treatment, and the areas covered are necessarily somewhat simplified. Anyone requiring more depth might turn first to their organisation's Chief Environmental and Safety Officer.

Sound in Air

B2. Sound is transmitted in air as a longitudinal pressure wave. It is characterised by its frequency (which is commonly termed pitch) and by its intensity (which we translate as loudness). It is possible to generate "pure tones" (a single frequency), but practical noise most often contains a range of frequencies, and varies in intensity with time.

Measuring Sound

B3. There are essentially two attributes of the sound pressure we might measure. The usual is called the "Sound Pressure Level"; it is connected with the energy transmitted by the sound, and relates to the square of a characteristic value of the sound pressure (technically, the 'root mean square' value). However, for some purposes, eg for gunfire, where the noise source is impulsive, we are interested in the very highest momentary value of the sound pressure – the 'peak' value.

B4. There are then issues about the way in which the contribution of sound at different frequencies is assessed. In practice, two scales are used: the C-scale, which treats the frequencies almost equally, and the A-scale, which discounts sound at lower frequencies. The value of the A-scale is that it matches the typical response of the human ear at lower Sound Pressure Levels, and correlates well with subjective assessments of noise such as acceptability. It is essential to specify the scale (or weighting) used for any measurement.

B5. The range of sound pressures a normal healthy ear is able to detect is very great, so that a straightforward pressure scale would involve inconveniently large numbers. Sound pressure level is therefore measured on a logarithmic scale, of decibels or dB. (It is vital to note that the decibel is not an absolute scale of noise, it is a logarithmic ratio between a measured quantity and a reference level. It is not exclusive to acoustics and could be used for anything eg it is commonly used in electronics. In acoustics, decibels are used as a scale for a wide range of sound attributes and characteristics, sometimes referred to as noise 'metrics' or 'indicators'. Therefore great care must be taken when stating a number of decibels to precisely define what it is describing. There is no necessary comparability between the number of decibels attached to one noise indicator and those attached to a different indicator.)

B6. The zero point for Sound Pressure Level is approximately the quietest sound that a person with "normal" hearing can detect at 1000 Hz[1]; normal conversation would be around

[1] As already mentioned, the ear's sensitivity varies with frequency.

[redacted]

[redacted]

[redacted]

60 dB(A); an unmuffled pneumatic drill around 110 dB(A); and a similar sound at around 135 dB(A) would approach the threshold of pain.

B7. A consequence of the use of the logarithmic scale is that a 3 dB increase in Sound Pressure Level represents a doubling of sound energy.

Comparing noise experiences over time

B8. In order to compare the impact on hearing or annoyance of differing sound patterns, the concept of the equivalent continuous sound level is used – that is, the sound level which, operated continuously over the period concerned, would give the same energy as the actual sound pattern. This is known as the $L_{Aeq,t}$ value, where t is the time period concerned[2]. For health and safety purposes, the usual period is 8 hours (a normalised working day); for environmental noise, separate 16-hour and 8-hour (night) periods have been used. The EU environmental noise directive signals a move to a composite day, evening and night (L_{den}) figure, in which the actual equivalent sound levels for the evening and night periods are weighted to allow for the potentially greater annoyance of noise at those times[3].

B9. The logarithmic scale dictates that, for example, an 80 dB(A) equivalent level over 8 hours ($L_{Aeq,8h}$ = 80 dB(A))[4] represents the same sound energy as 3 dB(A) less over 16 hours (ie $L_{Aeq,16h}$ = 77 dB(A)). Moreover, that same sound energy ($L_{Aeq,8h}$ = 80 dB(A)) would be reached in 0.9 s at a constant 125 dB(A)[5]. In practice, a fast-jet overflight which reaches 125 dB(A) will do so for a smaller fraction of a second, and the total overflight will be equivalent to about $L_{Aeq,8h}$ = 77 dB(A). Moreover, measurements show that most fast-jet overflights are rather quieter, because the aircraft is higher or slower, or the track is further away from the receptor.

B10. There are two further relevant applications of this principle. The L_{AE}[6] takes all the A-weighted noise energy of a single event (eg an aircraft overflight) and equates it to the sound pressure level of the continuous sound level that would produce that energy in one second. This can make subsequent calculations easier. L_{AE} is rarely used for long events.

B11. The L_{Amax} is the A-weighted constant sound pressure level that over a period of one-eight of a second would produce the same sound energy as the actual noise over that same one-eighth of a second.

Noise and Annoyance

B12. Sociological surveys show a good correlation between the $L_{Aeq,16h}$ = civil aircraft noise and annoyance. The assumption is that the same holds true for military aircraft noise, even

[2] The EU Physical Agents (Noise) Directive (see para 81. above) uses the form $L_{Ex,t}$; it has the same meaning.

[redacted] [Redacted under s.35].

[4] $L_{Aeq,8h}$ = 80 dB(A) is the lower action level from the Physical Agents (Noise) Directive – see para 81. of the main paper.

[5] If that seems surprising, consider that the sound pressure level is 45 dB(A) higher. Since 3 dB represents a doubling, it has increased by 2^{15} = 32 768 times. The time period must be reduced by that factor, and 8 hours is 28 800 seconds.

[6] LAE is not used in the paper, but it is mentioned here because it appears in NVD's reports of airfield surveys.

[redacted]

[redacted]

though the same equivalent level is reached through far fewer, much louder flights. A further complication is daily and seasonal variation. DfT use noise measurements at Heathrow from the busiest (summer) season. Our usual calculations for military airfields take an annual average, but over 220 flying days, thus taking the quiet weekend and Bank Holiday days right out of the equation. Complaints from residents near Stornoway, which was then usually quiet but the site of an intensive two-week exercise, resulted in the adoption of noise values from the exercise period. There is some research to show that annoyance correlates better with figures for the worst short period than with annual values.

B13. At a given sound level, annoyance is increased: if there is a discernible tone; with impulse noise (ie bangs); with startle effect (ie a very sudden arrival of a loud noise); and with low frequency content. Helicopter and propeller aircraft noise can thus be more annoying than jet noise.

Noise and hearing

B14. Clear links between noise and hearing loss have been demonstrated, both for loud impulsive sources such as gunfire and for continuous noise over a long period of exposure. However, the classic studies rest on high noise levels (eg a working life as a boiler maker, or in a forge or weaving shop). The link at lower noise levels or shorter periods is harder to demonstrate, both because the relevant noise exposure history is harder to establish, and because controlled experiments would breach ethical guidelines. [redacted] [Redacted under s.35].

[redacted]

B15. [redacted] [Redacted under s.35].

[redacted]