

TOWN AND COUNTRY PLANNING ACT 1990 - SECTION 77 AND TOWN AND COUNTRY PLANNING (INQUIRIES PROCEDURE) (ENGLAND) RULES 2000

APPLICATIONS BY LONDON ASHFORD AIRPORT LTD

SITE AT LONDON ASHFORD AIRPORT LIMITED, LYDD, ROMNEY MARSH, TN29 9QL

PROOF OF EVIDENCE OF TRUDY AUTY, BSc, ARCS

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FOR LAAG

PLANNING INSPECTORATE REFERENCE: APP/L2250/V/10/2131934

LPA REFERENCES: Y06/1647/SH and Y06/1648/SH

NUCLEAR SAFETY CONFLICTS

POSITION:

- 1) We are three physicists who studied at Imperial College; we have over 90 years combined experience in government and industry. We are strong supporters of nuclear power. However we cannot support an airport development which introduces this unnecessary and unquantifiable risk of a nuclear accident.
- 2) We believe that the interactive variables associated with large aircraft taking off, landing and performing low level emergency procedures close to a nuclear power stations are too complex to model with any degree of certainty. We believe they should be screened out by the implementation of a minimum separation policy (minimum distance between an airport and a nuclear site). This would provide the safest and least bureaucratic solution given that there is currently no mechanism for taking a holistic view of the risks associated with this complex and multidisciplinary problem.
- 3) The minimum separation policy is a matter that we are pursuing with relevant national and international bodies. In the interim this document provides evidence to the Secretary of State, recommending that he refuse the application to expand London Ashford International Airport (known as LAA).
- 4) It should be noted that, up to now, we have acted independently of Lydd Airport Action Group (LAAG) in putting our views forward to the planning process. However, in the interest of consolidating the nuclear case, we are presenting this evidence under the LAAG umbrella. It should be read in conjunction with that supplied by Spaven, Large and Pitfield.
- 5) It should also be understood that the well reasoned arguments put forward by this team are those of qualified industry commentators and not merely the concerns of local residents which the final draft of the GOSE's (Government Of South East Office) recommendations to the Secretary of State tend to imply.

PROFESSIONAL QUALIFICATIONS AND EXPERIENCE.

Trudy Auty, BSc, ARCS

- 6) I have a BSc Honours Degree in Physics from Imperial College. I worked as a development engineer within the defence industry for five years. This was initially in the field of laser range finding and target designation. I subsequently led a small team in building the first laser gyroscope to be flown in UK.
- 7) After a two year period in Hong Kong, where I sat on the laser safety committee, I returned to the UK and spent the next 13 years working for a manufacturer of industrial lasers. These were used for high precision cutting, drilling and welding within the nuclear, aerospace, automotive and electronic industries.
- 8) As a member of the management team I led both product and market development programmes. Product development programmes were multi-disciplinary with emphasis on drawing together different departments (R&D, engineering, production, service, marketing) to ensure an integrated approach to this emerging technology. It required judgements to be made on the fit and applicability of mathematical models derived in the course of such development .
- 9) The technology carries a high safety onus due to real and perceived hazards associated with laser radiation. Risk assessments were conducted both on the laser systems and in support of customers who might be applying them to their manufacturing process for the first time.
- 10) I spent the next four years working for a company which built production lines, primarily for welding tailored blanks within the automotive industry. Again this equipment carried high safety implications due to its laser and robotic content.

In studying this case I have been supported by Commodore S.J. Auty and Dr M.S. White.

Commodore Stephen Auty, BSc, ARCS, MInstP, ChPhys, FRMetS

- 11) Commodore Auty has a first class honours degree in Physics from Imperial College and 30 years experience as a Royal Navy Officer specialising in meteorology and oceanography in support of maritime and aviation operations.
- 12) Qualifying in 1980, he saw active service in the Falklands Campaign as an officer of the watch and as Flight Deck Officer, landing and recovering aircraft, by day and night, in difficult weather conditions in a combat situation.
- 13) Further operational tours saw him forecasting in Hong Kong and for NATO in Naples, Italy.
- 14) He is extremely knowledgeable about the impact the weather can have on the safe operation of aircraft, ships and submarines and the physical limitations of the human-machine interface when it is stressed by chains of events in a real time, operational scenario.

- 15) He has used sophisticated models to forecast the downwind effects from nuclear fallout, including such studies during the Chernobyl incident, and understands the potential impact a nuclear accident could have on people and the environment.
- 16) In later years he was appointed the Director Of Naval Surveying, Oceanography and Meteorology in the MOD with responsibility for policy formulation and procurement of products and services from the Met Office and Hydrographic Office to support fleet operations, including the nuclear deterrent.

Dr M.S. White, BSc, ARCS, DIC, PhD, MInstP, ChPhys

- 17) Dr White has over 30 years industrial experience, primarily in the laser and nuclear industries.
- 18) He has first class BSc Honours Degree in Physics and a PhD in Experimental Plasma Physics, both from Imperial College. He has published papers in plasma physics, laser physics and general physics.
- 19) He is one of the team that built the Vulcan laser at the Rutherford laboratory, the first high power laser in Europe.
- 20) He led the team that produced the TIALD thermal imaging laser designator pod ahead of schedule so that it was able to make a major contribution to the Gulf war.
- 21) Dr White was Managing Director of Electrox, a laser marking equipment manufacturer, for many years. He developed the business such that a third of the world's computers and quarter of the world's mobile phones were being marked by Electrox systems. He won the Queens award for export for this work.
- 22) Dr White is currently a consultant within the Nuclear Industry supporting one of the UK's largest nuclear companies on both their civil and military programmes.

SCOPE:

23) This evidence looks at some fundamental problems associated with the way in which the nuclear safety issue has been considered. It covers:

*** Problems with the assumptions, application, structure and interpretation of the risk assessment methodology**

(This is primarily by example. It is intended to be supportive and complementary to the work conducted by Large and Pitfield)

*** Considerations for a risk assessment of this airport system**

An airport whose operations are affected by the presence of two Ministry Of Defence (MOD) firing ranges, a nuclear power station and a bird reserve.

*** Confirmation that the birdstrike hazard has not been fully accounted for:**

The Civil Aviation Authority (CAA) has confirmed in writing that this hazard cannot be mathematically modelled. Therefore it is not implicit within the Nuclear Installations Inspectorate (NII's) methodology and presents an unquantifiable, hence unacceptable, risk to the nuclear power stations.

*** Conflict between international birdstrike regulations and the European Habitat's Regulations.** The former implies a requirement to discourage hazardous birds from the flight path of any aircraft which finds itself over the RSPB bird reserve and heading towards the nuclear power stations. The latter seeks to preserve their habitat.

*** Lack of connectivity between relevant government departments.**

The nuclear and aviation risks are interactive but there is no forum for taking a holistic view of the nuclear safety case.

*** Misperception that NII's position takes priority.** Includes NII's written confirmation that its view does not take priority over EDF or other consultees.

*** Dilution of GOSE's nuclear statement.** Changes from the first to the final draft of GOSE's recommendations create an impression that the nuclear concerns are merely those of anxious local residents. In practise, NII has yet to answer specific deficiencies and inconsistencies raised by a number of qualified commentators including: Auty, Auty. White, Spaven and Large . Added to by Pitfield in this Public Inquiry.

SECTION1: PROBLEMS WITH THE NUCLEAR RISK ASSESSMENT

Step Change In Risk Posed By LAA Expansion

- 24) Risk is defined as the probability of an event weighted by the severity of the consequences.
- 25) NII admits that if a large commercial aircraft were to crash onto the nuclear site then it has the potential of causing an its highest category 'Target 9' nuclear accident, defined as having the risk of causing more than 100 deaths (*Appendix 1, Letter 1, Note 1*)
- 26) Currently light aircraft constitute 99% of LAA's movements. A collision by one of these aircraft is unlikely to have sufficient impact to cause off-site, radiological consequences.
- 27) Therefore it should be understood that approval of these planning applications would introduce a step change in the risk of a major nuclear accident derived from LAA based traffic. This is because, regardless of the probability of an aircraft crash, there could be a step change in the off-site radiological consequences.
- 28) This is an important concept to grasp. A notion has been generated that an expansion of LAA somehow results in only a small incremental risk over that presented by current operations at the site. This is fundamentally flawed because current operations do not carry the same severe consequences that could be introduced by large commercial aircraft taking off, landing and conducting low level manoeuvres close to the nuclear power plants.
- 29) NII inspectors have a mandate to err on the side of caution where there is uncertainty and where the safety of the general public is concerned. Given the magnitude of the consequences in the event of a large commercial aircraft crashing onto Dungeness site one would have to interpret this as a precautionary principle, requiring a high degree of confidence in the methodology before these planning applications could be approved.

Deficiencies In The Application Of The Byrne Model

- 30) The following section provides evidence which illustrates problems in the assumptions, application, structure and interpretation of the Byrne crash rate model (*Reference 1*) which the NII has used; in particular the flawed comparison with a notional background crash rate. It is intended to be complementary and additional to the evidence provided by Pitfield (LAAG/5)

Should Not Be Used In Isolation

- 31) We do not belittle the notion that it is useful to analyse historical data which describes the crash patterns surrounding other airports. It is helpful in identifying trends at a general level.
- 32) What is flawed is the suggestion that this empirical study can provide a meaningful estimate of the probability of an aircraft colliding with the nuclear power station when it carries no information on the specific operating conditions, constraints and hazards associated with a particular airport system. It contains no mechanism to evaluate such variables, either singly or in combination.
- 33) To draw comparison, in preparing a risk assessment for a complex production line one might, in the preamble of a report, make reference to the nature of hazards associated with similar systems based upon national or international empirical data. However, the Health and Safety Executive (HSE) would never accept such comparisons as the definitive risk assessment for the installation under review. It would demand that a rigorous study be made of all of the possible failure mechanisms of that particular installation together with the proposed mitigating actions before determining whether the resulting system was safe to use.
- 34) In this case too much reliance has been placed on a generalised model derived from historical crash rates rather than taking a holistic view of the specific risks associated with the LAA airport system

Consideration Of The Initial Screening Criteria

- 35) The NII currently uses the Byrne model to assess the risk presented by an airport which is located near to a nuclear power station. This methodology states that the majority of aircraft crashes occur within 10km of the runway. It states that the acceptability of an airport must be closely examined if it is either:
- Less than 10km from the nuclear power station (LAA is <6km from the Dungeness nuclear site), **or**
 - Operates more than 20,000 flight movements per year (LAA's is proposing around 40,000 flight movements per year), **or**
 - If its runway points in the general direction of the nuclear power station (Any aircraft which veers to the left after take-off or an aborted go-around at LAA would be pointing directly towards the nuclear power station).

LAA exceeds all three of these criteria which immediately puts into question the wisdom of supporting these plans.

Failure To Assess The Severity Of The Outcome In The Event Of A Collision

- 36) In September 2009, the NII wrote to local residents (*Appendix 1, letter 2, note 1*) saying that it did not feel the need to assess the severity of the outcome in the

event of an aircraft collision at Dungeness because it deemed the probability of this event was sufficiently low. This is contrary to the common sense, basic principles of any risk assessment which state that you must consider the outcome as, if too extreme, there may even be a need to reduce the probability of an event to zero, for example.

37) It is also contrary to the NII's letter to residents in October 2008 (*Appendix 1, letter 1, note 2*) in which states '*...hence a more detailed evaluation of the likelihood and consequences of aircraft crash is required*'. In other words, NII failed to carry out an assessment of the consequences, despite confirming to residents that such an analysis would be required.

Failure To Review The Allowable Frequency Of An Aircraft Collision

38) NII's , 'Numerical targets and legal limits in Safety Assessment Principles for Nuclear Facilities - An explanatory note' , paragraph 51 states that '*In the case of accidents where the consequences are very much larger than those of Target 9 (100 fatalities) then there may be a need to demonstrate correspondingly lower predicted frequencies of occurrence.*'

39) Whilst NII failed to assess the severity of the outcome, it must be assumed that there is potential for considerably more than 100 deaths. This implies that a review of the allowable frequency should have been undertaken.

40) However, NII confirms that it did not carry out this due process because it perceived the predicted frequency of an aircraft collision to be below its existing Basic Safety Objective (*Appendix 1, letter 2, note 1*). This is perverse. The sequence should be to: first assess the severity of the outcome in the event that the worst happens, then set the allowable frequency accordingly.

Failure To Present The 2 Million Passengers Per Year (Mppa) Case

41) LAA submitted a planning application for an expansion to 500,000ppa but declared a target of 2 million passengers per year. The NII confirmed to us, both in writing (*Appendix 1, letter 3, note 1*) and during a telephone conversation (Trudy Auty/Allmark), the need to assess the 2Mppa scenario. This was on the grounds that, if the Nuclear Safety Case failed at this volume, then it might affect the council's (*now Secretary of State's*) decision.

42) Despite making this commitment, the NII only presented the Department Of Energy and Climate Change (DECC) with its case for 500,000ppa without substantiating its calculations and without justifying why the projected crash rate had been decreased by two orders of magnitude since its 1997 Periodic Safety Review.

43) NII's assessment of the increased risk posed by this airport development must consider the target throughput of 2Mppa. It must substantiate its calculations and make them available for external peer review.

The Byrne Model Cannot Account For Integrated Risk

- 44) The 'Principles And Guidelines To Assist HSE in its Judgements Of ALARP (As low as reasonably practicable), Paragraph (17) states. *'Risks should be assessed in an integrated manner. It is important to consider the 'full picture' when assessing risk and not a partial view from considering hazards in isolation, or in a slice of time, or location by location rather than across the whole system.'*
- 45) This recognises that the combined effect of a number of different problems occurring 'simultaneously' is greater than the sum of the parts. So, for example, whereas a pilot might be able to cope with a strong tail wind, or a tight banking turn or a lost engine or a birdstrike; his or her ability to cope with a number of complexities within a single chain of events is likely to be impaired. So it is the **interaction** of such local hazards and operating conditions which must be considered.
- 46) We are not convinced that NII understands this point. It seems to think that overlaying the crash patterns of many different airports integrates the risk. In fact this process tends to mask any specifics or directionality that might exist at any one airport. For example, it may be that airport A would have a tendency for aircraft to crash at an 11 o'clock bearing to the runway due to some particular constraint, airport B at 1 o'clock and so on. So the resultant plot, when you overlay all of this data, is a distribution which suppresses the directional tendency at any one of these locations.
- 47) The Byrne model does not represent integrated risk because it has no mechanism to interpret how a particular suite of conditions at a particular airport interact with each other.

Comparison With Overflying Aircraft

- 48) The NII has stated its primary reason for not objecting is that it perceives the increased risk posed by an expanded LAA would be small compared with the background risk posed by aircraft flying at altitude over head. It puts forward a rationale which says that society will not give up the right to fly, so if the incremental crash rate posed by this development is small, then NII cannot object. (Appendix 1, letter 3, note 2)
- 49) We consider the NII's conclusion to be wrong and the comparison flawed on a number of levels. We make the following observations in this regard.
- 50) A comparison with the background crash rate is not covered by nuclear safety guidelines and would appear to be outside of the NII's remit. It is not clear, therefore, what criteria NII could apply in making such a comparison as they have no published guidance in this matter.
- 51) That said, the principle of comparing a new risk with the ambient risk might be considered reasonable if the information under consideration had some substance. However in this case it does not.

- 52) The primary threat to public safety comes from small and large transport aircraft (as defined by the Byrne model aircraft classifications). The model attempts to create a notional 'background' density of aircraft crashes, measured in terms of crash rate per m^2 per year. This is derived from only 4 crashes (in the case of large transport aircraft) and 2 crashes (in the case of small transport aircraft) which occurred at different locations across the UK during the period 1985 to 1994. To suggest that an extrapolation of this scant information to the nearest square metre per year has any meaning is not credible.
- 53) Moreover, the whole basis for the comparison (airfield crash rate vs background crash rate) is flawed because:

a) The data base used to derive this notional background rate includes aircraft that have been brought down by terrorist activity (Lockerbie) whereas the airfield is only considered in terms of the potential for an accidental crash onto the site i.e. it is not an apples-for-apples comparison.

If terrorist activity is to be accounted for then one would need to consider that the closer the airfield is to a nuclear power station, the greater the risk posed by a terrorist gaining control of an aircraft during the late stages of approach, leaving no time to apply a deterrent. This might not be a significant issue whilst the airport operates light aircraft but it would pose a threat to Public Safety if LAA expands to operate large commercial aircraft.

b) The background crash rate only considers crashes which occur more than 5 miles from a runway. It screens out those which do not involve fatalities and *'those which are as a result of a forced landing in which the pilot had some degree of control over the landing site. In these cases it is reasonable to assume that the pilot could avoid built up areas or large structures'*

This seems appropriate as a pilot descending from cruising altitude would have more time to take evasive action. A small change in position or angle at that height would result in a large change in position on the ground, conceivably giving a better chance of avoiding the nuclear site.

However the aircraft reliability figures generated for the airfield case (*Byrne and Jackson, Reference 2*) apply similar screening criteria, taking out cases where the fault was merely an engine failure, where there were no fatalities or where the aircraft was forced to land in the wrong place. This logic is flawed as if that wrong place happened to be the nuclear site then it could result in a collision. For example, if an error chain was set up such that the aircraft finally lost an engine over the bird reserve the pilot might have no time left to take effective diversionary action, being only a few seconds away from crashing onto the nuclear site.

This implies that the airfield crash rate has been understated relative to the background crash rate as there is no facility to take into account the fourth dimension of time.

- 54) These are just a few examples to illustrate the extent to which the 'airfield to background' crash comparison is flawed and lacking in substance. It cannot, therefore, be used as a meaningful comparator in this case.

Section 1 Summary

- 55) Airport expansion introduces large commercial aircraft taking off, landing and performing low level procedures in the vicinity of the nuclear power station, introducing a step change in the risk of a major nuclear accident derived from LAA based traffic.
- 53) If one of these aircraft were to crash into the nuclear power station it has the potential to cause its highest category (Target 9) nuclear incident.
- 54) NII failed to assess the magnitude of the consequences in the event of an aircraft collision, despite committing to do so.
- 55) The methodology applied to estimate the probability of a crash onto the nuclear site is inadequate and cannot account for integrated risk.
- 56) The way in which the model has been applied is called into question as NII failed to review the allowable frequency and failed to present DECC with the 2Mppa case, despite confirming that it should be considered.
- 57) There is insufficient data to derive a meaningful background crash rate so it should not be used as a comparator.
- 58) NII's attempt to draw such comparison is, in any case, flawed by inappropriate screening criteria and by consideration of terrorist activity within the background case only.
- 59) **General note to Section 1:** *It is clear from Allmark's letter (Appendix 1, letter 3, note 3) that NII applied the Byrne's methodology (AEA Research Report 150, 1997) to this nuclear safety case. It is not clear whether the aircraft crash rate data had been updated since the examples given in this evidence but the principle of our arguments remains the same.*
- 60) *Despite several FOI requests and the intervention of the Information Commissioner's Office, HSE has refused to disclose its 2007 Dungeness B Periodic Safety review and refused to explain why NII's crash rate estimates are now around two orders of magnitude less than those which it projected in 1997.*

61) *We have been advised that the Ministry of Justice has refused this release on grounds of National Security. As an observation, we are surprised that, on the one hand, we are refused access to these estimates which cannot be construed as sensitive (the methodology has been published, the parameters are either in the public domain or could easily be measured by anyone passing by the site); yet on the other hand it appears that the planning process does not require a full study of the terrorist implications of such a development. If there are genuine concerns relating to National Security then we question the proportionality of this situation.*

SECTION 2: CONSIDERATIONS FOR A RISK ASSESSMENT

Correcting misperceptions:

62) Returning to the basic principles of a risk assessment, it must be recognised that when an airport is near to a nuclear power station then the potential for collision is fundamentally driven by the proximity of the two locations and cannot be prevented by exclusion zones or selective flight path control.

63) Accidents happen when things go wrong in which case these theoretical constraints are meaningless. The exclusion zone around a nuclear site is not an arrester wire. It offers no physical protection so, whilst reducing the probability of collision (by reducing traffic in the area), it cannot be offered up as some form of definitive mitigation.

64) Likewise, planned flight paths are not railway tracks and do not physically constrain aircraft movement in any way.

65) The probability of a nuclear accident in this case is driven by the probability of a large commercial aircraft crashing onto the nuclear site¹. This means considering the different ways in which such an aircraft might fail to execute its intended flight path and arrive at that location. One would then need to consider the probability of each of these scenarios occurring and sum the elements to estimate the total probability of a collision.

66) Within this, there is a need to understand that the probability of an event is not synonymous with frequency. For example, whilst relatively few aircraft might fail to execute the right hand turn after an aborted go around and find themselves over the bird reserve, heading towards the nuclear power stations; the probability of such a flight resulting in a collision with the nuclear power station is clearly much higher than one in which the plane followed its intended path.

¹ The additional risk posed by an aircraft crashing onto a train carrying nuclear waste is not considered

67) In other words, a risk assessment must recognise the fact that different flight scenarios have different probability weightings. NII's methodology has no mechanism to differentiate between these different risk profiles which is why its assessments are incorrectly dominated by flight frequency rather than the true probability of an aircraft crashing onto the site.

Scenarios

68) It is generally accepted that the majority of aircraft accidents are a result of a chain of events rather than one single incident. Spaven, LAAG/10, has listed four scenarios which could result in an aircraft pointing towards the nuclear site, a situation which NII deemed to be unacceptable in 1988.

69) In particular, Mr Spaven notes that the probability of Scenario 2

Engine or other failure to an aircraft flying an ILS, NDB or RNAV approach to runway 21 which precludes the aircraft from making the required right turn on the missed approach

is increased from the previous study in 1988.

'Go-arounds from the ILS approach are now more likely because it is offset from the runway centreline by the maximum allowed 5°, as well as having the steepest allowable glidepath. In addition to that, Lydd Airport has based its operational case on airliners using runway 21 for landing in tailwinds of up to 10 knots – a much larger tailwind component than is accepted at other UK airports with preferential runway schemes.² Putting those factors together – high ground speed due to a tailwind, a steeper than normal approach and the requirement for a turn to align with the runway at a late stage in the approach – makes it much more likely that the aircraft is not stabilised on the approach in time to make a safe landing, and the crew opt to go-around.'³

70) Mr Spaven goes on to note that *An airliner would take approximately a minute and a half to fly from the missed approach point to the boundary of the range danger area. If the Lydd air traffic controller was unable to get confirmation of a cessation of firing well inside that time, he might have no choice but to advise the crew of the aircraft to turn left to avoid the range, thereby directing them towards, or close to the power stations.*

71) This situation would likely bring the aircraft over the RSPB bird reserve which supports geese, swans and ducks. These are classified at the severe end of the bird strike severity matrix (Section 4), being the species most likely to cause damage to aircraft engines and hulls.

³ This view is endorsed by the CAA's Group Director Of Safety Regulations in a letter to the Autys (Appendix 1, letter 4)

- 72) It should be recognised that, whereas the pilot may have had a minute and a half to take action at the start of this chain of events; if it culminates in a bird strike over the reserve, then he or she may have only a handful of seconds left before the aircraft crashes onto the nuclear site.
- 73) Commodore Auty has been in active service and experienced life and death situations unfolding in real time. He observes that, when NII officers make statements such as *'even when multiple engine losses occur, the pilot retains some control of the aircraft as seen in the recent events in Rome and New York* (Appendix 1, letter 3, note 4) it suggests that those commentators, whilst well intended, clearly have no appreciation of the reality of such emergency situations.
- 74) It is a credit to the highly experienced, ex-military pilot that he managed to achieve a successful outcome on the Hudson River. However it is clearly not a situation that any pilot would wish to encounter less than a mile from, and pointing towards, a nuclear power station given the enormity of the consequences if he or she was unable to take avoidance action in time; that is assuming the pilot even knew which parts of the nuclear power station to avoid.
- 75) There will be other examples where the outcome of such chains of events has not been so good; where pilots, despite their training, are unable to physically take the actions necessary to operate the aircraft and its systems within the time available.

Mitigating Action Implies Netting Ponds On RSPB Reserve

- 76) Whilst it may not be possible to fully model these scenarios, they are real possibilities which cannot be ignored. If one were in an industrial environment then, having identified a potential hazard, and having assessed its probability and consequences, one would have to consider the extent to which it is appropriate to take some form of mitigating action.
- 77) In a situation where the outcome is intolerable then there would clearly be a requirement to do this, having been formally advised of routes by which such a disaster could occur.
- 78) In industry, failure to take appropriate action to prevent a hazard which could have been reasonably anticipated is considered to be a criminal offence and those responsible can be prosecuted in the event that the worst happens.
- 79) This presents a problem to the notion of expanding LAA as it implies that the ponds on the bird reserve should be netted over which is clearly not acceptable under the European Habitats Regulations.
- 80) The government has, through these and earlier reports, been served with notice of scenarios that could develop into an aircraft flying over the bird reserve in close proximity to the nuclear power station.

- 81) The airport's ornithologist stated in his risk assessment that hazardous wildfowl do not respond well to bird scaring techniques and that the only way to discourage their presence is to apply passive techniques such as netting over the ponds which support them. This is what LAA has proposed on the airport site.
- 82) So unless equivalent action was taken on the bird reserve, it implies that the government would be endorsing expansion of an airport where there is a known bird-strike hazard that could escalate the probability of an aircraft crashing onto the nuclear site.

Section 2 Summary:

- 83) Exclusion zone boundaries do not offer any physical protection of the nuclear site; they cannot be offered up as some form of definitive mitigation.
- 84) Accidents happen when things go wrong, so one must consider the possibility of an aircraft deviating from its intended flight path towards the nuclear site.
- 85) Spaven's work (LAA/10) has identified four scenarios which could result in aircraft pointing towards nuclear site, deemed unacceptable in 1988
- 86) These would have to be considered within any risk assessment. Also the potential for any scenario to develop into a chain of events that could bring the aircraft close to the nuclear power station.
- 87) NII's comments suggest a lack of appreciation of the realities of an emergency situation with a tendency to give the benefit of the doubt to a positive outcome. This is contrary to the requirement to err on the side of caution where public safety is concerned.
- 88) If an aircraft suffered a birdstrike incident over the reserve it might be less than a mile from the nuclear power station.
- 89) In industry or other walks of life, of life, failure to take mitigating action against an identified hazard leaves the responsible body liable to prosecution. This implies the need to discourage hazardous birds from the trajectory of any aircraft which has deviated from its path, across the reserve, in the direction of the Nuclear site

SECTION 3: BIRDSTRIKE HAZARD NOT FULLY ACCOUNTED FOR

- 90) The CAA's Group Director Of Safety Regulations confirmed in a letter to Autys dated 17th Sept 2009 (Appendix 1, Letter 4, Note 1) that birdstrike, a hazard associated with take-off, landing and low level emergency procedures, cannot be mathematically modelled.
- 91) *'There is no proven mathematical model relating to the probability of a birdstrike incident at a given airport. This is because local variables such as nearby attractants, local habitat management, seasonal weather variations, migratory bird patterns, etc will determine the birdstrike risk at an aerodrome'*

- 92) In other words you cannot predict either the probability or severity of a birdstrike incident at one airport based upon the experience at another because no two situations are alike.
- 93) This means, de facto, that it is not implicit within NII's crash damage model as some commentators have tried to suggest. In doing so they make the mistake of thinking that, because the NII's methodology looks at the collective experience of a number of different airports, then implicit within this is the fact that some of them will be close to bird reserves. However, as the relative location, nesting and flocking habits are different in each case it means you cannot draw comparison or suggest that the specific posed to the nuclear power station by the RSPB bird reserve has been represented by these equations.
- 94) Such claims also suggest a failure to grasp the concept of integrated risk and probability weightings. For an aircraft to collide with the nuclear power station it would have already deviated from its intended flight path and be flying towards the nuclear site; in many cases passing over the bird reserve.
- 95) Therefore the threat posed by hazardous birds, such as geese, swans and ducks, would be high when the probability of a collision has already been increased by the aircraft deviating from its path in that direction. NII's methodology has no facility for addressing this kind of directionality or integrated risk; in fact it serves to suppress it.
- 96) Whether or not the CAA has applied some latitude in allowing bird reserves to exist close to other airports is irrelevant; other airports do not have a nuclear power station sited on the opposite side.
- 97) It should be noted that in his letter of September 17th, 2009, the CAA's Group Director Of Safety Regulations is somewhat dismissive of the work carried out by Deacon (the airport's ornithologist) pointing out *that at no point had the CAA been asked to accept or agree to the findings of his study (Appendix 1, letter 4, note 2)*. He goes on to cite Dr John Allan (Natural England and RSPB's consultant in this case) as having provided the definitive methodology for assessing bird strike risk; his work being '*recognised and adopted as best practise worldwide*' (Appendix 1, letter 4, note 3)

Section 3 Summary:

- 98) The CAA's Group Director Of Safety Regulations confirmed that there is no proven mathematical model relating to the probability of a birdstrike
- 99) This means that it has not been and cannot be accounted for within the NII's crash rate estimates.
- 100) It is unacceptable to have such an unquantifiable risk in the vicinity of a nuclear power station. It is our opinion that this phase of flight should be screened out by the implementation of a minimum separation policy.

SECTION 4) CONFLICT BETWEEN BIRDSTRIKE REGULATIONS AND EUROPEAN HABITATS REGULATIONS

101) Bird-strike is a threat to aircraft manoeuvring at low altitude corresponding to a distance of 13km from the runway (CAA's CAP772, para 4.4). This is why ICAO (International Civil Aviation Organisation) and CAA regulations state that airports and local authorities must work together to actively minimise the presence of hazardous birds over this 13km radius.

102) The Introductory Paragraphs Of The Civil Aviation Authority's Birdstrike Safety Guidelines CAP772 (corresponding to International Civil Aviation Organisation's Annexe 14), Reference 3 state:

'When a birdstrike hazard is identified at an aerodrome, the appropriate authority shall take action to decrease the number of birds constituting a potential hazard to aircraft operations by adopting measures for discouraging their presence on or in the vicinity of an aerodrome.....the appropriate authority shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any such other source attracting bird activity on, or in the vicinity of, an aerodrome unless an appropriate aeronautical study indicates that they are unlikely to create conditions conducive to a bird hazard problem' (underlining is my emphasis)

103) The term 'in the vicinity' is taken to be land or water within 13km of the aerodrome reference point. An "appropriate authority" is deemed to be an authority that has the power to take action in a particular situation....generally taken to be the airport operator on site and the local authorities outside of the airport boundaries.

104) In this case the airport conducted a risk assessment which identified; 'Mute Swans, Canada Geese, Greylag Geese, Mallard, Grey Partridge, Herring Gull and Pheasant as being in the red zone of the hazard severity matrix, defined as risk unacceptable.

		EXPECTED STRIKE FREQUENCY				
		Very Low	Low	Moderate	High	Very High
RISK OF DAMAGE	Very Low			linnet	meadow pipit house martin	skylark barn swallow swift
	Low		jackdaw thrush species	kestrel barn owl		
	Moderate		teal common gull oystercatcher golden plover lapwing marsh harrier feral pigeon	lesser black-backed gull black-headed gull red-legged partridge woodpigeon stock dove rook carrion crow starling		
	High		cormorant grey heron	mallard grey partridge	herring gull pheasant	
	Very High	Bewick's swan	mute swan greylag goose Canada goose			

105) The assessment then went on to discuss measures to control grey partridge, herring gull and pheasant both inside and outside of the airport boundary, which implies that the author fully understood the requirements set out in CAP772/ICAO Annex 14 above.

BIRD HAZARD CONTROL STRATEGY.	
A short list of species categorised "unacceptable" is included in the risk matrix table in section 6. These are listed below along with the recommendations to reduce the probability of birdstrikes to acceptable levels.	
Species	Require Mitigation Measures
mute swan	Net ponds and open ditches on airport, pass warnings to aircrew when swans overfly airport.
Canada & greylag goose	Net ponds and open ditches on airport, pass warnings to aircrew when geese overfly airport.
mallard	Net ponds and open ditches on airport.
pheasant	Remove feeders from areas adjacent to airport. Clear scrub to expand cleared area between cover and runway.
grey partridge	Remove feeders from areas adjacent to airport. Clear scrub to expand cleared area between cover and runway.
herring gull	Increased patrols and inspection of runway surfaces, particularly at dawn and in wet weather. Increased vigilance when ploughing, harvesting, etc. is in progress in adjacent fields.

106) However the study only considered measures to prevent the highest risk category (mute swans, Canada geese and mallard) from habituating the airfield. It explained that bird scaring techniques are not effective in discouraging this type of bird, therefore the ponds and ditches on the aerodrome should be netted over.

There was no mention of applying similar measures outside the airport perimeter.

107) This ignored CAA and ICAO safety regulations which state that action must be taken *to eliminate....any other source attracting bird activity on or in the vicinity of an aerodrome unless an appropriate aeronautical study indicates that they are unlikely to create conditions conducive to a bird hazard problem"*

108) An appropriate aeronautical study is defined as one that compares the birdstrike risk in the 'with and without' bird attractant case and makes clear that this process applies to existing bird attractants in the vicinity of the aerodrome as well as proposed new developments.

109) Such a study would have to take a holistic view of the risk posed by hazardous birds supported by the SPA and RSPB reserve. It would have to consider that, if an aircraft had deviated from its intended flight path across the reserve, then a birdstrike at that position could increase the probability of a crash onto the nuclear site.

- 110) It is hard to see how any exception to the requirement to 'decrease the number of birds constituting an identified birdstrike hazard in the vicinity of an aerodrome' could be granted in the area of the RSPB reserve when the potential consequences are so extreme.
- 111) This suggests that the requirements of CAP772/ICAO Annex 14 are in direct conflict with the requirements of The European Habitat's Regulations which seek to preserve the ponds and ditches that also support protected species such as the Bewick swan.

Section 4: Summary

- 112) ICAO Annex 14/CAP 772 states the need to actively decrease the number of birds constituting a potential hazard for a distance of up to 13km from the aerodrome.
- 113) This to be achieved by eliminating source attractants in the area, unless an aeronautical study indicates that the attractant is unlikely to be conducive to a bird hazard problem.
- 114) LAA identified an unacceptable hazard posed by a number of water fowl (red zone of the matrix). It stated that passive methods such as netting were required to discourage these species.
- 115) LAA proposed netting of ponds and ditches on the aerodrome. It failed to recommend equivalent action on the RSPB bird reserve and SPA.
- 116) An appropriate aeronautical study comparing the 'with and without' bird attractant would have to consider that a birdstrike incident over the bird reserve could increase the probability of an aircraft crash onto the nuclear site.
- 117) Given the potential outcome, it is hard to see how any exception to ICAO Annex 14/CAP772 requirement to eliminate the source attractant on the RSPB reserve could be granted which implies a need for passive control such as netting
- 118) This would be in direct conflict with the European Habitats Regulations

SECTION 5: LACK OF CONNECTIVITY BETWEEN DEPARTMENTS

Example of Nuclear Safety Falling Through Gap

- 119) There is currently no process in place to automatically alert NII to changes in flight paths that could materially affect the nuclear safety case. The NII concedes that there is a need to restrict take off and landing routes at an airport which is located so close to a nuclear power station. In fact, it restricted certain flight paths at the time of the last planning application and is proposing to eliminate a flight path as a result of the current planning process – no left hand departures from runway 21 for aircraft over 5.7 tonnes.
- 120) However there is no follow through to this procedure. In this case, the CAA recently approved new flight paths that could increase the probability of an aircraft collision at Dungeness and these are already in operation. The CAA concedes that it is not expert in assessing nuclear safety (Appendix 1, Letter 4); yet these changes were made without recourse to the NII, demonstrating that there is no ongoing control of flight paths beyond the snapshot taken at the time a planning application is assessed. In this case the new flight paths were introduced in 2009, but NII's next periodic safety review of Dungeness B is not until 2014, leaving a five year gap in which nuclear safety could be inadvertently compromised.
- 121) Whilst this process failure has less significance if the airport continues to operate small aircraft, it would clearly be unacceptable if the airport expanded to operate large aircraft capable of causing a major nuclear accident in the event of a collision.
- 122) A further example of the mismatch between the nuclear and aviation worlds can be seen in the treatment of 'go arounds'. The CAA treats a 'go around' as a single flight movement (*confirmed in Appendix 1, letter 4*). The aircraft could start an approach to the runway, abort the procedure and go around two or three times; yet it would still be considered as one flight movement.
- 123) However each of these go arounds would need to be assessed within the nuclear safety case, not only in terms of the added frequency (*the CAA director confirms that the conditions at LAA could be conducive to a propensity for the go around procedure, Appendix 1, letter 4,*) but also in terms of the increased possibility that a failed go around procedure leaves the aircraft pointing towards the nuclear site.

Lack Of Joined Up Thinking

- 124) One of the difficulties in dealing with a case of this complexity is that it requires the interaction of a number of different disciplines and government departments. To conduct a comprehensive risk assessment would require a multidisciplinary approach incorporating the relevant aviation and nuclear specialists, meteorologists, ornithologists, MOD firing range staff, etc, taking a holistic view of the possible error chains that could lead to an aircraft collision.
- 125) However the process is not structured in this way. Instead each department acts independently with the potential for nuclear safety to fall through the gap in the middle. No single, qualified person is taking an overview and there appears to be no forum in which these complex issues can be resolved⁴.
- This situation is illustrated by comments which we received from:
- 126) The CAA's Group Director Of Safety who stated that '*The CAA has no obligation to alert the NII of concerns (should it have any) and the NII is responsible for obtaining the information it needs in support of its regulatory role. (Appendix 1, letter 4, note 4).*' This was in response to our question as to whether the CAA had made NII aware of some of the operational constraints at the airport, such as those now described by Spaven's (LAAG/10) evidence.
- 127) CEO of HSE (*email to the Autys dated 26th April 2010, Appendix 1, Letter 5, Note 1*) who stated '*we can offer no comment as to the nature of airfield operations which are regulated by the civil aviation authority*' This was in response to our alert that, as neither the CAA or the airport had advised the NII of these operational constraints, then it meant the NII's risk assessment had incorrectly assumed that aircraft were always free to land according to the prevailing wind (*This incorrect assumption is stated in Append.1, Letter3, Note 5*)
- 128) It is disappointing that the Government's Chief Scientist's Office declined to engage on this case, given its mandate to resolve interdepartmental issues. Whilst it failed to deliver any written response to our deputations (made since January 2010) it verbally stated the reason for not applying any urgency to this matter was because the relevant departments did not perceive any problem. This suggests that only those government departments whose interface is in question can bring an issue to the table, which is a concern as other qualified bodies or individuals might be better positioned to provide objective input.
- 129) In my experience of managing cross departmental programmes, the failure of an individual department to recognise that it has a problem, particularly at the interface, is common which is why complex issues must be debated and resolved in an appropriate forum.

⁴ We understand that memorandum of understanding exists between NII and CAA but does not seem to be applied and/or effective in this regard. In any case the issue spans a number of disciplines.

130) It appears that the task of pulling together the threads of this nuclear safety issue has been left to the planning process which we feel is unreasonable. It creates a potential for public safety to be compromised, as illustrated by the determination of these planning applications on 3rd March, 2010.

Councillors Failed To Comprehend The Interdependencies

131) During the determination the MP, Michael Howard (now Lord Howard), took the extraordinary action of encouraging councillors to override the recommendations of their own planning officer, to adopt the airport's appropriate assessment and pass these planning applications.

132) Councillors had been advised by their own, independent, expert that the necessary bird controls could be detrimental to the SPA. Despite this advice, a majority of councillors voted to adopt an appropriate assessment which had been produced by an interested party and which served to protect hazardous bird species in the area.

133) Because they didn't understand the interdependencies, councillors had no comprehension that their action, not only conflicted with aviation safety regulations (reference Section 4), but also invalidated NII's decision not to object which was based upon an understanding that strict bird control measures would serve to protect the nuclear site.

134) It is clearly unacceptable to have a process which allows a group of councillors to overrule the recommendations of their own experts and take decisions in a way that compromises nuclear safety. This is why we recommend a minimum separation policy as a simple failsafe mechanism to prevent such a situation from ever happening again.

Section 5 Summary

135) No process in place to alert NII to flight path changes that could affect the Nuclear Safety Case.

136) There is potential for nuclear safety to fall down a gap between departments

137) A risk assessment of this complexity requires a holistic view and a multi-disciplinary approach.

138) There does not appear to be an appropriate structure or forum to enable an effective overview or meaningful debate.

139) This leaves the planning process unsafe. It allows councillors to make decisions that could compromise nuclear safety because they do not understand the interdependencies involved.

140) A minimum separation policy would provide a failsafe mechanism to prevent this situation from happening again.

SECTION 6: NII'S POSITION

Nuclear Concerns Suppressed In Final Draft From Gose

141) There appears to be a general impression that the NII's opinion automatically takes priority. This is borne out by the fact that the GOSE's original recommendations to the Secretary Of State, obtained as the result of an FOI ,(*Appendix 2, Revision 1, Note 1*) stated:

142) *'Concerns have been raised in relation to the close proximity of the Dungeness Power Station. The Nuclear Industry Inspector (NII) does not object to the proposal, whereas British Energy (EDF) has raised an objection on grounds of safety and potential aircraft accident with the Dungeness Nuclear Power Station. Concerns have also been raised about bird strike. LAA presented evidence that the potential number of incidents (referring to Birdstrike) is within the CAA guidelines. However the CAA says that there is no such guidelines and that they have made no comment on these applications.'*

143) The Planning Central Casework's Division (PCC) response had a margin note **'Presumably in view of the NII stance, GOSE are content that there is not an issue here?'** and an instruction to delete the words *'LAA presented evidence that shows the potential number of incidents is within CAA guidelines. However, CAA say there are no such guidelines and they'* (*Appendix 2, Revision 1 annotated by PCC, Note 2*)

After further iterations the final draft simply read:

144) *'Members of the public and local campaign groups have raised concerns about the proximity to the Dungeness Nuclear Power Station. The NII does not object. British Energy (now EDF) objected but has not made representations to the Secretary of State. The Civil Aviation Authority has not commented. GOSE is content in respect of these matter. (Appendix 2, Final Draft, Note 3)*

145) We are disturbed by this editing as it seems to change the entire meaning of GOSE's original submission which had:

- Emphasised the fact that EDF had objected on grounds of safety and potential aircraft collision with the nuclear site,

- Flagged the birdstrike concerns

- Made reference to the fact that the CAA had not endorsed or commented on LAA's birdstrike targets and methodology. The last two sentences refer to the CAA's letter to the Autys of September 17th, 2009 (*Appendix 1, letter 4, note 2*) which had been submitted to GOSE.

146) Moreover, prefacing the statement with the words 'Members of the public and local campaign groups have raised concerns' gives an impression that these are merely the fears of a few local residents which belies the considerable amount of qualified evidence which had been submitted into the planning process.

NII Confirms That Its View Does Not Take Priority

147) Likewise it is clear from the planning officer's report and comments that he believed NII's lack of objection took priority over all other commentators; even over the licensee, British Energy whose formal input to the planning process had stated:

'The large scale increase in air traffic around the site is a risk that should be sensibly avoided in the local and wider public interest and we maintain our strong objection to the proposed development' (Appendix 1, Letter 6, note 1)

148) Interestingly this position was not adopted by NII itself. When asked to comment on how its opinion should be ranked it stated:

'HSE has provided its advice to Shepway District Council, as have British Energy. It is up to Shepway to balance these items of evidence along with many others in order to reach a view on the overall acceptability of the proposed development. The relative importance of consultation responses is not in our remit to comment upon, neither is any question of indemnification of the local authority'.

(Appendix 1, Letter 3, note 6)

149) This created a situation where the legally responsible entity had objected on grounds that the increased risk *should be sensibly avoided'*, where the regulator had adopted a lower standard of safety by failing to object and where the regulator then stated that it was up to the council to chose between these two opposing views.

150) We feel this situation is unreasonable as clearly the council is not qualified to adjudicate on matters of nuclear safety. If there was disparity then the precautionary principle should have applied and the 'safest' view should have been adopted.

151) We submitted NII's statement to the planning process in April 2009 requesting that councillors be advised of their responsibility in this matter. It was not included in the planning officer's report. The statement was resubmitted for inclusion in the pink papers in February 2010. However this request was refused (telephone conversation with the planning officer a few days prior to the determination).

Section 6 Summary

152) The nuclear safety concerns raised by GOSE seem to have been suppressed on an assumption that the NII's view must take priority..

- 153) GOSE's final draft recommendation reduces these concerns to the fears of a few local residents. This belies the considerable amount of qualified evidence which had already been submitted into the planning process.
- 154) There seems to be a general perception that NII's position must take priority. However NII states that it does not and that it is up to the council (*now Secretary Of State*) to weigh its view against other consultees.

SECTION 7: EVIDENCE SUMMARY

- 155) The rationale which NII presents for not objecting to these planning applications is based upon a highly approximated crash rate model which it claims shows that the airfield related crash rate is less than its Basic Safety Objective and small compared with aircraft flying overhead.
- 156) We believe the NII's analysis is incorrect and fundamentally flawed. It provides no evidence for supporting this claim and no evidence for why its projections are now at least two orders of magnitude less than its 1997 estimates and those of most other commentators.
- 157) Our evidence has shown:
- a) NII failed to consider the consequences of an aircraft crash on the Dungeness site, despite stating a requirement for this to be assessed.
 - b) It failed to review the Basic Safety Objective and allowable frequency in light of such a study
 - c) Fundamental flaws in the Byrne crash rate methodology and an inability to account for integrated risk.
 - d) Fundamental flaws in both the notion and implementation of the 'airfield to background crash rate' comparison.
 - e) Failure to consider the terrorist threat posed by allowing large aircraft to take off and land at an expanded LAA.
 - f) Failure to consider the practical scenarios which could develop into an accidental collision with the nuclear power stations.
 - g) Birdstrike, a key consideration, cannot be mathematically modelled and has not been fully accounted for in this case.
 - h) The conflict between applying the relevant birdstrike controls and the European Habitats Regulations

- i) Examples of nuclear safety falling down the gap between departments which could compromise public safety if these plans were to be approved
- j) The interdependency of these issues when an airport is located so close to a nuclear site. The fact that there is no multi-disciplinary forum in which they can be considered, debated and monitored at an appropriate level. This leaves the planning process vulnerable to unwittingly making changes in one area which could have serious consequences for public safety in another.
- k) A perception that the NII's position automatically takes priority; a notion which is not shared by the NII itself.

8) CONCLUSION

158) In our view, there has been an over reliance on a highly approximated, untested, mathematical model in assessing this case with a tendency to give the benefit of the doubt to a human's ability to manage a chain of events, under emergency conditions.

159) There has been a failure to stand back from the equations and take a common sense overview of the situation. The evidence suggests that there are too many flaws, deficiencies and conflicts in the assessment to allow this development to proceed. We have shown that

- One cannot say with any certainty that the increased risk is small compared with overflying.
- One cannot model the dynamic phases of an aircraft taking off, landing and performing low level procedures with any degree of certainty

The nuclear industry has a clear mandate to 'Err on the side of caution where there is uncertainty and where the safety of the general public is concerned' . On this basis these planning applications should be refused.

TRUDY AUTY

References:

- 1) AEA (1997) The Calculation of Aircraft Crash Risk in the UK, J.P.Byrne, AEA Technology, Warrington, Cheshire for HSE (150/1997).
- 2) AEA (1992) Aircraft Reliabilities and Airfield Dependencies, Byrne, J P & Jackson, P, AEA RS 5407
- 3) CAA (2008) CAP 772, Birdstrike Risk Management For Aerodromes. Safety Regulation Group.