ARCADIS Design & Consultancy for natural and built assets

TECHNICAL ASSESSMENT (HAZARD LOG)

Of the Possible Impact of the IFA2 Interconnector on the Solent Airport, Daedalus

35588100/NT/300916/2

SEPTEMBER 2016

Incorporating
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VERSION CONTROL

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1	1	30/09/2016		New document to address comments on main report.	

TABLE OF CONTENTS

REFERENCES

Ref No	Reference Identifier	Title
1	CAP 760	Civil Aviation Procedure (CAP 760) Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases
2	35588100/NT/300916/1	Technical Assessment (Main Report) of the possible impact of the IFA2 Interconnector at Solent Airport Daedalus.

TERMS AND DEFINITIONS

Term / Abbreviation	Definition
Airport	Solent Airport at Daedalus
AC	Alternating Current
AGL	Aeronautical Ground Light
AIP	Aerodrome Information Package
ALARP	As Low as Reasonably Practicable
AOA	Airport Operators Association
ARP	Aerodrome Reference Point
ATS	Air Traffic System / Air Traffic Services
BHMP	Bird Hazard Management Plan
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CEMAST	Centre of Excellence in Engineering and Manufacturing Advanced Skills Training
CFD	Computational Fluid Dynamics
CIGRE	Conseil International des Grands Réseaux Électriques
DC	Direct Current
DfT	Department for Transport
EMC	Electromagnetic Compatibility
EMF	Electromotive force
EPSRC	Engineering and Physical Sciences Research Council
FBC	Fareham Borough Council
FHA	Functional Hazard Assessment
GB	Great Britain
HIRA	Hazard Identification and Risk Assessment

Term / Abbreviation	Definition
HMS	Her Majesty's Ship
HV	High-Voltage
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Commission
IFA2	The IFA 2 Interconnector, being developed by National Grid jointly with Reseau de Transport d'Electricite
IHS	Inner Horizontal Surface
ILS	Instrument Landing Systems
kV	Kilovolt
MW	Mega Watt
National Grid	National Grid Interconnector Holdings
NG	National Grid Interconnector Holdings
NGET	National Grid Electricity Transmission
NOTAM	Notice to Airmen
OFZ	Obstacle Free Zone
OLS	Obstacle Limitation Surfaces
RCA	Regional and City Airports
RCAM	Regional and City Airports Management
RFI	Radio frequency interference
SMS	Safety Management System
Solent Airport	Solent Airport at Daedalus
The (Control) Tower	The Control Tower at Solent Airport
VFR	Visual Flight Rules

Term / Abbreviation	Definition
VSC	Voltage Source Converter

1 INTRODUCTION

National Grid Interconnector Holdings (National Grid) is proposing to develop and implement an electricity interconnector facility. The facility (referred to as IFA2) is being developed jointly with Reseau de Transport d'Electricite (RTE), the French transmission system owner and operator. It links the United Kingdom's electricity transmission network with France's, and helps to enhance the security, affordability and sustainability of energy supply to both countries.

The facility consists of two converter stations, one sited in each country. It is to be sited to the north-east of Solent Airport, with high-voltage direct current (HVDC) and high-voltage alternating current (HVAC) cables proposed to be routed in the same cable corridor to the west and north of the main runway.

National Grid, in agreement with Fareham Borough Council and RCAM, has commissioned a number of initial assessments as part of best practice development and design to determine whether the siting of the converter station at Solent Airport could impact the Airport's operations. These assessments will also help to address local concerns over the proposals to site the converter station at Solent Airport and have already provided supporting information to the Public Consultation Process being led by Fareham Borough Council.

As part of this work, National Grid has commissioned Arcadis to undertake a technical assessment of the converter station to support the planning and land acquisition process. The assessment is also intended for the benefit of stakeholders, in particular Fareham Borough Council as Landowner and RCAM as the Operator of Solent Airport. It will be made publicly available. At the date of issue of this report, a planning application has been submitted, but has not yet been determined.

The assessment includes undertaking a functional hazard assessment (FHA), in accordance with Civil Aviation Authority (CAA) standard CAP 760 [1].

The output of the technical assessment is reported in [2]. This report documents in detail the results of the FHA and therefore supports [2]. It incorporates the Hazard Log, which should be used as a tool to track the risk management process as the project lifecycle progresses.

2 FUNCTIONAL HAZARD ANALYSIS PROCESS

The FHA is part of a systematic a process to:

- identify ways in which the proposed IFA 2 installation might impair the safety of air traffic operations at Solent Airport (hazards);
- identify how severe such impairment might credibly be;
- estimate the approximate likelihood of such impairment where possible.

The FHA does not explore in depth any new ways of reducing the likelihood or severity of such impairment. The means of managing risk should be identified later in the overall risk management process, however possible ways to manage risks identified during the FHA are recorded in the Hazard Log, which should be used to manage the risks to closure.

The FHA was carried out at a workshop held on the 24th August 2016. The workshop was co-ordinated and facilitated by Arcadis. Technical and other experts from National Grid, Fareham Borough Council, RCAM and Arcadis participated in the workshop to ensure comprehensive coverage and representation from all the specialist areas necessary to identify hazards and assess risks.

The following sections document the output of the FHA as follows:

Section 3 – lists the “Contributing Factors”. These are not hazards in themselves, but are factors that could contribute to an accident when combined with other factors.

Section 4 – contains the Hazard Log Forms, capturing each hazard as advised by CAP 760 [1]. The Hazard log is based on the output from the FHA workshop (Section 5).

Section 5 – contains the Hazard Record Sheets that were recorded at the FHA workshop, incorporating all subsequent comments, and is the agreed output from the workshop.

3 HAZARD CONTRIBUTING FACTORS

The disposition of contributing factors to hazards identified in the FHA meeting, as recorded in the hazard record sheets is shown in the cross-reference Table 1 below.

Contributing factor ID	Factor	Hazards or explanation
CF01	Distraction of aircrew caused by lighting from the facility - building and security lighting.	HAZ01, HAZ06, HAZ08, HAZ10, HAZ15.
CF02	Distraction of aircrew caused by reflection from building structure and cladding.	HAZ01, HAZ06, HAZ08, HAZ10, HAZ14.
CF03	Human (public and workers) exposure to magnetic fields (see 8.2 for impact on equipment).	HAZ18.
CF04	Communication interference, impacting the workload of the staff in control tower or aircrew (e.g. dealing with instrumentation and radio problems).	HAZ01, HAZ06, HAZ08, HAZ10, HAZ15.
CF05	Noise from IFA2 facility causes a distraction.	HAZ01, HAZ06, HAZ08, HAZ10, HAZ15.
CF06	Pilots under training who are not accustomed to any impacts from converter station - e.g. as they have undergone training before the converter station is operational.	HAZ01, HAZ06, HAZ08, HAZ10, HAZ15.
CF07	Magnetic compass / magnetometer deviation caused by magnetic fields from HV cables.	HAZ19.
CF08	Air-ground communications impacted by interference caused by emissions from HV cables / facility.	Not applicable for current operations (airport ground operator role is not safety significant). May need review for future operations.
CF09	Ground- ground communications (UHF) impacted by interference caused by emissions from HV cables / facility.	HAZ12.
CF10	Interference caused by emissions from HV cables / facility delays Emergency Services communication (Note airport fire service response relies on ground - ground communications), backed up by general Fire Service (999))	HAZ11.
CF11	Altimeters (UHF) impacted by emissions from HV cables / facility.	Not applicable for current operations. May need review for future operations.

Contributing factor ID	Factor	Hazards or explanation
CF12	Instrumented Landing Systems (ILS) impacted by emissions from HV cables / facility.	Not applicable for current operations. May need review for future operations.
CF13	GPS impacted by emissions from HV cables / facility (note current aircraft have their own GPS).	Not applicable for current operations. May need review for future operations.
CF14	Impact from RFI / emissions on power supply system in aircraft.	Not credible.
CF15	Interference with Maritime Coastguard Agency communications caused by RFI /emissions from / HV cables / facility. The station, mast and tower are on the Airport.	Out of scope of airport risk assessment, but effects are likely to be managed by the specified mitigations.
CF16	Emissions from HV cables and facilities impacts Britten Norman activities involving complex avionics and military aircraft.	Commercial, not safety, risk.
CF17	Impact on Radar due to emissions from HV cables / facility.	Not applicable for current operations. May need review for future operations.
CF18	Ionising radiation from HV cables.	Not credible.
CF19	Touch potential from HV cable layout. Fences (planned or existing) and risk of high 50 Hz induced touch potentials.	HAZ20.
CF20	Emissions / RFI from KV cables / facility cause malfunctioning of unmanned aerial vehicle (UAV) (e.g. drones).	HAZ21.
CF21	Heat generated from converter station - air density changes immediately above the facility impacts aircraft or gliders.	HAZ02, HAZ04, HAZ05, HAZ07.
CF22	Compass mis-calibrated due to calibration taking place in zone impacted by magnetic fields (see contributory factor CF07).	HAZ19.
CF23	Equipment within the converter station catches fire and generates smoke impeding vision of aircrew.	HAZ22, HAZ23.
CF24	Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear etc.) - noted that worst case at Daedalus is wind from NE.	HAZ02, HAZ04, HAZ05, HAZ07.

Contributing factor ID	Factor	Hazards or explanation
CF25	Emissions from HV cables / facility impact meteorological instruments.	Not applicable for current operations. May need review for future operations.
CF26	Night flying - impact of high-voltage cables on ground lighting.	Not applicable for current operations. May need review for future operations.
CF27	Insulation failure of HV cables - impacts other system (e.g. AGL).	HAZ03.
CF28	Future construction works (once converter station in operation) - digging in vicinity of HV cables.	HAZ03.
CF29	Future planning of landscaping - attracts birds near to airport.	HAZ03.
CF30	Heat from converter station - warms air immediately above the converter station and attracts birds.	HAZ03.
CF31	Building design -flat roof - attracts birds.	HAZ03.
CF32	Tall trees	HAZ07.

Table 1 – List of Contributing Factors

4 HAZARDS

The hazards identified are shown on the following hazard log forms.

Risk is a combination of the likelihood and severity of the hazard. At this early (planning) stage in the project lifecycle, hazard mitigation measures are not fully defined, hence in most cases only severity was assigned during the FHA.

All severities are those of the effect of IFA2. It should be noted that the hazards might also be caused in ways that are independent of IFA2, which should also be considered when assessing the overall airport risk.

At this preliminary FHA stage in the safety management process, the severities do not take into account the various existing studies associated with a specific design, nor do they take into account the proposed controls and mitigations. Those studies, controls and mitigations should form part of the subsequent safety management of the project (Steps 5 and 6 of the CAP760 safety management process), which extends over the whole of the project lifecycle.

Actions for the risk mitigation measures identified are assigned in the hazard record sheets to “owners”, who are identified by the organization best placed to progress the action, i.e.:

NG- National Grid

FBC- Fareham Borough Council

RCAM- Regional and City Airports Management Ltd

Some hazards have been identified as “Significant” in terms of severity. A severity of “Significant” is defined in CAP 760 [1] as follows:

> Significant incident involving circumstances indicating that an accident, a serious or major incident could have occurred, if the risk had not been managed within safety margins, or if another aircraft had been in the vicinity.
>
> A significant reduction in safety margins but several safety barriers remain to prevent an accident.
>
> Reduced ability of the flight crew or air traffic control to cope with the increase in workload as a result of the conditions impairing their efficiency.
>
> Only on rare occasions can the occurrence develop into an accident.
>
> Nuisance to occupants of the aircraft or staff/members of public at the aerodrome.

Note that this is the not the risk; likelihood will need to be defined once the risk mitigation measures are developed to evaluate the risk using the risk matrix in CAP 760 [1].

The following hazards have been identified as having significant severity:

- HAZ02, HAZ04, HAZ05, HAZ07: Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear and so on);
- HAZ03: Bird strike;
- HAZ14: Distraction of aircrew caused by reflection from building structure and cladding (procedural non-radar operations);
- HAZ17: Terrorist attack on IFA2;
- HAZ19: Magnetic fields lead to incorrect calibration of magnetic compass;
- HAZ21: Emissions / RFI from KV cables / facility cause malfunctioning of UAV; and

- HAZ22, HAZ23: Equipment within the converter station catches fire and generates smoke impeding vision of aircrew.

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ01</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Distraction of aircrew</td></tr>
<tr><td colspan="3">Hazard category
Human Factors</td></tr>
<tr><td colspan="3">Hazard consequence
Aircraft unintentionally deviates from normal in-flight parameters.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
No immediate effect</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation

Lighting direction to be downwards towards the ground, away from flight paths and control tower (NG).

External surfaces of building to be designed not to present a distraction to aircrew (NG).

Design to ensure RF levels are too low for significant interference (NG).

Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots (NG).

Ensure aircrew and airport ground operators are kept up-to-date with changes and likely effects (RCAM).</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
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<tr><td colspan="2">Project or system
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<tr><td>Hazard ID
HAZ02</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear and so on). Note that the worst case at Daedalus is wind from north-east.</td></tr>
<tr><td colspan="3">Hazard category
Environmental Factors</td></tr>
<tr><td colspan="3">Hazard consequence
Aircraft unintentionally deviates from normal in-flight parameters.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
Significant</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Wind assessment to ensure minimal impact on wind from the building (including consideration of light aircraft and UAVs) (NG)

Airmanship provides mitigation.

Publicity and training (RCAM).

Obstacle clearance surfaces to be protected (FBC).

Keep under review in case of increased traffic (FBC)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
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<tr><td>Hazard ID
HAZ03</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Bird strike</td></tr>
<tr><td colspan="3">Hazard category
Environmental factors</td></tr>
<tr><td colspan="3">Hazard consequence
Aircraft unintentionally deviates from normal in-flight parameters.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
Significant</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Implementation of bird management strategy (RCAM).

Building to provide appropriate access for bird management strategy (NG).

Consider risk of bird strike in future landscaping and choice of trees, etc. (FBC)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
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<tr><td colspan="2">Project or system
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<tr><td>Hazard ID
HAZ04</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear and so on). Note that the worst case at Daedalus is wind from north-east.</td></tr>
<tr><td colspan="3">Hazard category
Environmental factors</td></tr>
<tr><td colspan="3">Hazard consequence
Inability to make a stop within the expected distance requirements.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
Significant</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Wind assessment to ensure minimal impact on wind from the building (including consideration of light aircraft and UAVs). (NG)

Airmanship provides mitigation.

Publicity and training (RCAM).

Obstacle clearance surfaces to be protected. (FBC)

Keep under review in case of increased traffic. (FBC)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ05	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear and so on). Note that the worst case at Daedalus is wind from north-east.		
Hazard category Environmental factors		
Hazard consequence Loss of directional control on the runway.		
This hazard probability	Severity Significant	
Cumulative hazard probability		
Proposed action / mitigation Wind assessment to ensure minimal impact on wind from the building (including consideration of light aircraft and UAVs) (NG) Airmanship provides mitigation. Publicity and training. (RCAM) Obstacle clearance surfaces to be protected.(NG) Keep under review in case of increased traffic. (FBC)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ06</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Distraction of aircrew or control tower staff,</td></tr>
<tr><td colspan="3">Hazard category
Human factors</td></tr>
<tr><td colspan="3">Hazard consequence
Aircraft does not accelerate or take off as expected.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
No immediate Effect</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Lighting direction to be downwards towards the ground, away from flight paths and control tower. (NG)

External surfaces of building to be designed not to present a distraction to aircrew. (NG)

Design to ensure RF levels are too low for significant interference. (NG)

Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots. (NG)

Ensure aircrew and airport ground operators are kept up-to-date with changes and likely effects. (RCAM)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
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<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ07</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear and so on). Note that the worst case at Daedalus is wind from north-east.

Tall trees – uncontrolled tree growth</td></tr>
<tr><td colspan="3">Hazard category
Environmental factors</td></tr>
<tr><td colspan="3">Hazard consequence
Terrain separation deteriorating below normal requirements.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
Significant</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Wind assessment to ensure minimal impact on wind from the building (including consideration of light aircraft and UAVs). (NG)

Airmanship provides mitigation.

Publicity and training. (RCAM)

Obstacle clearance surfaces to be protected. (NG)

Keep under review in case of increased traffic. (FBC)

Tree growth management strategy to be in place. (FBC)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ08	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Distraction of aircrew or control tower staff.		
Hazard category Human factors.		
Hazard consequence Terrain separation deteriorating below normal requirements		
This hazard probability Extremely improbable	Severity No immediate effect	
Cumulative hazard probability		
Proposed action / mitigation Lighting direction to be downwards towards the ground, away from flight paths and control tower. (NG) External surfaces of building to designed not to present a distraction to aircrew. (NG) Design to ensure RF levels are too low for significant interference. (NG) Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots. (NG) Ensure aircrew and airport ground operators are kept up-to-date with changes and likely effects. (RCAM)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

HAZ09 not used (no impact currently).

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ10</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Distraction of control tower staff.</td></tr>
<tr><td colspan="3">Hazard category
Human factors.</td></tr>
<tr><td colspan="3">Hazard consequence
Incorrect presence of aircraft, people or vehicles in the protected area.</td></tr>
<tr><td colspan="2">This hazard probability
Extremely improbable</td><td>Severity
No immediate effect.</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Lighting direction to be downwards towards the ground, away from flight paths and control tower. (NG)

External surfaces of building to be designed not to present a distraction to aircrew . (NG)

Design to ensure RF levels are too low for significant interference. (NG)

Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots. (NG)

Ensure aircrew and airport ground operators are kept up-to-date with changes and likely effects. (RCAM)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ11	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Impaired ground to ground communications.		
Hazard category Technical factors		
Hazard consequence Delay to emergency services response		
This hazard probability	Severity No immediate effect	
Cumulative hazard probability		
Proposed action / mitigation Design to ensure UHF RF levels are too low for significant interference. (NG)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

Project or system IFA 2		Hazard log ID
Hazard ID HAZ12	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Impaired ground to ground communications.		
Hazard category Technical factors		
Hazard consequence Incorrect presence of people or vehicles in the protected area		
This hazard probability	Severity No immediate effect	
Cumulative hazard probability		
Proposed action / mitigation Design to ensure UHF RF levels are too low for significant interference. (NG)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ13</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Distraction of aircrew or control tower staff (class G airspace operations)</td></tr>
<tr><td colspan="3">Hazard category
Human factors</td></tr>
<tr><td colspan="3">Hazard consequence
Aircraft in close proximity with another aircraft such that their safety is or may be compromised.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
No immediate effect</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Lighting direction to be downwards towards the ground, away from flight paths and control tower. (NG)

External surfaces of building to designed not to present a distraction to aircrew (NG)

Design to ensure RF levels are too low for significant interference. (NG)

Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots. (NG)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ14	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Distraction of aircrew caused by reflection from building structure and cladding (procedural non-radar operations)		
Hazard category Human factors		
Hazard consequence CAT aircraft in close proximity with another aircraft such that their safety is or may be compromised.		
This hazard probability	Severity Significant.	
Cumulative hazard probability		
Proposed action / mitigation External surfaces of building to be designed not to present a distraction to aircrew. (NG)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ15</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Distraction of aircrew or control tower staff, other than by distraction of aircrew caused by reflection from building structure and cladding (procedural non-radar operations)</td></tr>
<tr><td colspan="3">Hazard category
Human factors</td></tr>
<tr><td colspan="3">Hazard consequence
CAT aircraft in close proximity with another aircraft such that their safety is or may be compromised.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
No immediate effect</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Lighting direction to be downwards towards the ground, away from flight paths and control tower. (NG)

Design to ensure RF levels are too low for significant interference. (NG)

Noise levels to be managed to ensure they are not distracting to pilots, particularly glider pilots. (NG)

Ensure aircrew and airport ground operators are kept up-to-date with changes and likely effects. (RCAM)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ17	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Terrorist attack on IFA2		
Hazard category Terrorist incident		
Hazard consequence. Aircraft unintentionally deviates from normal in-flight parameters.		
This hazard probability	Severity Significant	
Cumulative hazard probability		
Proposed action / mitigation Assessment of terrorist threat and security measures. (NG/FBC)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

Project or system IFA 2		Hazard log ID
Hazard ID HAZ18	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Exposure of public and workers to magnetic fields		
Hazard category SHE		
Hazard consequence Health hazard		
This hazard probability	Severity	
Cumulative hazard probability		
Proposed action / mitigation AC and DC Fields will comply with requirements and this will be demonstrated in project documentation. (NG)		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

Project or system IFA 2		Hazard log ID
Hazard ID HAZ19	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Magnetic fields lead to incorrect calibration of magnetic compass		
Hazard category Technical factors		
Hazard consequence Terrain separation deteriorating below normal requirements		
This hazard probability	Severity Significant	
Cumulative hazard probability		
Proposed action / mitigation Identify areas where magnetic fields could lead to incorrect calibration of magnetic compass, and promulgate instruction not to calibrate in those areas. (NG/RCAM) General airmanship provides a mitigation, because incorrect calibration should be quickly identified by reference to visual landmarks.		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ20</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Touch potential from HV cable layout. Fences (planned or existing) and risk of high 50 Hz induced touch potentials.</td></tr>
<tr><td colspan="3">Hazard category
SHE</td></tr>
<tr><td colspan="3">Hazard consequence
Electric shock / electrocution from induced touch potential</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation

This risk of touch potential / short circuit to be eliminated by design specifications. (NG)</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
Open</td><td>Date closed</td></tr>
<tr><td colspan="3">Continuation sheet (Y/N) N</td></tr>
</table>

Project or system IFA 2		Hazard log ID
Hazard ID HAZ21	Identified by FHA meeting	Date created 24 Aug 2016
Last update action Created		Date of last update 24 Aug 2016
Hazard description Emissions / RFI from KV cables / facility cause malfunctioning of UAV.		
Hazard category Technical factors		
Hazard consequence Aircraft in close proximity with another aircraft such that their safety is or may be compromised.		
This hazard probability	Severity Significant	
Cumulative hazard probability		
Proposed action / mitigation Review RFI impact on UAVs. (NG) Note that the risk is dependent on the location UAVs are permitted to fly in.		
Proposed by FHA meeting	Actionee – see above	Planned date
Mitigation / action taken		
Date of action	Action status	
State of this hazard log entry Open		Date closed
Continuation sheet (Y/N) N		

<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ22</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
Created</td><td>Date of last update
24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
Equipment within the converter station catches fire and generates smoke impeding vision of air crew</td></tr>
<tr><td colspan="3">Hazard category
Fire and smoke</td></tr>
<tr><td colspan="3">Hazard consequence
Terrain separation deteriorating below normal requirements.</td></tr>
<tr><td colspan="2">This hazard probability</td><td>Severity
Significant</td></tr>
<tr><td colspan="3">Cumulative hazard probability</td></tr>
<tr><td colspan="3">Proposed action / mitigation
Design specifications to require fire protection systems and few combustibles, such that fire is a controllable situation. (NG)

Powered aircraft can divert from smoke, gliders would need to avoid or land.

Risk is unlikely to be significantly worse than any other building near the Airport.</td></tr>
<tr><td>Proposed by
FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
<tr><td colspan="3">Mitigation / action taken</td></tr>
<tr><td colspan="2">Date of action</td><td>Action status</td></tr>
<tr><td colspan="2">State of this hazard log entry
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<table>
<tr><td colspan="2">Project or system
IFA 2</td><td>Hazard log ID</td></tr>
<tr><td>Hazard ID
HAZ23</td><td>Identified by
FHA meeting</td><td>Date created
24 Aug 2016</td></tr>
<tr><td colspan="2">Last update action
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24 Aug 2016</td></tr>
<tr><td colspan="3">Hazard description
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<tr><td colspan="3">Hazard category
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<tr><td colspan="3">Hazard consequence
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<tr><td colspan="2">This hazard probability</td><td>Severity
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FHA meeting</td><td>Actionee – see above</td><td>Planned date</td></tr>
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</table>

5 HAZARD RECORD SHEETS

The hazard record sheets which record the agreed output from the FHA workshop is in Table 2 below.

Note these are the record sheets recorded at the FHA on the 24th August 2016 with all comments incorporated.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
Human Factors CAA Sequence 8.1								
CF1	HIRA 24-8-16	24/08/2016	Distraction of aircrew caused by lighting from the facility - building and security lighting	Human Factors	Temporary reduction in vision caused by glare.			Lighting direction is face down towards the ground. This should be Input to the design specifications.
CF2	HIRA 24-8-16	24/08/2016	Distraction of aircrew caused by reflection from building structure and cladding	Human Factors	Temporary reduction in vision caused by glare.			Building surfaces to be designed not to present a distraction to aircrew. This should be Input to the design specifications.
CF3	HIRA 24-8-16	24/08/2016	Human (public and workers) exposure to magnetic fields (see 8.2 for impact on equipment)	Human Factors	Health hazard.			AC and DC Fields will comply with requirements and this will be demonstrated in project documentation.
CF4	HIRA 24-8-16	24/08/2016	Communication interference, impacting the workload of the staff in control tower or aircrew (e.g. dealing with instrumentation and radio problems)	Human Factors	Interference impacts radio or causes damage to communication or navigation equipment. Increased workload dealing with this causes distraction, which contributes to an accident.			LSA RFI assessment showed that emissions are below the levels at which interference will occur and the probability of interference to radios is very low for current airport operations. There is no credible risk of equipment damage. Risk of interference for equipment introduced for future operations to be considered further. Include in future design specification.
CF5	HIRA 24-8-16	24/08/2016	Noise from IFA2 facility causes a distraction.	Human Factors	Distraction to aircrew due to noise from facility contributes to an accident.			Noise levels low. Unlikely to be heard by aircraft, possibly could be heard by glider pilots. Noise levels unlikely to be higher than the background noise. To be considered as part of the design specifications.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF6			Pilots under training who are not accustomed to any impacts from converter station - e.g. as they have undergone training before the converter station is operational.	Human factors	Contributes to an accident.			For Pilots under training, the onus is on instructor. It will takes 4 years to build the facility, with plenty of publication, so trainees have time to adjust. Communications required on switching on of the facility.
Technical Factors CAA Sequence 8.2								
CF7	HIRA 24-8-16	24/08/2016	Magnetic compass / magnetometer deviation caused by magnetic fields from HV cables.	Technical factors	Wrong compass reading and heading indication contributes to an accident.			LSA RFI assessment demonstrated only a potentially localised impact on magnetic fields for compass and magnetometers on the ground in certain locations, if after post installation tests show that this is an impact. Provided the compass is calibrated correctly, reading will revert back to correct reading once outside the zone. Proposed that the local impact is managed by communicating the areas where compass calibration should not be carried out.
CF8	HIRA 24-8-16	24/08/2016	Air-ground communications impacted by interference caused by emissions from HV cables / facility.	Technical factors	Delayed air-ground communication contributes to an accident.			LSA RFI assessment concludes low probability of interference for current operations. Risk of interference for equipment introduced for future operations to be considered further. Include in future design specification.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF9	HIRA 24-8-16	24/08/2016	Ground- ground communications (UHF) impacted by interference caused by emissions from HV cables / facility.	Technical factors	Delayed ground -ground communication contributes to an accident.			LSA RFI assessment concludes low probability of interference for current operations. Risk of interference for equipment introduced for future operations to be considered further. Include in future design specification.
CF10	HIRA 24-8-16	24/08/2016	Interference caused by emissions from HV cables / facility delays Emergency Services communication (Note airport fire service response relies on ground - ground communications), backed up by general Fire Service (999))	Technical factors	Delay in response from Emergency Services contributes to escalation of an incident.			LSA RFI assessment concludes low probability of interference for current operations. Risk of interference for equipment introduced for future operations to be considered further. Include in future design specification.
CF11	HIRA 24-8-16	24/08/2016	Altimeters (UHF) impacted by emissions from HV cables / facility	Technical factors	Wrong or no altimeter reading contributes to an accident.			For current operations, control is visual when landing. Review for future operations.
CF12	HIRA 24-8-16	24/08/2016	Instrumented Landing Systems (ILS) impacted by emissions from HV cables / facility	Technical factors	Malfunction of ILS on precision approach, contributing to an accident.			No ILS currently. May need to be considered for future developments.
CF13	HIRA 24-8-16	24/08/2016	GPS impacted by emissions from HV cables / facility (note current aircraft have their own GPS).	Technical factors	Wrong or no GPS location contributes to an accident.			Pilots do not depend on GPS for navigation, aircraft have their own GPS as an aid.
CF14	HIRA 24-8-16	24/08/2016	Impact from RFI / emissions on power supply system in aircraft.	Technical factors	Damage to / loss of power supply in aircraft, contributing to an accident.			LSA RFI report concluded that there is negligible impact.
CF15	HIRA 24-8-16	24/08/2016	Interference with Maritime Coastguard Agency communications caused by RFI /emissions from / HV cables / facility. The station, mast and tower are on the Airport.	Technical factors	Delayed response from Coastguard agency contributes to escalation of a maritime incident.			LSA RFI report concluded that the probability of interference is low.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF16	HIRA 24-8-16	24/08/2016	Emissions from HV cables and facilities impacts Britten Norman activities involving complex avionics and military aircraft.	Technical factors	Potential impacts being evaluated.			National Grid is completing detailed study is being completed to evaluate the potential impact on Britten Norman activities.
CF17	HIRA 24-8-16	24/08/2016	Impact on Radar due to emissions from HV cables / facility	Technical factors	Temporary loss of radar, contributing to an accident.			No impact, no radar at Daedalus. The service is provided from Solent. Consider further for future plans for the Airport. However, LSA RFI assessment concludes that it is unlikely that the facility would cause RFI to future radar.
CF18	HIRA 24-8-16	24/08/2016	Ionising radiation from HV cables.	Technical factors	Impact on equipment, contributing to an accident Health hazard to public or workers.			No Ionising radiation from AC or DC equipment. No impact, no radar at Daedalus. The service is provided from Solent. Consider further for future plans for the Airport. However, LSA RFI assessment concludes that it is unlikely that the facility would cause RFI to future radar.
CF19	HIRA 24-8-16	24/08/2016	Touch potential from HV cable layout. Fences (planned or existing) and risk of high 50 Hz induced touch potentials.	Technical factors	Electric shock / electrocution from induced touch potential.			This will be managed as part of the design specifications for the HV cables.
CF20	HIRA 24-8-16	24/08/2016	Emissions / RFI from KV cables / facility cause malfunctioning of unmanned aerial vehicle (UAV) (e.g. drones).	Technical factors	Malfunction of UAV and loss of control contributing to an accident.			RFI impact on UAVs requires further consideration. Note the risk is dependent on the location they are permitted to fly in.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF21	HIRA 24-8-16	24/08/2016	Heat generated from converter station - air density changes immediately above the facility impacts aircraft or gliders.	Technical factors	Loss of control of aircraft / glider contributing to an accident.			Any change in temperature will be slight change (a few degrees) and is very localised. Aircraft / gliders do not take off in the vicinity of the converter station. No material impact. Potential for this to be notified to glider pilots so they are aware of possible slight effects.
CF22			Compass mis-calibrated due to calibration taking place in zone impacted by magnetic fields (see contributory factor 6)	Technical factors	Wrong compass reading and heading indication contributes to an accident.			Compass checks are done separately from the calibration. Communication on any specific areas where calibration should not be carried out. DC cables are a distance away from the taxiway - note AC cables don't emit magnetic fields. Any compass deviation will revert back following localised impact.
CF23			Equipment within the converter station catches fire and generates smoke impeding vision of air crew	Fire and smoke	Aircrew vision impeded contributes to accident.			Design specifications require few combustibles, fire protection systems, such that fire is a controllable situation. Powered aircraft can divert from smoke, gliders would need to avoid or land.
Environmental Factors CAA Sequence 8.3								

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF24	HIRA 24-8-16	24/08/2016	Wind impact, caused by building (turbulence and unexpected changes in wind patterns, wind shear etc.) - noted that worst case at Daedalus is wind from NE. Noted that changes in wind could cause distraction initially for glider pilots in particular, i.e. until they become familiar with the changed wind patterns.	Environmental Factors	Loss of control of aircraft / glider.			Wind assessment concludes minimal impact on wind from the building. Airmanship and reports to airport management to be included in NOTAMs if affect material. Publicity and training. Obstacle clearance surfaces to be protected.. This needs to be considered for increased traffic in future.
CF25	HIRA 24-8-16	24/08/2016	Emissions from HV cables / facility impact meteorological instruments.	Environmental Factors	Undetected adverse meteorological conditions.			Controlled by visual reference. No Instrumented Meteorological Conditions (IMC) or immediate plans for IMC. Possibility that this could be introduced in the future, if so will require consideration.
CF26	HIRA 24-8-16	24/08/2016	Night flying - impact of high-voltage cables on ground lighting.	Environmental Factors	Malfunction of lighting impacts aircraft landing at night.			Currently use Solar lights (no impact) ground lighting / AGL to be considered in the future. Manage through design specification / selection of lighting systems in future.
CF27	HIRA 24-8-16	24/08/2016	Insulation failure of HV cables - impacts other system (e.g. AGL)	Environmental Factors	Damage / malfunction of equipment.			Protected by cable protection system - including auto trip To be managed by design specifications.
CF28	HIRA 24-8-16	24/08/2016	Future construction works (once converter station in operation) - digging in vicinity of HV cables.	Environmental Factors	Electrocution / electric shock to future construction workers.			Cable location records To be managed for future construction activities (after facility in operation).

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
CF29	HIRA 24-8-16	24/08/2016	Future planning of landscaping - attracts birds near to airport	Environmental Factors	Bird strike.			Consideration to be given to future landscaping and the choice of trees.
CF30	HIRA 24-8-16	24/08/2016	Heat from converter station - warms air immediately above the converter station and attracts birds.	Environmental Factors	Bird strike.			Building to provide easy access to roof to enable a bird management strategy to be implemented.
CF31	HIRA 24-8-16	24/08/2016	Building design -flat roof - attracts birds	Environmental Factors	Bird strike.			Building to provide easy access to roof to enable a bird management strategy to be implemented.
CF32	Safeguarding assessment	24/08/2016	Tall trees	Environmental Factors	Tree growth impacts the obstacle limitation surface.			Highly unlikely that trees would grow to this height but a tree management strategy will need to be in place.
Aircraft Upset (Human Performance) CAA Sequence 1.1								
HAZ1			Distraction of aircrew (see contributory factors 1 to 6 above).	Human factors	Contributes to aircraft unintentionally deviates from normal in-flight parameters.		No immediate Effect	see contributory factors 1 to 6 above.
Aircraft Upset (Environmental Conditions) CAA Sequence 1.2								
HAZ2			Wind impact (e.g. Turbulence) - (see contributory factor 24 above)	Environmental factors	Contributes to aircraft unintentionally deviates from normal in-flight parameters.		Significant	see contributory factor 24 above.
HAZ3			Bird strike (see contributory factors 29 to 31) above	Environmental factors	Contributes to aircraft unintentionally deviates from normal in-flight parameters.		Significant	see contributory factors 29 to 31 above.
Inability to Stop Within Distance CAA Sequence 2.1								
HAZ4			Wind impact (e.g. Turbulence) - (see contributory factor 24 above)	Environmental factors	Contributes to Inability to make a stop within the expected distance requirements.		Significant	see contributory factor 24 above. Note that the wind assessment has considered existing aircraft but lighter aircraft (and UAV) may need to be considered.
Loss of Directional Control (Take-off and Landing) CAA Sequence 2.2								

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
HAZ5			Wind impact on arrival (e.g. Turbulence) - (see contributory factor 24 above) Tall trees (see contributory factor 32 above)	Environmental factors	Contributes to Loss of directional control on the runway.		Significant	see contributory factor 24 and 32 above.
Acceleration or Take-off Differs from Expected CAA Sequence 2.3								
HAZ6			Distraction of aircrew or control tower staff (see contributory factors 1 to 6 above).	Human factors	Contributes to Aircraft does not accelerate or take off as expected.		No immediate Effect	see contributory factors 1 to 6 above.
Terrain Separation Deteriorating (Arrival or Departure—General) CAA Sequence 3.1								
HAZ7			Wind impact on arrival (e.g. Turbulence) - (see contributory factor 24 above)	Environmental factors	Terrain separation deteriorating below normal requirements.		Significant	see contributory factor 24 above.
Terrain Separation Deteriorating (Non-Precision Approach) CAA Sequence 3.2								
HAZ8			Distraction of aircrew or control tower staff (see contributory factors 1 to 6 above).	Human factors	Terrain separation deteriorating below normal requirements.	Extremely improbable	No immediate Effect	see contributory factors 1 to 6 above.
HAZ9			Malfunction of ILS due to RFI (see contributory factor 12 above)	Technical factors	Terrain separation deteriorating below normal requirements.			No impact currently. May need to be considered for future (see contributory factor 12 above).
Incorrect Presence (Aircraft Ground Operations) CAA Sequence 4.1								
HAZ10			Distraction of control tower staff (see contributory factors 1 to 6 above).	Human factors	Contributes to incorrect presence of aircraft in the protected area. Also incorrect presence of people or vehicles in the protected area.	Extremely improbable	No immediate Effect	see contributory factors 1 to 6 above.
HAZ11			RFI to ground to ground communications, delay to emergency services response (see contributory factor 9 above).	Technical factors	Contributes to incorrect presence of aircraft in the protected area. Also incorrect presence of people or vehicles in the protected area.			see contributory factor 9 above.

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
HAZ12			RFI to ground to ground communications, interruption to communications with ground operations. (see contributory factor 8 above).	Technical factors	Contributes to incorrect presence of aircraft in the protected area. Also incorrect presence of people or vehicles in the protected area.			see contributory factor 9 above. Further consideration needed as if there is a delay to communications on the ground (e.g. blackspots) - ground operations may cross anyway. Note however that interruption to communication is not necessarily related to the converter station, effects such as lightning can interrupt communications.
Incorrect Presence (Vehicles and People) CAA Sequence 4.2								
			As 4.1					
Close Proximity (Class G Airspace) CAA Sequence 5.2								
HAZ13			Distraction of aircrew or control tower staff (see contributory factors 1 to 6 above).	Human factors	CAT aircraft in close proximity with another aircraft such that their safety is or may be compromised.		No immediate Effect	see contributory factors 1 to 6 above.
Close Proximity (Procedural—non-radar) CAA Sequence 5.3								
HAZ14			Distraction of aircrew caused by reflection from building structure and cladding (see contributory factor 2 above)	Human factors	CAT aircraft in close proximity with another aircraft such that their safety is or may be compromised.		Significant	see contributory factor 2 above.
HAZ15			Distraction of aircrew or control tower staff (see contributory factors 1 to 6 above).	Human factors	CAT aircraft in close proximity with another aircraft such that their safety is or may be compromised.		No immediate Effect	see contributory factors 1 to 6 above.
Outside Mass and Balance Envelope (Landing Operations) CAA Sequence 6.1								
HAZ16			Distraction of aircrew or control tower staff (see contributory factors 1 to 6 above).	Human factors	Runway overrun and collision with structure object or terrain.		No immediate Effect	see contributory factors 1 to 6 above.
Aircraft Ground Damage CAA Sequence 6.2								
			As 6.1					

Hazard ID:	Identified By:	Date Created:	Hazard Description:	Hazard Category:	Hazard Consequence:	Hazard Probability	Severity	Proposed Action/Mitigation:
Others								
HAZ17			Risk of terrorist attack at facility	Terrorist incident	Terrorist incident			All National Grid infrastructure is risk assessed. This will be a low risk, it is not critical infrastructure or a priority target.
HAZ18			Exposure of public and workers to magnetic fields	Technical factors	Health hazard.			See contributory factor 3 above. AC and DC Fields will comply with requirements and this will be demonstrated in project documentation.
HAZ19			Magnetic fields lead to incorrect calibration of magnetic compass	Technical factors	Terrain separation deteriorating below normal requirements.		No immediate Effect	See contributory factor 7 above. Identify areas where magnetic fields could lead to incorrect calibration of magnetic compass, and promulgate instruction not to calibrate in those areas.
HAZ20			Touch potential from HV cable layout. Fences (planned or existing) and risk of high 50 Hz induced touch potentials.	Technical factors	Electric shock / electrocution from induced touch potential.			See contributory factor 19 above. This risk to be eliminated by design specifications.
HAZ21			Emissions / RFI from KV cables / facility cause malfunctioning of UAV.	Technical factors	Aircraft in close proximity with another aircraft such that their safety is or may be compromised.			See contributory factor 20 above. Review RFI impact on UAVs. Risk cannot be ranked without further consideration. Note that the risk is dependent on the location UAVs are permitted to fly in.
HAZ22			Equipment within the converter station catches fire and generates smoke impeding vision of air crew	Fire and smoke	Terrain separation deteriorating below normal requirements.			See contributory factor 23 above. Design specifications to require fire protection systems and few combustibles, such that fire is a controllable situation.

Table 2 – Hazard Record Sheets

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