LOX

The Best Practicable Environmental Option for an integrated transport hub in South East England?... London Oxford Airport

SUMMARY REPORT • 2003

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ACKNOWLEDGEMENT

Ove Arup & Partners and Arup Economics & Planning contributed greatly to the engineering, transport, environmental impacts, economic and planning aspects of the LOX project from its inception through to mid 2000. Conflicting commercial interests have since emerged which have led to their withdrawal from the Project Study Team and Arup are not presently associated with the project.

LOX

CONTENTS

Figure 1 South East Region

INTRODUCTION

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. It is put forward as the 'Best Practicable Environmental Option' for airport development in the region – its environment 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 a hub airport with a large runway capacity, yet with a comparatively low level of environmental impacts.

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

- sufficient land is available;
- 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 currently proposed Government options*;
- to serve as a hub 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 competition to the BAA monopoly.

THE PROPOSAL

A single option is advanced for a four runway airport with two pairs of close parallel runways. The annual capacity would be 120 million passengers and 4 million tonnes of air cargo. The initial phase of passenger Terminals would provide an annual capacity of 60 million passengers, with the anticipated further phases in 2021 and 2024 giving a combined capacity of 90 and 120 millions respectively.

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 2024.

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

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.

Costs

The airport development costs are estimated at about £11.2 billion (based on Quarter 1 2002 prices). A Pre-feasibility estimate of costs, including those for infrastructure and a Development Zone, is included in an associated report. This is available on: http://www.pleiade.org

Demand forecast

Forecasts of passenger demand at the airport is based on the Department for Transport forecasts to 2030 [Note 1]. In order to demonstrate a 25 year project operational period the demand is projected to 2040 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)
2 runways	2015	Capacity	60	513
		Demand	35	250
2 runways	2020	Capacity	90	513
		Demand	50	338
4 runways	2030	Capacity	120	756
		Demand	98	606
4 runways	2040	Capacity	120	756
		Demand	120	719

Note 1: Air Traffic Forecasts for the United Kingdom 2000. Department for Transport. London, 2000.

Air cargo forecast

Forecasts of air cargo demand at the airport is [see Appendix Figures A.1-A.9]:

Table 2 Forecast air cargo demand for LOX

Option	Year		Air cargo (million tonnes)	Cargo Air Transport Movements ('000 annual ATM's)
Phase 1	2015	Capacity	1.0	25
		Demand	0.9	12
Phase 2	2020	Capacity	2.0	25
		Demand	1.4	18
Phase 3	2030	Capacity	3.0	50
		Demand	2.9	33
Phase 4	2040	Capacity	4.0	50
		Demand	4.0	44

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 Paddington / South Wales Main line. The airport would provide full integration with rail transport: with an 8 platform passenger station adjoining the passenger terminals and a 2 platform cargo station within the mid-field Air Cargo centre.

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.

Potential strategic rail improvements

- Enhanced capacity to the GWML.
- Additional London Terminal capacity.
- The extension of Crossrail to the airport.
- A inter-main line shuttle service linking the existing radial main line network between London and Scotland, the Midlands and the North of England [see figure 3].
- 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].

Roads

The airport is accessed from the A34, A415 and A338. The projected A415 Marcham bypass has been assumed on its presently declared route.

Strategic road improvements needed

The A338 from Grove to the A420 would be diverted to the west of 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;
- modification of junction 13 on the M4;
- construction of a dual 4-lane motorway link from the A34 at Didcot to the M40 [see Figure 5]. 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 6]. This route would share the transport corridor of the Paddington/South Wales railway for the majority of its length.

IMPACTS

Land and property

The construction of the airport would result in these effects:

- The airport would cover just over 33 km^2 – including a mixed uses Development Zone of 230 Ha and Wildlife Reserves of just over 600 Ha.

- 188 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 168.
- 3213 hectares of agricultural land [see Figure 7] would be lost, comprised of:

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

Heritage

The construction of the airport would require the:

- 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 and Steventon Conservation Areas [see Figure 8];
- 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 significant and no Sites of Special Scientific Interest or other areas given statutory protection are within the airport site. The site is predominantly improved farmland with scattered small areas of coppice. However the area is drained by the River Ock and numerous small tributary watercourses – preliminary studies have demonstrated that these and their associated banks support a valuable riparian ecosystem. These habitats would be relocated and extended within the proposed Wildlife Reserves and replacement floodplains.

A part of a small area of Ancient Woodland (Hutchins's Copse) is within the site boundary: this would be retained and would be unaffected by the development.

Water

The floodplain of the River Ock and its tributary streams occupies some 1055 Ha of the site [see Figure 9] 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 575 Ha with enhanced holding capacity;
- On-airport temporary ponds with a capacity of about 1 million cubic metres;
- A holding pond of with a capacity of 2.25 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 a section 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.

Noise

The table below shows the land areas and number of people predicted to be exposed to various levels of aircraft noise in 2040. These levels are based on an assumed operational day of 16 hours duration (07:00 – 23:00). See Figure 10.

Table 3 Noise levels

	L_{eq} (dBA)							
	Year	>54	>57	>60	>63	>66	>69	>72
Land area affected (km^2)	2040	370	209	122	74	43	26	15
People affected ('000s)	2040	45	22	13	6	3	>1	0

Air quality

Under European Union legislation, mandatory limits for airborne pollutants will apply to all airport development from 2010. The population predicted to be exposed to airborne pollutants in excess of these EU limits in 2030 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 2030 in the 4 runway option. These effects could probably be prevented. None are affected by the 2 runway option.

Safety Risk

There are no impacts within the 1 in 100,000 risk contours defined for the runways. [See Figure 11]. All runways would have Runway End Safety Areas of 985 or 1000 metres in length [see Figure 13].

REGIONAL PLANNING

To serve as a hub 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's proximity to the "Area of Managed Economic Growth" to the west of London offer the potential to augment the economic potential of this 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)

	2015	2020	2030	2040
	2 runways	2 runways	4 runways	4 runways
Direct on-site	18	25	49	60
Direct off-site	4	5	10	12
Indirect	6	9	18	22
TOTAL	27	39	77	94

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.

Except for the construction of the proposed A38 - 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 to them – often resulting in the environmental impacts of the airport falling on the new developments. In order to prevent this effect, 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 12 and Appendix figure A.12.]

Table 5 Forecast new dwellings ('000)

2015	2020	2030	2040
2 runways	2 runways	4 runways	4 runways
15	21	41	51

The main areas envisaged for urbanisation are settlement expansions to Swindon, Grove and Didcot together with a mixed use development zone at the airport [see figure 12]. Should the relocation of RAF Brize Norton procede then the site of the former air base may then be available as a 'brownfield' development site.

AIRPORT ISSUES

Airport layout

The airport facilities would include:

- Terminal capacity for 120 million passengers per annum;
- Air Cargo Centre capacity for 4 million tonnes per annum;
- four 4000 metres runways in two close parallels pairs;
- intermediate parallel taxiways between the close runway pairs;
- dual parallel taxiways to each runway pair;
- 12800 metres of passenger aircraft stands;
- 1200 metres of air cargo aircraft stands;
- Passenger rail station with 8 platforms of 450 metres length;
- Rail head for air cargo within the Cargo Centre;
- Aircraft maintenance centre.

The airside facilities and operational layout of the airport are shown on Figure 13.

Obstacle Limitation Surfaces

There are several physical features which are infringements of the Obstacle Limitation Surfaces. The infringements of the Inner and Outer Horizontal Surfaces [see Figure 14] are not viewed as significant to the safe operation of the airport [Note 3].

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 Didcot A Power Station: Main Chimney
This obstacle would penetrate the Outer Horizontal Surface to a significant extent – some 169 feet. Since it extends to a height more than 150 metres above ground level high intensity obstacle lights will be required.

2 Lambourne Downs
Areas of natural terrain above 677 feet.

3 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.

Take-off Climb Surface (runway 09R) and Appoach Surface (runway 27L)
Didcot A Power Station: Main Chimney
Although the hazard presented by this obstacle in the OHS may be mitigated by lighting, it would penetrate the Approach Surface to runway 27L (the fourth runway) and thus represent an unacceptable hazard to aircraft using this runway. A reduction in the height of the chimney of some 60 metres (197 feet) would therefore be required for the landing of aircraft on the instrument runway or a reduction of 75 metres (247 feet) for both landings and take-offs [see Figure 15].

The loss of the potential fourth runway would reduce the capacity of the airport to 638 000 air transport movements a year and the passenger capacity to 112 million passengers a year.

Runway Usability

Based on the Met Office records (1990-2000) for RAF Brize Norton and RAF Benson the 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.

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 would require low scale counter measures to deter colonisation by wildfowl [see Figure 16].

Interaction with RAF Brize Norton

The proximity of RAF Brize Norton would require joint management of the operations from the airbase 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 would constrain 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 pattern of movement into the existing confirguration 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.

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].

The potential co-location of RAF Brize Norton and the airport

Preliminary studies were made into the feasibility of the relocation of RAF Brize Norton to an area of land adjoining the airport and enabling the shared use of the runway, airside and aircraft maintenance facilities of the airport. This co-location would offer the prospect of substantial capital release and operation savings to the Ministry of Defence. The proposal has not been developed in detail [see Figure 23].

Compensation for aircraft noise nuisance

A novel scheme for the direct compensation of those households impacted by aircraft noise is advanced in a separate document [see Appendix Figures A.13-A.14].

DEVELOPMENT PROGRAMME

The airport is programmed to open in 2015. The project programme is based on the achievement and implementation of Her Majesty’s Goverment's proposed revisions to the planning procedures for major infrastructure projects [see Figure 24].