Mayor's Aviation Works Programme - New Hub Airport

Technical Note - Stansted Master Plan

Transport for London

19 July 2013

Plan Design Enable

Notice

This document and its contents have been prepared and are intended solely for Transport for London's information and use in relation to [PURPOSE]

[ATKINS ENTITY] assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 15 pages including the cover.

Document history

Job number: 5120377			**Document ref:**			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Updated draft	RJS	NDB	BC	MP	19/07/2013

Client signoff

Client	Transport for London
Project	Mayor's Aviation Works Programme - New Hub Airport
Document title	Stansted Master Plan
Job no.	5120377
Copy no.	
Document reference	

Table of contents

Figures

1. Purpose of technical note

This paper describes the proposed master plan layout, the strategies that underpin the layout and discusses some of the issues that affect operational viability for a new Hub Airport at Stansted. The site is contiguous with the existing airport and the new Hub will complement the continuing operation of the existing airport.

2. Background

Previous studies showed how a generic 4 runway master plan for 180 million passengers per annum (mppa) Previous studies showed how a generic 4 runway master plan for 180 million passengers per annum (mppa) might be realised at each of the proposed sites, Isle of Grain, Outer Estuary or Stansted. The three chosen sites exhibit the following unique characteristics that have contributed to their selection. It is assumed that Heathrow will close to all operations at the same time as the new Hub opens. The shortlisted sites are shown in Figure 2–1.

- The Isle of Grain site has the best potential for good surface access both to central London and the rest of the UK
- The Outer Estuary site almost completely avoids displacing homes by the development and impacting people by aviation noise
- Stansted has the benefit of having an established airport operation today

Figure 2–1 - Shortlisted sites for a new hub airport

3. Site Location

The proposed site at Stansted is contiguous with and immediately to the North East of the existing airport site. The primary reasons for opting for this particular location at Stansted are:-

- to allow the existing airport to remain operational during construction and operation of the new hub;
- to benefit from the existing surface access provision;
- to minimise the impact on the local environment
- to minimise the noise impact on adjacent communities.

It is assumed that existing Stansted Low Cost Carrier (LCC) traffic grows and is handled alongside the overall hub operation. This inherently caps the growth of the LCC operation at Stansted. It is assumed that the existing airport operation continues separately and in parallel with a new hub airport with minimal sharing of infrastructure. The master plan allows the retention of the existing terminal, runway and airfield infrastructure in the long term. It is proposed that the existing runway and the most north-westerly of the new runways operate in segregated mode (rather like Madrid Airport), while the other 3 new runways operate in mixed mode.

4. Strategies underpinning the layout

Figure 4–1 shows the outline master plan of a future 5 runway airport designed to meet the following strategic parameters.

- Master plan layout to safeguard for expansion to 210 mppa (180 hub + 30 low cost carrier in 2050).
- Runway configuration to permit 1,153,000 ATMs with 75% runway utilisation average over the year.
- A layout that can be phased to match increasing demand with an opening capacity of 116 mppa.
- (26mppa for the expected growth of existing Stansted traffic and 90mppa for new hub traffic)
- A minimum connection time (MCT) of 45 - 60 minutes in the new airport to facilitate ‘hub’ operations.
- Infrastructure that provides operational resilience and delivers 95% jetty service over the year for the hub.
- Unconstrained access for the largest aircraft (A380 and B748) to the new part of the airport.
- A surface access strategy that encourages the use of public transport
- Rail connections to central London and the local rail network.
- Road connections to the motorway network.
- Assumption that the existing night noise restrictions (maximum of 12,000 movements per annum between 23:30 and 06:00 local time) would remain

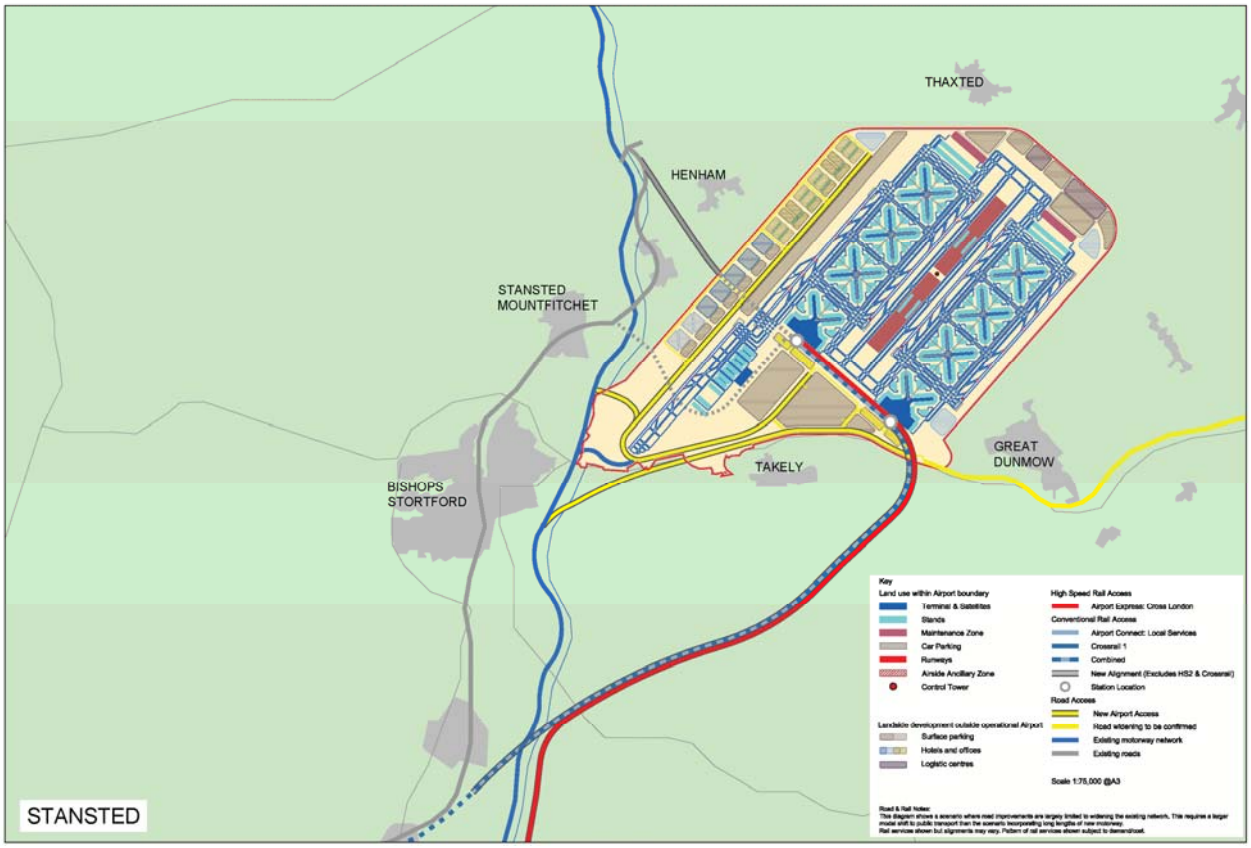


Figure 4–1 - Stansted master plan

5. Context

The location of the runways and the proposed aircraft flight paths seek to assist the continued operation of the existing airport and to minimise the noise impact on local communities. This is discussed further in the environmental section. A number of small communities will be displaced by the airport expansion. The proposals include a high speed rail connection to central London, conventional rail connections to the local rail network and new highways connections to the M11.

There are considerable levels changes across the proposed site and further work will be required to show how the levels of the new development will be matched to the existing airport. During construction a logistics centre will be required part of which will be beyond the boundary of the site. It is envisaged it will be served by both road and rail connections.

The Stansted area contains a number of Sites of Special Scientific Interest (SSSIs) and a number of areas that have other ecological designations as well as a number of listed buildings and scheduled monuments. These aspects are discussed further in the environmental section.

6. Masterplan layout

The new airport is divided into two terminal zones as this will simplify the hub operation for the global alliances, limit the number of runway crossings, and make the scale of the terminals understandable. Each of the terminals will handle up to 90mppa, a level of traffic equivalent to the total projected throughput of Heathrow.

Each terminal zone is divided into 4 elements, a main terminal building which is in turn supported by 3 cruciform satellites. This particular layout was chosen to be compatible with the airport's operation as a hub and in particular to offer competitive MCTs.

The zone between the central pair of runways is reserved for cargo and a variety of ancillary activities such as fire stations, motor transport maintenance, transit maintenance and testing and de-icing and snow clearance facilities.

To the North East are zones for aircraft maintenance, sized for casualty maintenance but not major checks and beyond a landside ancillary zone for cargo/freight/courier services developed by third parties.

Each terminal has its own public transport interchange immediately to the South West giving priority to rail and coach travellers. Beyond that, forecourts, multi storey and surface car parks are provided. The main passenger access to the airport is from the South West, via the existing airport approach route.The whole site is surrounded by a perimeter road.

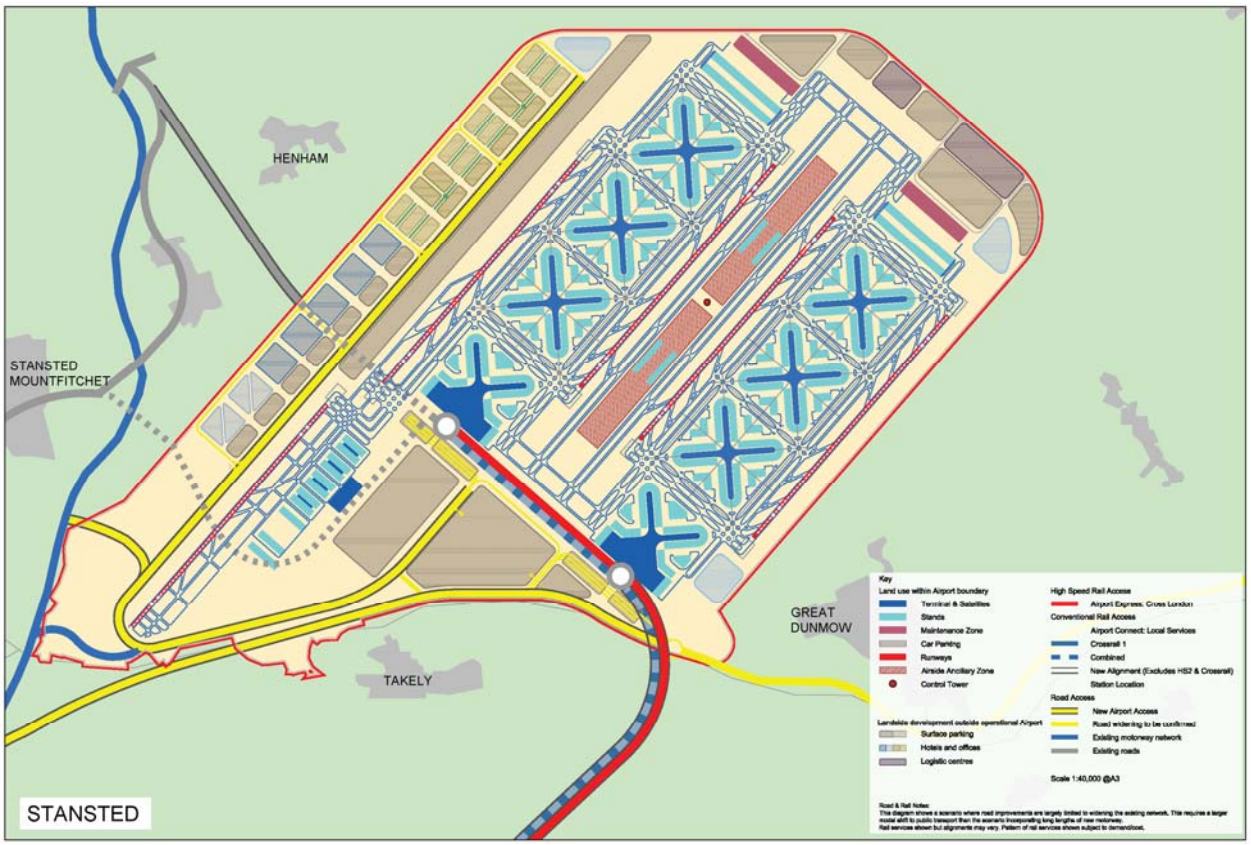


Figure 6–1 - Stansted detailed master plan

The geometry of the site is governed by the following key factors:-

- Independent operation in mixed mode of each of the runways requiring a minimum runway separation of 1035m (middle pair currently shown as 1035m)
- Sufficient space for approximately 400- 500 jetty served aircraft stands (numbers are dependent on typical aircraft sizes) divided into two separate zones calculated as requiring a runway separation of a nominal 2000m (currently shown as 1988m)
- Runaway length of 3500-4000m (currently shown as 3900m)
- Sufficent width to the side of the runways to allow a perimeter road with a nominal 5.5m headroom not to infringe the safeguarded 1:7 side slope
- Ability to taxi around the ends of the central pair of runways without infringing the 1:50 approach or take off climb surfaces and so avoid runway crossings by aircraft
- Cruciform geometry for the gates and stands of the terminal and satellites to give the optimal 45 minute intra terminal MCT, and an inter terminal MCT of 60 minutes, which balances walking distance against the number of transit stops
- Space for a taxiway network that will minimise delays to aircraft movement on the ground by providing taxiways to the rear of the stands and so avoid the need for aircraft to be pushed back onto the main parallel taxiways with a single control tower at the centre of the operational airport

- Space for essential airport activities - terminals, satellites, and aircraft maintenance, cargo and ancillary facilities .
- Space for some activities that benefit from being immediately adjacent to the airport such as, hotels, airport offices, car parking and logistics centres
- Each of the two terminals sized to handle 90mppa and has its own public transport interchange
- Most of the stands have the ability to handle either a single long haul wide bodied aircraft or two narrow bodied short haul aircraft in MARS configuration to give operational flexibility.

A more detailed layout of part of the airport is illustrated in Figure 6–2 below. It shows the ability for most stands to handle either a large wide bodied aircraft or two narrow bodied aircraft.

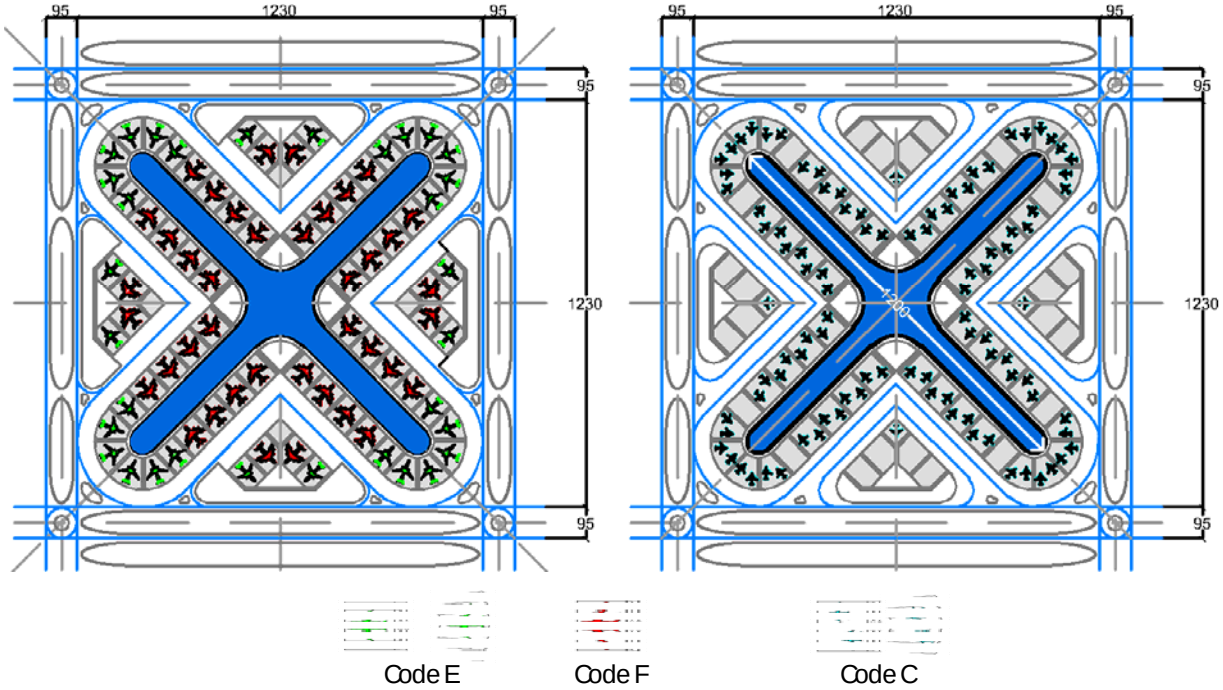
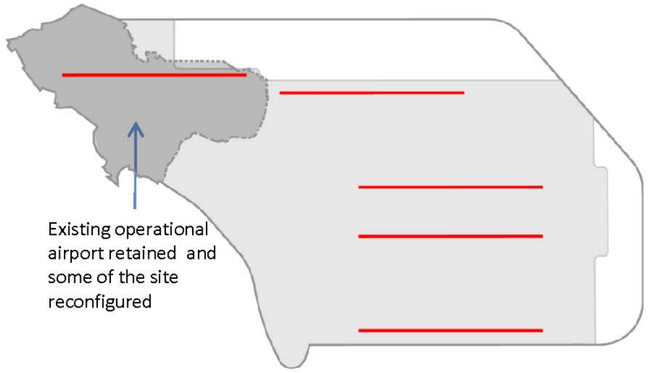


Figure 6–2 - Typical satellite layouts showing MARS stand capability

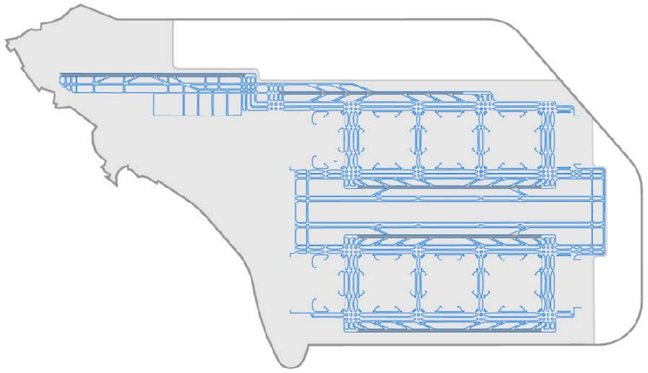
The resultant overall size of the airport site has been benchmarked against the world's top 20 existing airports (by volume of traffic), and also against published airport master plans for airports planned to deliver over 100mppa.

The key concepts that underpin the master plan are illustrated in Figure 6–3 overleaf.

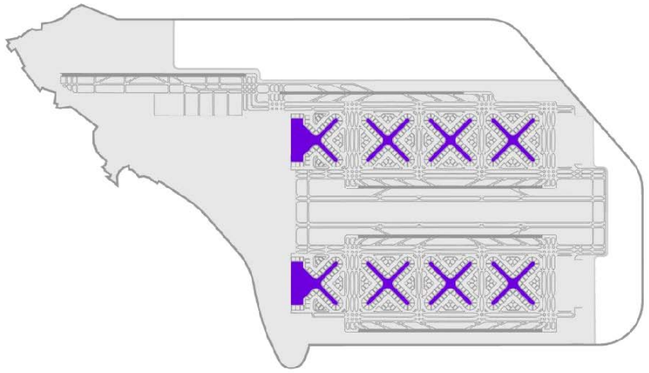
Runways - 3 independent and 2 dependent runways delivering a high capacity hub operation, circa 1.1 million movements per annum at 75% utilisation



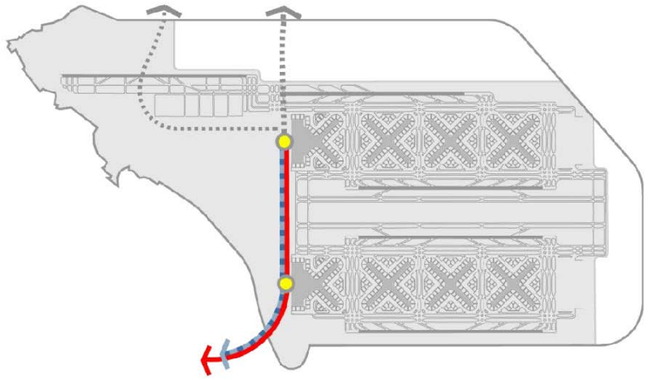
Taxiways - network maximises efficiency & minimises delays by providing End Around Taxiways eliminating runway crossings



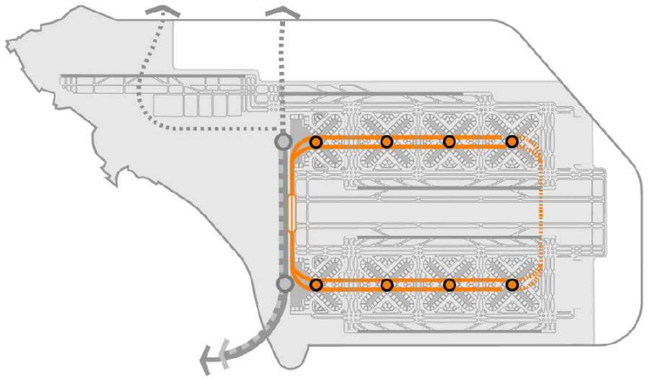
Terminals - Flexible airline hub facilities with twin terminals and satellites providing capacity for 180mppa



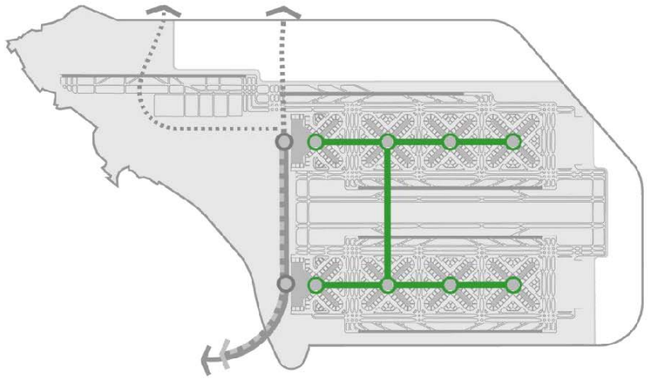
Surface access - public transport interchanges prioritises rail and coach services supporting a world class public transport mode share



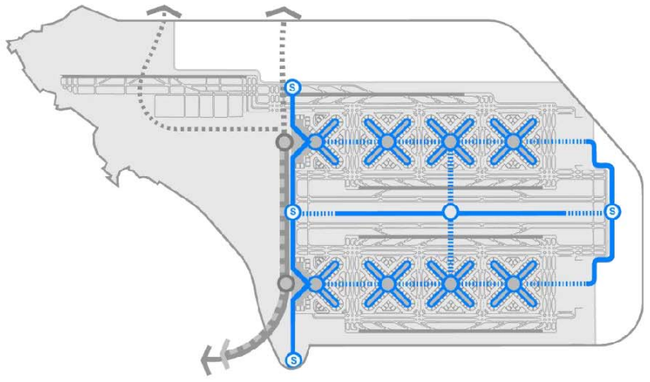
Hub transfers - with world class connections via airside people movers delivering 45 - 60 minute minimum connection times



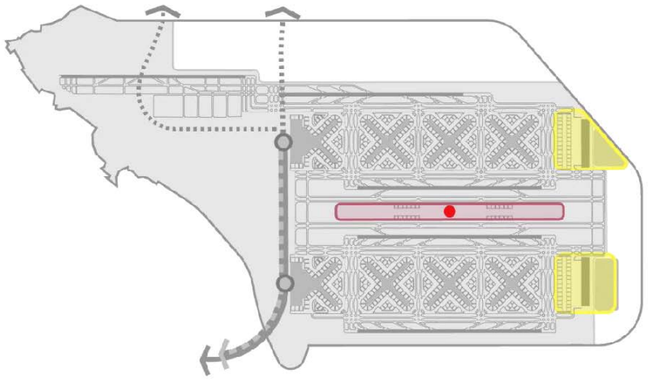
Baggage system - decentralised build & break for efficiency & performance supporting hub transfers



Airside roads - A resilient network linking operational areas



Airport & airline technical support facilities - for airline line maintenance, freight and general airside operations



Landside zones & airport city - encompassing hotels, offices, conference & logistic support facilities, developed by the private sector

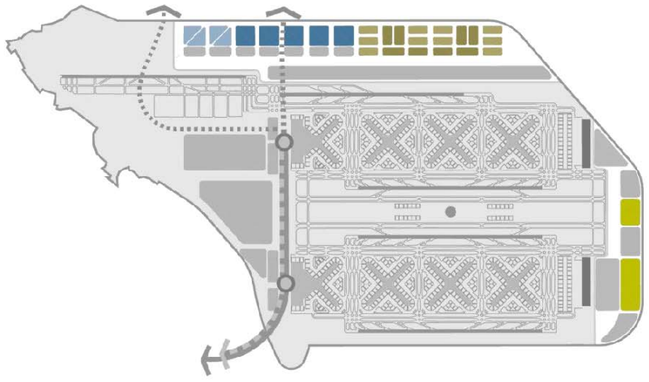


Figure 6–3 - Master plan concept diagrams

7. Phasing

The airport is assumed to open in 2029 with a capacity of 90 million passengers per annum (mppa) and expands in a modular fashion through to 2050 with a capacity 170mppa and able to grow to 180mppa if demand requires.

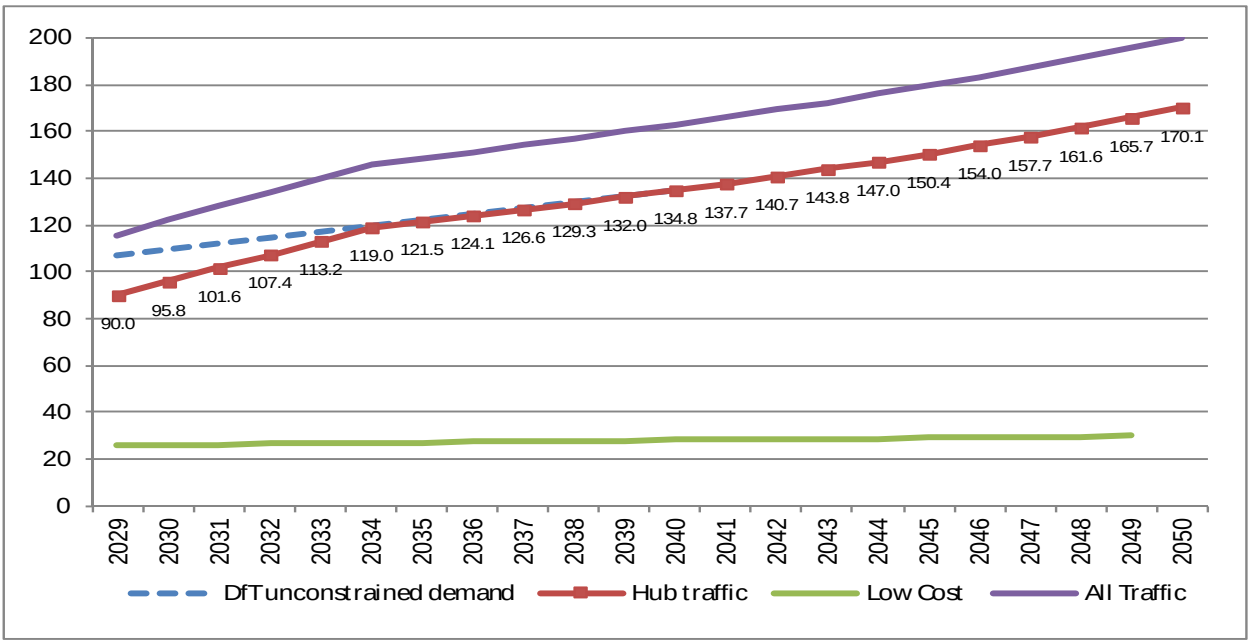


Figure 7–1 - Growth profile

The development is planned in phases delivered just in time to meet demand. Figure 7–2 below show the anticipated dates at which each of the phases will open to satisfy the anticipated growth profile.

It is planned to open the main terminals with processing capacity for 60mppa each (a total of 120mppa) and then add capacity in two increments, of 15mppa, provisionally in 2035 and 2045, to give an overall capacity of 90mppa in each terminal (a total of 180mppa).The satellites will be extended more progressively as demand increases by adding an arm, to the cruciform in each phase each serving an additional 14 to 16 stands.

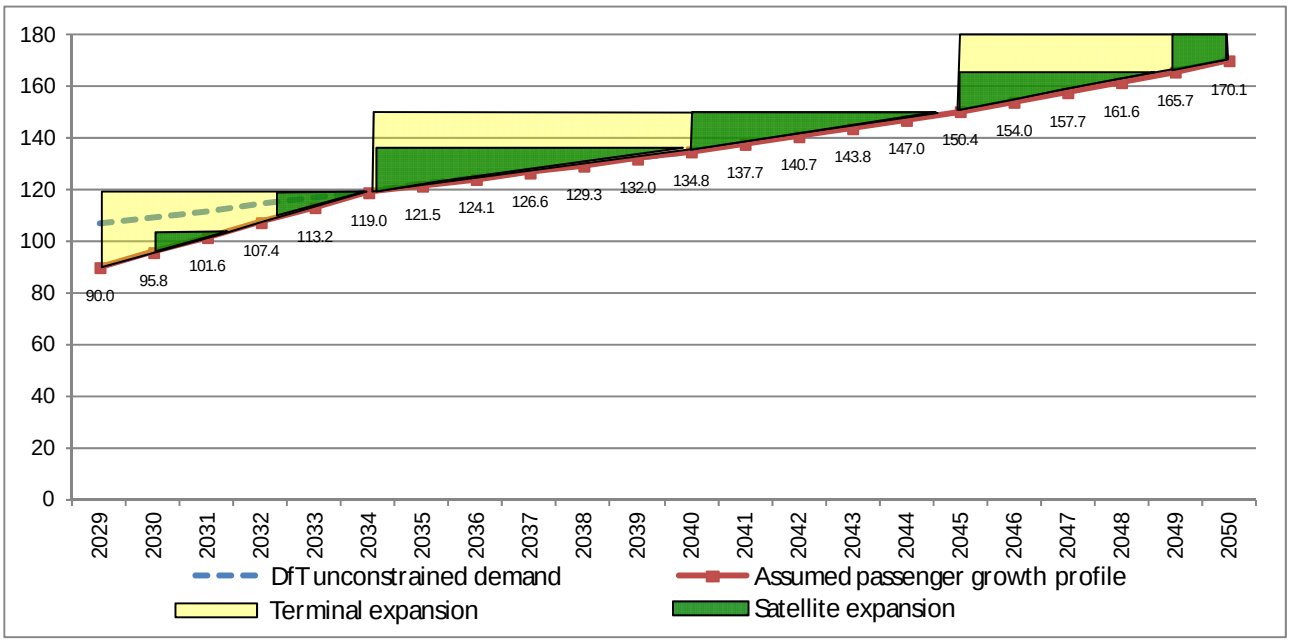


Figure 7–2 - Airport phasing

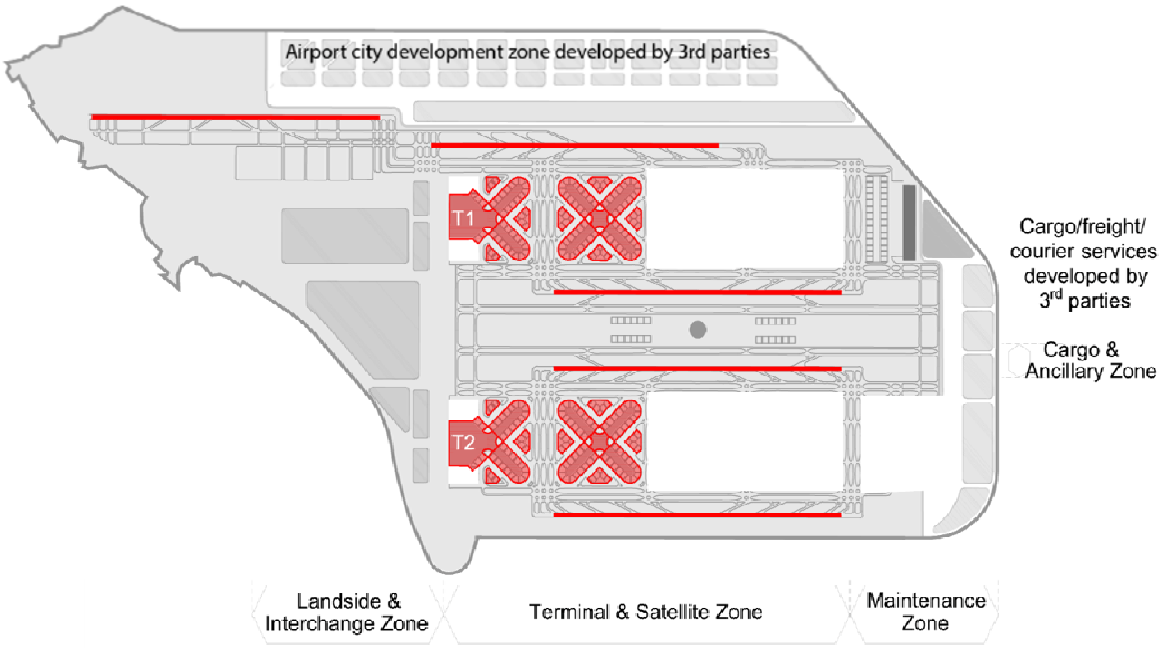


Figure 7–3 - Phase 1 layout

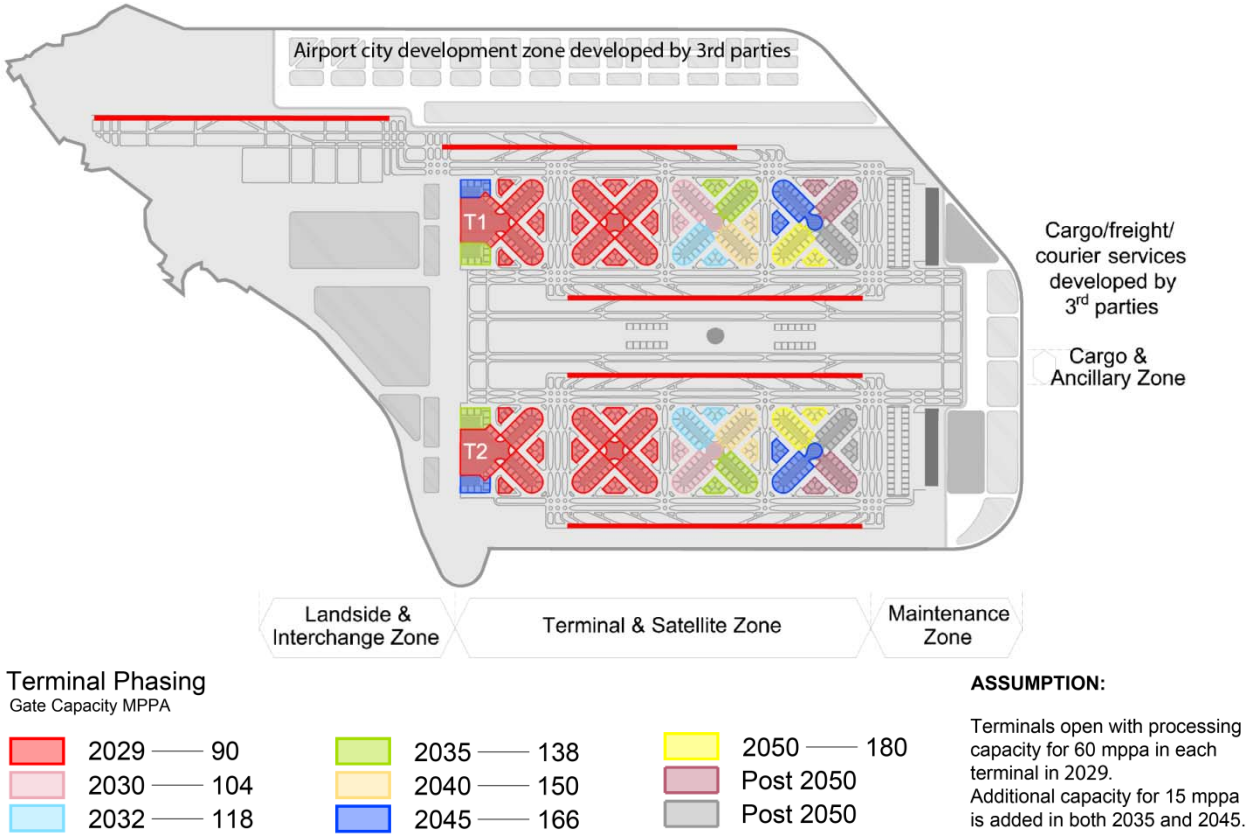


Figure 7–4 - Phase 2 layout

8. Operational viability

8.1. Safety standards

The new airport, its runways, taxiways and operational areas are set out to in accordance with CAA safety standards (CAP 168 - Licensing of Aerodromes and CAP 738 – Safeguarding of Aerodromes). A notional10^{-5} public safety zone has been used to inform the setting out of the runways by checking that the safety zones would stop short of populated areas including Thaxted. As the size of the safety zone is dependent on the frequency and type of services this will have to be rechecked at a later date to inform the final runway setting out. The particular requirements for baulked landing movements that are associated with the dependent operations on runways one and two (the two north west runways) have been accommodated in the 5 runway configuration.

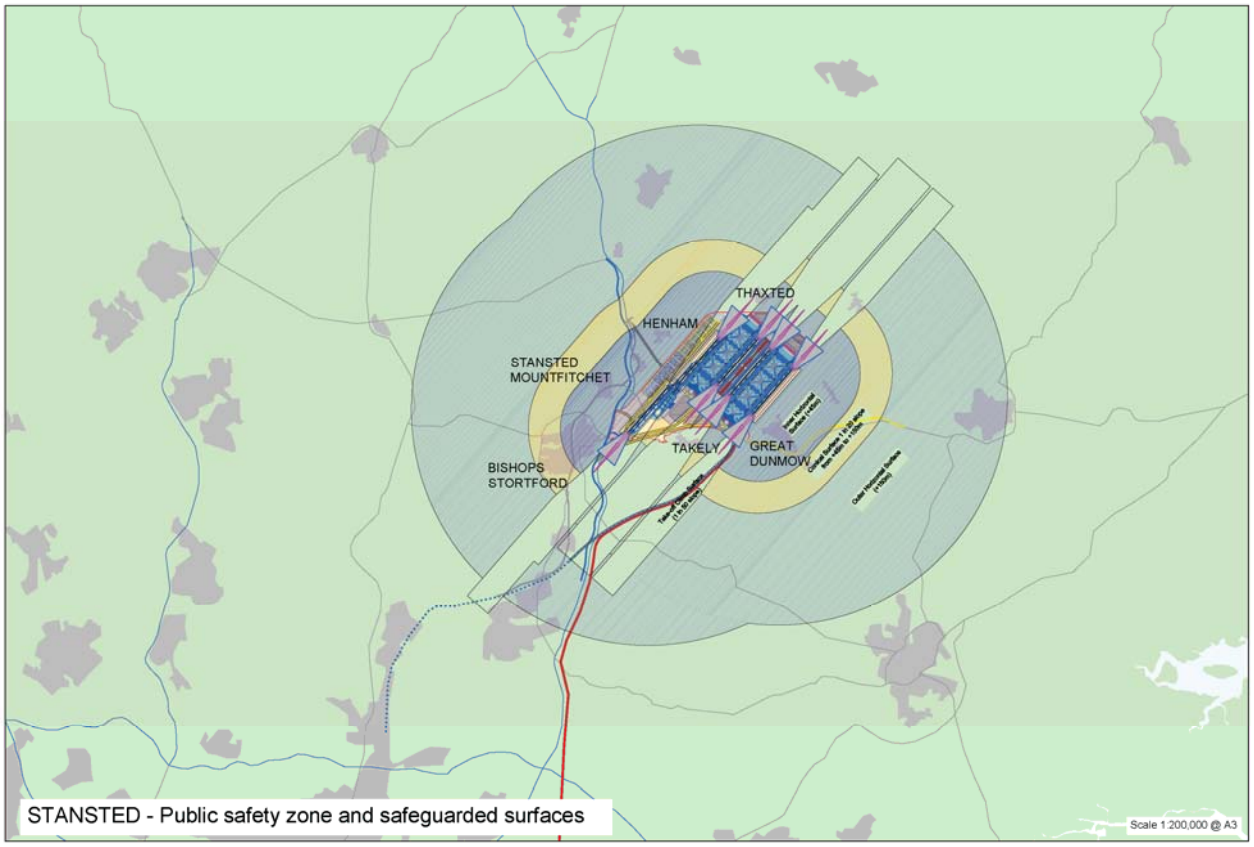


Figure 8–1 - Public safety zones and safeguarded surfaces

8.2. Airspace

Overall this study has assumed that the airspace in the South East of England and further afield can be re-designed and implemented over the years it will take to deliver a new hub airport. Preliminary consultation with NATS indicates that an airport in this location and of this configuration and size could be accommodated within redesigned UK airspace and be provided with operational resilience.

For the purposes of noise modelling only notional flight paths for the Stansted site have been developed in relation to standard instrument departure routes (SIDS) and standard arrivals routes (STARS) and utilising the current beacons. It is anticipated that new hold locations will be developed in conjunction with NATS although with planned annual runway utilisation of 75% in conjunction with widespread use of flow management between the originating airport and the new hub limited use will be made of them.

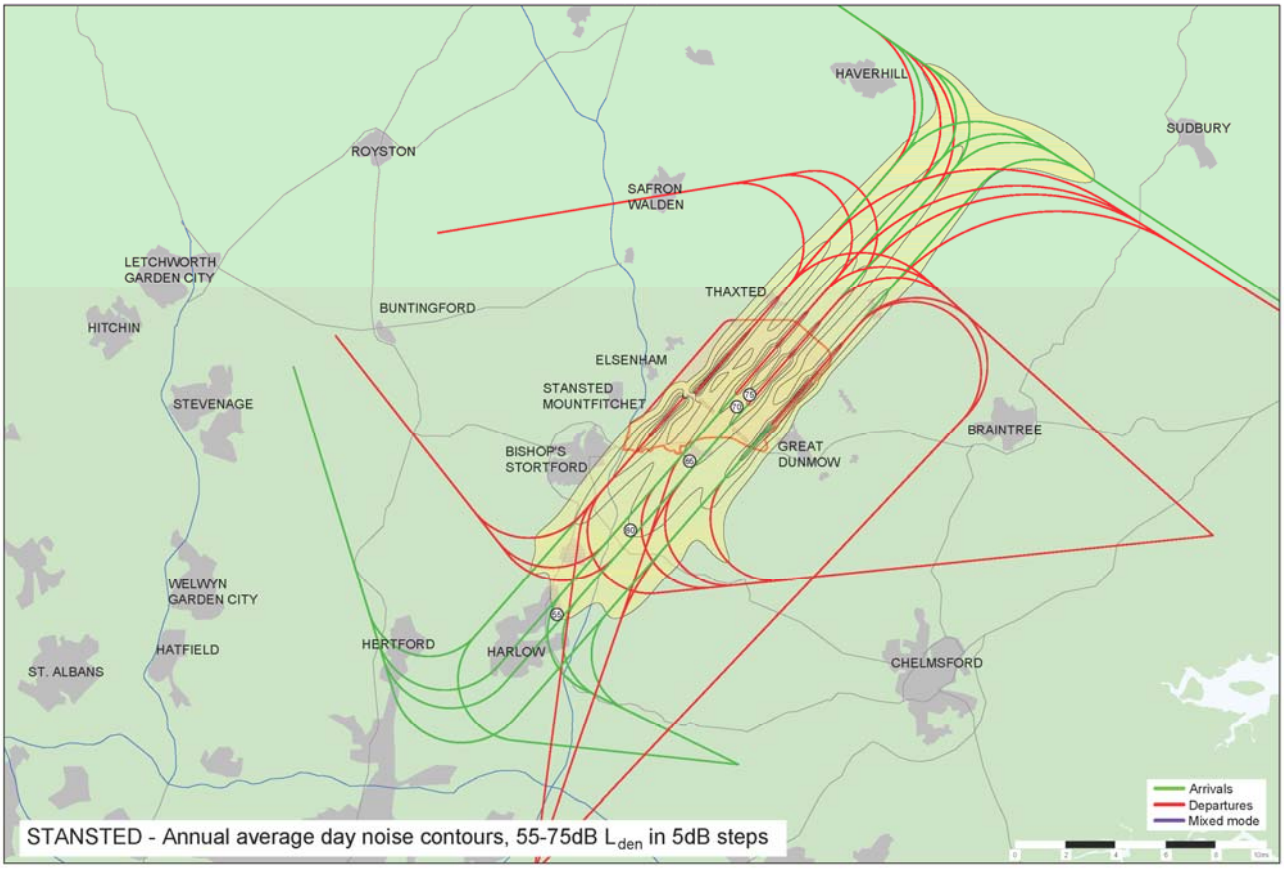


Figure 8–2 - Notional flight paths

8.3. Bird strike

The airport will be developed in accordance with the recommendations of the Civil Aviation Authority CAP 772- Bird strike management for Aerodromes. Specific measures will include developing a bird control management plan (BCMP), the avoidance of planting fruit bearing trees and shrubs, maintaining weed free grass at a height of 150 to 200mm, and the covering of water run-off balancing ponds with netting. Habitat compensation measures are discussed in the section on the environment.

8.4. Runway Orientation

The location and orientation of the new hub airport is compatible with the requirements for the continuing operation of the existing airport on the basis that the existing runway and the most north-westerly of the new runways were to operate in segregated mode (rather like Madrid Airport).

The orientation of the airport, presented here, is based on the existing orientation of Stansted's current runway. The North East / South West orientation takes into account the prevalent wind direction. An East West orientation is not proposed as it is believed to cause greater conflict with Luton Airport's airspace, and potentially brings new population within the noise footprint. Wind rose data from Stansted has been used to confirm that the cross wind component is compatible with modern aircraft types. ICAO Annex 14 Volume 1 – Aerodrome Design and Operations (Jul 2009) requires runways to be available 95% of the time in relation to wind conditions and advises that the cross wind component should not exceed 20 knots on more than 5% of the time. Winds greater than 21 knots, from any direction, are typically experienced at Stansted less than 1% of the time, whilst winds greater than 17knots occurs less than 4.3% of the time, hence the cross wind component will not exceed the ICAO recommendation. The wind rose data for Stansted is consistent with the prevailing winds across the South East of England and as such the airport would not be expected to experience any increase in operational impacts due to wind than other South East airports.

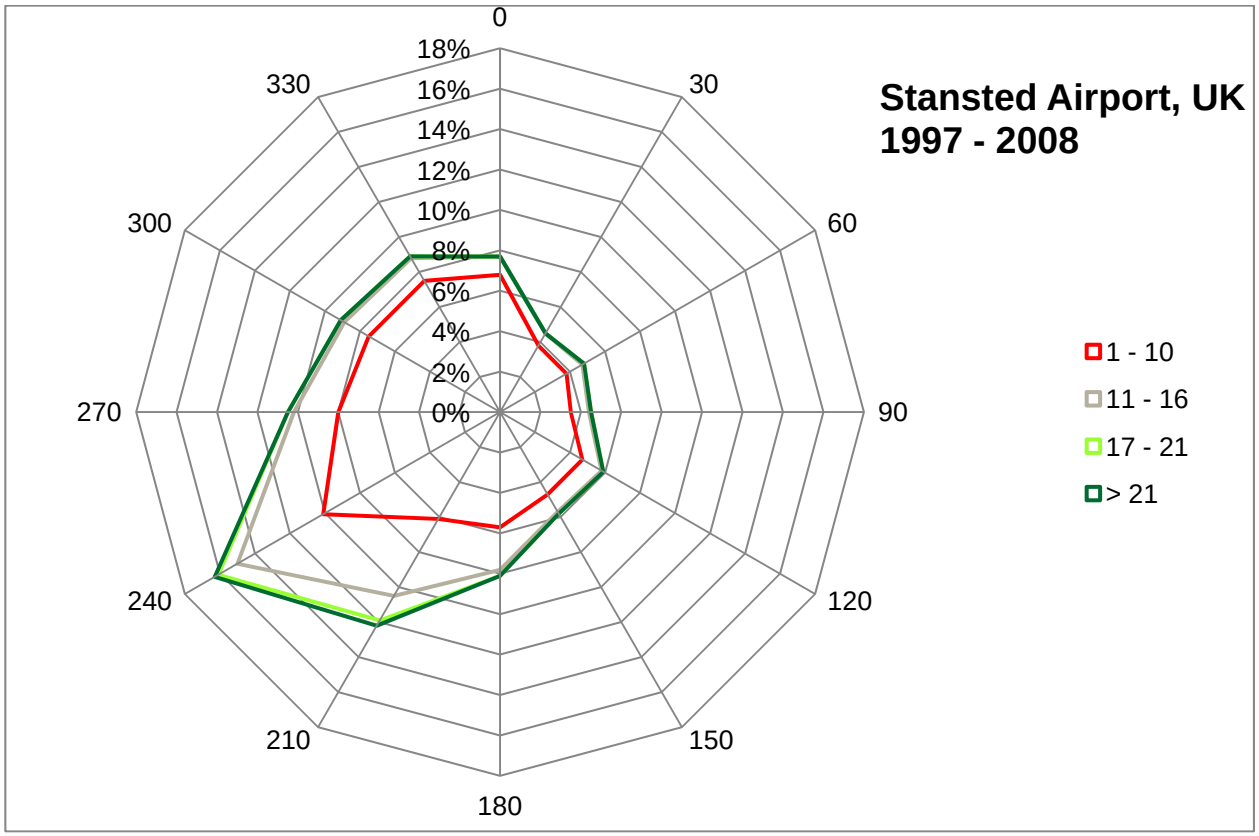


Figure 8–3 - Shoeburyness wind rose

8.5. Operational resilience

Operational resilience is built into the master plan by adopting internationally recognised best practice and by incorporating the following initiatives that will ensure the highest standards of safety. The measures will also minimise ground movement delays and facilitate the smooth movement of aircraft, passengers and baggage under adverse conditions.

- Provision of triple taxiways parallel to each of the runways to allow both re-sequencing and contra flow of aircraft widening to four taxiways in the zone between the two dependent runways.
- One of these latter taxiways will be between the dependent pair of runways to facilitate movement between the existing and new parts of the airport.
- Provision of twin cross taxiways between each of the satellites.
- Quadruple cross taxiways at the runway ends between the terminal and first satellite.
- Quadruple cross taxiways at the runway ends between the furthest satellite and maintenance base.
- Rapid exit taxiways (RETs) and rapid entry taxiways (RATS) to and from each of the runways.
- Avoidance of cul-de-sacs that can require one aircraft to wait while another manoeuvres.
- Provision of 'end around taxiways', (EATs) to eliminate the need for runway crossings.
- Provision of a pool of remote stands adjacent to each of the satellites to avoid the need to tow aircraft on the main taxiways.
- Redundancy built into the transit, baggage and road networks.
- On site combined heat and power generation and dual links to separate parts of the national grid.
- Ability to receive aviation fuel both by land pipeline and road tankers.
- A centrally located control tower with clear sightlines to the airfield which is supported by the continued operation of the existing facility.
- State of the art navigation aids.

Airport Team
Atkins
Woodcote Grove
Ashley Road
Epsom
KT18 5BW

info@atkinsglobal.com