Low flying military aircraft noise - operational flying

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Abstract: Low flying military training is widely distributed across large areas of the United Kingdom and crews are encouraged to diversify their routes as much as possible. This significantly reduces the number of overflights at any one place but it also increases the difficulty of being able to estimate noise exposure. Aggregate noise exposure can be calculated by starting with the area included within estimated $L_{\text{Aeq}}$ noise contours to either side of the flight track as determined from controlled trials data, multiplying by the number of flights booked, divided by the overflyable area, and then making assumptions about the degree of flight track concentration that might typically occur in certain areas. Comparisons against field survey data show that this method can provide reasonable estimates of aggregate noise exposure over large areas. For precisely defined points on the ground the method can only be expected to give a general indication because of the inherent flexibility and hence unpredictability of military training operations.

INTRODUCTION

In principle, the whole of the United Kingdom is available for low flying by fixed wing military aircraft down to a minimum separation distance (MSD) of 250ft but certain designated areas of restricted airspace, civil airports, glider sites and other hazards and larger centres of population are excluded. Crews are encouraged to diversify their routes as much as possible. In practice, actual flight tracks are constrained to some extent by a range of geographic, climatic, operational, and flight safety considerations, but they are still very widely distributed across rural areas. This widespread distribution significantly reduces the number of overflights at any one place, but it also increases the difficulty of being able to determine noise exposure by any of the available methods. There are no detailed records of actual flight tracks flown which could be used to calculate aggregate noise exposure in the same way as is often done for civil aircraft noise exposure. Large scale continuous noise monitoring is also impractical except for use in relatively small areas.

In a recent study of low flying military aircraft noise (1), aggregate noise exposure was estimated by multiplying the area included within estimated $L_{\text{Aeq}}$ contours to either side of the flight track by the number of flights booked to transit through the area, dividing by the overflyable area, and then making assumptions about the degree of flight track concentration that might typically occur in certain areas. The widths of the $L_{\text{Aeq}}$ noise contours were extrapolated from data collected in specially arranged noise measurement trials (2, 3) and required assumptions to be made regarding generic height, speed and other flying parameters during normal operations. Comparisons were then made against field survey data collected in the Vale of Evesham (4) as part of the original study, at Moffat and in Wales to test the model under operational conditions.

METHODOLOGY

The necessary flight tracks required for conventional noise contour calculations cannot be determined from air traffic control radar records because most low flying takes place below air traffic control radar horizons. The flight navigation systems on some aircraft types can be set up to record the necessary information, but there is no practicable method of being able to collect and collate this information on a large enough scale to be useful in this application. It would be similarly impractical to obtain the same sort of information by debriefing aircrews. On the other hand, it is possible to estimate noise exposure on a statistical or probabilistic basis on the basis of estimated heights and speeds for operations within the permitted flight parameters.

Once the height, speed, and if necessary, engine power setting have been determined, then it is relatively simple to calculate the noise event profile at different distances off to either side of the flight track by a process of interpolation and extrapolation from data collected under known flight parameters in specially arranged noise
measurement trials (2, 3). Under field conditions, there will always be some variation above and below the assumed typical or average flight parameters. The only way that the extent of this variation can be determined is by direct observation in the field. For example, all aircraft can be expected to be flown some way above the 250ft MSD to avoid the possibility of inadvertently approaching closer than 250ft to buildings, trees, electric power cables, and small undulations in the ground, etc.

The next level of uncertainty concerns the actual flight tracks as flown. The simplest assumption to make is that the flight tracks of all aircraft transiting any permitted overflyable area will be evenly spread across the entire area. In practice, there will always be a certain amount of flight track concentration along particular routes, depending on the geographical distribution of features on the ground and the extent to which pilots wish to exploit the terrain for particular training missions. Formation flying is responsible for further departures from an even spread. Actual flight tracks can only be determined by direct observation, but for modelling purposes further assumptions have to be made. In some respects, this is the most difficult part, since flying as unpredictably as possible is an important component of low flying to enhance survival. Nevertheless, where low flying aircraft events have been detected by noise monitors set out in the field, then it is important to try to develop generic rules from these observations that can be used on a probabilistic basis to support aggregate noise exposure estimates even where individual flight tracks cannot be predicted with any degree of certainty.

The ideal situation for field surveys would be to use fully attended noise monitoring with trained observers recording estimated height, track, speed, and aircraft type for each identified low flying event. Unfortunately, because overflights tend to be relatively infrequent at any one site, the man-power resources required per single overflight recorded would be prohibitive. In addition, high speed overflights directly overhead give little or no audible warning on approach and this means that great concentration is required to be able to attend to each event before the aircraft has flown too far away to be properly recorded. The most practical method is to use multiple noise monitors deployed in a linear array at around 400m spacing across the anticipated line of flight. In the absence of other noise sources, each aircraft overflying at least part of the array should be detected by three or more adjacent noise monitors and an investigation of the noise level profiles recorded by each noise monitor against time can then reveal a considerable amount of flight track information, although height remains difficult to determine. Further time synchronised noise monitors positioned up or down stream can reveal additional speed information which all contributes to the overall model.

Data will be presented at the conference to show that a reasonable correlation between calculated noise levels based on operational assumptions and actual noise exposure can be achieved, provided that the main aim is to produce generalised estimates of aggregate noise exposure. On the other hand, the inherent flexibility of military training operations is such that while this methodology can indicate the range of specific noise levels at defined spot points on the ground, it cannot be used to pinpoint specific noise levels precisely. The only realistic alternative in such cases must be to deploy continuous noise monitoring at such sites.

ACKNOWLEDGEMENTS

The financial and technical support of the Royal Air Force Institute of Health and the Royal Air Force Scientific Support Branch is gratefully acknowledged. The interpretation of the data and the conclusions drawn are of course entirely attributable to the authors alone.

REFERENCES


2548