



Chief Nuclear Inspector's Technical Advisory Panel on Accidental Aircraft crash risk evaluation

Consultation document

Purpose

In July 2012, ONR's Chief Nuclear Inspector (CNI) took a decision to convene a Technical Advisory Panel (TAP) to review the current state of the art in accidental aircraft crash risk evaluation. A series of five meetings has been held and a comprehensive research project undertaken. This note is provided to consultant members of the panel on the proposed way forward.

TAP Scope and Terms of reference

The Technical Advisory Panel (TAP) was established to provide independent, objective, authoritative, professional scientific and technical advice to the Chief Nuclear Inspector in the area of accidental aircraft crash hazard assessment. It was the CNI's aim that the TAP should:

1. provide relevant, state of the art advice to address the particular issues or questions that are posed to it, and to obtain specialised technical opinion as needed
2. advise on the state of scientific and technical knowledge related to each area, highlighting implications where relevant
3. interact in a complimentary manner with other relevant scientific and technical bodies to provide expert technical advice as requested in a timely manner
4. identify areas of uncertainty, emerging issues and knowledge gaps, and suggest research needs

The TAP set itself the following objectives

1. Assess the limitations of the existing Byrne method and the practical impact of those limitations
2. Identify aspects of "good practice" in application of the Byrne Method to reduce those limitations
3. Appraise other extant methodologies available and their associated limitations
4. Identify those methods that would be seen as good practice and if possible best practice
5. Identify any future research needs

The following technical areas were identified within the scope of the panel's deliberations:

1. Methodologies for the prediction of accidental aircraft crash risk
 - a. Current practice and the state of art;
 - b. Case studies for the definition of public safety zones and precedents set;
 - c. Limitations of the Byrne methodology;
 - d. Influence of local aerodrome operations;

- e. Influence of local flight paths;
- f. Influence of local environmental features ;
- g. Influence of target area and target area projections;
- h. Consideration of skidding;
- i. Confidence and treatment of uncertainties;
- j. Application to random site location;
- k. Application to site located near to airfield.

2. Base Crash Data

- a. Data sources;
- b. Data screening;
- c. Data limitations and uncertainties;
- d. Data application

The following topics were specifically excluded from the scope of the TAP:

- Planning policy
- Individual sites
- Justification of risk acceptance criteria
- Airspace restrictions policy
- Development of Target Areas
- Structural Response to Impact
- Post impact mitigations
- Malicious events

Summary of meetings

Meeting 1: This meeting set out the CNI's aims for the TAP, and established the terms of reference and scope. The Byrne methodology was discussed, including its history, application, fitness for purpose and availability of crash rate data.

Meeting 2: Crash rate data was discussed in more detail during meeting 2.

Meeting 3: This meeting saw presentations on ALARP/Target 9, statistical modelling of crash probabilities, and modelling of frequency, location and consequences of accidental aircraft crash. The aim of this meeting was to determine the current state of the art in aircraft crash risk modelling.

Meeting 4: This meeting adopted a workshop-based approach to identify strengths and weaknesses of the Byrne methodology. This led to a more informed and structured discussion on fitness for purpose. The TAP concluded that it could not usefully (within the limitations of time and resource available)

undertake any further meaningful deliberations until targeted research had been undertaken on some aspects of the data and methods used in calculating accidental aircraft crash risk. The TAP recommended that a research project should be undertaken to address this knowledge gap.

Meeting 5: Loughborough University (LU) and the Health and Safety Laboratory (HSL) presented the work they had undertaken at the request of the TAP. In general, the TAP felt that the project had met its expectations and supported the conclusions and recommendations.

Current position

ONR believes that the CNI's aims have been met. The TAP comprises a broad range of disciplines from the aviation industry, the nuclear industry, engineering contractors and academia. Throughout all interactions, the TAP has willingly and openly offered advice and expert opinion on the subject of accidental risk crash evaluation. It has identified gaps in knowledge and identified research needs, which have been fulfilled. The TAP has sought the views of other relevant scientific and technical bodies to support its deliberations where necessary.

ONR believes that the TAP's objectives have been met. Objectives 1 and 2 were met during the workshop event held during meeting 4 and supported and informed by discussions during meeting 1. Objectives 3-5 were met primarily by the research project prompted by the TAP following meeting 4; these objectives were also supported by discussions during Meetings 3-5.

ONR believes that the technical areas that the TAP set out to address have only been partially addressed. In particular skidding, local aerodrome operations, flight paths, target area/target area projections and local environmental features have not been discussed in any useful detail.

The TAP and the HSL/LU research project have made a number of preliminary recommendations.

1. Background crash rates should be recalculated per km flown rather than expressed per km² land area and used in conjunction with location specific information on flight density.
2. Data from North America or Europe should be considered in place of GB data for large transport aircraft
3. For airfield-related crashes a three stage assessment should be adopted: estimation of an average crash frequency; adjustment of the average crash frequency for local factors, if possible; and application of a crash location distribution
4. Data relating to crashes in Great Britain for the period 2007 to 2013 should be collated and added to the data analysed in the HSL/LU report
5. Crash location data for accidents involving light aircraft in the vicinity of airfields in Great Britain should be collated and analysed to determine suitable crash location distributions for this category of aircraft, accounting for local flight operations which may not have been reflected in previous models
6. Calculations for crash frequencies should include quantification of uncertainties, both the uncertainty in the crash frequency and in the crash location distributions
7. Overall crash probabilities should be accompanied by a confidence interval and an appropriate upper confidence limit used in risk assessments.

Way forward

ONR's view is that additional work is needed before the recommendations can be fully supported. ONR would advocate undertaking a project to investigate Recommendation 1 more thoroughly and to investigate the significance of local aerodrome operations, flight paths and local environmental features on crash risk.

Consultation questions

1. Has the TAP met the Chief Nuclear Inspector's aims?
2. Has the TAP met its objectives?
3. Do you agree that there are some technical areas (listed above) that the TAP has not addressed in sufficient detail?
4. Do you consider the TAP should deliberate further on all or some of those technical areas not addressed (listed above)?
5. Are there any other technical areas you consider should be investigated?
6. Has the LU/HSL research report met your expectations?
7. Do you support the report's conclusions and recommendations?
8. Do you agree there is a need for further work?
9. Do you agree with the areas proposed by ONR for further investigation?
10. Are there other areas for investigation or research questions you believe should be addressed?