ARCADIS Design & Consultancy for natural and built assets

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By email

Date: 21st March 2017

Subject: Technical Assessment of the co-existence of the IFA2 Electricity Interconnector and Daedalus Airfield Operations (Future Airport Development).
Our ref: 35588100

Dear Morris

Thank you for your invitation to us to undertake further technical assessment in support of the next stage of the IFA2 electrical interconnector programme (the "Services"), in particular, to develop the preliminary assessment which indicated that the proposed IFA 2 facility, once built, can co-exist with the existing Daedalus airfield without affecting safe airfield operations. Following the meeting with National Grid Interconnector Holdings (National Grid), Fareham Borough Council (FBC) and Regional City Airports Management (RCA) on the 10th February 2017, we are pleased to provide this proposal outlining the scope of our support and costs, for your consideration. The scope of work in this proposal is to support the programme of work to achieve Landowner Approvals for commencement of the construction phase, as discussed at the 10th February meeting and subsequently agreed with you.

The specific matters in relation to the Services are as follows:

1. Scope of Services

The full scope of the Services which we will carry out for you is set out in Appendix B. We are proposing to structure the full scope of work in Appendix B into two phases as follows:

- Phase 1 will review the current position and the evidence available to establish a baseline and identify any gaps in the evidence that will need to be filled.
- With the full knowledge of the gaps that need to be filled identified from Phase 1, a programme of work will then be agreed with National Grid and FBC to undertake the technical assessments necessary to fill the gaps and complete the evidence base.

We have determined a scope of work for Phase 1 that we believe will meet National Grid's and FBC's requirements. This is in Appendix A. We are offering a budget estimate for this scope. The scope of work for Phase 2 will be agreed with you on completion of Phase 1 and priced separately. Additionally we suggest some optional activities that National Grid and FBC may wish to consider to strengthen the assessment.

The completion of the Phase 1 work will provide an opportunity to include any assessment focussed at addressing any specific questions and concerns from stakeholders, including FBC Councillors. We will endeavour to respond to any questions that are raised during the course of the Phase 1 work that can reasonably be answered without extending the scope of the Phase 1 work. We recommend however that any such questions are collated and, where further assessment is agreed as necessary, this is addressed as part of the Phase 2 scope of work.

2. Personnel

I will be your principal point of contact in relation to this appointment and shall retain responsibility for the Services being delivered on your behalf. The day to day delivery of the services will be managed by Jane Wilson, an experienced Principal Consultant in our Safety and Risk Management team.

Given the multi-disciplinary nature of the work, which also covers a number specialist areas, the day to day delivery of the full scope of Services (in Appendix B) will be carried out by a core team involving the following personnel. Note that not all these personnel will be involved in Phase 1:

- Jane Wilson, Principal Safety Consultant, Arcadis UK Safety and Risk Management team;
- Tim Rowe, independent specialist in aviation safety engineering;
- Iain Coutts, Senior Consultant, Arcadis UK Aviation team;
- Mike Flaton, EMC Manager, Arcadis Netherlands;
- Martin van Essen, EMC specialist, Arcadis Netherlands;
- Martin Standaart, RFI specialist, Arcadis Netherlands;
- Dr. Ahmed Maki, Building Physicist and wind effects modelling specialist, Arcadis UK;
- Martyn Clarke, independent expert on unmanned aerial vehicles;
- Ken Ashton, independent navigation systems expert.

CVs for all of our team members are included in Appendix C.

We will do our utmost to avoid changing the personnel delivering the Services, but if this cannot be avoided (for example, because of absence due to sickness or for some other reason) then in the interests of efficiency and avoiding delay, delivery of the Services will on such occasions be handled by a suitable and equally experienced alternative individual, and you will be notified accordingly.

Equally, if for any reason there is a need to permanently change any member of the team you will be notified promptly and given the reason for such change.

3. Terms of Business

We anticipate that the same framework agreement contractual terms between Arcadis and National Grid Interconnector Holdings Ltd as applied for the previous technical assessment work will also apply to this phase of work. If National Grid wishes to use any alternative commercial arrangements, other than those stated above, we reserve the right to amend or withdraw our proposal if it is considered that there are more significant contractual risks associated with the alternative terms.

4. Complaints and Problem Resolution

As a leading international built asset consultancy, we will always seek to carry out the Services to your satisfaction and in accordance with the agreed terms of business. In the unlikely event that you consider that the Services fail to meet this standard for whatever reason, please contact me in the first instance.

Should you have any questions or require clarification of any aspect of this letter, please do not hesitate to contact myself or Jane Wilson ([redacted] jane.wilson@arcadis.com).

Yours sincerely,

Stefano Scannali, Head of Safety Risk Management

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Appendix A: Phasing of the Scope of Services

This note details how the full Scope of Services detailed in Appendix B is proposed to be structured.

Since the completion of Arcadis' preliminary technical assessment to support the land application acquisition process there have been a number of developments, and further analysis has been completed to support the Planning Application. In summary, the current position is as follows:

- The Planning Application was accepted with a number of planning conditions imposed, including stringent conditions concerning emissions from the IFA2 Facility. Land agreements are being negotiated.

- The Masterplan has been modified and there is a much firmer position concerning the future Airport developments and the surrounding businesses.

- The specifications for the IFA 2 facility have been modified and the modifications are anticipated to reduce any adverse impacts upon the airport from the facility, including emissions that will meet the requirements of the planning conditions and a more compact building that should have less impact on wind flow.

- HV cable routes are now known.

- Further analysis has been carried out, particularly in the area of EMI / RFI effects, to reinforce the position that the IFA 2 facility will have no adverse impact on the Airport or its operations or the other businesses in the vicinity of the airfield.

It is proposed that the scope of work is covered in two phases to take full benefit from the above developments since the completion of Arcadis' preliminary technical assessment.

- Phase 1 will review the current position and the evidence available to establish a baseline and identify any gaps in the evidence that will need to be filled.

- With the full knowledge of the gaps that need to be filled identified from Phase 1, a programme of work will then be agreed with National Grid and FBC to undertake the technical assessments necessary to fill the gaps and complete the evidence base.

The Hazard Identification and Risk Assessment / FHA process outlined in the Scope of Services spans both Phases 1 and 2, hence this activity will be split accordingly over the two phases, specific details are provided below. At the end of Phase 1 an interim report will be produced to detail the extent of the evidence demonstrating control of risk, and the risks where further evidence will be needed to close them at Phase 2.

The scope of Phase 1 is summarised below with reference to the tasks detailed in Appendix B, the full scope of services.

Scope of Phase 1

Task 1 – Review of Current Position and Evidence

- A review to be carried out of the additional analysis available to support the EMI / RFI justification for the IFA 2 facility. It is assumed that there are 15 new documents to review, each of about 30 to 40 pages.
- Based on this review, establish the baseline of evidence and identify the gaps where further evidence is still needed and form a view on the areas where further analysis will be needed at Phase 2.
- Prepare an interim report documenting the above, setting out a revised description of the IFA2 project in the context of the Airfield developments and compare this with the Arcadis 2016 work in order to draw conclusions and make recommendations on what further assessment is warranted.

Task 2.1 – Hazard Identification and Risk Assessment

- A 2 day (consecutive) Hazard Identification and Risk Assessment / FHA workshop to be held to review the hazards identified from the preliminary technical assessment carried out by Arcadis, in the light of the updated Masterplan and changes to the IFA 2 design. It will also consider the future runway extension. Additional hazards and evidence will be added to the log where these arise. Where evidence is available to verify control measures, risks will be assessed and ranked where possible in accordance with CAP 760. It is assumed that the workshop will include a half day site visit for the benefit of familiarisation with the site layout.
- Based on the output from the workshop and taking into account the review of Task 1, the Hazard Log will be updated. This will reinforce the position regarding gaps in the evidence that need to be filled at Phase 2.
- Prepare an interim Hazard Identification & Risk Assessment report and an updated Hazard Log.

Task 2.10 – Buildings Wind Assessment

The Stage 1 wind assessment as detailed in in Appendix B will be completed and an interim report prepared.

Tasks 2.12 and 3 – CAA and AAIB Hold Points

The scope of work as detailed in Appendix B will be completed and an interim report prepared.

Summary of Position at end of Phase 1 and outline our view of the work required for Phase 2

An interim report will be prepared to summarise the position at the end of the Phase 1 work describing the new baseline and any gaps in the evidence, and will also outline the work required for Phase 2. This will form the basis for discussion with National Grid and FBC.

The scope of work proposed for Phase 2 and discussed with National Grid and FBC may include any specific questions and concerns from stakeholders, including FBC Councillors, where further assessment is considered to be necessary. Additionally, it may include any physical or practical tests, assessments or demonstrations considered as

beneficial to support the technical assessments at Phase 1 or to mitigate specific hazards. The scopes of such practical assessments or demonstrations will need to be agreed by National Grid and FBC and (where possible to do so and agreed) these will be carried out and reported within the period of the Arcadis Phase 2 work and included in the final report.

Appendix B: Full Scope of Services

Background

National Grid Interconnector Holdings (National Grid) and Fareham Borough Council (FBC) have been granted planning permission to develop and implement an electricity interconnector at Solent Airport, Daedalus, Lee-on-the- Solent; the land agreements are being negotiated. The facility (referred to as IFA2) is being developed jointly with Reseau de Transport d'Electricite (RTE), the French transmission system owner and operator.

The converter station is being sited to the North East of the Airport, with high voltage cables (HVDC and HVAC) planned to be routed in the same cable corridor to the west and north of the main runway.

Arcadis completed a preliminary technical assessment to support the land acquisition process for the facility. This concluded that the risks posed by IFA2 are not expected to adversely impact the Airport's current operations and any hazards are expected to be manageable. No significant issues were identified that would prevent National Grid and Fareham Borough Council proceeding to the land acquisition stage. Recommendations for the next phase of development were raised. As is typical with any major project, these would be expected to be managed as part of the future planning process and agreements and the design specifications for the facility.

Having now completed the preliminary technical assessments, National Grid and FBC have requested that Arcadis provide support during the next phase of development i.e. the detailed design phase of the facility through to commencement of work on site. This work will develop the preliminary technical assessment and additionally consider future airfield developments and Fareham Borough Council's intentions as landowner for the wider developments.

National Grid will be the contracting party for this work, however the resulting report will be for the benefit of both National Grid and FBC. Hereafter where reference is made to National Grid, this is also a reference to National Grid and FBC jointly.

To this effect, on the 10th February 2017, Arcadis attended a workshop organised by National Grid together with FBC and RCA (the Licenced Airport Operator on behalf of FBC) to plan the scope of the next phase of the technical study. This proposal for the full scope has been prepared following the workshop and includes the scope of work, based on our understanding of the requirements and areas of the next phase of technical assessments.

Purpose, Scope & Approach

The purpose of this work is to provide technical assessment to support National Grid in the next phase of development of the IFA2 electricity interconnector i.e. the detailed design phase in order to support them in their dealings with FBC and to gain the necessary Landowner and local planning authority approvals and consents for commencement to the construction phase. The work may also support stakeholder engagements as a secondary purpose.

The assessment will develop and extend the preliminary technical assessments undertaken in support of the land acquisition stage which assessed potential adverse safety impact on the current airfield operations. This work will progress the recommendations raised by the preliminary assessments, and consider any potential adverse impact to and from the IFA 2 Facility related to the future airfield developments and the wider planned developments, within a scope agreed with National Grid.

The work will centre around the 4 core areas below which were confirmed in the preliminary assessment to be the key risk areas to be considered, to ensure that the facility once built, can co-exist safely with the airfield without affecting safe airfield operations.

i. **Electromagnetic compatibility** (including EMF and RFI) – to provide assurance of safe compatibility with other users of the airfield and future airfield development.
ii. **Wind flow** – to provide assurance of no material adverse effects of the IFA2 facility to flight operations in the context of the Masterplan.
iii. **Aerodrome Safeguarding** – to provide assurance that the IFA 2 facility and development of the airfield is in accordance with relevant licence and CAP conditions to provide assurance of compatibility with licence requirements.
iv. **Hazard Identification & Risk Assessment** – to continue to identify hazards, risks and mitigations and develop / manage the Hazard Log.

Additionally, the work will provide support in some other specialist technical areas, identified in the detailed scope of work below.

It is proposed the work is split into two phases as detailed in Appendix A. this will allow Phase 1 to establish the existing baseline of evidence and identify any gaps, after which the scope for Phase 2 will be finalised and agreed with National Grid.

A set of interim deliverables is proposed in line with the IFA2 project programme to enable them to review the progress and to provide the necessary assurance to National Grid to support the detailed design in a timely manner. The programme of deliverables will be discussed and agreed, giving priority to any key areas of assessment as identified by National Grid and FBC.

The final output of the work will be a report (for Phase 1 and Phase 2 respectively) which is based on a compilation of the interim deliverables. This will provide a justification that within the boundaries of the scope of work undertaken, the hazards are managed and the risks will not adversely impact the airfield operations and planned developments. The Phase 2 report, together with documentation and assurance evidence provided by the designer of the IFA2 Facility, will provide a basis for gaining the necessary stakeholder approvals and consents for progressing to the construction phase.

The above work will be undertaken in accordance with the relevant standards and guidance, including:

- Civil Aviation Procedure (CAP 738) Safeguarding of Aerodromes.
- Civil Aviation Procedure (CAP 760) Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases.
- Civil Aviation Procedure (CAP 168) Licencing of Aerodromes
- Daedalus Airfield Safety Management System.

Detailed Scope of Work and Requirements.

The detailed scope and requirements for the work is given below. The scope and requirements are based on the output of the workshop held on the 10th February 2017.

A programme for the Phase 1 work only is included in Appendix D, which will fit within the wider programme for the IFA2 Facility and meet the key deliverable dates. The Programme for the Phase 2 work will be agreed on completion of the Phase 1 work. This programme is dependent on a number of assumptions and factors, including the timely provision of the information (pre-requisites) necessary to undertake the work.

Assumptions and Actions / pre-requisites for each item of work are stated below and Action Holders (NG, FBC and RCA) identified.

1 Task 1 – Review of Current Position and Evidence

The task will be completed at Phase 1 as detailed in Appendix A.

The agreement of the Masterplan and review of evidence on which the work will be based, together with an assumption that the IFA 2 design will meet the Planning Conditions, will form boundaries for the technical assessment, i.e. any changes e.g. additional equipment to be located in the airfield that is not already shown on the Masterplan or any potential non-compliances emerging with the Planning Conditions, will require re-assessment which is not included within the scope of this proposal.

Actions / Pre-requisites:

A version of the Daedalus Masterplan is to be agreed and made available which will form the basis of the assessment. This will show the latest information regarding airfield development with any variations likely for locations of these future developments shown on the Master Plan, where they are known (FBC).

Assumptions

It is assumed that the specifications and requirements for the evolving design of the IFA2 Facility will meet the Planning Conditions specified in the Planning Report (NG).

2 Technical Assessment of Airside Developments

2.1 Hazard Identification and Risk Assessment

As was the case for the preliminary assessment, Hazard Identification and Risk Assessment in the form of Functional Hazard Analysis (FHA) considering the impact of the IFA2 Facility to and from the wider airfield developments, will form the cornerstone of the technical assessments. The Hazard Log will be used to record potential hazards and risks and to track them to closure based on the existing evidence (analysis already undertaken) and the new evidence being developed throughout the course of the technical assessments as discussed in 2.2 to 2.11 below.

Arcadis will facilitate the FHA for a fixed version of the Masterplan (as in 1 above) which sets out the known plans, including any options. This will develop the preliminary FHA undertaken at the first phase of work and progress the 7 Steps for risk assessment in CAP 760 as appropriate for the detailed design stage of the project.

This Task will span Phases 1 and 2. At Phase 1 hazards identified by the Arcadis preliminary assessment will be reviewed in the light of the revised design information, the updated Masterplan and the existing evidence available to establish the extent to which hazards and risks are addressed by the evidence base and to identify any gaps. Phase 2 will focus on risk management and the closure of any gaps by the generation of additional evidence.

The Hazard Log will be developed from the output of the assessment, with likelihood and severity categories assigned and risks evaluated using the risk matrix and guidance in the Daedalus Airfield Safety Management System (see below).

The Hazard Log will be managed throughout the detailed design stage with control measures and safety requirements developed and claims, arguments and evidence that the safety requirements have been met documented.

Assumptions:

- The hazard assessment is confined only to the hazards arising from the IFA2 Facility that could impact the airport and excludes any hazards from other sources, including the other developments planned for the Airport.
- The agreed version of the Masterplan in Item 1 will form the basis of the FHA.
- The evaluation of risk will be qualitative, but make use of quantitative data where appropriate.
- Cumulative risk assessment would normally be done at Step 7 of the CAP 760 process (see below). As the scope of the hazard assessment is confined to hazards arising from the IFA2 Facility, no assessment of cumulative risk can be made (i.e. taking into account all sources of risk). In order to assess cumulative risks, all the hazards arising from all the equipment and all operations that can potentially affect the Airport and its operations would need to be considered, and this is outside the scope of this assessment.
- It is proposed to use the risk evaluation scheme in the Daedalus Airfield Safety Management System. This is closely aligned to that of CAP 760, but includes the Daedalus Airfield process for acceptance of risk.
- Step 7 of CAP 760 i.e. "Claims, arguments and evidence that the safety requirements have been met and documenting this in a safety case", can only be fulfilled so far as the assumptions and boundaries of this study allow, i.e. only in respect of the IFA2 Facility and within the limits of the equipment and infrastructure on the agreed Masterplan. The work will not provide a safety case for the Airport, as this would need to address all hazards arising from all equipment and operations.
- The safety justification for the new equipment to be introduced with the wider airport and the production of the Safety Case for the wider Airport is the responsibility of RCA and FBC.
- National Grid and FBC will provide access to relevant domain experts to ensure appropriate attendance at the FHA workshop, and also ensure the provision of information and evidence to mitigate hazards and risks in a timely manner.
- There will be one FHA workshop, which will take place over two consecutive days at Daedalus Airfield.
- There will be no change to the type of air traffic service offered by Daedalus Airfield control tower from that assessment in the first stage of FHA. Currently the Solent Airport Tower provides an advisory service rather than controlling air traffic movements. The possible move to FISO during 2017 (also an advisory system) will be considered.

2.2 - Airfield Ground Lighting.

This Task will be completed at Phase 2.

Arcadis to provide technical assessment and advice on impact to and from the IFA2 Facility in relation to ground lighting and advise of any potential constraints. The main impact is anticipated to be proximity of LV electrical cables to the IFA 2 HV cables and potential induction effects.

Assumptions:

The assessment will consider ground lighting on the main runway, as well as the future runway extension and other taxiways and aprons.

Ground Lighting to be implemented includes:

- Runway Edge lighting
- APAS
- Approach lighting
- Any other ground lighting.

It should be noted that non-FBC lighting equipment (e.g. MCA) will not be expressly considered (unless similar information is provided by FBC at Phase 1) but recommendations and conclusions will be provided for use by the MCA.

Actions / Pre-requisites:

- Output of surveys (RCA)
- Details of LV supplies & ducting and groundworks for LV cables (existing and new) (FBC)
- Details of HV cable runs (NG)
- Types / specifications of lighting proposed (FBC / RCA).

2.3 Navigational Aids

This Task will be completed at Phase 2.

Arcadis to provide technical assessment and advice on navigational aids and advise of any potential constraints, the assessment will consider potential adverse impacts, including:

- The potential for adverse effects from the IFA 2 facility to navigational aids through EMI/RFI (Magnetic fields).

Arcadis to advise on suitable types / specifications of navigation equipment available, including market leaders and recent technology.

Assumptions:

The assessment will consider the main runway, as well as the future runway extension and other taxiways.

Navigational Aids to be implemented are:

- GPS
- ILS (See Note *)
- NDB (positional identification beacons – see Note *)

Note * - As only GPS is likely to be used, these other systems will be assessed only if agreed to be necessary.

The assessment will also consider any data services associated with the above equipment.

Actions / Pre-requisites:

- Output of surveys (RCA)
- Details of any associated data services (RCA)

2.4 Fuel Installations and mobile fuel bowsers

It is expected that any hazards and adverse effects related to the IFA2 interface with the fuel installation facility and mobile fuel bowsers will be addressed through the Hazard Identification and Risk Assessment with supporting evidence provided by the relevant technical areas (EMI / RFI, airport safeguarding and other experts). This Task will therefore span Phases 1 and 2 as required.

Assumptions;

- It is assumed that the fixed fuel installation is not a piped fuel system.

Pre-requisites:

- Location (or locations) of the fixed fuel installation to be updated on Masterplan (FBC).

2.5 Compass Base and Pre Flight Check Area Proposal

This Task will be completed at Phase 2.

Arcadis to provide technical assessment and advice on the impact of the IFA2 Facility with the proposed compass base and the area proposed for pre- flight checks and advise of any potential constraints, the assessment will consider potential adverse impacts, including:

- The potential for adverse effects on the compass base from the IFA 2 Facility and HV cables through EMI/RFI (Magnetic fields).

This work will take into account the proposed runway extension and any impact as discussed in Section 2.7.

Assumptions:

- The location of the proposed compass base and the area proposed for the pre-flight checks will be agreed and shown on an update of the Master Plan.
- The location and design of the compass base will meet the requirements of a standard compass base at Level 2.

The location of other 3rd party equipment (e.g. MCA satellite installations) will not be considered (unless specified and agreed during the Phase 1 work) as this assessment is of effects arising from the IFA2 installation, not other 3rd party equipment.

Actions / Pre-requisites:

- Output of surveys (RCA)

2.6 Engine Testing Area

It is expected that hazards and adverse effects related to the interface between the IFA2 Facility and the engine testing area will be addressed through the Hazard Identification and Risk Assessment with supporting evidence provided by the relevant technical areas (airport safeguarding). This may include noise and vibration considerations. This Task will therefore span Phases 1 and 2 as required.

Actions / Pre-requisites:

- Location of the engine testing area (if defined) to be updated on Masterplan (FBC).

2.7 Runway extension

This Task will be completed at Phase 2.

The future runway extension to be considered in all aspects of the technical assessments described elsewhere in Section 2. The objective is to ensure that the IFA 2 Facility design is "future-proofed", thus Arcadis to advise on any potential constraints to the runway extension.

It is expected that the main impact is the potential for adverse effects at the runway extension from the IFA 2 Facility and HV cables through EMI/RFI (Magnetic fields) (e.g.

due to the impact of HV cable runs which may run across the runway extension rather than parallel to them). Arcadis therefore to assess the impact of the IFA 2 Facility on compass deviation specifically for the runway extension.

Assumptions:

- Extension will be up to 100m to Code 2 status.
- An asset protection agreement would be put in place between the parties to preserve mutual asset development within the cable easement.
- The runway pavement specification will be defined by RCA.

Actions / Pre-requisites:

- Runway extension to be updated on Masterplan (FBC).

2.8 Weather Forecasting Equipment

This Task will be completed at Phase 2.

Arcadis to provide technical assessment of any adverse effects due to the interface between the IFA 2 Facility and weather forecasting equipment and to advise on any potential constraints (e.g. where the equipment may be located). The assessment will consider potential adverse impacts, including:

- The potential for adverse effects through EMI/RFI (Magnetic fields)

As an option, Arcadis can advise on current types of ground based weather forecasting equipment if National Grid require this.

Assumptions:

Weather forecasting equipment to be considered are:

- Visio meters;
- cloud base recorder;
- AFTN lines (messaging system);
- equipment in MCA hangar.

The assessment will also consider any data services associated with the above equipment.

Actions / Pre-requisites:

- Details of weather forecasting equipment in MCA Hangar to be provided (e.g. type, specifications, location) (FBC).
- Details of any data services associated with the above equipment (RCA)

2.9 Third Party Equipment

This Task will be completed at Phase 2.

Arcadis to provide technical assessment and advice on the effects of the IFA2 Facility on third party equipment, the assessment will consider potential adverse impacts, including:

- The potential for adverse effects through EMI/RFI (Magnetic fields).

Assumptions:

Third Party equipment to be considered are:

- NATS radar – It is assumed that this is used for training purposes only and there are no plans to use this for operational purposes.
- MCA satellite communications.

It is assumed that Solent Airport has no permitted development rights.

Actions / Pre-requisites:

- FBC to coordinate provision of 3rd party information based on requests by NG,FBC, RCA and Arcadis. This is to include details requested for NATS and MCA equipment (FBC).

2.10 Buildings (Wind Assessment).

This Task will span Phases 1 and 2.

Arcadis to extend the preliminary wind assessment to advise on the impact of the IFA2 Facility together with the surrounding buildings on the airfield. This work to take into account changes to building profile of the facility as well as the buildings on the agreed version of the Masterplan (see Item 1).

The wind assessment is proposed to be completed in 3 Stages, with Stages 2 and 3 to be completed if considered necessary and if the information is available:

Stage 1 (Phase 1) – re-assessment of the wind effects as modelled in the preliminary assessment with the revised (more compact) IFA 2 Facility profile, and draw comparisons and conclusions with Arcadis 2016 assessments.

Stage 2 (Phase 2 and optional) – model extended to include adjacent buildings on the Faraday Business park (making appropriate assumptions to simplify this as necessary for the purposes of the model) and analysis repeated.

Stage 3 (Phase 2 and optional) – model to be extended to include all the buildings on the Masterplan (making appropriate assumptions to simplify this as necessary for the purposes of the model) and analysis repeated.

Comparative assessment with previous analysis to identify any trends which may assist in making appropriate assumptions for the purposes of modelling and / or enable comparative predictions to be made.

Actions / Pre-requisites:

- Stage 1 - dimensions of the revised IFA2 Profile (NG).
- Stage 2 - dimensions and details of the buildings on the Faraday Business Park and include on Master Plan (FBC).
- Stage 3 - details of revised IFA2 building profile and other buildings to be included on the Master Plan and dimensions / information required for the analysis to be provided (FBC).

2.11 Drainage & Services crossings

Arcadis to provide technical assessment of any adverse effects due to the interface between the IFA 2 Facility and existing / future drainage plans and to advise on any potential constraints. It is expected that hazards and adverse effects related to the drainage interface will be addressed through the Hazard Identification and Risk Assessment with supporting evidence provided by the relevant technical areas. Potential hazards and adverse effects related to the IFA 2 facility are likely to include flooding / water ingress to cables. This Task will therefore span Phases 1 and 2 as required.

Actions / Pre-requisites:

- Details of drainage and other services and future plans (FBC).

2.12 Assessment of relevant hold points relating to other airports and comparison with other similar airports.

This Task will be completed at Phase 1, together with Task 3.

Assessment to identify and consider the impact of any CAA investigations relating to other similar airport (e.g. London City Airport, Barajas, Madrid) and recommendations from the investigation that may be relevant to the IFA 2 Facility. In particular, any hold points concerning EMF and RFI affects to be considered.

This will include the potential hold point (at London City Airport) relating to the proposals for the engine run up and pre-flight check area to the west of main runway and identify any requirements for any additional area that may be required to do pre-flight checks (taking into account the output from Task 3 below).

If National Grid require, as an option, Arcadis can provide support to National Grid in visits to other similar airports. The purpose of the visits would be to define a benchmark and reinforce the completeness of the technical assessments.

Assumptions:

The review of investigations will be based on those historical and current investigations available on the AAIB website, over the last 5 years at the date of the review and any other information sources reasonably known to Arcadis.

3 CAA Licencing Requirements

This Task will be completed at Phase 1.

Arcadis to extend the preliminary safeguarding work and assess / advise on compliance against CAP 168 – Licencing of Aerodromes.

Arcadis to advise / assess the risk of any future regulatory changes that may impact the facility in terms of impact on the licencing of the Airport.

Arcadis to consider any requirements for any additional area that may be required to do pre-flight checks arising from the discussion with CAA (in conjunction with the output from Task 2.12 above).

If National Grid require, Arcadis can provide support for CAA discussions.

Assumptions:

- RCA will lead discussions with CAA
- Arcadis will support these discussions and attend the meeting with CAA.
- It is assumed that the meeting with CAA will be held in London or at Daedalus.

4 Aircraft Types

This Task will be completed at Phase 2.

Arcadis to undertake assessment of aircraft types in terms of size and volume.

Arcadis to review the EMI / RFI analysis already completed for specialist equipment / aircraft types which were not available to inform the preliminary assessment.

Arcadis to advise on any gaps in the existing analysis and provide technical support / advice on any EMI/RFI impacts from specialist equipment / aircraft not already considered within an agreed scope.

Basing the assessment on types of equipment, Arcadis to advise on whether any equipment types may be specifically affected and any special considerations for particular aircraft types.

Safeguarding work and assess / advise on compliance against CAP 168 – Licencing of Aerodromes.

Assumptions:

Third Party equipment to be considered are:

- Civilian: up to 19 seater passenger jet, helicopters;
- Coastguard: helicopters;
- Military: Hercules, Apache, Chinook;
- UAVs;
- Historic aircraft.

Current licence allows 40k. Consider maximum of 120k for assessment, pre-flight checks at hold/stop points.

Actions / Pre-requisites:

- Details of aircraft and movements to be provided. In particular, the extent of any unusual types of aircraft using the airport. For instance, typical movements of coastguard helicopters, military aircraft (FBC and RCA).
- Details of UAVs currently flying at Solent Airport, including current Airport permissions and restrictions on flying and details of future UAVs planned (assumed to be commercial UAVs).

5 (and 6) Expansion of airside related businesses and non-airside related businesses.

This Task will be completed at Phase 2.

Based on the Commercial Agents Lambert Smith Hampton Scope of Work for the expansion of business, the technical assessment to adopt a bounding approach and filter out of the assessment the businesses whose activities are not likely to affect or be affected by the IFA2 facility.

It should be noted however that:

- The expansion of the businesses on the wider site could grow as this phase of the work progresses.
- some of the businesses could themselves introduce potential impacts on airfield operations separately to any impact from the IFA2 facility e.g. EMI/RFI effects or by the size of the building premises and impact on wind flow.

The scope of this assessment does not include re-assessment on subsequent expansion of the number and types of different business beyond that detailed on the Masterplan (see Item 1 above) and only covers the wind effects insofar as the interface of the other buildings with the IFA2 Facility, which is included in this scope of work in 2.10 above.

Actions / Pre-requisites:

- The Commercial Agents Lambert Smith Hampton Scope of Work for the business development work to be provided to Arcadis (NG).
- National Grid to set up a regular liaison meeting with stakeholders such that Arcadis can keep up to date in business development plans (NG).

7 Detailed Design of IFA2 Development

This Task will be completed at Phase 2.

In order to ensure the completeness of the FHA, the detailed design and safety assurance undertaken by the contractor appointed to design and construct the IFA2 Facility will need to run hand in hand with the assessment of hazards considering the wider safety considerations. This means that any hazards identified within the Designers Risk Assessments (as required under the CDM Regulations) which may affect the wider facility, need to be notified to National Grid for consideration within the scope of this work, equally the validation of control measures and safety requirements stemming from the FHA will require certain information from the IFA2 designers in order to close them. Examples identified by the preliminary assessment, which will require information from the designer include:

- Details of the facility lighting to ensure this will not pose a distraction to aircrew and the Control Tower.
- Details of the external surfaces to ensure this will not pose a distraction to aircrew.
- Estimates of RF emissions from the facility to ensure compatibility.
- Estimates of noise levels from the facility to ensure they are not distracting to pilots, particularly glider pilots.

Some of the information requirements may be covered by the Planning Conditions, however it is unlikely that these will cover all the information necessary required to address the control measures and requirements.

Arcadis scope of support to the IFA2 detailed design will be to develop and manage the Hazard Log in line with the Hazard Identification and Risk Assessment studies and any hazards notified by the designers of the facility that may impact airfield operations and / or the wider facility. Control measures and safety requirements will be defined, and where relevant included in specifications and / or passed to the designers of the IFA2 Facility to seek evidence of closure. In this way, the Hazard Log will maintain an up to date record of the status of the justification for the facility at any point throughout the design development. As an option, Arcadis can also provide input and guidance to the IFA 2 Contractor to ensure that expectations regarding the quality of the Designers Risk Assessment are met if National Grid require this.

Actions / Pre-requisites:

National Grid to consider an appropriate mechanism (e.g. a meeting or workshop) for the transfer of hazards and information between the designers of the IFA2 Facility and the wider Hazard Log (NG).

8 Optional Scope

The following optional work is suggested in the sections above which is not included in the price quoted. We are happy to provide a price for this optional work, should this be required by National Grid.

- Work stream 2.8 - Advise on current types of ground based weather forecasting equipment if National Grid require this.
- Work stream 2.10 – Wind assessment including the effects of the Faraday Business Park and adjacent buildings.
- Work stream 2.12 - Provide support to National Grid in visits to other similar airports. The purpose of the visits would be to define a benchmark and reinforce the completeness of the technical assessments.
- Work stream 7 - Provide input and guidance to the IFA 2 Contractor to ensure that expectations regarding the quality of the Designers Risk Assessment are met if National Grid require this.

- General – additional face to face technical meetings can be arranged as required, this may be particularly useful as regards the technical assessment of EMI / RFI.

Methodology

Our letter Reference 35992 of the 24 June 2016 set out in detail the generic methodology to be used in each of the core areas (Aerodrome safeguarding, Electromagnetic compatibility, Hazard Identification and Risk Assessment and Wind Assessment) and this same methodology will be used for this phase of work, supplemented where necessary to meet the specific requirements as identified in the Scope of Work above. As stated above, all work will be compatible with the Civil Aviation Procedures and relevant standards.

Deliverables

Our proposed deliverables over both Phases 1 and 2 are shown in the table below, and are also included as part of the programme (see later). The deliverables have been planned to meet National Grid's requirement to provide interim deliverables as far as possible. In addition, we will also prepare a main report. The main report will cover the full scope of the technical assessment and consolidate the final versions of the all the interim deliverables from the various streams of work.

The planned and optional deliverables are listed below. This also includes the suggested options for interim deliverables should these options be required by National Grid and FBC.

Planned Interim Deliverables

No	Task	Interim Deliverable
1	Review of Current Position and Evidence	Phase 1 Interim Report *
2.1	Hazard Identification and Risk Assessment (FHA)	FHA Briefing Note FHA worksheets FHA Interim Report (Phase 1) with Hazard Log* FHA Interim Report (Phase 2) with Hazard Log*
2.2	Airfield Ground Lighting	EMC / RFI Interim Report (Phase 2)*
2.3	Navigational Aids	EMC / RFI Interim Report (Phase 2)* Technical Note advising on current navigational equipment (Phase 2)*
2.4	Fuel Installations and mobile fuel bowsers	Covered as part of the FHA and a Section in the Phase 2 Main Report
2.5	Compass Base Proposal	EMC / RFI Interim Report (Phase 2)*
2.6	Engine Testing Area	Covered as part of the FHA and a Section in the Phase 2 Main Report
2.7	Runway extension	EMC / RFI Interim Report (Phase 2)*
2.8	Weather Forecasting Equipment	EMC / RFI Interim Report (Phase 2)*
2.9	Third Party Equipment	EMC / RFI Interim Report (Phase 2)*
2.10	Buildings	Sub-task (ST) 1 wind assessment – interim report.(Phase 1)*

2.11	Drainage	Covered as part of the FHA and a Section in the Phase 2 Main Report
2.12	Assessment of relevant hold points	Interim Report on CAA investigations and Hold Points Report (Phase 1)* Update to the Arcadis Preliminary Safeguarding Report (Phase 2)*
3	CAA Licencing requirements	
4	Aircraft types	EMC / RFI Interim Report (Phase 2)*
5 (&6)	Expansion of airside related businesses and non-airside related businesses	Covered as part of the FHA and a Section in the Phase 2 Main Report
7	Support to development of IFA2 detailed design	Covered as part of the FHA and a Section in the Phase 2 Main Report

Note * these interim deliverables are milestones in the programme (see below).

A Main Report will be the overall deliverable for Arcadis' scope of supply at Phase 1 and Phase 2 respectively. The various Interim Deliverables listed in the table above will be the primary inputs to the Main Report, and we will prepare two versions of the Main Report:

- A DRAFT version of the Main Report, which will be issued for comment
- A FINAL version of the Main Report, which will be finalised following the incorporation of comments (see assumptions).

The Interim Deliverables and the DRAFT and FINAL versions of the Main Report are proposed to be milestones in the programme.

Optional Deliverables

Some of the optional tasks will result in specific optional deliverables listed below:

No	Task	Interim Deliverable	Main Deliverable
2.8		Technical note advising on ground based weather forecasting equipment.	Section in Phase 2 Main Report
2.10		Sub-task (ST) 2 wind assessment – interim report * Sub-task (ST) 3 wind assessment – interim report *	Section in Phase 2 Main Report

Transfer of information and Communication

All transfer of information and documents to be used for the assessment and those produced by the assessment will be via the SharePoint site established by National Grid for the project. This does not preclude the use of email as necessary for communications, clarifications etc.

There will be a number of contracted milestone dates for each work stream (as proposed in the programme) for information to be provided to us to underpin the technical assessment. We will review that information within 1 week of receipt, and confirm back to National Grid which documents will be taken forward and put those documents in a specific folder on the SharePoint site. We will request any other information that will be required. It is assumed that this will be provided via the Share Point site within 1 week of the request being sent.

National Grid and FBC will establish forums for regular communication, progress updates, reviews of hazards etc. This is to include:

- an appropriate mechanism for the transfer of hazards and information between the designers of the IFA2 Facility and the wider Hazard Log.
- A forum for regular communication and review of hazards with the Commercial Agents Lambert Smith Hampton.

It is assumed that communication will be by mainly by phone and conference call. Attendance by Arcadis in person at Daedalus is built-in to the programme for the following:

- Attendance at a 2 Day FHA workshop (by the Facilitator, a scribe and the Arcadis technical representatives for EMF and RFI effects). It is requested that the workshop includes a site visit for the purpose of our familiarisation which would be useful at this stage of the assessment.
- Attendance at the regular 2 weekly meeting at Daedalus between National Grid, FBC and RCA by I Coutts and / or J Wilson (or their delegated representative) for the purpose of updating on progress. It is assumed that we will attend every second meeting in person and join the remaining meetings via conference call.
- We can provide support or arrange additional technical meetings if necessary as an option. This may be particularly useful for the EMI / RFI technical assessments.

Programme

A detailed programme is attached in Appendix D showing the dates for the various work-streams and the deliverables as shown in the Table above.

Assumptions / Basis of our Understanding

For clarity and ease of reference, a full list of all the assumptions stated in the preceding sections is given below, this provides the basis of our understanding of the scope of work.

General (i.e. not related to a specific task)

1. The scope of the assessment is restricted to assessing the potential impact upon Solent Airport operations arising from the IFA2 facility once built and in operation. The potential impact on Solent airport operations arising from the construction of the IFA 2 facility is not within the scope of work and is assumed to be dealt with by National Grid and FBC via the Land Agreements Working Group and by the provision by National Grid and its contractors of a Construction Methodology.
2. There will be contracted milestone dates (as proposed in the programme) for information to be provided to us to underpin each of the technical assessments. We will review that information within 1 week of receipt, and confirm back to National Grid which documents will be taken forward and put those documents in a specific folder on the SharePoint site. We will request any other information that will be required. It is assumed that this will be provided via the SharePoint site within 1 week of the request being sent.
3. A hazard identification and risk assessment / FHA workshop of 2 consecutive days will be held at Solent Airport. National Grid will make arrangements for this workshop and will ensure appropriate representation by domain experts at this workshop. This will require participation / representation by domain experts, including appropriate airfield operations and management personnel and any other key stakeholders who are identified as important to the outcome of the risk assessment.
4. The price quoted is based on Arcadis conducting the work from their own premises other than for the specific meetings / workshops stated below.
    - An Arcadis facilitator, a scribe and our EMC / RFI representatives attending the 2 day hazard identification and risk assessment workshop at Solent Airport. As for the preliminary Hazard Identification and Risk Assessment, this will focus on the hazards relating to the IFA2 interface with the Airport and Airport Operations. The Hazard Log will be reviewed for the proposed developments (based on the Masterplan) and the risk mitigation developed in line with the available evidence;
    - Attendance at one National Grid / FBC / RCA regular workshop per month (i.e. 4 in all) by J Wilson and I Coutts (or their delegated representative) for the purpose of liaison and reporting on progress or discussing comments; this is assumed to be at Solent Airport. All other Arcadis input to the workshops will be through conference call or Skype.
5. One set of consolidated comments will be received from National Grid and FBC on the deliverables submitted. Comments will be discussed with National Grid and FBC and agreed responses addressed in a final issue of the repot (with the worksheets and Hazard log appended).
6. It is assumed that comments on interim reports and the Phase 1 report will be received within 1 week. 1 month is assumed for comments on the final Phase 2 report,
7. The pre-requisites indicated throughout the scope of work
8. It is assumed that 1 set of consolidated comments will be received from National Grid and FBC on each of the deliverables submitted. Comments will be discussed with National Grid and FBC and agreed responses addressed in a final issue of the repot (with the worksheets and Hazard log appended).
9. In the event that there is a delay outside our control that affects the provision of information to Arcadis extending for more than 4 weeks, this would significantly impact our anticipated payment and cashflow. In such circumstances, we would reasonably request the opportunity to invoice for all the work completed up to the date that the delay occurred, on each particular task (s) affected by the delay.

Task 1 – Daedalus Masterplan

10. A version of the Daedalus Masterplan will be agreed by National Grid and FBC and made available by a fixed date which will determine commencement of the work. This will show the latest information regarding airfield development with any variations likely for locations of these future developments which need to be

considered in the assessment. Re-assessment on subsequent changes to this Masterplan during the course of this work is not included in the price quoted (FBC).

11. The specifications and requirements for the evolving design of the IFA2 Facility will meet the Planning Conditions specified in the Planning Report (NG).

Task 2.1 - Hazard Identification and Risk Assessment

12. The agreed version of the Masterplan (Assumption 6) will form the basis of the FHA.
13. The evaluation of risk will be qualitative, but make use of quantitative data where appropriate.
14. It is proposed to use the risk evaluation scheme in the Daedalus Airfield Safety Management System. This is closely aligned to that of CAP 760, but includes the Daedalus Airfield process for acceptance of risk.
15. Step 7 of CAP 760 i.e. "Claims, arguments and evidence that the safety requirements have been met and documenting this in a safety case", can only be fulfilled within the constraints of this study, (i.e. only in respect of the IFA2 Facility interface and within the limits of the equipment and infrastructure stated on the agreed Masterplan). The work will not provide a safety case for the Airport as this would need to address all hazards arising from all equipment and operations.
16. The overall safety justification for the third party new equipment to be introduced within the wider airport and the production of the CAA Safety Case for the wider Airport is the responsibility of RCA and FBC.
17. National Grid, FBC and RCA will provide access to relevant domain experts to ensure appropriate attendance at the FHA workshop and also the provision of information and evidence to mitigate hazards and risks.
18. A hazard identification and risk assessment / FHA workshop of 2 consecutive days will be held at Solent Airport. National Grid will make arrangements for this workshop, to be held at the most appropriate locations and will ensure appropriate representation at this workshop. This will require participation / representation by domain experts, including appropriate airfield operations and management personnel and any other key stakeholders who are identified as important to the outcome of the risk assessment.
19. There will be no change to the type air traffic service offered by Daedalus Airfield control tower from that assessment in the first stage of FHA (e.g. a move to Operator control, rather than advisory as at present). The possible introduction of FISO in 2017 (also an advisory system) will be considered.

Tasks 2.2 to 2.10 - Technical Assessment

20. The technical assessments will consider the main runway, as well as the future runway extension and other taxiways.
21. Information required for each technical assessment as to commence (as specified in the scope of work above) will be provided in a timely manner and in accordance with assumption 1 to enable the work to commence according to the programme for the work within this proposal.
22. The Technical Assessment will cover the equipment agreed in the Scope of Work above. Any additional equipment is not included in the price stated.
23. The location of any facility, installation and equipment to be considered in the assessment will be shown on the Masterplan (Assumption 6). Any changes to this are not included in the price quoted.
24. It is assumed that the fixed fuel installation is not a piped fuel system.
25. The location and design of the compass base will meet the requirements of a standard compass base at level 2.
26. The runway extension will be up to 100m to Code 3 status and will be shown on the Masterplan (Assumption 5).

27. NATS radar – It is assumed that this is provided for training purposes only and there are no plans to use this for operational purposes.

Tasks 2.12 and 3 – Review of AAIB Hold Points and Licencing Requirements

28. The review of hold points is subject to the availability of relevant information. This will be primarily based on those historical and current investigations available on the AAIB website at the date of the review and other sources of information reasonably known to Arcadis.
29. National Grid and FBC require Arcadis to lead independent discussions with CAA with the involvement of RCA.
30. RCA will be available to support these discussions.
31. It is assumed that the meeting with CAA will be held in London.

Task 4 – Aircraft types

32. Details of future aircraft plans and movements to be confirmed. In particular, the extent of any unusual types of aircraft using the airport. For instance, typical movements of coastguard helicopters, military aircraft (FBC and RCA).

Tasks 5 and 6 – Expansion of Airside and Non-Airside businesses.

33. National Grid to set up a regular liaison meeting with stakeholders such that Arcadis can keep up to date in business development plans (NG).
34. Task 7 – Support to IFA2 Detailed Design
35. National Grid will arrange an appropriate mechanism / forum for the transfer of hazards and information between the designers of the IFA2 Facility and the wider Hazard Log.

Appendix C: Curriculum Vitae

TIMOTHY ROWE

[redacted]

CORE SKILLS

1. Safety Cases
2. Hazard Identification
3. Functional Hazard Assessment
4. HAZOP
5. Functional Risk Management
6. Systems Assurance
7. Aviation Systems
8. Fault Tree Analysis
9. Goal Structuring Notation
10. FMECA
11. System Safety Analysis
12. IEC 61608

POSITION

- Senior Consultant

QUALIFICATIONS

- BSc (Hons) Electrical and Electronic Engineering
- BA (Hons) Humanities with English Language
- MSc Computing for Commerce & Industry
- Eur. Ing.
- Chartered Engineer
- Member of the British Computer Society
- Member of the Institution of Engineering & Technology

sfep Entry-Level Member

Over 15 years' success in the safety management of software-intensive systems

Professional Summary

Tim is an experienced safety engineer, adept at assisting clients to ensure that safety of complex systems is successfully managed in a manner that is demonstrable to stakeholders. Key strengths include coordinating with multidisciplinary and multicultural teams to identify system risks, using strong analytical skills to propose and assess approaches to those risks, and recording the arguments and evidence for the achieved safety in a clear and persuasive manner.

Key Project Experience

Kloten-Dübendorf Transition

Skyguide

The Swiss Air Navigation Service Provider, Skyguide, wanted to move area and approach air traffic control functions from a facility at Zürich Airport to a new facility at Dübendorf, approximately 10 km away. The operational safety at the new facility was being managed by an independent consultant, but stakeholders were concerned that the transition of operations from the old to the new facility involved significant risk, particularly because it involved passing through an operational state very similar to that which contributed to the Überlingen mid-air collision in 2002. It was not possible to completely close the airspace during the transition, because of the need to maintain the ability to handle certain emergency flights. Tim used an innovative blend of HazId and risk-response techniques to ensure that the system would remain in a safe state throughout the transition, and recommended the establishment of communication barriers to ensure stakeholders not directly involved in the transition could not interfere with it. The transition succeeded without significant safety issues.

Key Project Experience Continued

CAIRDE 2000

Irish Aviation Authority

The Irish Aviation Authority (IAA) was replacing the equipment at Dublin and Shannon air traffic control centers. The equipment supplier was contracted to produce the safety case for the new equipment, and Tim was contracted to review that safety case, audit it against European guidelines for air traffic control safety cases, and provide advice to the IAA on the safety case. Tim found that the supplier's submission contained a great deal of safety evidence but with very little context to identify what safety claim the evidence would support. In discussion with the IAA it was agreed that Tim would attempt to form the safety argument to go with the evidence supplied. In doing so, Tim identified a substantial shortfall in the evidence relating to part of the required safety claim. The IAA decided to accept the risk and went ahead with the introduction of the new system. Shortly after the introduction to service, the failure Tim had identified did occur, but, because the IAA was alert to the risk, the failure was handled safely. Tim was subsequently contracted to assess the supplier's changes to the equipment to eliminate the risk, and the system has operated successfully since then.

Zürich ILS

Skyguide

Zürich Airport was experiencing difficulties with inaccurate guidance from the instrument landing system (ILS), due to signal reflections from terrain. Research was available on an alternative signal structure that would improve the ILS accuracy, at the expense of increased flight crew workload at the commencement of the approach flight phase. Tim was contracted to assist with the preparation of a safety case for the use of the alternative structure, and was able to show that the increased risk due to the extra flight crew workload was small because it occurred where there should be no conflicting aircraft, no nearby terrain, and no other significant flight crew tasks that might be missed as a result of the increased workload. Tim's safety case was accepted, and the approach has been used without incident since then.

Examples of Other Project Experience

Hong Kong New Air Traffic Management Facility

Hong Kong Civil Aviation Department

Support to the client in the development of safety cases for the transition of operational air traffic management to a new en-route and approach facility, including new equipment (particularly flight data and surveillance data processing and display) and procedures, addressing the entire lifecycle from requirement capture through installation, integration, operational transition and continued operation.

Hong Kong Safety Training

Hong Kong Civil Aviation Department

Development and delivery of training in the preparation and presentation of safety cases, with particular emphasis on the use of Goal Structuring Notation.

Ground-Air Communication System

Skyguide

Safety management and production of safety case for primary (area and approach) and emergency (area) ground air communication systems for Zürich and Geneva air traffic control centers.

Maastricht NOR

EUROCONTROL

Safety analysis of a new air traffic control operations control room (NOR) at Maastricht Upper Airspace Control Centre, as part of a team. Tim introduced an innovative approach to the safety analysis of the transition into service. That approach successfully anticipated issues that were encountered in the actual transition, ensuring effective contingency plans were already in place

Heathrow Airport

Terminal 5 Passenger Shuttle

Assistance with the safety case for the tunnel ventilation system for the Heathrow Terminal 5 track transit (people mover) system

Linux Kernel Safety

UK HSE

Contribution to a feasibility study of safety validation of the Linux kernel for the UK Health and Safety Executive (HSE).

ATC Contingency Plan

EUROCONTROL

Safety analysis of a coordinated contingency plan for a number of air traffic control centers in northern Europe.

Airspace Restructuring

Air Services Australia

Safety analysis of changes to airspace use at Australian remote airfields.

Reduced Vertical Separation Minima

UK NATS

Safety analysis and safety case for the reduction of vertical separation minima from 2000ft to 1000ft for suitably equipped aircraft flying between flight levels FL290 and FL410 inclusive.

Reduced VHF Aviation Channel Spacing

UK NATS

Safety Analysis and safety case for a reduction in VHF air-ground radio channel spacing from 25 kHz to 8.33 kHz.

Personal Profile

Working as an independent consultant, Tim has over 15 years' experience in the safety management of software-intensive systems and over 25 years' experience in systems engineering.

Initially trained as an electronics technician, performing first and second line maintenance on air traffic control equipment, Tim migrated to equipment line management and from there to system safety management within UK National Air Traffic Services (NATS).

From NATS, Tim moved to an independent consultancy, CSE, and subsequently to ARCADIS. He has provided safety expertise on a wide variety of projects worldwide, including UK, Switzerland, the Netherlands, Portugal, USA, Australia, Canada and Hong Kong.

Tim particularly enjoys the problem-solving challenges of engineering, and is enthusiastic about continued learning, having completed his BA in Humanities and MSc in computing as an adult. He continues to progress this through participation in open on-line courses in fields including computing, mathematics, music and literature. Through work and leisure activities, Tim has a good awareness of a range of programming languages, including Ada, C++, Scala, Python and Ruby, and of software lifecycle approaches including waterfall, V and agile. He is excited at the prospect of transferring his skills to new domains and industry sectors.

MARTYN CLARKE

Technical Expert – Unmanned Aerial Vehicles

"Martyn's determination and focus assures appropriate technical, safe, supportable and commercial solutions to the benefit of staff, customers and shareholders."

CORE SKILLS

1. Safety and Airworthiness
2. Hazard and Risk Assessment
3. PHI, FHA, SSA, FFA, FTA, HAZOP, CCA and FMECA
4. Air Safety Group - RPAS Lead
5. Parliamentary Council on Transport Safety (PACTS) - Advisor on RPAS and Drones

ROLE ON THIS PROJECT

- Technical Expert

POSITION

- Technical Expert

QUALIFICATIONS

- HNC in Electronic Engineering and Control Computing
- Advanced Theology and Communication Skills
- BSc Mathematics
- MSc Safety Critical Systems Engineering (Software)
- Member (MRAeS)
- ISO 9001 - Qualified Lead Auditor

Martyn is a Safety professional with particular expertise in Safety Critical Systems and Software safety, originating from an Avionics Engineering background. He is also a proven Engineering Operations Manager experienced in delivering integrated engineering solutions to customer requirements safely, on time and in budget. Martyn has been the Lead Independent Safety Auditor for most MoD Drone programmes for the last 10 years including Protector (formally Scavenger) and is now the Drone Lead for the Air Safety Group advising the Parliamentary Advisory Council on Transport Safety and Drone issues. Martyn's unique style for bridging vertical and horizontal interfaces at all phases of programmes and strong interpersonal skills result in the building of strong teams internally and externally.

Project Experience

PYRAMID

September 2016 to Present; Safety and Airworthiness Manager – MoD DE&S UAS Team

Safety and Airworthiness Manager for the MoD DE&S UAS Team on a purely software programme developing an underlying software architecture and components for future defence mission systems.

SCSS Ltd

May 2016 to Present; Principal Software Safety Critical Consultant

Martyn is building relationships with Safety and Airworthiness Consultancies and completing his long awaited Chartered Engineer's submission. Advising the Air Safety Group (ASG) and the Parliamentary Advisory Council on Transport Safety (PACTS) on International Military and Civilian Drone Safety and Airworthiness issues.

Project Experience Continued

QinetiQ
Sep 05 to Sep 06; Independent Software Safety Auditor

In September 2005 Martyn moved to QinetiQ to be a software independent auditor on the Apache programme. Martyn conducted the independent safety assurance effort on the Apache Mission Planning System.

MC3 Consortium
Aug 05 to Sept 05; Training Consultant

For one month as one of Vosper Thornycroft's training leads used military experience, engineering skills and course design expertise to manage the bid input and write the MC3 Training Design and Development, and Training Delivery volumes for MC3's Defence Training Review (DTR) Proposal.

Vosper Thornycroft Military Support
Feb 01 to Aug 05; Course Design Officer

As part of the Ministry of Defence Army Training organisation, Martyn designed equipment and engineering career courses using the systems approach to training formal methods (DSAT). His course designs ensured that personnel achieved degree status and at the same time are able to service, repair, modify and maintain complex battle winning weapon systems under field (battle) and workshop conditions. This required Martyn to have engineering and authoring skills and experience in the design, operation and maintenance of distributed military electronic and optronic systems and automatic test equipment.

Sabbatical
Jul 00 to Jan 01

Long awaited leave and travel.

Serco Europe ESA ID Contract
Nov 99 to Jun 00; Desktop Global Manager

Martyn was responsible for all operational and commercial aspects of the delivery of Desktop Global Information Systems to over 4000 users at 8 European Space Agency (ESA) sites across Europe. The task included management and the delivery of Y2K applications across the whole of ESA to their complete satisfaction

Key Communications Dev. Co. Ltd
Apr 99 to Nov 99; Commercial Management

For Serco Middle East, at Key Communications Development Company as a General Manager (Commercial) Martyn negotiated and secured the $10M programme to carryout civil, electrical, fire and HVAC modifications to live telephone exchange buildings throughout Saudi Arabia. He was then responsible for the start-up, operational and commercial management of the programme.

Project Experience Continued

Engineering Operations Management – Serco Aviation

Jan 99 to Apr 99

Manager of Engineering Operations for Serco Aviation from Dubai, until Serco Aviation was disbanded, responsible for Serco Aviation's engineering operations for Europe and the Middle East and the introduction of licensing for all Air-Traffic Control (ATC) engineers.

Key Communications Development (KCD) Co. Ltd

Jan 97 to Jan 99; General Manager

KCD was a 100% Saudi owned company for which Serco had the management contract. As Serco's General Manager Saudi Arabia, Martyn was seconded to KCD to implement the transition from a trading company into a systems engineering company. This required the development, documentation, and institution of good business systems, best engineering practice and sound programme management practices within the organisation, the re-training of all personnel and the design and development of new products and services.

Serco Systems

Oct 94 to Jan 97; Sub-Contract Management

From October 1994 Martyn managed negotiations for four software intensive, IPR sensitive contracts at board level, with Aerospace OEMs on the Merlin Avionics Test Systems (MATS) programme for the production of 140 test packages, (their data, software and hardware). Martyn established a management and production team and associated business and engineering processes to interface with the suppliers, customer and Ministry of Defence at a variety of different levels and forums.

MOD UK

Nov 87 to Oct 94; Army Aviation Maintenance Advisory Group

As an Avionics Software Engineer and the leader of Army Aviation's Software Maintenance Advisory Group, project managed on behalf of MOD (PE) and QMG, up to six software intensive projects valued in excess of £100 million throughout all phases of projects from pre-definition to service delivery. (Technologies included guided missiles, IR, thermal imaging, microwave detection systems, AFCS, ATE and software development and support environments).

Martyn managed an LSA Review Team and the processes for implementing LSA programmes including; scheduling, data collection and analysis, delivery of findings in reports and presentations during LSA conferences. As a Technical Assessor on the UK Attack Helicopter (AH) Programme, pioneering Software ILS and LSA of Software.

On behalf of the Army's Chief Aircraft Engineer Martyn presented software procurement practical experiences, developed during the AH Programme to international avionics audiences during ERA conferences. He carried out and reported on six hands-on ease of maintenance assessments of the six helicopter types for the AH Programme and was awarded the Director General Equipment Support (Army)'s commendation for services to Military Software.

Project Experience Continued

Aeronautical Engineering (Avionics)

Mar 73 to Oct 94

Whilst serving with British Army Aviation over 22 Years (8 years in Germany), operated and maintained all aircraft types and associated avionics and support equipment in fixed and mobile field locations under all operational conditions, Martyn introduced Lynx Mk 1s into service from Middle Wallop in Hampshire England as an Avionics shift leader during the contractorisation of first and second line support operations.

Martyn managed the support, availability and safety of up to 18 Lynx helicopters and all personnel during five live firing exercises in Northern Germany, including Exercise Joint Strike and Lucky Strike.

Martyn introduced the Lynx Mk 7 into operational service in Germany.

PUBLISHED PAPERS

- The British Army Attack Helicopter Software Support; 1993 ERA Avionics Conference “Integrated Avionics – How Far, How Fast?”, December 1993;
- Logistics Management of a Major Test Support Programme; Test 95;
- Planning Software Support for continuing Safety; ESAS 2007 Abbey Wood, Bristol, November 2007;
- An ISA’s view of Data Off The Shelf; Advanced MSc in Safety Critical Systems Engineering, September 2008;
- Data Off The Shelf – An Accident Waiting To Happen? ESAS 2008 Abbey Wood, Bristol, October 2008;
- ISA Challenges in the Modern World – Safety Critical Software Club, 26 November 2009;
- Contributing Author to the GSN Standard, 2011 and;
- ISA Challenges in the Modern World – Safety Critical Software Club, Set of three articles in the Safety Systems magazine 2013-2014;
- How can we recognise a safe design – 30th April 2014;
- BALPA The Log “The Drone Debate”, Summer 2015;
- UAS 2015, Twickenham, “What is Safe Enough?” 1st and 2nd December 2015;
- Founder and contributing Author to the Data Safety Initiative, 2015;
- Contributing author to Data Safety Guidance, published February 2016.

ARCADIS Design & Consultancy for natural and built assets

Martin Standaart

Senior Consultant

My life motto is 'Stop, Think, Do'

CORE SKILLS

1. Analytical
2. Creative
3. Innovative
4. Team player
5. Aware of the risks and safety

ROLE ON THIS PROJECT

- Senior Consultant

POSITION

- Senior Consultant RFI

QUALIFICATIONS

- Aware of the risks
- Durability
- Knowledge of Asset Management
- Knowledge of radio communication systems
- Knowledge of telecommunication systems

In his field of expertise, Martin Standaart is a real team player. Through his professional and positive attitude, he encourages and stimulates his (fellow) team members to make valuable contributions to projects. When and where required, he can operate independently to obtain the desired results.

Because of his broad background, Martin is capable of making thorough analyses of complex technical situations as well as interpersonal issues. As a result, Martin can provide solid advice and make customized designs.

Martin's life motto implies that his actions are always preceded by a thorough analysis of the situation.

Suitability to the Role

Martin is a Senior Consultant in the field of EMC and RFI

Education

1988 – 1991	**Higher Electronics Education, Rens en Rens**
	Graduated in Electronics and Telecommunication
1984 - 1988	**Secondary Electronics Education, Rens en Rens**
	Graduated in Electronics and Telecommunication
1978 – 1984	**General Secondary Education** (HAVO)

Most relevant additional studies and courses

2014	VCA-VOL Diploma for Safety for Operational Supervisors SCC (SOS-SCC).
2012	Systems Engineering course
2011	Result Oriented Coaching
2010	Masterclass "Strategic advice and process management"
2008	Systems Engineering course, in English
1997	AXE Survey (Ericsson Telephone Exchanges)
1995 – 1996	Post Higher Vocational Education, Digital communication

1994 – 1995 Post Higher Vocational Education, Mobile communication

Professional Memberships

Member of IRSE (Institution of Rail Signal Engineers)

Kivi Niria (Dutch Association of Engineers)

Relevance of Experience

1998 to date ARCADIS Nederland BV, Amersfoort

- Technical Advisor for various telecommunications systems and other installations.
- Systems Engineering Advisor
- Support role for several national and foreign companies, as well as Arcadis divisions and business units, in the Telecom field.
- Acquisition activities for the department.
- Supporting Legal Advisor
- Keeping track of international ambitions of department employees.
- Helping new employees getting started.
- Coaching of (young) employees.

1997-1998 Telfort (Mobile), Network and Systems, Amsterdam

1994-1996 NS (Dutch Railways) Network Services B.V., Utrecht

1992-1994 NS Railinfrabeheer B.V., Utrecht

1992-1992 PTT Telecom, Hilversum and Utrecht

Project Experience

Program of Requirements for HF installation at railway stations

2015- to date

- Over time, many radio telecom systems and antennas have been installed in railway stations, increasing interference and limiting the possibilities to modify, change and expand these systems. This situation needs to be improved, including the esthetical aspects.
- ProRail Stations, in collaboration with NS Stations, has asked Arcadis to draft specific parts of a Program of Requirements for suppliers
- Martin's role in this program includes:
  - through interactive workshops, inform suppliers and obtain their input and suggestions;
  - provide knowledge and experience on applicable systems: GSMR and C2000;
  - co-operation with other contributors to the Program of Requirements.

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Microwavelink Genk and wind turbine

Arcadis Belgium 2014 - 2015

- Arcadis Belgium has designed a wind turbine. The building of the wind turbine coincided with a microwave link being realised by other parties. The wind turbine was in the path of the microwave link. Arcadis Netherlands were asked to advise on possible solutions.
- Martin's role in this Project included:
  - identification / evaluation of the problem;
  - determination of the exact location of the microwave path and the wind turbine;
  - determination of the size of the microwave path (Fresnel-zone) and the percentage of blocking of the microwave path by the wind turbine;
  - advising the Belgian colleagues about the next steps to take.

NS-P project Arnhem

ProRail 2006 - 2014:

- As part of the modernization of its railway stations, NS (Dutch Railways) had initiated a number of key projects in which several stations will be modernized or completely rebuilt.
- Martin's role in this Project included:
  - advising on C2000;
  - advising on GSM/UMTS and GSM-R;
  - completing C2000 designs;
  - training and coaching junior specialists;
  - consulting with civil construction contractors / principal contractor;
  - consulting with the rail safety authorities;
  - consulting with DMD (Directie Mobiele Diensten = Mobile Services Directorate), known as vtsPN (Dutch Police Cooperation Facility) at a later stage.

Project:GSM-R. Changing mast sites around Zevenaar

ProRail 2013

- ProRail have the contract to realize a third railway track between Zevenaar and the Dutch-German border.
- Consistent with EU rail regulation (international) the route section was to be provided with ETCS (European Train Control System). To realize ETCS the coverage of GSM-R required to be improved. This included building 3 new GSM-R sites. Additionally in parallel, a new site at Arnhem-Zuid was to be realized
- Martin's role in this Project included:
  - undertaking desktop research for possible suitable locations in accordance with local infrastructure;
  - undertaking location surveys with ProRail and suppliers;
  - working location recording;
  - advising on the location / siting of the masts and cable routes.

GSM/UMTS measurements on waterways

Department of Public Works and Water Management 2011 - 2012

- The Department of Public Works and Water Management needed to determine the coverage of GSM and UMTS on Dutch waterways, in order to be able to improve data communication from and to ships. Arcadis were asked to coordinate the measurements and to draft the final measurements report.
- Martin's role in this Project included:
  - undertaking research on most suitable measurement method;
  - advising about the measurements;
  - checking of the measurements;
  - advising on the final report.

Shore radar Noordzeekanaal

Department of Public Works and Water Management 2010

- The Department of Public Works and Water Management had ordered the realization of a new Radar System along the “Noordzeekanaal” (IJmuiden to Amsterdam). Arcadis were asked to review the documentation of the suppliers.
- Martin’s role in this Project included:
  - studying the requirements and specification of the department;
  - co-ordinating with the supplier of Radar and VHF (Ship Radio communication System);
  - assessing the designs;
  - co-ordination with the Client.

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KENNETH JOHN ASHTON

Technical Expert – Navigation Systems

"A passionate advocate for the implementation of Performance Based Navigation across all sectors of the aeronautical community"

CORE SKILLS

1. Preparation of Safety Cases
2. Preparation of Concept of Operations
3. Registered Independent Expert with the EU's Horizon 2020 Programme
4. Global Navigation Satellite Systems (GNSS)

ROLE ON THIS PROJECT

- Technical Expert

POSITION

- Technical Expert

QUALIFICATIONS

- Ordinary National Diploma in Engineering - East Devon Technical College.
- Air Traffic Engineering Apprenticeship with Civil Aviation Authority - Bletchley Park.
- City and Guilds Full Technical Telecommunications Engineering Certificate Correspondence Course.
- Higher National Diploma - Farnborough Technical College (Day Release)
- Engineering Council Part 2 - Reading Technical College (Day Release)

Internationally recognised as an expert in Aeronautical Navigation Engineering and service provision. National recognition in the UK as an expert on the impact of severe space weather on air traffic operations. Participation and management of TEN-T, Framework and SESAR projects delivering technical innovation and change. A passionate advocate for the implementation of Performance Based Navigation across all sectors of the aeronautical community, with particular emphasis on expediting the roll-out of Approaches with Vertical Guidance at all runways that will enhance the safety and reliability of services.

As a former Head of Navigation and Spectrum, Ken was responsible for the provision, design and safety assurance and evolution of the UK En-route Navigation Infrastructure as well as for NATS radio spectrum requirements and WT Act licences (approx. 650 separate licences).

Experienced at working and leading multi-discipline and multi-cultural technical and drafting groups.

An experienced Project Manager with skills gained through experience and formal training, with a good understanding of cost, schedule, performance and risk management.

A good understanding of the roles and workings of various European institutions gained through involvement in various projects and working groups, including The European Commission, European Space Agency, SESAR Joint Undertaking, GNSS Supervisory Authority and Eurocontrol.

Good communication and presentation skills gained through the conduct of duties and experience, supported by formal company training programmes.

Accomplished Chairman at international technical meetings.

Able to communicate effectively with people from diverse backgrounds on technical subjects.

Experienced in writing Specifications, Proposals, Reports etc. gained through the conduct of duties.

Project Experience

Head of Section Engineering Performance, Innovation and Assurance (EPIA), International Engineering

2010-2014

This was a technical leadership role with no direct staff responsibilities. The role required extensive co-ordination both within and external to NATS and had an International dimension.

International Civil Aviation Organisation

I was the Panel Member nominated by the UK DfT to the ICAO Navigation System Panel (NSP), where I acted as an independent technical expert and as Rapporteur to one of the Panel's technical sub groups. I led the drafting of the paper on, 'Rationalisation of Aeronautical Navigation Aids,' that was presented by the ICAO Secretariat at the 12th Air Navigation Conference in Montreal in 2012.

Navigation Architecture

I was responsible for planning the architectural transition from conventional ground based navigation facilities to a Performance Based Navigation (PBN) environment in the UK. This will be based on a balanced mix of ground and space based navigation technologies, to provide a robust and 'right sized' terrestrial navigation infrastructure. I led the technical conversations for NATS with the CAA aviation regulator to reduce the number of navigation beacons required in the UK from 47 to 19, resulting in significant cost savings and at the same time increasing the resilience of the navigation service. This has been subject to industrial consultation by the UK Civil Aviation Authority and is now being implemented.

Internationally (within ICAO, the Eurocontrol Navigation Steering-Group and the European SESAR project 15.3.2), I was instrumental in promoting the modernization of the aeronautical navigation ground infrastructure, to take account of the advances in aircraft avionics and satellite navigation capability, to provide a robust navigation infrastructure to support and hasten the transition to a Performance Based Navigation environment.

I undertook proactive engagement with airport and aircraft operators to promote PBN operations, to accelerate the delivery of benefits enabled by PBN. These benefits include improved aircraft trajectories and shorter routes, resulting in reduced CO2 emissions, reduced cost of infrastructure provision and maintenance and improved resilience and track keeping accuracy.

Approaches with Vertical Guidance

I led the Eurocontrol /TEN-T funded project consortium comprising NATS, Aurigny Air Services, States of Guernsey and Pildo Labs in Barcelona. This project implemented PBN GNSS Approaches with Vertical Guidance (APV) into the Island of Alderney and the operational approval of Aurigny Air Services to be the first European commercial aircraft operator to undertake APV Approaches in revenue passenger service.

These approaches provide a significant increase in safety by providing vertical guidance to aircraft at low cost, allowing implementation at locations where a conventional Instrument Landing System either cannot be provided for technical reasons, or be economically justified.

Impact of Extreme Space Weather

I was responsible for leadership of the NATS activity on Extreme Space Weather which led to attendance at meetings with the Cabinet Office with other diverse organisations to input to the UK National Risk Register. These included, National Grid, Met Office Rutherford Appleton Laboratories, satellite operators, Defence Scientific and Technical Laboratories, QinetiQ and academic institutions etc.

This activity included undertaking an impact assessment of an extreme space weather event on NATS Air Traffic Operations, the business impact and the resilience of technical facilities. This internal impact assessment led to invitations to participate as a member of the CAA Space Weather Experts Group and the Royal Academy of Engineering's Extreme Space Weather Study Group. Presentations on space weather impact to aviation were been undertaken at National and European level.

Head of Navigation and Spectrum Whiteley

2005-2010

I managed a team of up to 15 staff, responsible for the provision, design and safety assurance and evolution of the UK En-route Navigation Infrastructure. I was also responsible for NATS radio spectrum requirements and WT Act licences (approx 650 separate licences). I prepared and agreed the NATS corporate responses to Ofcom and HMG Department of Culture Media and Sport (DCMS) consultations on radio spectrum reform and the introduction of Administered Incentive Pricing (AIP) for aeronautical radio spectrum.

ESSP General Meeting Member

I continued in this role through to the maturity of the EGNOS Operational Business Case. Following the creation of the limited liability ESSP.SAS based in Toulouse (to operate the EGNOS Service under contract to the European Commission), I represented NATS in the liquidation of the ESSP.EEIG in Brussels.

EGNOS Operation

I managed the preparation of the NATS commercial proposal (approximately £4M over a 4 year contract) which was accepted by the ESSP.SAS for the operation of the EGNOS Mission Control Centre located at Swanwick.

International Civil Aviation Organisation

The International Civil Aviation Organisation is the United Nations Specialised Agency which standardises International Civil Aviation operations.

I became the Panel Member nominated by the UK DfT to the ICAO Navigation System Panel (NSP), where I act as an independent technical expert. The NSP defines Standards and Recommended Practices, which are essential to ensure global interoperability of aircraft and ground facilities. In this capacity, I am also the Rapporteur

of one of the Sub-Groups of the NSP. Following the 11th Air Navigation Conference in 2003, I chaired the group which undertook a major update of the global Technical Standards for Navigation which are detailed in Annex 10 to the Chicago Convention, which is the International Treaty which standardises International Civil Aviation Operations.

Deputy Engineering Manager (Navigation) Gatwick
1996-2005

Responsible for managing NATS participation in the European Space Agency's (ESA) European Geostationary Overlay Service (EGNOS). This activity required interfacing in a number of fora with the European Commission, ESA, UK DfT and British National Space Council / UK Space Agency, government departments and sections of UK and European Industry. This activity included having a NATS staff member (for whom I was responsible, over a 7 year period) seconded to the ESA project team based in Toulouse.

I participated in the formal phase design reviews for EGNOS at Mission, Baseline, Preliminary and Critical Design and Factory Integration Test.

During this period I also represented NATS at the General Meeting (Board) of the European Satellite Service Provider (ESSP) in Brussels - a European Economic Interest Group, created by 6 European Air Navigation Service Providers, to develop the business case to operate the EGNOS service and to manage the transition of EGNOS into an initial pre-operational service.

System Manager DVOR / DME
1991-1995

Senior Engineer responsible for system engineering of DVOR and DME systems supporting UK en-route navigation services. Responsible for procurement specification, tender and selection of new equipment, together with the preparation of factory and site acceptance criteria and the System Safety Cases.

Project Manager of the £5.2M DVOR replacement project at 25 sites.

Project Manager of the £4M DME replacement project - responsible for preparing the business case, specification, tender evaluation, procurement, technical acceptance, conduct of an 'in service' reliability demonstration and the preparation of the DME System Safety Case.

Project Manager, responsible for acceptance, deployment at 60 sites and transition to service of a new remote control and monitoring system for the UK en-route navigation infrastructure from the Swanwick Air Traffic Control Centre.

System Engineer NATS Headquarters
1987-1991

Provision of engineering support to the NATS en-route navigation System Design Authority, including the safeguarding of navigation systems from RF interference and multipath propagation degradation; through review and agreement of developments in close proximity to navigation facilities, through a formal review of planning applications. Project Engineer on the DVOR installation programme - responsible for planning on site installation, management of project finance and equipment acceptance test procedures.

System Engineer NATS Headquarters
1982-1987

Responsible for specification and analysis of routine Instrument Landing System (ILS) flight inspections and the definition of protection areas, to protect ILS guidance from multipath interference.

System Engineer Sumburgh Airport

1980-1982

Responsible for undertaking planned and corrective maintenance on airport communication, navigation and surveillance systems and Coastguard radio communication facilities throughout the Shetland Islands.

System Engineer at Area Maintenance Unit Heathrow

1975-1980

Responsible for undertaking planned and corrective maintenance on en-route navigation facilities and responsible for minor installation and maintenance activities on HM Coastguard Marine VHF and MF communications systems throughout the South of England.

1973-1975

Air Traffic Engineering Apprenticeship with Civil Aviation Authority at Bletchley Park with block Release to Wolverton Technical College.

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JANE LESLEY WILSON

Engineering Safety Manager

"An Engineering Safety Manager with over 30 years experience delivering safety assurance in several industry sectors"

CORE SKILLS

1. Safety Engineering Management
2. RAMS
3. Safety Assurance

PRESENT POSITION

- Principal Consultant

QUALIFICATIONS

- Chartered Engineer: Member of the Institution of Mechanical Engineers (CEng MIMechE) and European Engineer (Eur Ing).
- Chartered Safety and Health Practitioner: Institute of Occupational Safety and Health (CMIOSH)
- MSc Safety Engineering Lancaster University (rail, aviation and nuclear safety engineering)
- NVQ Level 4 in Occupational Health and Safety Practice, City and Guilds
- BSc Mathematics Southampton College of Higher Education
- Certificate in Environmental Management CIEH
- National General Certificate in Occupational Safety and Health NEBOSH

HOME LOCATION

- London

SPEAK / READ / WRITE ENGLISH

- Yes

Jane is an Engineering Safety Manager with over 30 years' experience, the majority in the global environment of major projects, delivering safety assurance in the rail sector and other industries.

Suitability to the Role

Jane has set up and implemented safety management systems in many industry sectors and successfully deliver the safety approvals to deliver a number of major rail and tramway projects into service operation.

Relevance of Experience

Expertise in safety engineering management in the rail, nuclear, aviation and defence areas to European and International standards, hazard management and the application of the Common Safety Methods.

Project Experience

Senior Safety Assurance Manager

Etihad Rail, 2013-2016

Leading the Etihad Rail System Assurance Team (Safety and RAM) and delivering the safety approvals to bring the Etihad Rail Network, the first freight mainline railway (with ERTMS / ETCS Level 2 signalling system) in the UAE into service operation.

Establishing, implementing and managing the Etihad Rail Safety and Technical Acceptance regime in compliance with European Standards, including EN 50156 and applying the Common Safety Methods. Establishing the Safety Assurance Review Board for internal approvals.

Working with an emerging UAE Rail Regulator, the ISA, the Programme Management Consultant, Contractors, the Operator and stakeholders to gain safety acceptance for operational service, resolving issues, overcoming barriers and delivering the programme of safety submissions.

Key achievements include meeting challenges, cultural differences and overcoming many barriers to successfully deliver the necessary safety approvals for operational service.

Project Experience Continued

Metrolink Extension Project

Transport for Greater Manchester (TfGM), 2010-2013

Jane was Rail Safety Manager on this project to establish and manage the Transport for Greater Manchester Safety and Technical Acceptance regime. Delivering the programme of safety assurance submissions to bring the Metrolink extension lines into service operation. Working with the Metrolink Operator and Maintainers, the Delivery Partner and suppliers, monitoring and auditing all aspects of safety management (including HSE), implementing real safety improvements and reporting to the Executive Board.

Key achievements include overcoming challenges in the contractual assurance framework and delivering the safety assurance for three new lines of Metrolink to be accepted into Passenger Service

Bombardier Transportation Passengers Division

2009 - 2010

Leading the Rolling Stock RAMS team and delivering the safety justifications for the new London Underground rolling stock to enter service operation.

Bombardier Transportation Systems Division

2007-2009

Principal Safety Engineer leading the safety management and delivering the safety assurance for the integration of the new signalling system (Distance to Go Radio) provided by Westinghouse Rail Systems Ltd for the London Underground Victoria Line Upgrade.

Bombardier Transportation London Underground Projects Division

2003 - 2007

HSE Manager leading the occupational Health Safety and Environmental team and safety management for London Underground Project, System Division

Bombardier Transportation Nottingham Tram Project

2001 - 2003

System Safety Manager delivering the safety justifications to successfully bring Line 1 of the tramway into service operation.

AEA Technology (Various Projects)

1992-2001

Independent Safety Assessor for various projects, HAZOP, FTA, FMEA and risk assessment within the rail, nuclear and defence industries, including Heathrow Express, Merseyrail, Safety Advisor to MoD for the Nuclear Submarine programme, Production of the Safety Case for refuelling submarines at Devonport Dockyard, ISA for a submarine weapons discharge system.

Rolls Royce and Associates
1988-1992

Safety Engineer – Thermal hydraulic analysis of the Naval Nuclear Power Plant as part of the Safety Case. Derinvng data for FTA and FMEA. Advising MoD on the thermal hydraulic performance of the plan to address in-service problem.

Scientific Officer – UKAEA
1984-1988

UK Fast Reactor development programme. Seconded to the CEA in France.

Employment History (Last 10 Years)

2013-2016 Etihad Rail, Senior Safety Assurance Manager

2010-2013 Transport for Greater Manchester, Rail Safety Manager

2006-2010 Bombardier Transportation, Principal Safety Engineer

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IAIN COUTTS

Senior Aviation Consultant

"Iain is a thoroughly detailed aviation consultant, with an eye for detail, regulatory compliance, safety and airport planning"

CORE SKILLS

- Aerodrome Safeguarding
- Airside Operations
- Airside Safety
- Airfield Inspections
- Airside Auditing
- CAA compliance
- Masterplanning
- Surface Access Planning
- Terminal Planning

ROLE ON THIS PROJECT

- Senior Aviation Consultant

POSITION

- Senior Aviation Consultant

QUALIFICATIONS

- MSc Transport Planning & Policy
- BA (Hons) Business Studies

Suitability to the Role

As a Senior Aviation Consultant Iain is a committed and professional airport planner with significant expertise within the industry and in related sectors. He has specialist knowledge in Airside Operations, Aerodrome Safeguarding, Surface Access and Masterplanning.

Iain joined Arcadis from Edinburgh Airport where he was the Aerodrome Safeguarding Manager. He was responsible for protecting the integrity of the airport by ensuring developments within 30km of the airport were compliant with CAA regulations. His primary function was to ensure Edinburgh Airport was compliant with CAP738 Safeguarding of Aerodromes.

Iain worked within Airside Operations and carried out regular airfield inspections including CAP168 Level 3 inspections. He was a key member of the team responsible for airside safety and regularly led the airside safety board and apron safety initiatives with wider airport users, particularly handing agents.

Iain was also an important member of an industry wide group working to resolve the ongoing conflicts between wind turbines and air navigation providers. These issues have a severe impact on the operations of air traffic control and ultimately the operation of the airport. Iain was proactive in working with the relevant stakeholders to make significant progress.

Project Experience

Master Plan & Terminal Development - Marseille Airport

Using the in-house planning model, AutoCAD and PathPlanner Iain has developed concept plans and facility sizing for the terminal redevelopment phase. Iain has ensured that the terminal concepts are designed to the needs of the client and are compatible with the proposed airfield improvements.

Project Experience Continued

Redevelopment of Jorge Chavez Airport – Lima, Peru

Iain was a key member of the team during the initial stages of this project for the expansion of Jorge Chavez International Airport in Lima. Iain was responsible for the initial airfield capacity and design work. Iain analysed and validated the current runway capacity whilst also validating the future capacity with the proposed 2nd runway included. This phase also included finalising the position of the proposed 2nd runway having regard to design standards, aerodrome safeguarding and local requirements. Iain also undertook data collection to inform the analysis of the master plan.

Airfield Modelling – Changi Airport, Singapore

Using PathPlanner software Iain produced a series of models to simulate the risks of different aircraft types deviating from the centreline of Rapid Exit Taxiways and overrunning into open airfield drains. The airport was sufficiently concerned about such a scenario occurring that they required appropriate risk assessments and the models were a key component of this work. The models provided a robust analysis of the likelihood of aircraft deviating from the centrelines and this enabled the airport to take the appropriate safety and compliance measures. It ensured that CAG could satisfy its airline customers that the airport was acting in a safe and compliant manner.

Technical Due Diligence – Greek Regional Airports

Iain undertook an important role in the completion of the Development Plans for 14 Regional Airports in Greece. Iain ensured that the base information and CAD drawings were accurate and presented in a consistent and structured format. This was a complex project due to the volume and diverse nature of the different airports.

Aerodrome Safeguarding Manager – Edinburgh Airport

Iain was fully responsible for the aerodrome safeguarding process at Edinburgh Airport. This included the full safeguarding function including consultation with local planning authorities, negotiating with developers and providing detailed planning consultation responses. Iain was also diligent in ensuring planning conditions were adhered to on sites with planning consents. He was also responsible for ensuring the airport was compliant with CAP738 Safeguarding of Aerodromes and CAP232 Aerodrome Survey Information.

Iain delivered and established a new safeguarding process for the airport. He successfully fostered excellent working relationships with local authorities and developers

Iain undertook a full review of the Aerodrome Safeguarding systems used by the airport and prepared a comprehensive strategy recommending to the Head of Airside that the process should be upgraded following a review of options. The final recommendation was accepted and Iain then sourced new software and streamlined the process whilst integrating it fully within Airside Operations.

As a significant potential threat to the safe operation of airlines operating at the airport Iain undertook a large scale project with the owners of a landfill sight in proximity to the airport to reduce the risk of bird strikes to aircraft. This work was recognised by the CAA and external auditors as being and excellent example of collaborative working and best practice.

Iain successfully created and delivered a comprehensive training package for his replacement in the post. Iain ensured that the package was tailored to suit the airport and delivered to the satisfaction of the Head of Airside.

Airside Auditing – Edinburgh Airport

Iain was responsible for implementing and managing a formal auditing process to ensure 3rd party airside users were operating in accordance with CAA regulations and airport requirements. The process ensured that other airside users were operating in accordance with Airside Operations, general airport requirements and Health & Safety regulations. Iain encouraged the airside users to make this a two-way process so that any issues or suggestions were raised at an early stage and then discussed and considered at an appropriate level within the airport. This work enabled Airside Operations to foster an excellent working relationship between the airport authority and other airport users, particularly handling agents. Most airside users recognised the importance of this process and it demonstrated to others, particularly the CAA, that Airside Operations was proactive in managing and communicating with 3rd parties

Wind Turbine Radar Interference – Edinburgh Airport

The ongoing issues regarding radar interference arising from wind turbines resulted in many large scale developments being stuck within the planning system. Iain managed a group of developers and the airports air navigation service provider to deliver a project to progress the long running issues. The outcome protected the interests of the airport and enabled the industry to make significant progress in resolving the issues. The project was recognised by the Scottish Government as an extremely positive and meaningful. Working in collaboration with developers, Scottish Government and the air navigation service provider Iain initiated a project to progress the long running conflict between wind turbines and radar clutter. This was delivered at no cost to the airport. As a result of this work Edinburgh Airport was recognised within the development industry to be a dynamic and open organisation willing to work with others to resolve the issues.

Airport Planning – Edinburgh Airport

Iain worked at Edinburgh Airport during a period of expansion and growth. Working in collaboration with the Head of Airside and the Airside Compliance Manager he successfully delivered numerous projects to enhance existing airside facilities and provide upgrades as necessary. This enabled the airport to cater for larger aircraft without significant capital expenditure. Working in partnership with airlines and handling agents Iain was instrumental in completing a project to enhance the airside environment to enable airlines to meet their turnarounds requirements. This was a particularly important project for the airport as several airlines were expanding with more based aircraft, therefore the airside environment needed to be operating with maximum efficiency.

ARCADIS Design & Consultancy for natural and built assets

Martin van Essen

Specialist

CORE SKILLS

1. EMC
2. EM-fields
3. Earth Potential Rise
4. Electric Networks
5. Load Flow
6. Rail traction
7. Lightning coverage
8. Data analysis

ROLE ON THIS PROJECT

- Specialist

POSITION

- Specialist

QUALIFICATIONS

- PhD in Physics
- VOL-VCA
- Digital Safety Passport

Martin studied Physics & Astronomy at Utrecht University and obtained his PhD in Physics at the University of Twente (NL). He has been a specialist at Arcadis since January 2010.

Suitability to the Role

Martin is a well-rounded, driven researcher and a harmonious team player, always on the look-out for creative solutions.

Relevance of Experience, highlights

During his time at Arcadis, Martin has built ample experience in modeling of electromagnetic fields and electromagnetic influence on third party objects. He has developed a simulation program (“Isabel”) for the study of Earth Potential Rise (EPR) and potential gradients at HV power stations resulting from short circuits. Also, he has built a program (“Eclair”) to simulate and 3D-visualize the coverage that lightning peaks offer for buildings and substations. Finally, he has performed numerous studies involving rail traction load flow and EMC in rail environment.

Project Experience (short selection)

Short-circuit studies in GDO-net

TenneT 2015 € 400 000 ,--

Modeling of EPR resulting from short circuits for 12 HV power stations. Also, for this project Martin has calculated (Lorentz) short circuit forces.

Noord-West 380 kV

TenneT 2013 – 2015 € 550 000 ,--

Very large study for electromagnetic influence of a 150 km long 380 kV 50 Hz transmission line on nearby infrastructure (railways, pipelines, …), including EPR and short circuit simulation. Martin has also been in touch with third parties including ProRail, GasUnie, Enexis, Alliander, KPN, Ziggo, NAM, Stedin, Rijkswaterstaat, Electrabel, Waterschappen.

Ombouw aardingsconcept Zuid-Nederland, “BO2”

TenneT 2015 – 2017 € 940 000 ,--

Lead Engineer. Change-of-earthing concept from Petersen to direct earthing drastically increases short circuit currents. This project studies the inductive and resistive influence on third party objects for the entire 150 kV net in the whole south of the Netherlands, including Zeeland(!).

ARCADIS Design & Consultancy for natural and built assets

DR AHMED MAKI

Senior Building Physicist

"Mechanical Engineer expert in engineering analysis using simulation and modelling techniques"

CORE SKILLS

1. Building Regulation Compliance Check
2. Thermal and Energy Modelling
3. HVAC systems simulation
4. Computational Fluid Dynamics (CFD)

ROLE ON THIS PROJECT

- Building Physicist

POSITION

- Senior Building Physicist

QUALIFICATIONS

- PhD Mechanical Engineering
- BEng (Hons) Mechanical Engineering
- CIBSE Low Carbon Energy Assessor (Levels 3,4 & 5)

Ahmed has over 12 years of experience in engineering analysis and modelling. His experience includes thermal, energy, daylight and lighting modelling. He has wealth of experience in building regulation Part L compliance. His pragmatic advice is invaluable to meet energy aspects of planning conditions and sustainability rating system (BREEAM, CEEQUAL and LEEDS).

He also carried out number of Computational Fluid Dynamics (CFD) analyses to provide critical design data and validation for complex natural ventilation, air quality and micro-environment problems.

Suitability to the Role

Ahmed is a fully qualified CIBSE Low Carbon Energy Assessor (LCEA) Levels 3, 4 and 5 which enables the production of Energy Performance Certificates (EPCs) and the generation of PartL2A compliance reports (BRUKL). He has other modelling capabilities such as residential experience ranging from system selection, thermal bridging modelling to SAP assessments.

- Energy / Thermal modelling and compliance software: IES-VE, TAS, ECOTECT, TRNSYS, CYMAP, NHER-SAP, Meteonorm
- CFD software: FLUENT, CFDesign, CFX.
- Analysis software: RADIANCE, Flucs DL, MATLAB, and advanced Excel user.

Relevance of Experience

Ahmed will bring experience to various aspects of the project ensuring optimised solutions throughout. He has worked on a wide range of sectors and building types, such as offices, schools, hospitals, laboratories, galleries, residential, retail, emergency services, stadiums and leisure centres. He has also worked on other system specific projects, including CCHP systems and buffer vessels, PVs, Solar hot water generation, and even CFD analysis of Wind Turbines!

Project Experience

Croydon Housing Programme
Croydon Council, Brick by Brick, March 2016-Date

Ahmed has been involved in energy strategy and building regulation compliance aspects of this residential housing programme ranging. The project contains over 50 sites (over 900 residential units) scattered all over the borough of Croydon. The main challenges were achieving the carbon dioxide reduction targets by proposing optimum engineering solutions that are bespoke to each building with the sites.

Creek Road Energy Modelling
Bouygues UK EPG team, 2015-2016

This was an Energy Performance Guarantee (EPG) project where a higher level of accuracy form the thermal modelling was required. The overall aim was to guarantee the cost of the heating bills for the tenants (i.e. constant annual charge) whilst minimising financial risk to the organisation. Ahmed carried out statistically based time occupancy profiling to predict heating and hot water usage including calculation of transient thermal losses from LTHW system. Ahmed performed various sensitivity and parametric analyses to provide realistic advice and estimation range.

Pears Building – Air Quality Simulations
Royal Free London NHS Foundation Trust, 2014-2015

Three dimensional CFD simulations of pollutants (including CHP and boiler flues, Chloroform from laboratories, and smells from commercial kitchen exhausts) from number of outlets located at roof level of the Pears Building section of the Royal Free Hospital. The results of the CFD simulations indicated that the most critical situation was the Chloroform (TriChloromethane) and the requirement of reducing the emissions to below the European Commission's Scientific Committee on Occupational Exposure Limits of 2ppm at ground level. Ahmed suggested strobic fans to meet the requirement and simulated them for various deigns and flow rates. This simulation informed the final design solution.

Dun Laoghaire Central Library and Cultural Centre
Matrix Ltd, BMS contractors, 2014-2015

Three dimensional CFD simulations to predict the window opening angle required for comfortable airflow rates. Such comfort is measured by ensuring no nuisance drafts for the occupants. CFD modelling for all window types, for various wind directions, wind speeds, and window opening angles. The results have been provided to the BMS contractor to be used as an input to the BMS that controls the automated window actuators.

University of Hertfordshire
University of Hertfordshire, 2014-2015

Full electrical and heating energy predictions for the whole campus to ensure correct design and size of a site wide CHP system and district heating network. CO_2 calculations were also performed in order to meet the Carbon Zero targets.

Brent Civic Centre
Brent Council, 2013-2015

Ahmed calculated carbon factor of a bio-fuelled CHP, which was inputted into compliance calculation using DSM. Ahmed also carried out wind assessments using CFD analysis to comply with planning conditions. This was performed for various wind directions and wind speeds. The study showed no requirement for obstructions because of the assistance surrounding built environment.

Design for manufacture and assembly (DfMA)

Liang O'Rourke, 2013-2015

Ahmed created energy and thermal modelling for a hypothetical school building. He performed a parametric and a sensitivity study to inform whole life cycle cost of the building elements. The report provide advice on prioritising energy saving measures based upon value for money. This joint venture had resulted in winning a prestigious CIBSE award, passive low carbon product of the year.

Inter IKEA Shopping Centres

IKEA, 2012-2014

Ahmed performed thermal and daylight analyses for number of IKEA store in Europe and China. He proposed balanced innovative solution which optimises daylight, improved perceived thermal comfort within the mall floor areas. He proposed various densities of fritted glass to achieve both daylight and perceived temperature comfort.

Teddington secondary school

Teddington secondary school, 2012-2013

The existing louvre within the examination hall caused uncomfortable drafts during examination periods in winter. To avoid nuisance drafts, the school left significant area in front of louvre which was utilisable. Ahmed carried out 3D CFD analysis of the hall and proposed a shielding screen. This solution mitigated the draft whilst ensuring comfort and CO_2 levels are in line with BB101 recommendations.

Teddington Secondary School post-occupancy energy monitoring. This work involved tool development for automating data diagnosis, highlighting problems, reporting exact of energy misuse, and energy advice generation. Ahmed produced and incorporated all of this in one integrated software together with a GUI (graphical user interface). This was a task beyond the client's request, but it had resulted in winning an excessive amount of work as anticipated.

Brighton General Hospital

Brighton General Hospital, 2011-2012

Ahmed was responsible for EPC / Part L modelling a carbon negative building design with over 3000 rooms. He also carried out energy and thermal modelling including thermal storage. Based upon modelling output and Life Cycle Cost analysis, Ahmed recommended that the CHP is more economical solution compared to tri-generation (i.e. with absorption chiller).

Essex Business School

Essex Business School, 2011-2012

Ahmed carried out mix-mode and displacement ventilation modelling for Breathing Buildings' E-Stack system. This design was fully investigated using CFD, in terms of its feasibility, and then implemented for Essex Business School.

UEA Low Carbon Innovation Centre

UEA, 2011-2012

UEA Low Carbon Innovation Centre (a Passive House design) renewable energy study involving the applications of the Passive House standards. Advice was given to the architects based on full thermal modelling of such high energy standards. The energy targets were achieved which informed the total design, from passive to active measures.

Terminal 3 Refurbishments

Heathrow Airport, 2011-2012

CFD techniques and thermal modelling software in order to predict comfort levels (PPD) in a high frequency entrance. The initial solution of a simple warm air curtain did not work. Other solutions were investigated such as relocation of entrances and application of obstructions (plastic screens). The studies had shown that the screens were the most feasible solutions. The results allowed correct positioning to maintain comfortable internal temperature in the queueing area (VAT desk).

London Fire Brigade Stations

LFB, 2011-2012

Utilised daylight modelling techniques to support planning stages of architectural designs for nine London Fire Brigade Stations. This study included developing robust rules of thumb for average daylight factor predictions for spaces with constant depth. The rules were validated and were proved to be sufficiently robust.

B&Q Headquarters

B&Q, 2010-2012

Mixed mode strategy controls optimisation for minimising energy consumption whilst maintaining thermal comfort for high-profile projects including B&Q Headquarters and PwC More London using IES and Fluent CFD code. The results indicated the optimum controls which were then used to predict the energy savings from the overall mixed mode system, validating the system financially.

Royal Albert Memorial Museum galleries

RAAM, 2009-2010

Royal Albert Memorial Museum (RAMM) galleries simulation for the purpose of artefact preservation. Stratification analysis for all air systems with tight temperature and humidity controls require detailed modelling of the variables such as temperature and levels of CO_2 build up with respect to the height of the galleries for various door opening frequencies.

Appendix D – Programme

ID	Task	Week 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
		06/02/2017	13/02/2017	20/02/2017	27/02/2017	06/03/2017	13/03/2017	20/03/2017	27/03/2017	03/04/2017	10/04/2017	17/04/2017	24/04/2017	01/05/2017	08/05/2017	15/05/2017	22/05/2017	29/05/2017	05/06/2017	12/06/2017	19/06/2017	26/06/2017	03/07/2017	10/07/2017	17/07/2017	24/07/2017	31/07/2017	07/08/2017	14/08/2017	21/08/2017	28/08/2017	04/09/2017	11/09/2017	18/09/2017	25/09/2017	02/10/2017
	Kick-off Workshop																																			
	Draft scope agreed																																			
	Draft programme agreed																																			
	Proposals from Arcadis																																			
	Final scope agreed																																			
	Final programme agreed																																			
	Agree masterplan and first information underpinning assessment (FBC)																																			
	NG/FBC Working Group (Arcadis Attendance in Red)																																			
1	**Phase 1 Review of Current Position and Evidence**																																			
1.1	Review of evidence																																			
1.2	Interim Report (Draft and final)																																			
2.1	**Phase 1 HAZARD ID and risk assessment**																																			
2.1.1	HAZID / FHA workshop																																			
2.1.2	HAZID worksheets issued																																			
2.1.3	Interim HAZID / FHA Report Phase 1																																			
2.1.4	Risk Management and Develop Hazard Log Phase 1																																			
2.1.5	Issue Interim Hazard Log (Phase 1) Draft and Final																																			
2.10	**Phase 1 Buildings (Wind Assessment)**																																			
2.10.1	Provide information for assessment (FBC & NG)																																			
2.10.2	Sub-task 1 - 1. Rerun (effect of Interconnector on Air field) based on revised facilities layout																																			
2.10.3	Interim Report (Draft and final)																																			
2.12	**Phase 1 Assessment of relevant hold points relating to other airports and comparison with other similar airports**																																			
2.12.1	Review of Holdpoints on AAIB website																																			
2.12.3	Interim Report (Draft and final)																																			
3	**Phase 1 CAA Licencing requirements**																																			
3.1	Preparation with RCA and NG (Meeting)																																			
3.2	CAA Meeting																																			
3.3	Interim Report (Draft and final)																																			
	Phase 1 Report issued for comment																																			
	Compile Report and summary of current position and issue reprt (draft and final)																																			
	PHASE 2																																			
	Agree Phase 2 work and information provided. Phase 2 work scope proposed and agreed																																			
2.1	**Phase 2 Risk Management**																																			
2.1.1	Risk management																																			

2.1.2	Risk Managememt Report and Hazard Log																																			
2.2	**Phase 2 Airfield Ground Lighting**																																			
2.2.1	Technical Assessment																																			
2.2.2	EMI / RFI - Interim report 1 (Draft and final)																																			
2.3	**Phase 2 Navigational Aids**																																			
2.3.1	Technical Assessment (EMI/RFI)																																			
2.3.2	EMI / RFI - Interim report (draft and final)																																			
2.3.3	Technical Assessment - navigational aids types																																			
2.3.4	Technical Note - navigational aids types																																			
2.4	**Risk Management activities associated with Fuel Installations and mobile fuel bowsers**																																			
2.5	**Phase 2 Compass Base Proposal**																																			
2.5.1	Technical Assessment (EMI/RFI)																																			
2.5.2	EMI / RFI - Interim report (draft and final)																																			
2.6	**Risk management associated with Engine Testing Area**																																			
2.7	**Phase 2 Runway extension**																																			
2.7.1	Technical Assessment identfy constraints on HV cables in runway extension based on assessment (EMI/RFI)																																			
2.7.2	EMI / RFI - Interim report																																			
2.8	**Phase 2 Weather Forecasting Equipment**																																			
2.8.1	Technical Assessment																																			
2.8.2	EMI / RFI - Interim report 3																																			
2.9	**Phase 2 Third Party Equipment**																																			
2.9.1	Technical Assessment																																			
2.9.2	EMI / RFI - Interim report 3																																			
2.10	**Buildings (Wind Assessment)**																																			
2.10.4	Sub task 2. Rerun model by incorporating nearby buildings such as Faraday Business Park:																																			
2.10.5	Interim Report																																			
2.10.6	Sub task3. Rerun model by incorporating all surroundings (may not be necessary i.e. optional):																																			
2.10.7	Interim Report																																			
2.11	**Risk management activities related to Drainage and other services**																																			
	Phase 2 Update to the Preliminary Safuarding Report																																			
	Safeguarding assessment																																			
	Safeguarding Interim Report																																			
4	**Phase 2 Aircraft Types**																																			
4.2	Technical Assessment																																			
4.3	EMI / RFI - Interim report Draft and Final																																			
5&6	**Risk Management related to Expansion of airside related businesses and non airside related businesses.**																																			
5.1	Liason with Commercial Agent																																			
7	**Detailed Design of IFA2 Development**																																			

7.1	Meeting / liason with NG and IFA2 Contractor on hazards																																			
	DRAFT Final Report issued for comment																																			
	Client review period of 1 month																																			
	Final report																																			
	FBC Executive recommendation regarding Airfield Condition																																			