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LOW FLYING AIRCRAFT NOISE - IS IT A HEALTH RISK?

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INTRODUCTION

Subject to certain limitations and exclusions, military aircraft may fly anywhere in the UK at altitudes down to 250' minimum separation distance (msd). Low flying remains a vital tactic to defeat sophisticated air defence systems, hence low flying remains a vital component in UK defence needs.

LOW FLYING - UK AND ELSEWHERE

Since the cold war there is an increasing need for aircrew to meet crisies of which we have had no significant forewarning. In consequence, they need to maintain proficiency in a wide range of flying skills, the most demanding of which are the low flying skills. The RAF's existing weapons systems and sensors are optimised for low-level; this is unlikely to change in the foreseeable future[2]. Training to 100' msd, known as operational low flying, offers the best opportunity to keep low flying skills honed; it is my judgement that training to 250' offers a compromise to retain most low flying skills; training above 500' does not help learn or retain low flying skill; whilst both current technology and the absence of the psychological 'fatality factor', mean that simulators can only compliment rather than replace the need for low flying. A military pilot who has previously been trained in operational low flying could regain those skills within relatively few sorties, whereas a pilot who has never experienced operational low flying would take considerably longer to train effectively. Reliance on a smaller regular Air Force and the requirement to provide rapid reaction Contingency Forces makes it imperative for aircrew to maintain currency across the spectrum of flying tactics.

Military low flying at altitudes between 500 and 250 feet takes place routinely in the UK. The majority of all military flying training is carried out between 7 am and 11 pm on weekdays and only in the most exceptional circumstances is approval for jet activity outside these hours granted. Jet flying after 11 pm was only approved twice in both 1994 and 1995. In fact, as a result of the 'Peace Dividend' the slimming down of the RAF's front line strength and of the USAF's presence in the UK have reduced the amount of jet low flying.

HEALTH EFFECTS - GENERAL PUBLIC

For this paper I have arbitrarily divided possible effects into 5 groups: general, hearing, children, neuropsychiatric and cardiovascular. There is inevitably some overlap between these groups and in addition, sudden noise may produce startle and some jet engines may produce vibrations at frequencies that affect humans.

General. Noise is a major source of complaint, and noisy neighbours followed by barking dogs top the cause of complaints league. Aircraft noise is well down the 'batting' order. Discrete tones are more distressing than broad-band aircraft noise[4] and distress caused by helicopter blade slap is related more to the level rather than the character of the noise[5]. The WHO recommend that nocturnal noise exposures should be below 35 dB(A) to 'preserve the restorative processes of sleep' . Fortunately, walls and windows attenuate the sound so aircraft noise over 35 dB is unlikely to be propagated inside a bedroom.

Hearing. Loud noise of rapid onset and short duration may produce unpredictable PTS effects, particularly if the rate of onset is faster than the stapedius reflex can protect the ear. Rates of onset below 60 dB/sec are unlikely to cause effects[6]. Extrapolating figures from military aircraft noise footprints shows that at the heights and speeds that aircraft operate over the UK, this rate of onset is not exceeded.
It has been suggested that children living in an area subject to low level military flying were more deaf than children living in quieter areas[7], but a paper that **quantitatively** relates aircraft noise to hearing; found that no subjects suffered hearing damage at typical noise levels[8]. MOD flying constraints limit the noise directly under our aircraft. Based on Robinson[9], I feel that even multiple 125 dB(A) overflights do not pose a credible risk to hearing. Moreover, some research conducted by the USAF showed that volunteers exposed to aircraft noise greater than 125 dB(A) suffered no PTS[10].

Children. Two studies claim that children's reading ability and psychological development may be impaired by high noise exposures in schools[11-12], but socio-economic factors could confound both of these studies. In addition, both studies were conducted under civilian airport approach paths so the data cannot be compared directly with military aircraft. Lastly, noise levels in classrooms often exceed 55 dB and 70 dB is not uncommon. Children reported to have suffered noise disturbance, when followed up, show normal scholastic achievement. Objectively, McLean[13] was unable to demonstrate any evidence of learning disruption, even when a teacher thought that overflight had caused a disturbance. In addition, there is no association between a threshold noise dose at which either concentration or long-term recall are affected[14].

Neuropsychiatric effects. Noise sensitive people may react in a way out of all proportion to the level of noise exposure. McLean[13] described the typical noise sensitive as being well-to-do, middle aged, intelligent though suspicious of modern technology, aware of the environment and social problems, afraid of aircraft, concerned with their health and high scorers on neuroticism indices. Individuals annoyed by noise are more likely to show psychological disturbance - at least in the research done to date on road noise[15]. EEG response to sound shows a greater effect when the noise is perceived as 'unpleasant', rather than just loud[16].

Cardiovascular effects. After hearing effects, cardiovascular effects are most frequently researched. The most commonly reported response is a rise in blood pressure which is usually small and short lived. Whether repeated rises in BP have long term effects is equivocal and requires much research. However, many other frequently repeated 'stresses' cause transient rises in BP without obvious long term sequelae. Most studies have been retrospective epidemiological studies which **cannot** prove **cause**. Additionally, studies conducted into identified cases of heart disease who live near airports may suffer selection bias. I do not feel it fair to claim from this evidence that hypertensives are at greater risk **from noise** than normotensives, for research is needed to see whether their responses are the same to the other stressors that are known to produce transient rises in BP. Schwartze[17] indicates that, although no single study shows a strong association between noise and raised BP, the aggregate of all the works indicates that such an association exists. However, there is not an equal body of research to show or refute an association between any of the other stressors that could cause raised BP and that stressor. One must be careful in citing noise as the major or rogue factor!

Lastly, although strictly not cardiovascular, blood levels of hormones like adrenaline and nor-adrenaline and blood levels of fats have been measured in noise experiments. Long term high levels of some of these substances are associated with heart disease. The reported changes in hormone levels are, at best, variable. One study reported high fats in a group **who were occupationally** exposed to noise[18]. However, the other lifestyle factors - such as smoking and diet did not appear to be adequately controlled. It is a sweeping generalisation, but workers in heavy industry traditionally eat a higher fat diet than white collar workers!

VIBRATION EFFECTS

Some jet aircraft produce a noise peak at 60 Hz which could cause chest wall resonance - but only to people who stay close to the engine for long enough - ie ground handlers. We notice it only with one aircraft type and only at a single point close to the aircraft. There is no evidence of exposure causing physical harm.[19]

Sonic boom. The research done prior to Concordes' introduction, and USAF research into the effects of military aircraft 'booming' over populated areas, have both failed to show health effects on people[20]. But public reaction to booms occurs at a pressure level well below 71.7 Nm^{-2} which, I suggest, is the lowest level associated with damage to ground structures.

ENVIRONMENTAL EFFECTS

Military aircraft effects on wildlife have been postulated to reduce breeding. The animals vacate former breeding areas which have now got too noisy,or are startled and driven away from their normal habitat. However, the Canadian Government's Environmental Impact statement[21] of the effects of aircraft noise on wildlife found minimal evidence of disturbance to wildlife.

CONCLUSION

Many nations possess capable air defence systems which can only be overcome by low flying tactics. Our duty of care includes training military aircrew to undertake all tasks that they may, predictably, be required to perform. Low flying is a manual skill which can only be perfected by rigorous training and continued practice; to be of value the training has to occur below 500' msd. As with any risk assessment, we must always balance the value of the military imperative to fly low against the possible environmental and health consequences. To do this well requires constant critical review of **all** the scientific evidence.

Naturally, when considering the evidence of effects we will give more weight to peer reviewed research published in journals than to unreviewed reports, but all credible work is considered. MODs current low flying policy minimises the potential for individual people, animals or structures to be overflown by military aircraft. I also suggest that the research to date has not identified a credible potential health risk that would require the policy to be altered. However, MOD is not complacent, new research will always be examined and should any firm evidence of a linkage between low flying aircraft noise and health be established I am sure that MOD would consider what changes should be made.

The views expressed in this paper are based on the professional opinion of the author and may neither reflect the Ministry of Defence's view nor be binding upon the Ministry.

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