4th Meeting of the Technical Advisory Panel on Accidental Aircraft Crash Risk
2 May 2013 – Redgrave Court

Attendees

Tim Allmark (TA)	Technical Lead – ONR
Peter Ackroyd (PA)	Meeting Facilitator – ONR
Joanna Cook (JC)	Business Support – ONR
Matt Lloyd Davies (MLD)	Technical Note-taker – ONR
Malcolm Goodwin (MG)	ABS Consulting
Sid Hawkins (SH)	Air Accident Investigation Branch
Roger Jackson (RJ)	AMEC – Representing DNSR
David Pitfield (DP)	Loughborough University
Malcolm Spaven (MS)	Aviatica
Matthew Greaves	Cranfield

Apologies
Ian Dugmore – UK Airprox Board

Introduction
TA welcomed the TAP members to the meeting and thanked them for their continued participation and contributions. TA confirmed the Chief Inspector's decision to withdraw [redacted] invitation to serve on the TAP.

TA reminded TAP members of the terms of reference of the TAP and the behaviours expected of TAP members. A slide was presented to reaffirm the terms of reference and behaviours. No clarifications or queries were sought from members.

Previous minutes and actions
Given the late issue of the previous meeting's minutes, TAP members were asked to comment on the minutes by 10/5/13. Comments from [redacted] and Dr Roberto Trotta had informed a revision of the minutes.

Action 01/02-01: It was agreed that this would be discussed as part of next steps and that a clear statement of objectives for the TAP would be understood by the end of the meeting. **CLOSED**

Action 01/02-02: MGR said that he had completed some work and that it could be discussed as part of the meeting. **CLOSED**

Workshop 1: Strengths and weaknesses of the Byrne methodology
The TAP formed two syndicates, each of which was asked to identify strengths and weaknesses of the Byrne methodology. The following list summarises the aggregated weaknesses of the Byrne methodology identified by the syndicates:

1. There is a disproportionate amount of data between the 3 aircraft crash categories (background, airways, airfield). Background and airways data are considered to be similar and there is a relative sparsity of data in these categories compared to airfield crash data.
2. There is a broad range of global and local factors, and so accident rate may not be the most appropriate variable to quantify.
3. The model hasn't evolved with time e.g. flight patterns have changed
4. There is a lack of confidence in the calculated values because there is no quantification of uncertainty.
5. The methodology uses narrow data sets UK data only, and data available elsewhere e.g. CAA, is not used.
6. The model is quite generic and doesn't take account of some local factors.

7. There is inflexibility in the methodology e.g. a straight approach to the runway is assumed and no account can be taken of any increased risk from a curved final approach.
8. The 'type' thresholds as defined by aircraft weight are arbitrary.
9. The extent of airfield thresholds is arbitrary
10. The methodology cannot distinguish between risks in controlled and uncontrolled airspace.
11. Different operational environments are not accounted for.

The following list summarises the aggregated strengths of the Byrne methodology identified by the syndicates:

1. The methodology distinguishes between airfield and 'other' crashes.
2. It is a simple method
3. It is a crude estimation tool to demonstrate low probability of occurrence
4. The methodology uses real data, which implies 'real' risk rather than purely theoretical risk.
5. The methodology is relatively updateable.
6. It is easy to perform a sensitivity analysis on the key parameters.
7. It allows for different categories of accidents.

In addition, the following list of issues was raised by one of the syndicates:

1. How do we know the methodology is 'right'?
2. The fact that the methodology is generic implies that it can be used everywhere, which is both a strength and a weakness
3. The dynamic nature of accident rates implies they are inherently unpredictable, so is a purely probabilistic approach suitable?

Fitness for purpose discussion

PA led a discussion on the adequacy of the Byrne methodology, initially focusing on what the Licensees' requirements are for a methodology to determine aircraft crash risk. The TAP identified the following characteristics:

1. Simplicity
2. Ability to calculate and model low frequency events; frequency is important to acceptability
3. Ability to estimate target area
4. Ability to count for site specific local factors e.g. proximity to an air field
5. Acceptability of methodology to ONR

The TAP identified that the Byrne methodology is useful at modelling crash frequency around airports in a general way. However, there are some local factors that it does not address. For example, the issue of military aircraft crash data in the Byrne methodology is problematic; there is very little data to inform the model effectively and it is difficult to separate 'genuine' data from 'outlier' data. However, there are some sites for which the military aircraft category is a significant local factor that should be included in their crash rate model.

ONR recognises that aircraft crash risk is low, irrespective of the method, and that estimating risk on a best estimate rather than conservative basis is proportionate. The Byrne methodology offers the ability to make a comparison of low frequency/high consequence risks across a nuclear site to put into context the risk from accidental aircraft crash.

The TAP determined that there were no known better methods. However, it was recognised that this was due to the limit of knowledge of the TAP, rather than a lack of available methods/models. It was suggested that the TAP may need to be informed by a programme of work to address this shortfall.

Whichever method is adopted by the Licensee, ONR expects the outputs to be judged in the context of any limitations the methodology has. The Licensee is also expected to demonstrate that the method/approach gives sufficient insight for qualitative judgements to be made.

Workshop 2: Alternative models

TA presented a table that listed various methodologies in addition to Byrne for calculating aircraft crash frequency. The table was intended to capture the current state of knowledge of each of the other methodologies. However, it was realised that whilst there was some high level knowledge within the group, there was not sufficient in-depth understanding of the methods amongst the members to adequately inform the TAP. TA suggested that it might be appropriate to commission an external body to review the existing methodologies and report back to a future meeting of the TAP. This was endorsed by all TAP members.

Next steps
The TAP felt that it had reached a point where it needed to be informed on a number of technical matters; this will require research to be commissioned. The areas of technical research identified by the TAP were:

1. Modernisation of the Byrne methodology by assessing the impact of applying larger (UK/Europe/US/Worldwide) and more contemporary datasets.
2. Review of other existing methodologies for calculating aircraft crash frequencies and compare to the Byrne methodology
3. Identification of methods for quantifying the uncertainties associated with this type of risk calculation to increase confidence

MLD agreed to produce a formal scope of work and circulate to members of the TAP before submission to ONR's resource review panel

Other areas the panel considered would need to be addressed were:

1. How to achieve confidence in low frequency data when many aspects to which the methodology may be sensitive change with time, such as the ways aviation is controlled, crash data etc.
2. The military aircraft issue needs to be considered further
3. Whether airfield geometry and flight approach needs to be reconsidered.

Conclusion
TAP members agreed that the meeting had been very productive and that good progress had been made in reviewing the Byrne methodology and determining what further information/data/analysis was required. TA summarised the position in relation to the Byrne methodology. The TAP recognises the weaknesses of the method and that there is a need to update it. However, there is a need to gain clarity on the issues identified to determine the next steps and whether or not the Byrne methodology is valid. It was stressed that whilst a broad range of weaknesses had been identified, there are also strengths that should be retained in any future iteration of the methodology.