Proposal:	LOX
Author:	Pleiade Associates
For:	The Airports Commission
Date:	19 July 2013

LOX

CONTENTS

page

FIGURES

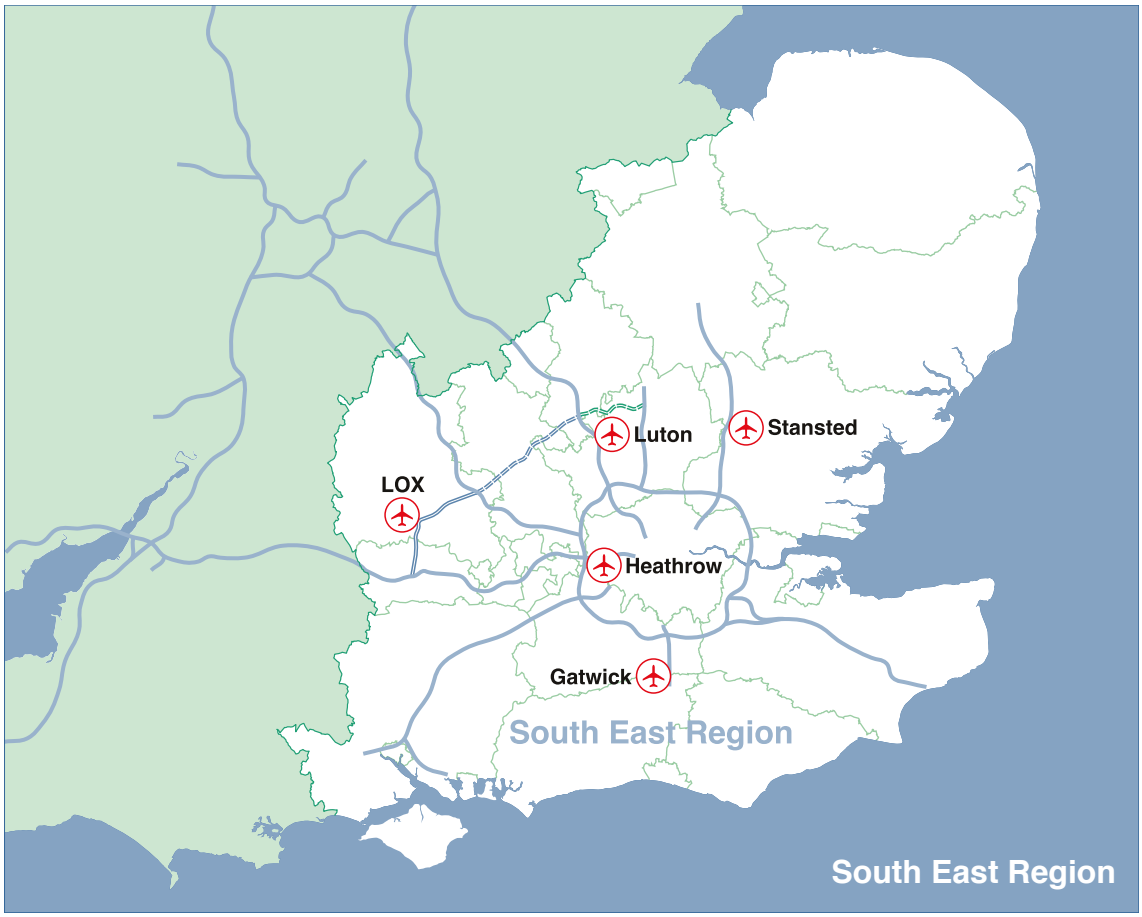
SUMMARY

The LOX project is presented as a solution to the impending crisis in airport capacity in the South East region of the United Kingdom. It is for a new four runway airport near Abingdon in Oxfordshire and is put forward as the 'Best Practicable Environmental Option' for airport development in the region – the environmental impacts being lower than all the alternative airports advanced in the national consultation on the Future Development of Air Transport in the United Kingdom: South East.

LOX would provide an integrated transport hub at an airport with a large runway capacity, yet with comparatively low levels of environmental impacts.

LOX is advanced as the 'Best Practicable Environmental Option' for air transport in the region for these reasons:

- good surface access transport links with central London, other parts of the South East and the United Kingdom;
- few people would be displaced by the development;
- it is close to the demand and highly accessible to the majority of Great Britain;
- the combined environmental impacts of the project are assessed as significantly lower than any of the other currently proposed options;
- to serve as an airport for GREAT BRITAIN, rather than merely the South East region, the new airport is sited outside of the transportation 'shadow' cast by Greater London, with good motorway and rail links to central London, the Midlands, Northern England and the South West;
- the airport adjoins the Western Arc area of managed growth to the west of London: it would augment the economic potential of this sub-region and thereby assist in the maintenance of the Capital's status as a global centre;
- its location would also ensure that transatlantic and transpolar flights would avoid many of the restrictions imposed by capacity limitations in London airspace;
- its proximity to Heathrow airport with a dedicated rail link would offer the opportunity for a dual-hub of airports providing an unparalleled level of service;
- it would provide direct and significant competition to the BAA monopoly.



THE PROPOSAL

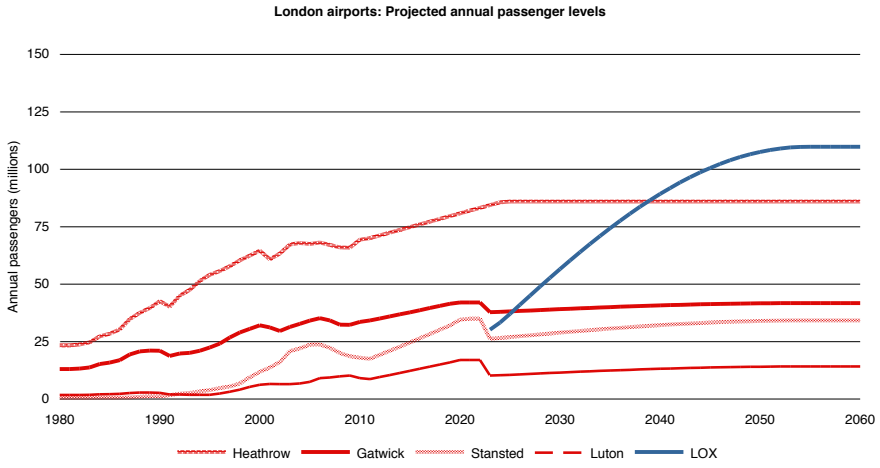
The principal option is advanced for a four runway airport with two pairs of close parallel runways. The annual capacity would be 125 million passengers and 4 million tonnes of air cargo. The initial phase of passenger Terminals would provide an annual capacity of 30 million passengers, with the anticipated further phases in 2030 and 2040 giving a combined capacity of 90 and 125 millions respectively. A secondary alternative is given for a three runway airport with two runways operating with dependent approaches and one with independant approaches – these would provide a lower overall capacity but a higher peak arrivals capacity.

Runways would be provided to match demand, in two phases each of two runways. Applying a utilisation limit of 80 per cent for the use of the airport runway system, all four runways would not be required until about 2038.

Although the demand forecast for the airport shows a need for a Terminal, serving 30 million passengers, and two runways from the opening date, the design allows for construction of combinations of Terminal and runway should demand not match the projected levels.

Other than the construction of a motorway link to the M40, there are no major “front end” capital costs entailed in the development of the airport. The comparatively low costs of the initial

phases and the ability to ensure that growth could be closely and economically matched to demand would significantly reduce the risk that the project would require Public Sector financial support.



Master plan

The airport Master Plan layout in the context of the nearby settlements is shown on Figure 2.

The airport facilities would include:

- Terminal capacity for 125 million passengers a year;
- Air Cargo Centre capacity for 4 million tonnes a year;
- four 4000 metres runways in two close parallels pairs;
- intermediate parallel taxiways between the close runway pairs;
- dual parallel taxiways to each runway pair;
- 250+ aircraft stands;
- Passenger rail station with 8 platforms of 450 metres length;
- Aircraft maintenance centre;
- Fuel Farm (154 million litres)
- On-airport operational facilities.

Costs

The airport development costs are estimated at about £18.2 billion (based on Quarter 2 2013 prices). All of these costs are based on prices pertaining in July 2013 (Royal Institution of Chartered Surveyors Building Cost Information Service Tender Price Index 225).

A pre-feasibility estimate of costs, including those for infrastructure and a Development Zone, is included below:

LOX Four Runway Option
Capacity: 125 mppa • Runways: 2 close parallel pairs

Airport		£000,000
Operational Airport, including Passenger terminal, other passenger facilities, aircraft pavement, airport and local roads		16,217
Air Cargo Terminal		207
Aircraft Maintenance Facility		559
Support Development		1,253
Total Airport Capital Costs	**£m**	**18,236**
	£/mppa	146
Airport Surface Access		
Motorways		
Upgrade existing A34 between M4 and Lox site motorway standard 2 X 4 lanes (D4M)		338
New motorway standard A34 from Lox site to M40		571
Trunk roads		
Diversion of A338 in 2 X 2 lane roadway		22
Diversion of A415 in 2 X 2 lane roadway		99
New LOX to A419 (Swindon) 2 X 2 lane roadway		415
GWR and EW Rail branch, passenger station and rolling stock		185
Reinstatement of Two up Two Down working to Swindon including Swindon suburban station and provision of rolling stock for local service between Swindon and Didcot via LOX		202
Total Airport Access Capital Costs	**£m**	**1,832**
	£/mppa	15
Possible HS2 Link (prices based upon HS2 2013 estimates)		
Independent single line branch with connecting stations	**£m**	**1,151**
Conjoined twin track branch line	**£m**	**1,425**
Additional Rolling Stock for either of the above	**£m**	**31**
Possible Crossrail extension		
Assumed no track upgrade necessary	**£m**	
Additional Rolling Stock	**£m**	**45**

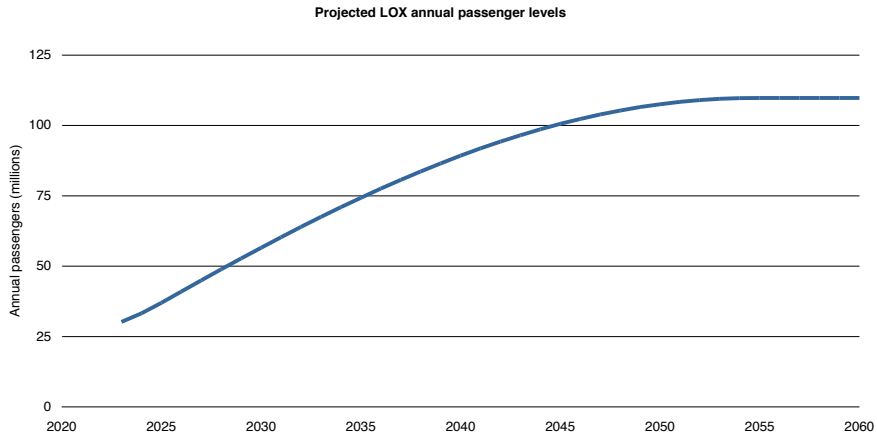
Demand forecast

Forecasts of passenger demand at the airport is based on the current Department for Transport forecasts and that body's Airport Allocation Model [Note 1]. In order to demonstrate a 30 year project operational period the demand is projected beyond 2050 on the basis of a long-term trend that assumes market stability for air transport in about 2050-2060.

Table 1 Forecast demand for LOX

Option	Year		Passengers (mppa)	Air Transport Movements (including Cargo ATMs) ('000 annual ATMs)
1 runway	2023	Capacity	30	240
		Demand	30	194
2 runways	2030	Capacity	60	480
		Demand	57	342
4 runways	2040	Capacity	125	720
		Demand	98	512
4 runways	2050	Capacity	125	720
		Demand	108	607

Note 1: Air Traffic Forecasts for the United Kingdom 2012. Department for Transport. London, 2012.

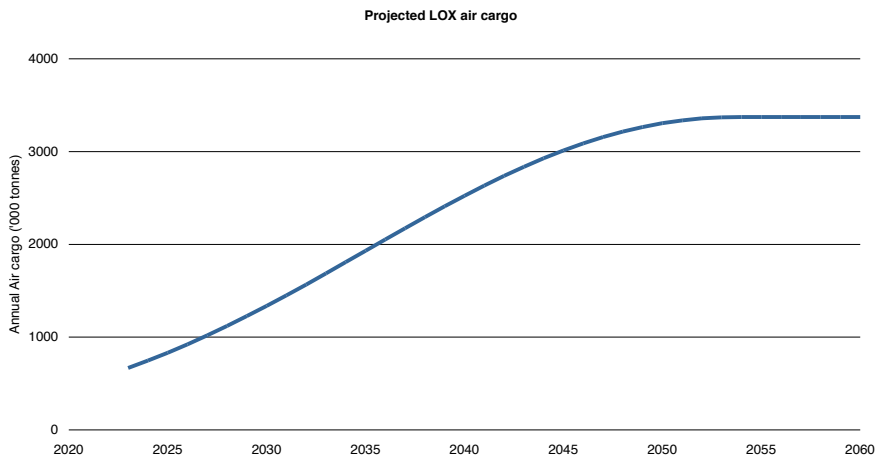


Air cargo forecast

Forecasts of air cargo demand at the airport is:

Table 2 Forecast air cargo demand for LOX

Option	Year		Air cargo (million tonnes)	Cargo Air Transport Movements ('000 annual ATM's)
Phase 1	2023	Capacity	1.0	12
		Demand	0.7	10
Phase 2	2030	Capacity	2.0	25
		Demand	1.3	19
Phase 3	2040	Capacity	2.5	50
		Demand	3.5	33
Phase 4	2050	Capacity	4.0	50
		Demand	3.3	39



SURFACE ACCESS

The airport and its associated surface access infrastructure will have significant medium and long-term implications for the planning of all transport modes. They would inform the Regional Transport Strategy and the normal strategic planning processes of the Highway Agency and the Strategic Rail Authority.

The LOX proposal outlines of the principal infrastructure works required for the operation of the airport. Further work would be required to determine the detailed nature of provisions and required levels of investment and the apportionment of these burdens between the airport developer and the transport network providers.

Rail

The site adjoins the Great Western Main Line (Paddington / South Wales). The airport would provide full integration with rail transport: with an 8 platform passenger station adjoining the passenger terminals.

On the Great Western Main Line, the Didcot east grade separated junction and new stations at Grove and the proposed urban expansion of Swindon are assumed [note 2].

Note 2: London to South West and South Wales Multi Modal Study. Government Office for the South West, May 2002.

HS2

There is the opportunity for the integration of the airport with the HS2 project. This would entail some 50 kms of new rail track and, possibly, a station on the HS2 mainline near to Wendover. [see figure 9].

Other potential strategic rail improvements

- Enhanced capacity to the GWML.
- Additional London Terminal capacity.
- The extension of Crossrail to the airport.
- In the event of HS2 not proceeding, there is the potential for a new rail connection to the West Coast Main Line with a connecting station near Leyton Buzzard [see figures 6 and 7] and even further to the Midlands Main Line to the north of Luton utilising the rejected M40 - M1 link corridor.
- A LOX-Heathrow Express using the existing GWML with a new dedicated line to Heathrow Terminal 5 using a grade separated junction to the east of Langley. This could offer a 20 minute service between the airports [see figure 4].

Road accessibility

The airport would be locally accessed from the A34, A415 and A338. [Figure 3]

Necessary strategic road improvements

The A415 and the A338 from Grove to the A420 would be diverted around the airport and would be upgraded from single carriageway to dual-carriageway standard.

The following strategic road improvements would be needed to service the airport demand beyond the initial airport phase;

- widening of the A34 to dual 4-lane motorway from junction 13 on the M4 to the A34 Abingdon junction [Figure 3];
- construction of a dual 4-lane motorway link from the A34 at Didcot to the M40 [see Figure 4]. This link would also provide a new Thames crossing;
- construction of a dual-carriageway standard link road from the A419 at Swindon to the A34 [see Figure 5]. This route would share the transport corridor of the Paddington/South Wales railway for the majority of its length.

Other potential strategic road improvements

- M40-M1 link [see Figures 6 & 7] construction of a dual 4-lane motorway link from the M40 at the M1 near Luton;
- construction of a dual-carriageway standard link road from the proposed new junction on the M1 north of Luton to an existing junction on the A1(M) at Stevenage [see Figure 8].

IMPACTS

Land and property

The construction of the airport would result in these effects:

- The airport would cover just over 3225 Ha – including a mixed uses Development Zone of 70 Ha and Wildlife Reserves of just over 600 Ha.
- 205 residential properties and a hotel, would be taken. Allowance is made in the Airport Cost Plan for 20 Listed Buildings to be taken down and re-sited within the residential district of the Development Zone, the loss of residential properties would thereby be reduced to 184.
- 3213 hectares of agricultural land [see Figure 10] would be lost, comprised of about:

ALC Grade 2	120 Ha
ALC Grade 3a & 3b	1535 Ha
ALC Grade 4	1558 Ha

Heritage

The construction of the airport would require:

- 23 Grade II Listed Buildings (including 3 milestones) to be taken down and re-sited;
- the loss of just over 20 hectares of the East Hanney Conservation Area [see Figure 11];
- encroachment into some 182 hectares of the Thames Valley and Buscot-Fyfield Ridge Area of High Landscape Value (Oxfordshire Structure Plan, 2001 designation).

Ecology

No impacts are assessed as being significant and no Sites of Special Scientific Interest or other areas given statutory protection are within the airport site, except for an unaffected Scheduled Ancient Monument (the site of a Romano-British temple). The airport site is predominantly improved farmland with scattered small coppices. However the area is drained by the River Ock and numerous small tributary watercourses – preliminary studies have demonstrated that these and their associated banks and margins support a valuable riparian ecosystem. These habitats would be relocated and extended within the proposed Wildlife Reserves and replacement floodplains.

There are no areas of Ancient Woodland within the site boundary.

Water

The floodplain of the River Ock and its tributary streams occupies some 1055 Ha of the site [see Figure 12] and is designated as a Functional Floodplain by the Environment Agency (under Planning Policy Guidance 25). Flood management to eliminate the adverse effects of development would comprise:

- A replacement floodplain of 550 Ha with enhanced holding capacity;
- On-airport temporary ponds with a capacity of about 1 million cubic metres;
- A holding pond with a capacity of 6 million cubic metres.

Except for two short sections of small streams under off-site roads and acoustical bunds, no watercourses will require culverting. The airport would require extensive and significant diversions of watercourses, including sections of the River Ock.

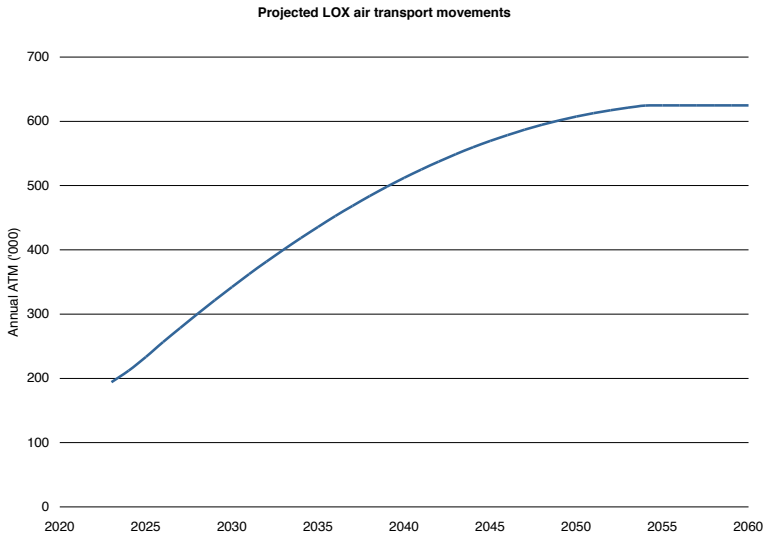
The level of demand for water associated with the airport would substantially add to the sub-regional demand. The projected demand for water supply within the Thames Water Company area is viewed as problematic and this increased demand may be difficult to meet, even with supply and demand management and water saving technology. In mitigation of this, a reservoir of some 2.4 million cubic metres is proposed.

Noise

The table below shows the land areas and population predicted to be exposed to various levels of aircraft noise in 2050. This assumes that the airport is then operating at its 'Max Use' capacity [see: Demand forecast above], this is not likely to be so. These levels are based on an assumed operational day of 16 hours duration (07:00 – 23:00). [See Figure 13].

Table 3 Noise levels

	L_{eq} (dBA)							
	Year	>54	>57	>60	>63	>66	>69	>72
Land area affected (km^2)	2050	359	201	118	71	42	25	15
People affected ('000s)	2050	40	19	11	5	2	>1	0



Air quality

Under European Union legislation, mandatory limits for airborne pollutants have applied to all airport development from 2010. The population predicted to be exposed to airborne pollutants in excess of these EU limits in c. 2050, again assuming 'Max Use' operations, is:

- Particulate matter: PM_{10} – nil.
- Nitrogen Oxide: NO_2 – it is estimated that less than 300 people would be exposed to excessive levels of NO_2 in 2050 in the 4 runway option. These effects could probably be prevented, if they have not been forestalled by technological developments in aircraft design. None are affected by the 2 runway option.

Risks

Birdstrike hazards

There are no significant birdstrike hazards in the vicinity of the airport site, although the potential for the build-up of hazardous levels of bird populations at the two nearby sewage works and several major rivers, reservoirs and areas of standing water within 8 miles of the airport would require continuous review. The management of the proposed airport Holding Pond and Reservoir would require low scale counter measures to deter colonisation by wildfowl [see Figure 16].

Public Safety Zones

Except for the necessary demolition of 7 buildings (by, say, 2050) , there are no impacts within the estimated 1 in 100,000 risk contours defined for the runways. [See Figure 15]. All runways would have Runway End Safety Areas of 330 metres in length, but some 1200 metres would be available should ILS/MLS technology be eventually superceded. [see Figure 16].

Health & Safety Executive PADHI+

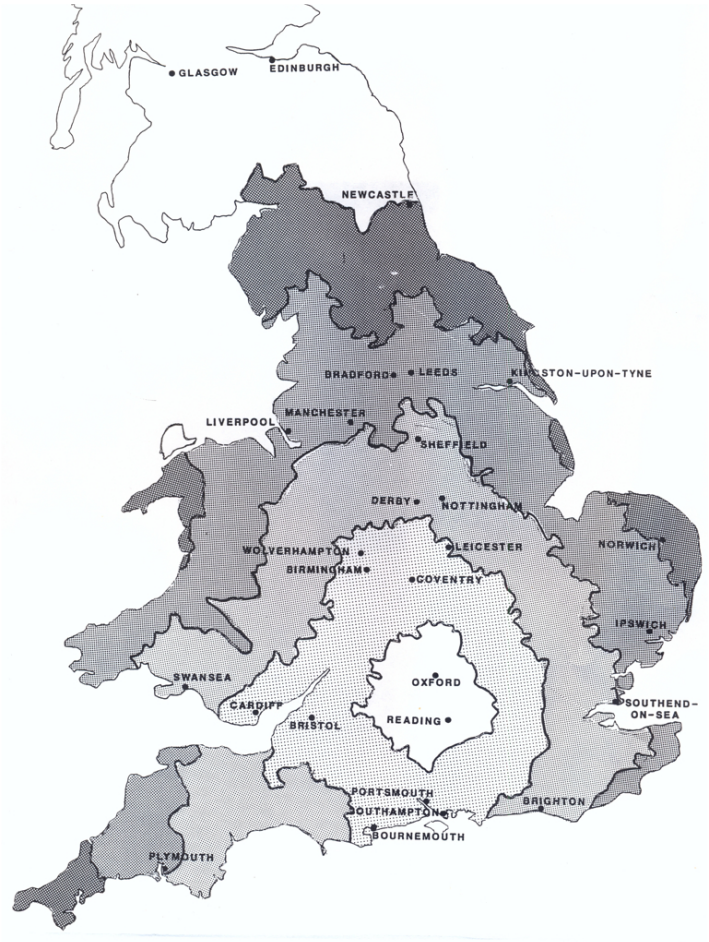
The entirety of the Health and Safety Executive (Planning Advice for Developments near Hazardous Installations) zones associated with the airport Fuel Farm are within the airport site [See Figures 15, 16]. Except for an airport Fire Station, water treatment apparatus and a DME facility (unmanned) in the Outer Zone there would be no buildings within these zones.

Climate change

Consideration of this cardinal issue is beyond our scope and competence. Even so, such impacts are probably, mutatis mutandis and ceteris paribus, broadly similar for all provisions of airport capacity and thus may not be critical to relative appraisal of various alternatives, should any proceed. The proximate location of LOX to the centres of demand at least reduces surface access travel impacts.

ECONOMICS & PLANNING

To serve as an airport for Great Britain, rather than merely the South East region, the new airport is sited outside of the transportation 'shadow' cast by Greater London, with good – and augmentable – motorway and rail links to central London, the Midlands, Northern England and the South West.



Road transport travel times to LOX (hours)

The airport's proximity to the "Area of Managed Economic Growth" to the west of London offers the potential to augment and geographically expand the economic potential of the sub-region and thereby assist in the maintenance of the Capital's status as a global centre. The location of the airport to the west of the Area would provide a strategic counterpoise to the "tidal" effects of west London.

Regional Planning Guidance

The development of the airport would impact upon the sub-regional planning of the Oxford/ Reading/Swindon sub-region and inform a major review of the Regional Planning Guidance for the South East (RPG9).

Employment

Table 3 shows the forecast employment generated by the airport. The airport's core catchment area would include Abingdon, Didcot, Faringdon, Oxford, Reading, Swindon, Thame, Wallingford, Wantage/Grove and Witney. [See Appendix Figures A.10-A.11]

Table 4 Forecast employment ('000)

	2023	2030	2040	2050
	1 runway	2 runways	4 runways	4 runways
Direct on-site	15	29	44	54
Direct off-site	2	6	9	11
Indirect	5	10	16	20
TOTAL	23	45	69	85

Land use and urbanisation

The levels of urbanisation which would be generated by the airport are in excess of the provision of the Regional Planning Guidance. The potential locations for urbanisation are: Swindon, Grove / Wantage, Didcot, and a prospective release of the Dalton Barracks (Abingdon). [see figure 3]

Except for the construction of the proposed A34 - M40 link road, the Oxford Green Belt would not be directly affected by the airport. The development of large airports frequently engenders associated development in close proximity – often resulting in the environmental impacts of the airport falling on the new developments. In order to prevent this, a proposed extension of the Oxford Green Belt towards the northern boundary of the North Wessex Downs Area of Outstanding Natural Beauty is advanced. [see Figure 3]

Table 5 Forecast new dwellings ('000)

2023	2030	2040	2050
1 runway	2 runways	4 runways	4 runways
13	24	37	46

AIRPORT ISSUES

Airport layout

The airside facilities and operational layout of the airport are shown on Figure 16.

Obstacle Limitation Surfaces

Several physical features are infringements of the Obstacle Limitation Surfaces. The infringements of the Inner and Outer Horizontal Surfaces [see Figure 17] are not viewed as significant to the safe operation of the airport [Note 3]. There are no infringements of Approach/Departure/Baulked-Landing surfaces.

Note 3: The Inner and Outer Horizontal Surfaces and the Conical Surfaces represent the levels above which consideration needs to be given to the removal or marking of existing objects and the control of new objects in order to facilitate practicable and efficient instrument approach procedures, and to ensure safe visual manoeuvring in the vicinity of an aerodrome.

These obstacles are:

Inner Horizontal Surface
Milton House
A structure at 371 feet above mean seas level.

Outer Horizontal Surface

1 Lambourne Downs
Areas of natural terrain above 677 feet.

2 Lambourne Down: communications mast
A radio transmission mast of 1013 feet above mean seas level in height, since this latter obstacle extends to a height more than 150 metres above ground level high intensity obstacle lights will be required.

Didcot A Power Station: Main Chimney
Following the operational closure of Didcot A Power Station, the obstacle posed by the main

chimney – which would have penetrated the Outer Horizontal Surface by some 169 feet – is now (since May 2013) of a redundant structure. Hence it is disregarded.

Runway Usability

Based on the Met Office records (1990-2010) for RAF Brize Norton (average usability >99.7%) and RAF Benson (average usability >99.4%) the probable airport runway usability for a cross-wind component of 20 knots (37 km/hour) was assessed as greater than 99.6 per cent.

Note: The International Civil Aviation Organization (ICAO) recommended minimum runway usability is 95 per cent.

Interaction with RAF Brize Norton

The proximity of RAF Brize Norton and RAF Benson would require joint management of the operations from the airbases and LOX [see Figure 17]. Likewise the occasional US forces operational use of Fairford would necessitate control and coordination by the joint facility.

Oxford Area of Intense Aerial Activity

A substantial reduction in the surface extent of the Oxford AIAA would be required, with the bulk of the designation being subsumed in the Airport Control Zone [see Figure 18].

Airspace Restrictions and Hazardous Areas

The Prohibited Area P106 around Harwell would prevent flight below 2500 feet within its extent. This constrains the recirculation of aircraft to the south of the airport to flight levels above 2500 feet. The Danger Area D129 (Brize Radar) is taken into account in the configuration of the Departure & Arrival Routes for the airport [see Figure 19].

Departure & Arrival Routes

Figures 20 and 21 show the Standard Instrument Departures & Standard Terminal Arrival Routes assumed in the study – these are based on the integration of the new patterns of movement into the existing configuration of the London system, a presumption which will need to be reviewed in the light of the future revisions and technological changes which will certainly intervene during the planning stages of the project. The north-western sectors of the London TMA are presently the least congested elements in the system.

Extension to the LTMA

In order to accommodate the new site traffic an extension to the London Terminal Manoeuvring Area is proposed [See Figure 22].

DEVELOPMENT PROGRAMME

For the purposes of this study the airport is programmed to open in 2023 [see Figure 23]. This would be an arduous target. Perhaps the greatest influence on the achievability of this

programme is the resolute implementation of Her Majesty's Goverment's revised planning procedures for major infrastructure projects and the active support of the Loyal Opposition.

THREE RUNWAY OPTION

We have also investigated in some detail an alternative runway configuration of three runways. Although this would provide a lower absolute level of annual air transport movements than the four runway option, viz. some 640,000 compared to 720,000, this configuration, which allows for two runways operating in a dependent parallel approaches / independent departures mode provides a higher peak hourly capacity: that is, 135 to 150 hourly movements in comparison to, say, 120 for the four runway configuration.

There has been a long-term trend for the reduction of the runway separations allowing for independent operations and there is no reason to presume that this will not continue. If this reduction eventually allows for No Transgression Zones to reduce from the present 610 metres to 220 metres (as provided in this configuration) then the potential hourly approach operations could be 180. This characteristic would effectively eliminate the peak hour operational constraints for the airport – this would be a unique advantage over a two runway Heathrow, for instance. [see Figures 24 & 25].

Costs

A pre-feasibility estimate of costs, including those for infrastructure and a Development Zone, is included below (page 19).

All of these costs are based on prices pertaining in July 2013 (Royal Institution of Chartered Surveyors Building Cost Information Service Tender Price Index 225).

LOX Three Runway Option

Capacity: 120mppa • Runways: 2 dependent approaches, 1 independent approaches

Airport		£000,000
Operational Airport, including Passenger terminal, other passenger facilities, aircraft pavement, airport and local roads		16,212
Air Cargo Terminal		194
Aircraft Maintenance Facility		546
Support Development		1,259
Total Airport Capital Costs	**£m**	**18,211**
	£/mppa	152
Airport Surface Access		
Motorways		
Upgrade existing A34 between M4 and Lox site motorway standard 2 X 4 lanes (D4M)		338
New motorway standard A34 from Lox site to M40		571
Trunk roads		
Diversion of A338 in 2 X 2 lane roadway		22
Diversion of A415 in 2 X 2 lane roadway		99
New LOX to A419 (Swindon) 2 X 2 lane roadway		415
GWR and EW Rail branch, passenger station and rolling stock		185
Reinstatement of Two up Two Down working to Swindon including Swindon suburban station and provision of rolling stock for local service between Swindon and Didcot via LOX		202
Total Airport Access Capital Costs	**£m**	**1,832**
	£/mppa	15
Possible HS2 Link (prices based upon HS2 2013 estimates)		
Independent single line branch with connecting stations	**£m**	**1,151**
Conjoined twin track branch line	**£m**	**1,425**
Additional Rolling Stock for either of the above	**£m**	**31**
Possible Crossrail extension		
Assumed no track upgrade necessary	**£m**	
Additional Rolling Stock	**£m**	**45**