

Appraisal Framework Module 15. Operational Risk: Ground Infrastructure Gatwick Airport Second Runway



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Executive Summary

Gatwick Airport operates today within risk parameters that are not excessive or unusual for an airport of its type. It appears to have adequate provision of utility infrastructure and procedures to be able to respond to extreme weather conditions that can affect the capacity and safety of airport operations. The airport, like other busy airports in the UK is sufficiently resilient to events that affect it alone and which have wider implications for the airport and airspace system.

The Gatwick Airport Second Runway scheme appears unlikely to change the likelihood or severity of the key risks that could impact the operations of the airport. Although expansion of the airport would increase the numbers of passengers and staff that would be affected by any incidents impacting operations, the proposed second runway and additional terminal capacity would also enhance the airport's ability to provide resilience (and recovery) in the event of some risks.

It should be noted that any expansion of a major airport is likely to put additional pressure on airspace in the event of a major disruption that delays or diverts landings. This is the inevitable consequence of intensification of airspace utilisation in a certain area, although technology improvements and continued refinement of operational procedures can mitigate this over time.

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1 Introduction and Methodology

1.1 Purpose and Structure

This document presents a strategic level assessment of operational risks at Gatwick Airport, the impacts of the Gatwick Airport Second Runway scheme (hereafter “the scheme”) on these risks and the capability of the airport to prevent, absorb, adapt to, and recover from disruptive events.

The analysis was undertaken against the Operational Risk module of the Airports Commission’s Appraisal Framework (April 2014).

1.2 Module 15: Operational Risk

The Operational Risk module is an assessment of the inherent risk to airport operations resulting from a number of identified disruptive events. The key measure is the extent to which the proposed scheme improves or worsens the airport’s ability to prevent, absorb, adapt to, and recover from such events, and the additional mitigation measures needed. Beyond airport operations, the Operational Risk assessment looks at how the proposal and accompanying mitigations may affect the impact of disruptive events on surrounding areas and industries.

The key disruptive events that are considered are:

- *flooding;*
- *birdstrike risk;*
- *power outages;*
- *reduced fuel supplies;*
- *terrorism attacks;*
- *extreme weather events (including volcanic ash); and*
- *adaptability to climate change.*

This report does not directly consider risks relating to adaptability to climate change, which primarily relate to flooding (as discussed in Section 2.2), and reference should be made to the Jacobs report covering climate change.

The assessment also considers the full range of risks listed in the National Risk Register¹ and examines those that could have a specific impact on the airport beyond the general disruption they may cause at a national or regional level.

1.3 Methodology

Each of the risks identified in the Operational Risk module were considered at a strategic level according to:

- *the type of impact on airport operations;*
- *the ability of the airport to mitigate or reduce the probability of the risk; and*
- *the scope of any measures that could reduce or mitigate the risk including measures proposed by the promoter.*

¹ National Risk Register of Civil Emergencies, 2013, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211867/NationalRiskRegister2013_amended.pdf

1.3.1 National Risk Register

The National Risk Register, 2013, has been reviewed and the highest level risks have been screened to identify:

- *relevance to airport operations; and*
- *the ability of the airport to mitigate or reduce the probability of the risk.*

The identified risks that are relevant to airport operations, and for which an airport specific response would be expected, were subject to the same assessment as the risks identified in Section 1.2.

Table 1-1 lists the key top level risks from the National Risk Register that have been reviewed for their relevance. It identifies whether the risk has specific airport impacts and whether it would be expected for the airport to have addressed the risk and made due provision. These risks are considered further in Section 2.

Additional Risks	Relevance to Airport	Airport Specific Response Required
Pandemic influenza	Yes	Yes
Coastal flooding	No	No
Catastrophic terrorist attacks	Yes	Yes
Severe effusive (gas-rich) volcanic eruptions abroad	Yes	No
Severe wildfires	Yes	No
Major transport accidents	Yes	Yes
Major industrial accidents	Yes	Yes
Other infectious diseases	Yes	Yes
Inland flooding	Yes	Yes
Animal diseases	Yes	Yes
Drought	Yes	Yes
Public disorder	Yes	Yes
Severe space weather	Yes	No
Low temperatures and snow	Yes	Yes
Heatwaves	Yes	Yes
Storms and gales	Yes	Yes
Disruptive industrial action	Yes	Yes

Table 1-1 National Risk Register Assessment

2 Risk Assessment

2.1 Introduction

Airports, like any major infrastructure facility, are at risk from major events that disrupt their ability to operate. These may be categorised into four groups:

- *criminal or human-led disruption (e.g. terrorism, civil disorder, industrial dispute);*
- *accidents (transport and industrial);*
- *interrupted utility supplies (including fuel); and*
- *extreme weather, including the effects of weather such as flooding.*

By their nature, airports concentrate people and activities that are inherently risky, and it is not feasible to eliminate all such risks. However, it is possible to take steps to reduce exposure, to mitigate impacts of exposure, and to facilitate response and recovery to minimise disruption and avoid harm to people and property. Airports have long been recognised as critical sites that are at risk from terrorism, and take extensive security measures to prevent this. However, airports share with other major transport and other facilities, such as ports, hospitals and universities the risk of interruptions to key utilities or human-led disruption due to industrial disputes or any wider disorder. These are not airport specific issues.

In general terms, a larger airport with more flights and more passengers and cargo will mean that disruptive events are likely to affect a greater number of people than had the airport not been expanded. However, expansion of an airport may not increase the probability of most of these events, and indeed the additional capacity may enable the airport to accommodate aircraft, passengers and baggage that may be delayed or redirected due to a specific unplanned event.

Beyond the impact at the airport, the airport's additional capacity and forecast growth results in a greater number of aircraft (and passengers and their bags) in the system, but without additional capacity elsewhere in the system. Consequently, should the expanded airport be unavailable, the system may have to accommodate a greater displaced demand within current capacity constraints. This will require careful management to ensure that events that require delays or redirection of incoming flights can be handled safely and as efficiently as possible.

The following sections discuss each of the risks set out in Section 1.

2.2 Flooding

This section summarises the assessments discussed at greater length within the separate Water and Flood Risk report to which reference should be made.

Gatwick Airport is located within the River Mole Catchment in the Thames River Basin District. Environment Agency Fluvial Flood Zone mapping shows significant areas of the current airport and the area of the proposed development lie within Flood Zones 2 and 3 and are at risk from river flooding. Areas downstream and upstream of Gatwick are also seen to be at risk of flooding, and hence further development at Gatwick has the potential to influence flood risk upstream and downstream.

A number of significant historic flood events are recorded in the Gatwick Airport area, namely; the 14th-15th September 1968 event during which the airport was closed for several days due to flooding of the runway; the flood event of 2000 when the A23 under Gatwick Airport's South Terminal was closed for three days; and more recently the 23rd-25th December 2013 event which flooded the North Terminal and caused significant disruption at the airport. The Crawter's Brook and River Mole caused flooding of an airfield substation (but not the airfield itself) during the December 2013 event. The McMillan Report (February 2014), which reviewed the disruption at Gatwick Airport reports that the North Terminal switch room was affected by surface water flooding.

Flooding from the River Mole and the Gatwick Stream are known problems in the area. In order to mitigate this flood risk, two flood risk alleviation schemes are being implemented. The Flood Map for Surface Water prepared by the Environment Agency shows significant areas of Gatwick Airport at Medium risk (1 in 100 to 1 in 30 risk) and isolated areas at High risk.

The proposed second runway is likely to present major changes to the water management environment which, without effective long term mitigation, could cause a significant increase in flood risk elsewhere.

A flood mitigation strategy should be developed to manage these risks including an adequately sized diversion channel for the two watercourses with appropriate compensatory storage and an adequately sized surface water drainage network as part of a comprehensive sustainable drainage strategy. Furthermore, the proposed drainage arrangement may require additional pump capacity and measures to address residual risks caused by pump failure or airfield runoff rates that exceed the capacity of the pumps.

The detailed design phase should give due consideration to the risks of flooding at the airport and to the flood risks in adjacent areas, including consideration of the reservoir flood risk and other issues identified in the Module 9. Water and Flood Risk: Flood Risk Assessment report.

2.3 Birdstrike Risk

Birdstrike presents a risk to airline operations primarily from ingestion of birds into turbofan engines, which could at worst result in engine shutdown. Although modern aircraft are designed to fly with one engine non-operational, it is during take-offs and landings, when operations are at their most critical, that birdstrike presents the greatest risk. Airlines and airports both manage the risk of birdstrikes by following procedures contained in ICAO and CAA guidance.

Gatwick's location is in the midst of agricultural land and small woodlands, interspersed with small villages. It is located on the floodplain of the River Mole which skirts the airport to the north, with a small number of balancing ponds that may attract ducks and geese.

Although Gatwick is required to have a birdstrike risk management plan, which is periodically audited by CAA, risks from outside the airport property can be difficult for the airport to manage or influence. Adjacent landowners are not obliged to allow access to disperse birds, or manage their properties to deter birds. It is key to any airport development that it does not introduce features to attract more birds that pose a risk of birdstrike or change the behaviour of existing birds so as to increase the risk (e.g. by increasing the likelihood of flying across active airspace).

The proposed new runway is on a similar alignment with the existing runway and will share a similar habitat to the existing. As such, it is expected that the risk will remain similar, although care will need to be taken to ensure environmental mitigation measures also take into account this risk. Proposals for environmental mitigation appear to do this, such as by environmental offsetting and netting lengths of river near runway thresholds.

In conclusion, the birdstrike risk is unlikely to be changed by the construction of the proposed second runway.

2.4 Utility Outages

2.4.1 Electricity

Electricity is a critical utility for the airport. Outages could cause disruption to passenger, baggage and aircraft handling functions and could require closure of areas of affected terminals or potentially the entire airport. Even a brief interruption to electricity supplies could have a long-lasting impact as systems can take time to recover.

Beyond the management of supply and grid services, which lie outside the airport's control, the responsibility for managing electricity supply risk lies with the airport and businesses operating from the airport. While some services can be temporarily supported with generator or battery backups, the key weakness is the main transmission line connections to the airport.

The airport is served by two sets of triplicate 33kV supplies, which are transformed down to 11kV and distributed to over 70 substations around the airport where the voltage is further transformed to 415V.

It is acknowledged that there are some limitations of the existing power supply infrastructure whereby the failure of one High Voltage (HV) feed could result in the loss of availability of some equipment while loads are switched over to another feed. It is proposed that with the Gatwick Airport Second Runway scheme that the expanded airport be supplied by an entirely new 33kV feed which, together with a new mesh HV network would provide a more resilient load sharing capability across the whole airport.

Essential terminal and airfield services are fed by two low voltage feeds which switch over automatically in the event of failure in supply of one of the feeds, with back-up diesel generation in the event of failure of both feeds. Certain functions are also served by Uninterruptable Power Supplies. It is proposed to develop a new energy centre to eliminate reliance upon third-party call-off contracts to supply back-up power.

A key vulnerability of the airport arises from flooding causing damage to power supply equipment, as occurred at Gatwick in December 2013. As a result of that event, the airport is implementing the recommendations of the McMillan report concerning the relocation of essential power supply and IT equipment away from areas susceptible to flooding.

While the expansion of Gatwick would increase the number of passengers and aircraft affected by any power outage, the scheme proposals to enhance the resilience and capacity of the electrical grid network would appear to improve the capability of the airport to withstand and recover from interruptions to supply.

2.4.2 Gas

Gas is used at airports primarily for heating, hot water, and for kitchen facilities. Interruption of gas supply is likely to have a greater impact during periods of cold weather. However, it is unlikely to have a critical impact on primary airport operations, but rather create discomfort and inconvenience (i.e. with less effective heating and reduced catering available in terminals).

Gatwick Airport has a maximum reported demand of 21.7MW across 30 metered sites. There are separate gas pipe supplies to both terminals at present.

Demand is likely to increase with expansion, but this would be tempered by ongoing improvements in energy efficiency. There is no existing or proposed on-site resilience system at the airport for heating, but in the event of an interruption to gas supply, there would be sufficient capacity for the heating system to function for several hours.

The scheme proposal is to develop a biogas plant undertaking anaerobic digestion of waste from the airport waste processing centre and sludge from the wastewater treatment plant, which would assist in enabling the airport to respond to any interruption in grid supply, with a capacity of up to 6MW by 2030.

Electric immersion heaters are included in hot water systems to enable continuity of hot water supply in the event of an interruption of gas supplies.

2.4.3 Water

Disruption to water supplies primarily affects sanitation, and secondarily the supply of water to aircraft, kitchens and ancillary facilities. As a minimum, this may interrupt and delay some operations, such as refilling aircraft water tanks; at worst it may result in restrictions on toilet availability and require provision of temporary sanitation facilities. Depending on the reason for the disruption to supply, it may be possible to supply some water by tanker (for aircraft) and it is noted that a proportion of catering water needs could be met by providing water in bottled form.

Water resource demand is driven principally by passenger and staff numbers. While passenger numbers have increased in recent years, the airport's water consumption is reported to have decreased as a result of actions to eliminate leaks and introduce more water efficient appliances. The scheme strategy is to use rain water harvesting to supply non-potable water to the new terminal buildings, to offset its increasing demands for water in the future.

Gatwick is served by Sutton and East Surrey Water. The airport is ultimately dependent upon the water supply company managing the risks to supply, including the impacts of drought and other demands on water. However, it could work with businesses at the airport that would be seriously impacted by a disruption in water supply to develop appropriate mitigation strategies, including prioritisation of demand and provision for alternative supply.

Gatwick does not appear to be disproportionately exposed, compared to any other airport, to issues with the supply or contamination of water. It appears that the expansion of the airport may not increase the exposure of the airport to risk of water supply disruption. In addition, the usage of water at the airport is unlikely to grow in proportion to passenger numbers, as efficiency of water use continues to improve

incrementally and the airport may become self-sufficient to an extent through rainwater harvesting.

2.4.4 Waste Water

Interruption to waste water facilities (unrelated to water supply disruption) has a direct effect on sanitation and is likely to impact as a minimum on passenger comfort (as toilets may be closed to manage demand) and at a maximum would limit airport operations for public health reasons. Limited alternative provision can be made for terminal waste water, although aircraft waste water might be handled by tankers if necessary.

Gatwick's sewage and waste water is handled by two sewage treatment works (STW) operated by Thames Water. The airport's demand for water treatment is expected to increase in line with passenger demand, mitigated in part by initiatives to reduce water consumption.

Gatwick Airport Limited (GAL) is considering developing a waste water treatment plant to treat surface water contaminated with de-icing fluid. The alternative option is to retain the current approach of pre-treating run-off in a storage lagoon before sending to Crawley STW. The scheme contains no preference as to the appropriate approach.

While it is noted that the existing Thames Water STW provision could become constrained, Thames Water does not foresee difficulty in providing upgrades to its facilities within the required timescale.

There appears to be no reason to assume that waste water treatment would present an operational risk to Gatwick Airport, or that expansion of the airport would impact on the airport's (or Thames Water's) ability to manage waste water collection, treatment and disposal.

2.4.5 Telecommunications

Telecommunications services are supplied to the airport by fixed lines, mobile networks and satellite communications to a wide variety of users involved in airport operations and ancillary services. Interruption to such services may as a minimum result in some inconvenience or slow operation for some airport services, and at worst is likely to result in significant reductions in the capacity of the airport to process passengers and aircraft.

Unlike other utilities, telecommunications services are subject to competitive service delivery, in some cases involving parallel competing infrastructure. Redundancy of critical systems could therefore be achieved by having in place arrangements to use alternative suppliers' infrastructure as a back-up in the event of primary telecommunications system failure.

Beyond loss of electricity supply to a network (which telecommunications network operators mitigate by having their own backup systems for transmission), the key risk is around physical disruption to a cable or to transmission/reception equipment. Critical systems affected by such an outage, such as ATC and emergency services, have resilience built into their communications networks on a national rather than airport specific basis. Unlike other fixed infrastructure, telecommunications networks can be partially replicated using mobile technologies, which should be capable of supporting some of the services that would otherwise be disrupted by

network disruption. Expansion of the airport appears unlikely to adversely affect the risk of disruption to telecommunications services, particularly if the progressive expansion of competition in such infrastructure continues.

2.5 Reduced Fuel Supplies

Risks from disrupted fuel supplies may arise from either local disruption to pipeline connections, or from network or wider systemic shortages that have a regional or national impact on the ability to meet demand for oil based fuels. The ability to manage disruptions of supply at a national level is limited and not within the capacity of the airport to reasonably address. However, disrupted fuel supplies can have a significant effect on airport operations, primarily by limiting the options for airlines to refuel at the airport.

If distribution to the airport is disrupted due to a supply network constraint, onsite storage may provide a limited time to enable alternatives to be established. At Gatwick, onsite storage is understood to be around 2.5 times daily demand. Various operational measures can be taken to mitigate the impacts of disruption, such as requiring short-haul flights to be fuelled at their destinations, and utilising road tankers to provide temporary supply.

Provision of additional pipelines and onsite storage are the primary means to mitigate this risk. Existing demand is 6 million litres per day and existing pipelines have a reported capacity of 15-16 million litres, which is expected to be sufficient to meet demand through to 2040. It is proposed that three additional 10,000 litre storage tanks should be built by 2050 to supplement the existing five. There is further scope to expand the fuel storage site, which would further increase the airport's ability to mitigate the risk of disrupted fuel supplies.

2.6 Terrorism Attacks

Terrorism attacks present a danger of death, injury, property damage and disruption to passengers and staff, and are one of the key priorities for airport security and for national security and policing authorities managing wider terrorism threats to the UK. Construction works can present a potential security vulnerability which may be mitigated by introducing background security checks for construction workers, physical screening of personnel and vehicles, and relocating perimeter fencing so that works take place outside the restricted zone.

There are many and varied potential sources of terrorist threat towards aircraft and airport infrastructure, the primary air traffic control towers, and critical systems such as power and fuel. The scheme would provide an opportunity to enhance resilience and to incorporate global best practice and the latest standards in design for security.

Security vulnerabilities and mitigations are managed through the Airport Security Plan, which is developed and maintained in collaboration with stakeholders. The airport is required to comply with international and national regulations governing physical and procedural security measures.

While it is reasonable to assume that expansion at Gatwick could increase the attractiveness of the airport as a target of interest to terrorists, there are no aspects of the proposal that would indicate greater security vulnerabilities or prevent security risks from being adequately mitigated to a level required for compliance with regulations.

2.7 Extreme Weather

2.7.1 Volcanic Eruption

The primary impact of volcanic eruption on airports is the risk that volcanic ash can have on aircraft safety. Such ash has been a clear danger to aviation in the past, specifically with the 1982 incident involving a British Airways Boeing 747 that lost engine power from ash over Indonesia due to the eruption of Mt Galunggung. More recently, the eruption of volcanoes in Iceland (Mt Eyjafjallajokull and Mt Grimsvotn) caused severe disruption to flights across Europe, including the grounding of all flights at many UK airports, as aviation safety authorities sought to avoid the risk of catastrophe from large volumes of airborne ash.

A repeat of such an incident that would affect UK aviation cannot be managed directly by any airport, as it is primarily a matter of airspace management. However, the indirect impact of disruption may be to delay or cancel some or all flights, or require diversion of flights from some airports to others. Airports that may remain open may have to handle far more flights than usual, while those that are to close must manage stranded passengers and daily new arrivals of passengers by surface transport seeking to board flights that may or may not depart.

The key consequence from expanding the airport will be to increase the scale of the impact due to a greater number of flights and passengers that would be affected by such an eruption. It is expected that Gatwick Airport would work closely with the CAA, NATS and its ATC provider as part of a co-ordinated UK and European response to such an event.

2.7.2 Snow

The snowfall experienced in the winter of 2010 highlighted the vulnerability of the UK's airports to adverse weather and led to significant flight delays and cancellations.

Snow clearance and aircraft de-icing have a consequential impact on airline schedules, while reduced runway friction conditions can increase aircraft braking distances and therefore require greater aircraft separation. Gatwick's runway is currently capacity constrained during peak times and so the airport does not have peak spare capacity to cope with snow events without disruption. The addition of a second runway would increase the resilience of the airport during those times, until demand means that both runways reach capacity at peak times.

GAL has made recent investments in snow clearing equipment and the airport is considered to be well prepared for periods of heavy snowfall. The scheme includes plans to provide additional snow clearing resources in proportion to the second runway development.

2.7.3 Wind

Wind can affect airport operations by disrupting flights, interfering with ground operations, and blowing debris or objects that can cause injury or property damage around the airfield. Analysis of ten years of historical wind rose data for Gatwick has found very few instances of high wind speeds or cross-wind that would cause disruption to operations, though the storm conditions of December 2013, in which baggage carts were blown onto the airfield, highlighted the potential impact of such events when they do occur.

Gatwick Airport has introduced a scheme of graduated response to wind conditions to help mitigate such risks, by providing common procedures and responses across key stakeholders to prioritise the highest probability and severity risks for earliest response. It is expected this will be developed further with the proposed expansion of the airport.

2.7.4 Fog

The presence of fog in the vicinity of an airport can have a significant impact on operations as low visibility procedures must be implemented, requiring the separation between aircraft both approaching and taxiing on the ground to be increased. This reduces the capacity of the airport.

An airport's ability to continue operations during periods of fog depends on the standard of the instrument landing system (ILS) equipment, and the approach and surface movement ground radar. CAT IIIa ILS equipment can accommodate operations down to a runway visual Range (RVR) of 200m. CAT IIIb operations can accommodate an RVR of between 75m and 200m. Below 75m RVR, i.e., very dense fog, airports are likely to be forced to close.

Analysis of hourly fog events at Gatwick over the period 2004 - 2013 found that fog at or below the 200m threshold was recorded on 337 occasions (0.38% of total annual hours). Sixteen hours of fog were below the 75m visibility threshold over the ten year period. There was one instance of fog lasting more than ten hours over the ten year period. Between 40 and 50% of fog events lasted one hour or less.

Gatwick is exposed to radiation fog rather than coastal fog and therefore instances are more likely to occur in the early morning during winter months, with November and December accounting for the majority of instances.

The scale of impact of fog depends to a great degree on how busy the airport is at the time, its spare runway capacity and, to a slightly lesser extent, its spare taxiway capacity.

Gatwick's exposure to fog can be considered low, but during periods of reduced visibility requiring CAT IIIa/b operations, the airport's resilience would be improved beyond current levels with addition of a second runway, until such time as that runway itself reaches capacity.

2.7.5 Storms

Storms (excluding snow and strong winds) are disruptive to airport operations due to low visibility, and the combined impact of heavy rainfall and winds, and as such reduce operations limiting the capacity of the airport and in some cases force temporary closure. Excluding flooding (which is discussed in Section 2.2), the primary impact is temporary disruption of flights and ground activity due to torrential rain. The probability and impact of such events does not change with the expansion of the airport and given the prevailing weather conditions at this location, is unlikely to be on a scale or severity to require additional mitigation measures.

2.8 Pandemic Influenza and Other Infectious Diseases

Pandemic influenza and other infectious diseases could have widespread national and local impacts. The National Risk Register considers that there is a high probability of an influenza pandemic occurring, and though it is not possible to forecast its impact or timing, modelling suggests that in the UK up to one half of the population may experience symptoms and potentially hundreds of thousands of deaths would occur. Widespread social and economic disruption would result, with significant threats to the continuity of essential services.

Airports are large employers and the impact on staff absenteeism resulting from pandemic diseases could cause disruption to operations.

The airport could also be expected to play a role in maintaining the UK's border controls against pandemic flu and other infectious diseases, with government agencies potentially implementing stricter controls to monitor inbound and outbound passengers.

Airport expansion would be likely to increase the vulnerability of the airport operation to pandemics, both as a result of a larger number of people travelling through the airport potentially spreading communicable diseases, and since the unavailability of some staff in specialist roles (e.g., ATC, those requiring security clearance) could have an impact on a greater number of passengers and aircraft movements. As the capacity of the airport grows, its ability to accommodate passenger health screening or other border controls as required by the government in extremis would also increase. Consideration should be given to the preparation of detailed contingency plans and rehearsals for these and other similar scenarios.

2.9 Major Transport Accidents

Airports inherently have significant exposure to major transport accidents given their operations and rail and road connections being critical to their operations. Major transport accidents, as defined in the National Risk Register, are those that require a national response. Such accidents are extremely rare.

It is very unlikely that any rail or road accident that would directly affect Gatwick Airport would be within the definition of a major transport accident, as this would likely require a catastrophic multiple vehicle incident that would disable a critical part of a network. Nevertheless, there is a risk of less serious transport accidents interfering with the efficient operation of the airport.

The primary risk to the airport of a major surface transport network accident is to limit access to the airport for passengers, staff and cargo. A major accident on the Brighton Mainline railway, particularly north of Gatwick, would have a significant impact on passenger access to the airport, but would be expected to be mitigated to some extent by the utilisation of road transport (although highway capacity on the A23 north of the M25 is highly constrained). Similarly, whilst closure of the M23 would also have a high impact, traffic would be expected to be diverted via the A23. Primary responsibility for management of these risks lies with Network Rail and Train Operating Companies, and the Highways Agency and local Highway Authorities respectively. The surface access proposals for the airport do not change these risks, and given that longer term trends in technologies for vehicles and network management are for improved safety, it is possible that this risk will be lowered over time.

It is reasonable to expect the airport to have contingency plans in place if a serious traffic accident were to close one of the key access routes to the airfield or airport buildings, and the layout would appear to enable alternative routes to be available in such event.

2.10 Major Industrial Accidents

Industrial accidents can take many forms and their impact can range from being contained within a very local area to having more far-reaching effects. The National Risk Register cites examples such as a fire in a telephone exchange leading to a loss of telephone communication with emergency services, and the Buncefield Oil Storage Terminal fire which led to the local area being evacuated, long-term disruption to operations, and reduced fuel supply to Heathrow, which at the time received half its daily fuel supplies from Buncefield. Other industrial accident risks include contamination of food or water supplies, or the release of toxic or radioactive substances.

Within the framework of an all-hazards risk assessment, many of the consequences of industrial accidents are shared with other risks such as disruption to fuel, electricity and telephone supplies, for which mitigation plans are in place. In addition, the scheme increases onsite fuel storage over the longer term, which will increase the airport's resilience to disruptions in fuel supplies.

At this stage it would not appear that an expanded Gatwick airport would be at a significantly greater risk from major industrial accidents than present day, though a greater number of passengers could be affected.

2.11 Drought

The direct effects of drought are likely to be limited, due to the airport not being dependent on rain water for critical facilities. However, the indirect effect of drought is to affect water supplies for the airport, which are essential for sanitation, cleaning, catering, aircraft supply and other purposes. Expansion of the airport would not change the risk to the airport, but it would increase demand for water as additional flights, passengers and terminal capacity requires.

Water companies are required to have drought plans. Provision for additional resilience in the event of disruption of water supplies is described in sub-section 2.4.3.

2.12 Public Disorder

Public disorder can manifest itself in rioting, looting, vandalism, violence and arson. Such events are unpredictable and there are no known instances of public disorder that have caused disruption to operations at a UK airport.

However, there have been instances of trespass and unlawful protests that have caused disruption at UK airports. It is reasonable to assume that expansion of any UK airport will attract opposition from climate change and other environmental groups, and that this poses a risk to airport operations. The greatest risk would appear to be in the period prior to and during construction.

Gatwick Airport's policing is provided by Sussex Police and funded by the airport under a police services agreement. While it is reasonable to assume that the risk of public disorder is considered as part of the airport's Multi-Agency Threat and Risk

Assessment process, it is likely that this would need to be revisited and updated in the event of the airport proceeding with runway expansion.

2.13 Disruptive Industrial Action

The risk of industrial action disrupting airport operations is primarily managed by the various employers and the respective trade unions that have a diverse range of relationships and roles across the airport. Given that many of these relationships do not involve the airport company itself (and in some cases the disruption arises from industrial action at other sites and sometimes in other countries), there is little that can be done by the airport to mitigate such risks, as they are driven by commercial and industrial interests of the parties concerned, and affected by legislation and relationships between parties.

As with any changes to the scale or nature of business operations, there will be a residual risk of industrial dispute arising from the expansion of airport operations. It is expected that this will be managed by employers and trade unions respectively as part of any negotiations involving expansion or changes in employment activity at the airport.

2.14 Multiple Disruptive Events

Airport operations are susceptible to many types of events and the risk exists that multiple events may occur simultaneously. Certain events such as storms and flooding could prevent the airport from responding according to its contingency plans, for example as a result of staff being unable to access the airport, or due to concurrent disruption to other services such as utility supplies. While there are potentially many combinations of events, many of them share similar mitigation strategies. Airports hold contracts with a diverse range of suppliers, many of which would have in place their own measures to ensure operational resilience. The occurrence of multiple events could put strain upon the airport's ability to co-ordinate its response. However, GAL's contingency plans can be expected to anticipate various types and scales of events to which the airport would have to respond by deploying its own resources and those of its contractors in order to minimise operational disruption.

Airport operations are vulnerable to a wide range of risks, including weather, interruption to fuel supplies, major incidents (e.g. industrial or transport related) and disruptive human activity (e.g. terrorism, crime, public disorder).

Types of operational risk that affect the airport include those that have national impacts on aviation and other industries and those that specifically impact the airport.

Many of these specific risks are primarily managed and mitigated by third parties, such as utility companies, whose expansion and contingency plans have not been assessed within this appraisal.

Some of the risks can be managed and mitigated by the airport, such as energy and fuel supplies, while certain mitigations will require cooperation from the wide range of businesses operating from the airport.

Airlines, ground support companies, surface transport operators and their suppliers all bear some responsibility for managing risks, although the key risks to be managed by the airport are those that have wider infrastructural impacts.

The proposed second runway is likely to present major changes to the water management environment which, without effective long term mitigation, could cause a significant increase in flood risk elsewhere. An effective strategy to mitigate this change in flood risk should be developed.

The proposed expansion of the airport does not change the probability or impacts of risks overall, but it will increase the numbers of people exposed given higher passenger and staff numbers.

However, the headroom in capacity afforded by a second runway and additional terminal capacity will improve the resilience towards and recovery from risks such as fog and snow, until such time as demand grows to fill that capacity during peak times of operation.