



Application of Wake Turbulence Separation at London Heathrow

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Heathrow Vital Statistics

Passengers per year 67 Million

Aircraft movements per year 470,000

Traffic Mix 31% Heavy, 69% Medium or below

	Typical	Busiest
Day	1350	1382
Hour	88-92	100

Inbounds 42-44

Outbounds 46-48



Noise Restrictions

Runways 27L & 27R

Runway Alternation:

Landing runway changes at 15:00

06:00 to 15:00

15:00 to 23:30

Runways 09L & 09R

Landing Runway 09L

Departure Runway 09R

TEAM

In peak periods allows up to 6 additional landing aircraft on the Departure runway

Wake Categories



ICAO				
LIGHT	MEDIUM		HEAVY	
<7,000kg	>7,000kg <136,000kg		>136,000kg	
NATS				
LIGHT	SMALL	LOWER MEDIUM	UPPER MEDIUM	HEAVY
<17,000kg	>17,000kg <40,000kg	>40,000kg <104,000kg	>104,000kg <162,000kg	>162,000kg
Pa34 DA20	DHC7 FK70	A318 FK100	A321 TU54	B757 B707 DC8
				A300 B747



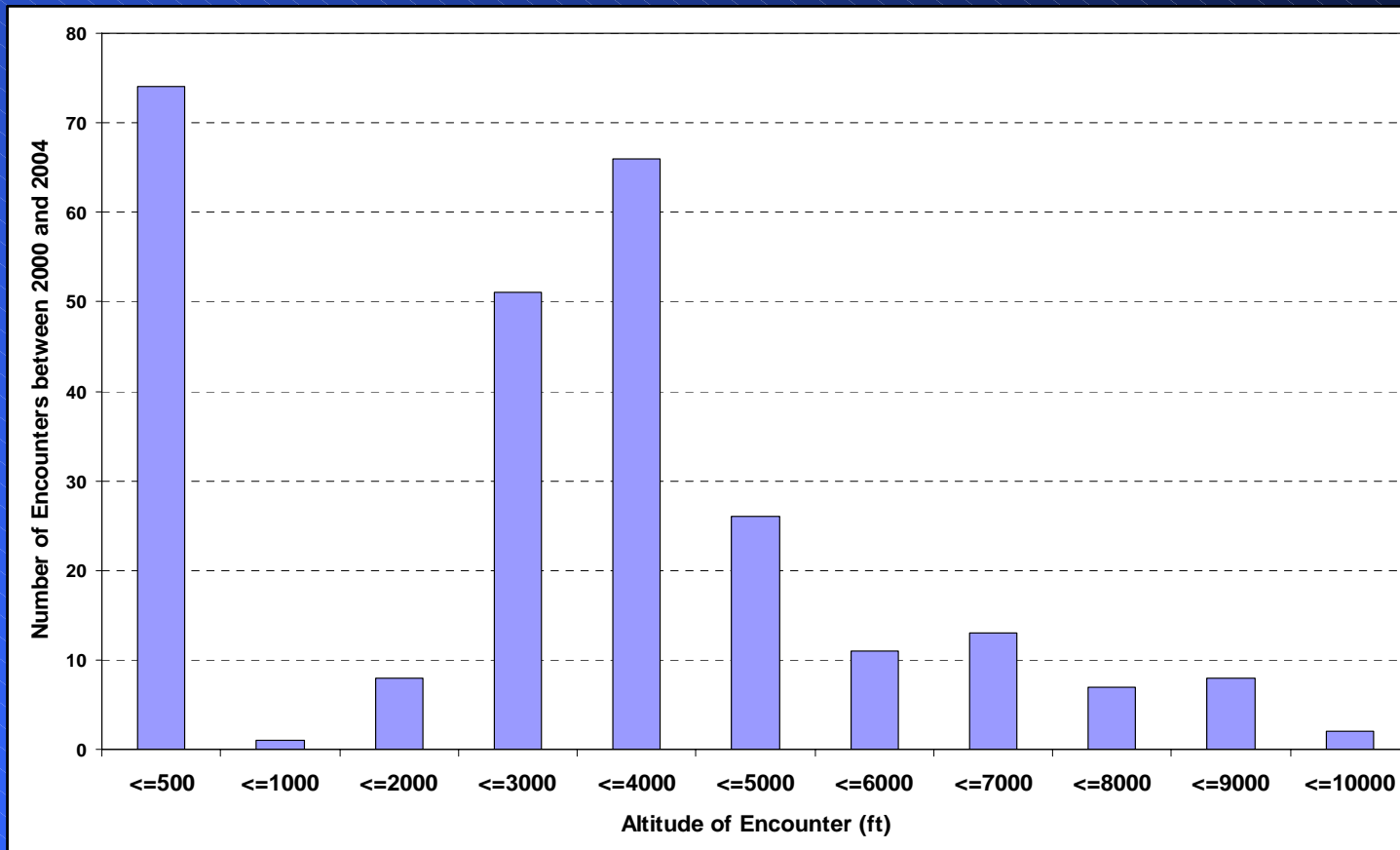
Separation Requirements are;

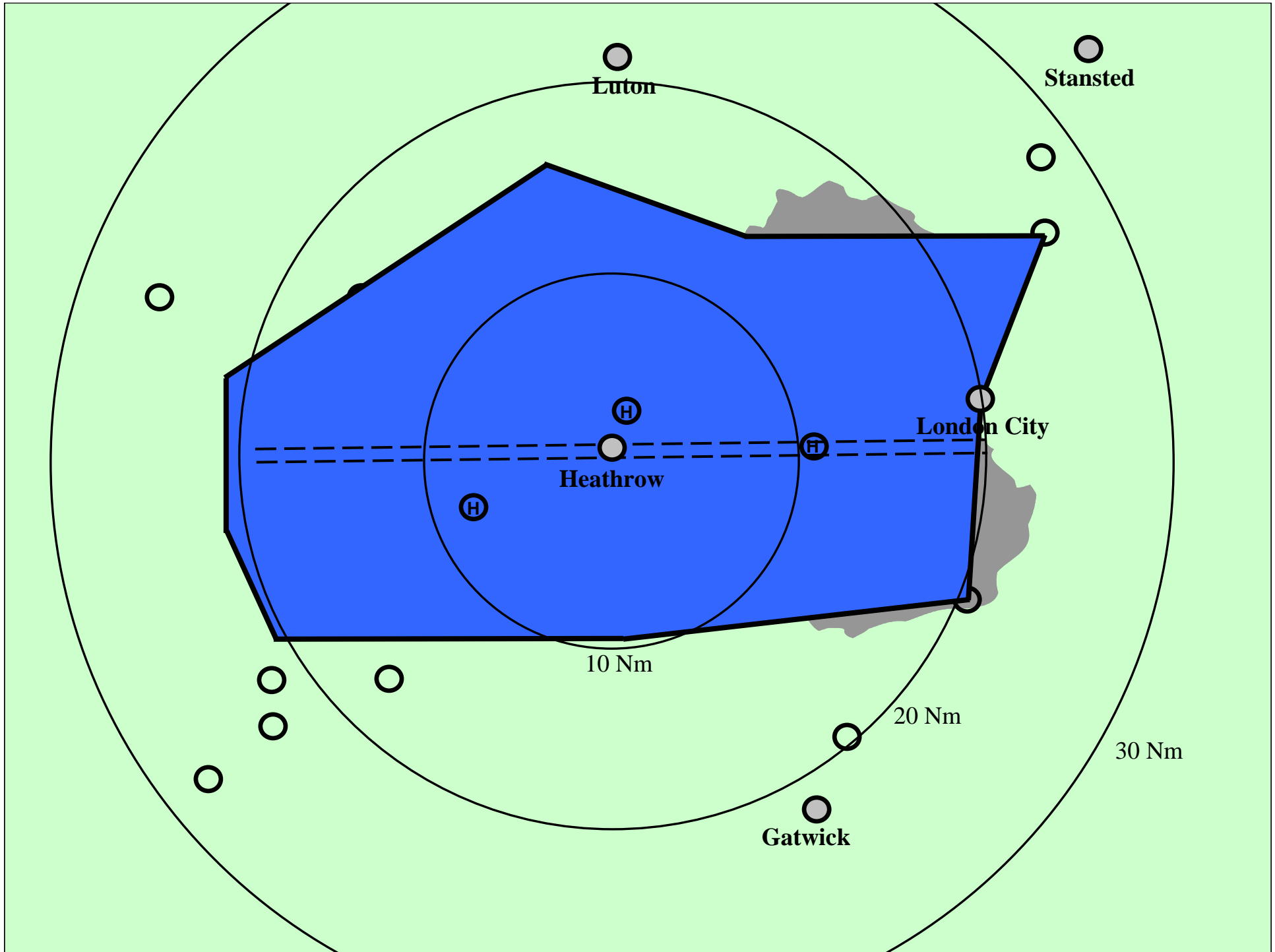
LEADER	FOLLOWER	SPACING (NM)
Heavy	Heavy	4
Heavy	Upper Medium	5
Heavy	Lower Medium	5
Heavy	Small	6
Heavy	Light	7
Upper Medium	Heavy	*
Upper Medium	Upper Medium	3
Upper Medium	Lower Medium	4
Upper Medium	Small	4
Upper Medium	Light	6
Lower Medium	Heavy	*
Lower Medium	Upper Medium	*
Lower Medium	Lower Medium	*
Lower Medium	Small	3
Lower Medium	Light	5
Small	Heavy	*
Small	Upper Medium	*
Small	Lower Medium	*
Small	Small	*
Small	Light	3
Light	Heavy	*
Light	Upper Medium	*
Light	Lower Medium	*
Light	Small	*
Light	Light	*

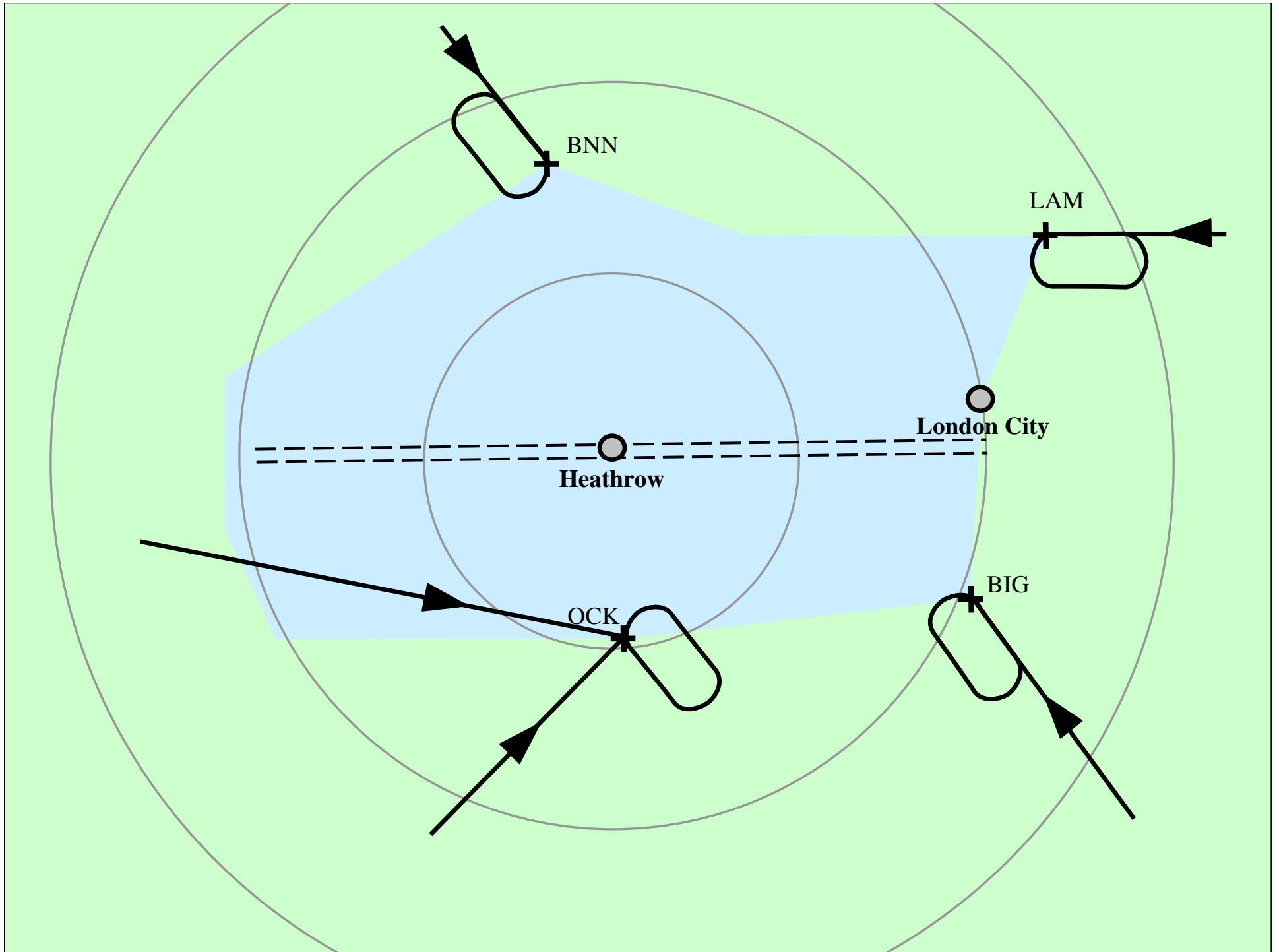
Notes:

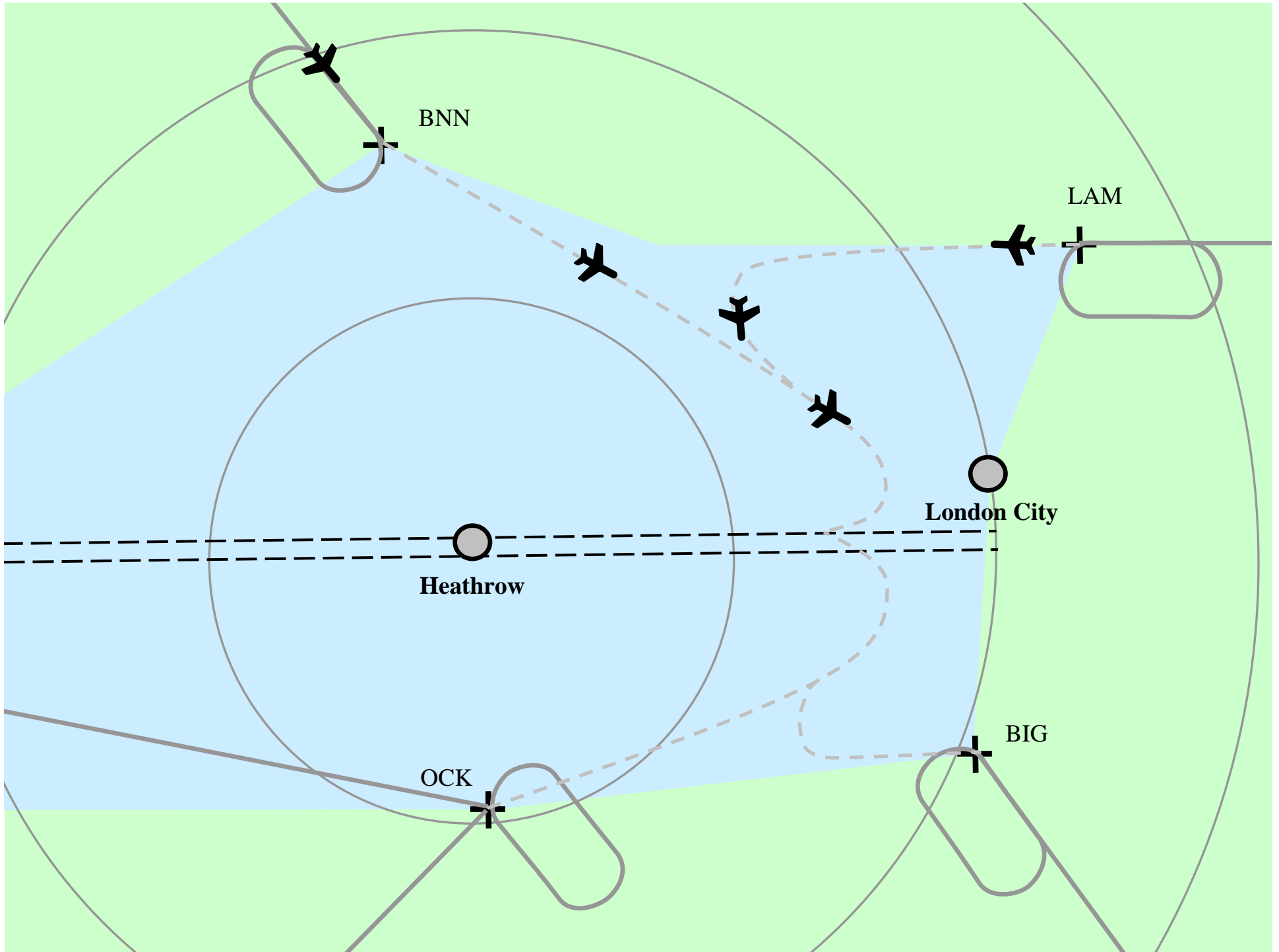
- Wake Vortex Separation applied to 4DME from touchdown.
- When the lead aircraft is inside 4DME and a reduction of ½ mile or more in the required wake vortex separation occurs, the pilot of the following aircraft must be informed.
- Heathrow Final Director (FIN) responsible for providing appropriate spacing to achieve this.
- Tower controller responsible for informing FIN of requirements related to runway occupancy time.
- Separation for Wake Vortex reasons is not necessary.
- Minimum radar separation on final approach 3nm.
- 2.5nm minimum radar separation can be applied under specified conditions.

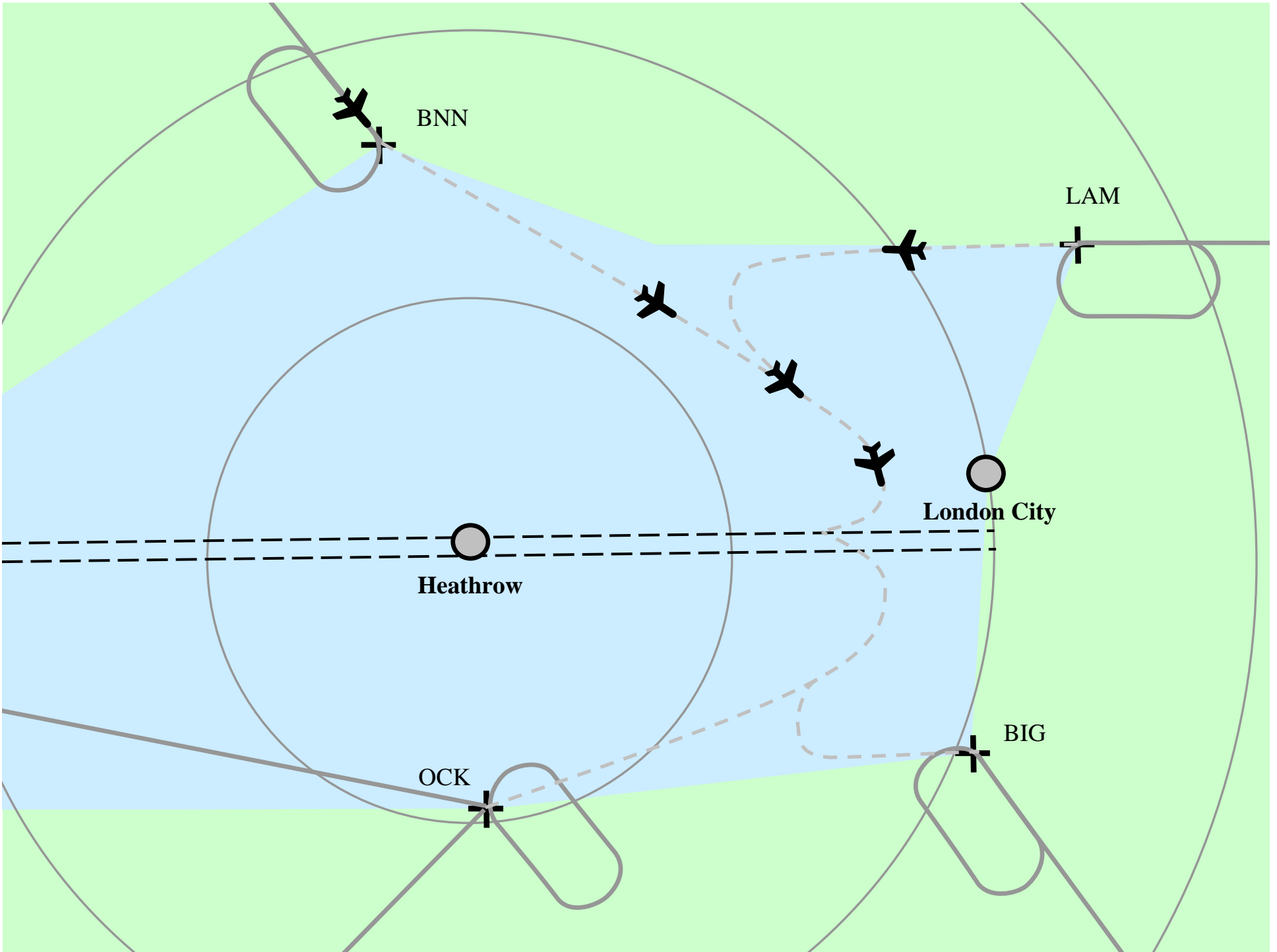
Wake Encounters by Altitude

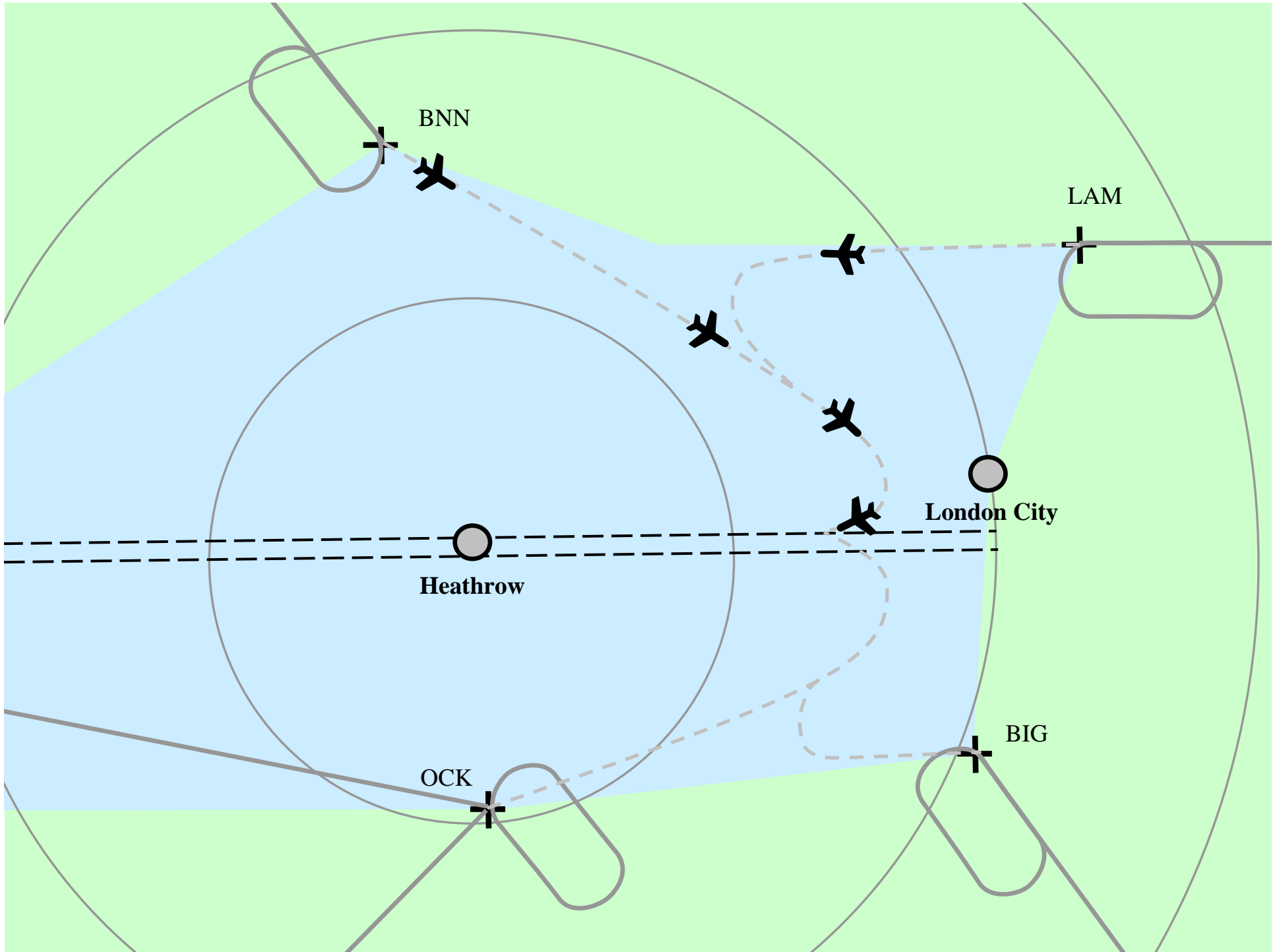


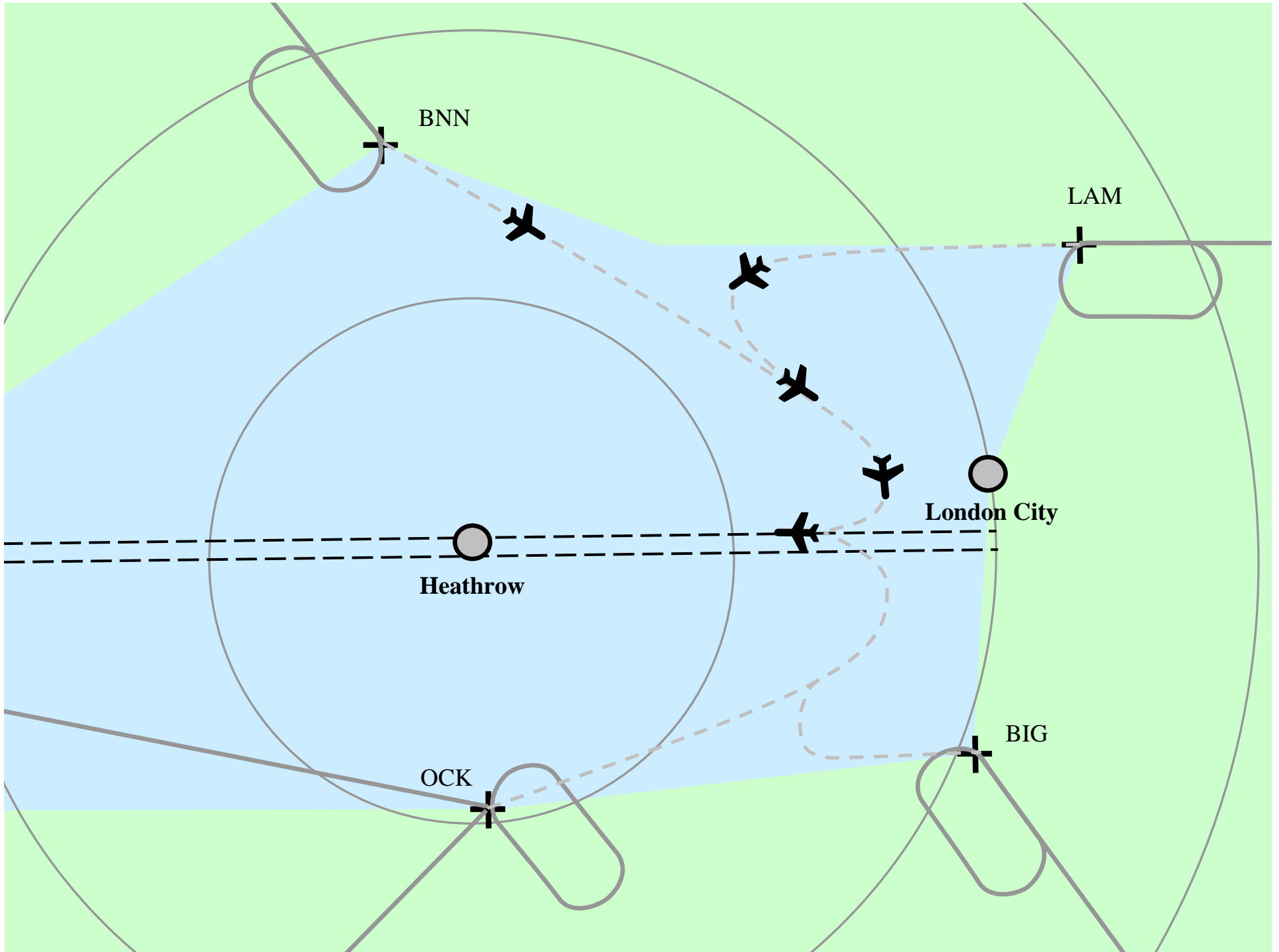








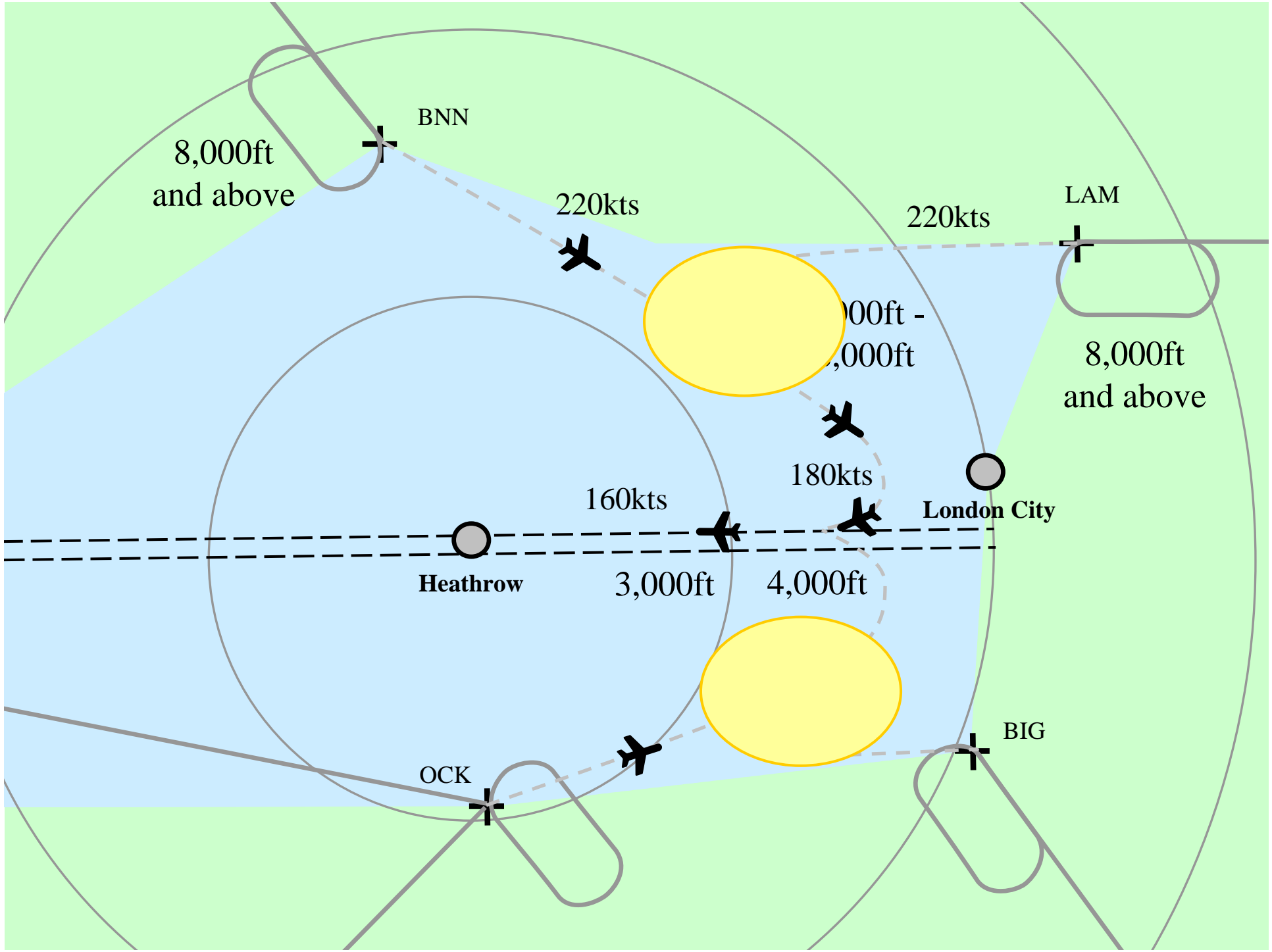




Intermediate
North (INT N)

Final
Director (FIN)

Intermediate
South (INT S)



8,000ft
and above

BNN

220kts

220kts

LAM

8,000ft
and above

3,000ft -
4,000ft

160kts

180kts

London City

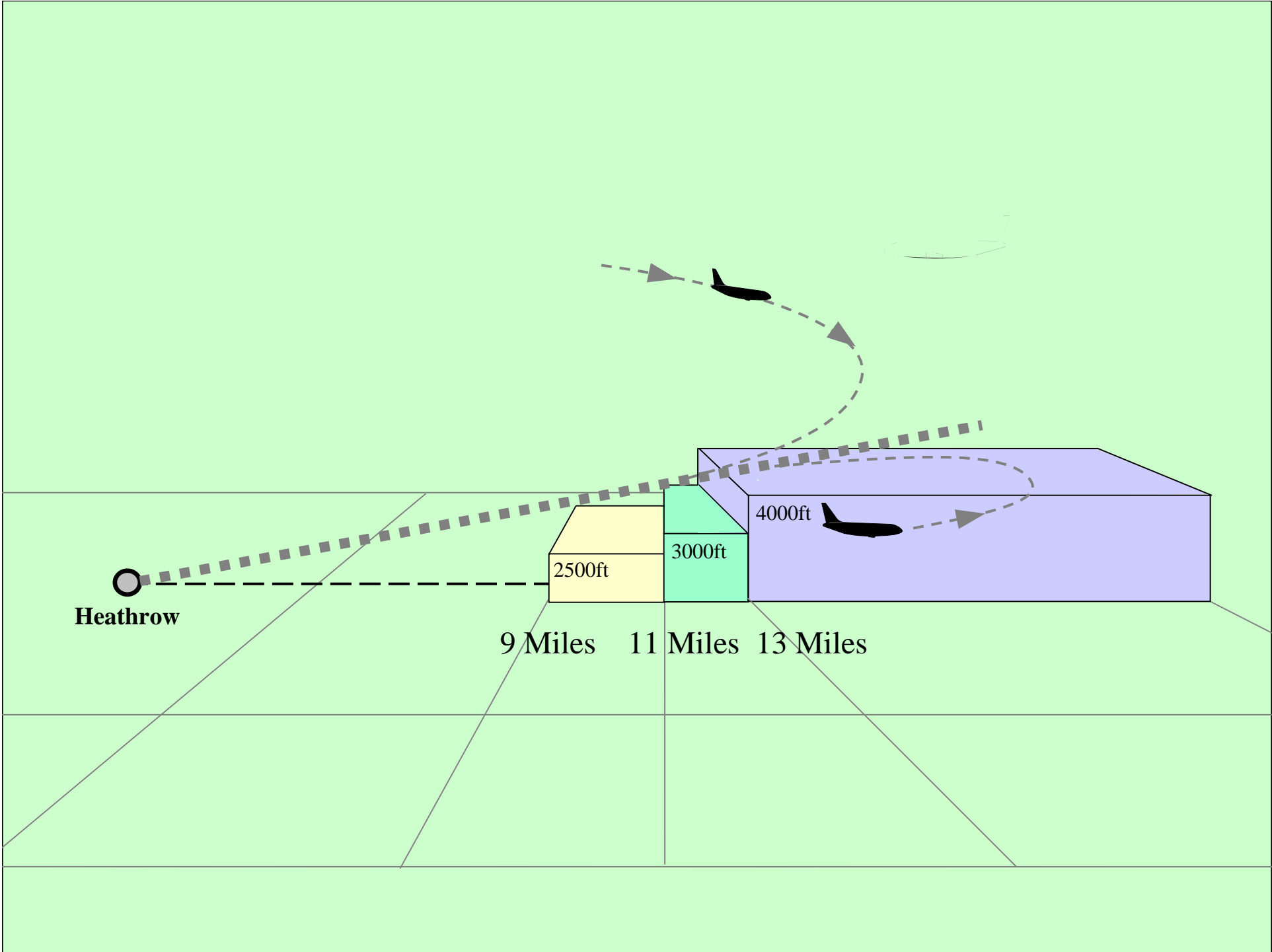
Heathrow

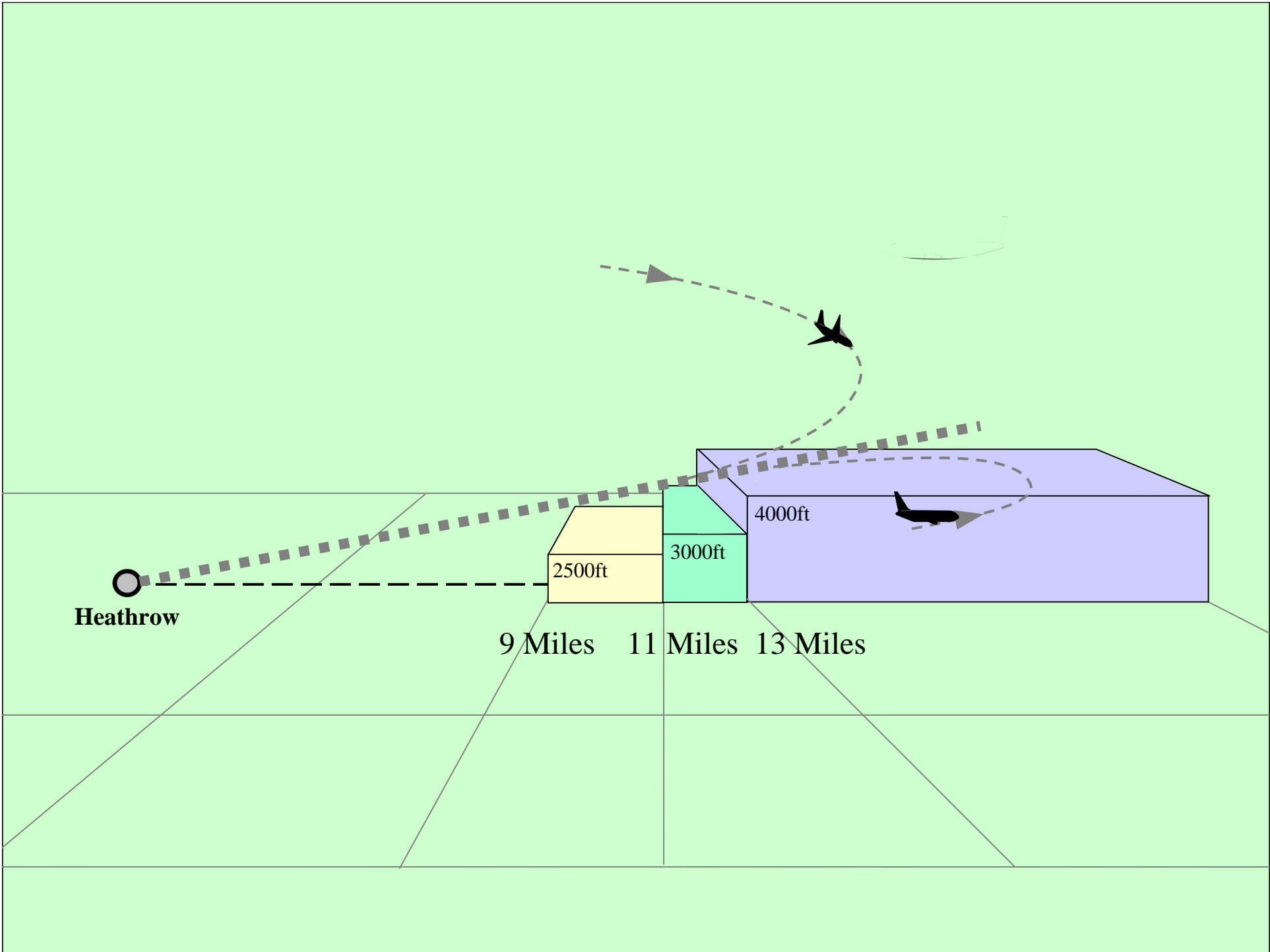
3,000ft

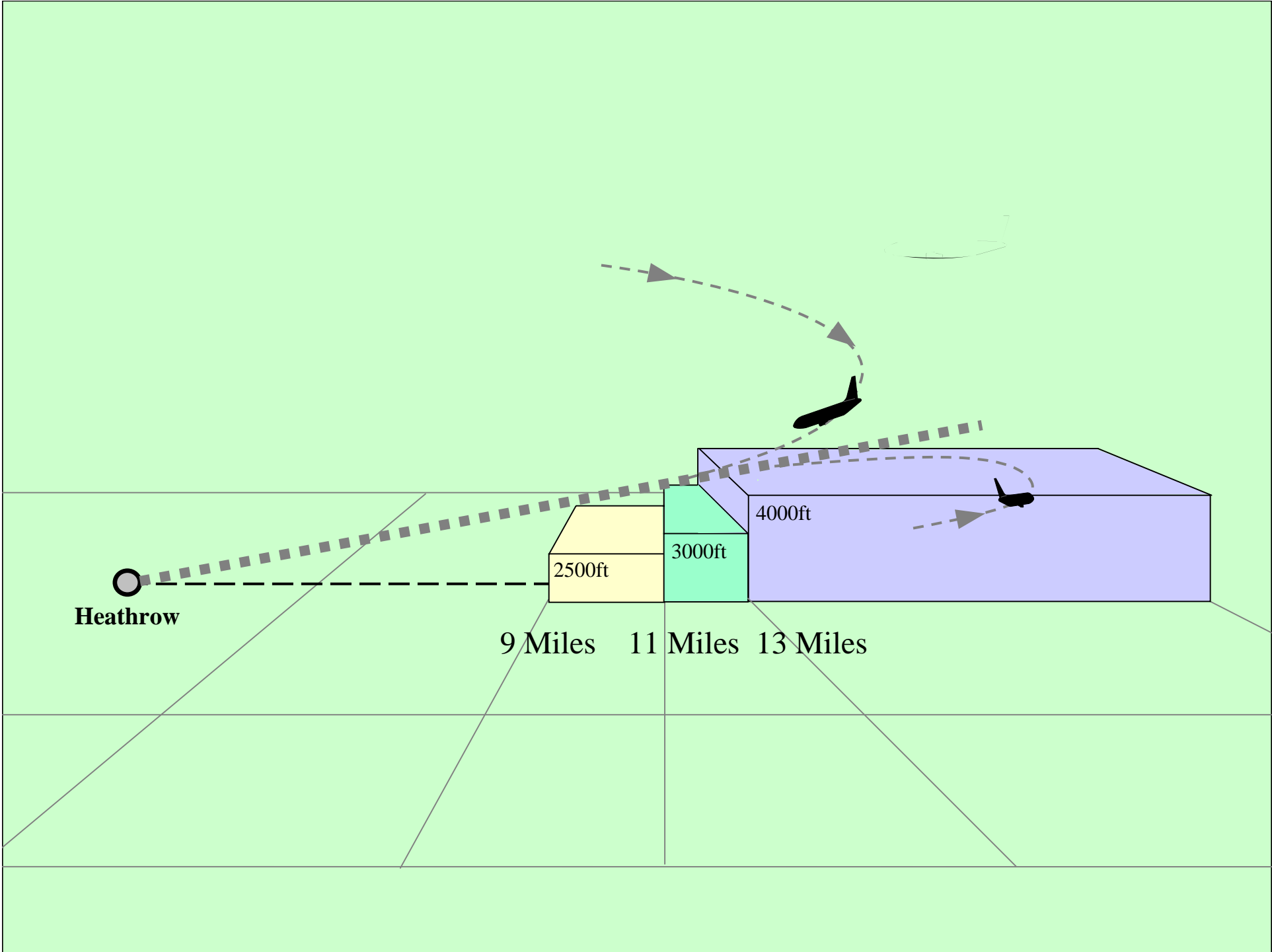
4,000ft

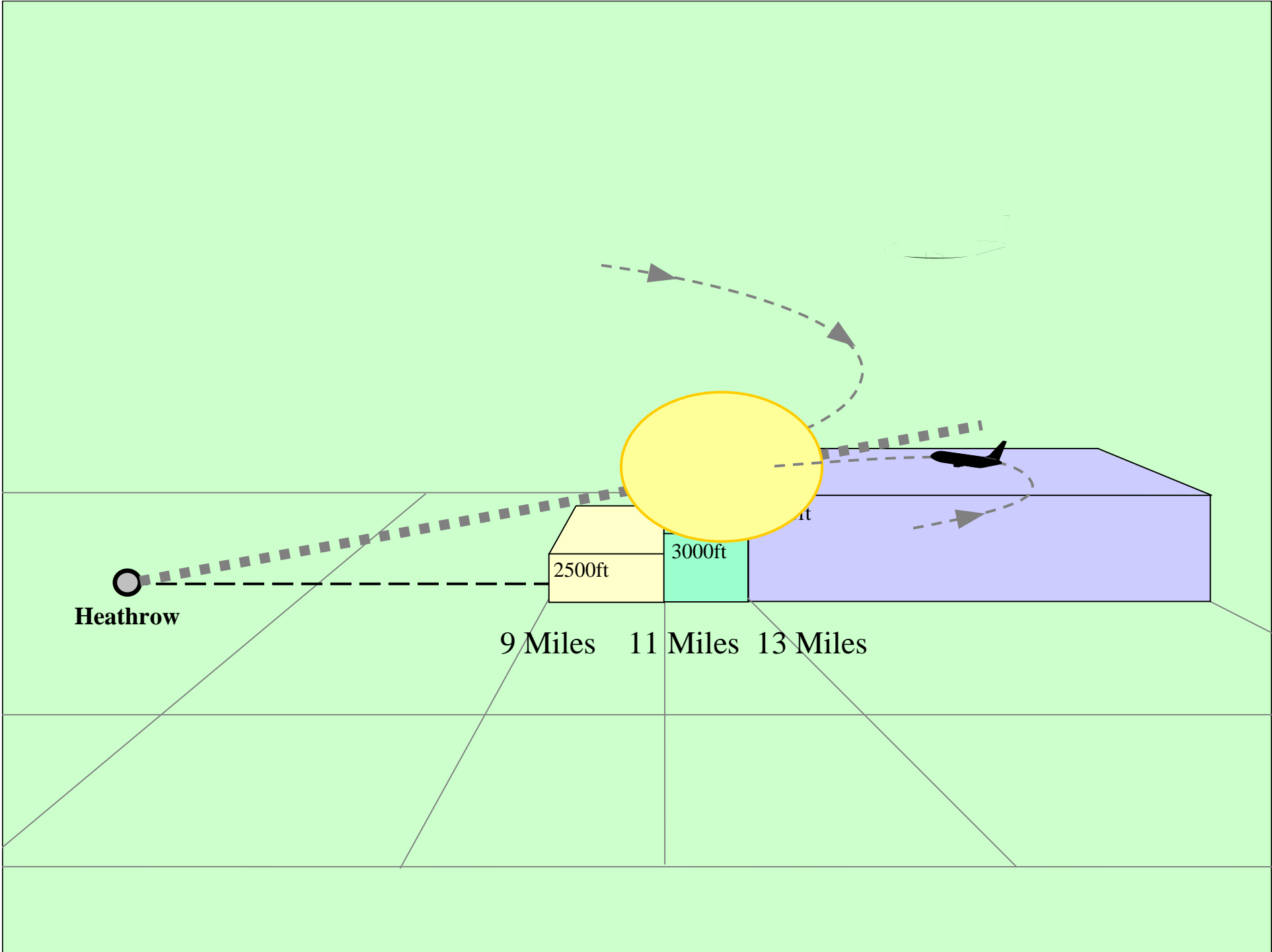
OCK

BIG

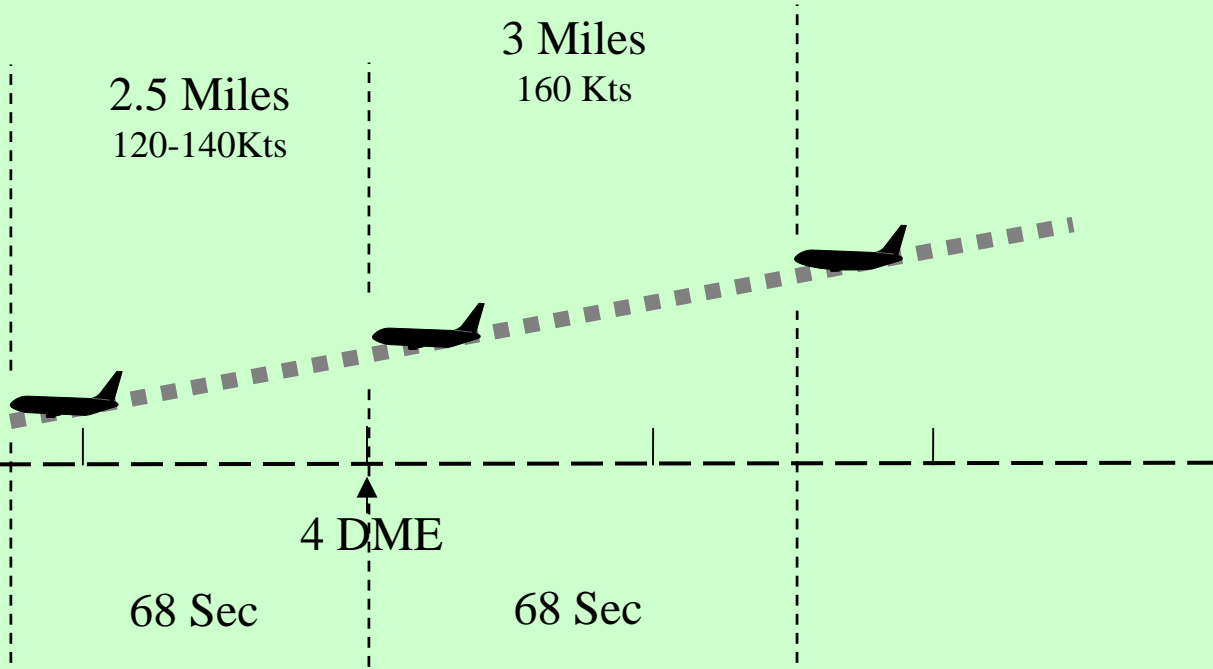








Heathrow



2.5 Miles
120-140Kts

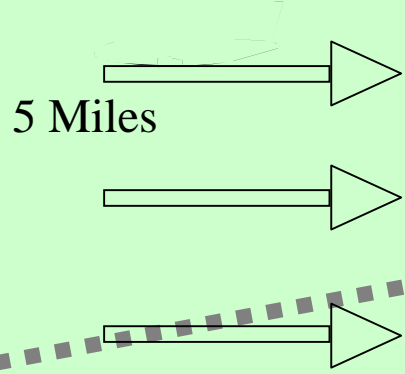
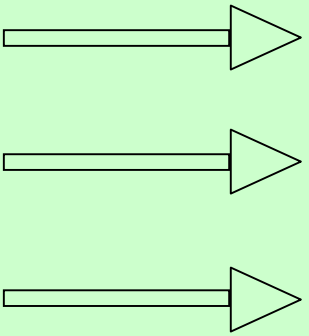
3 Miles
160 Kts

4 DME

68 Sec

68 Sec

No Wind



Heathrow

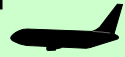
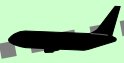
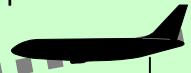
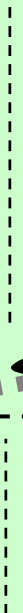
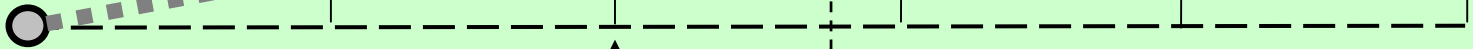
4.5 Miles

4 DME

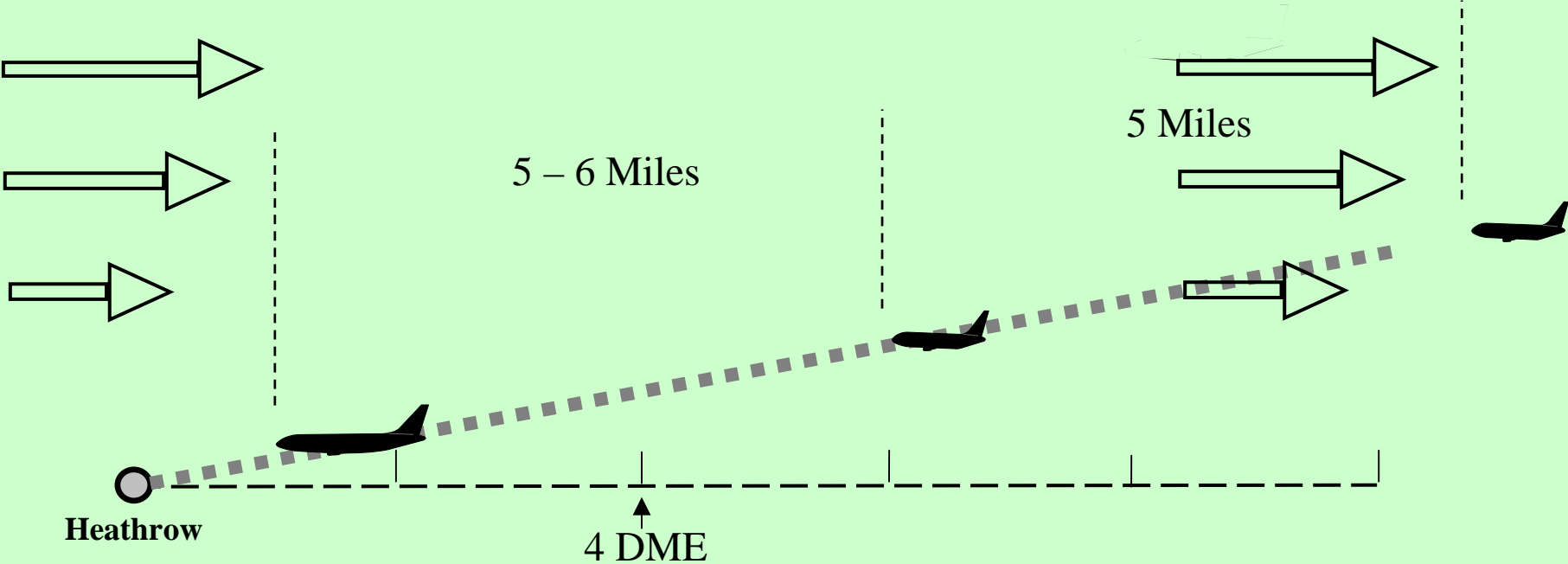
5 Miles

113 Sec

113 Sec

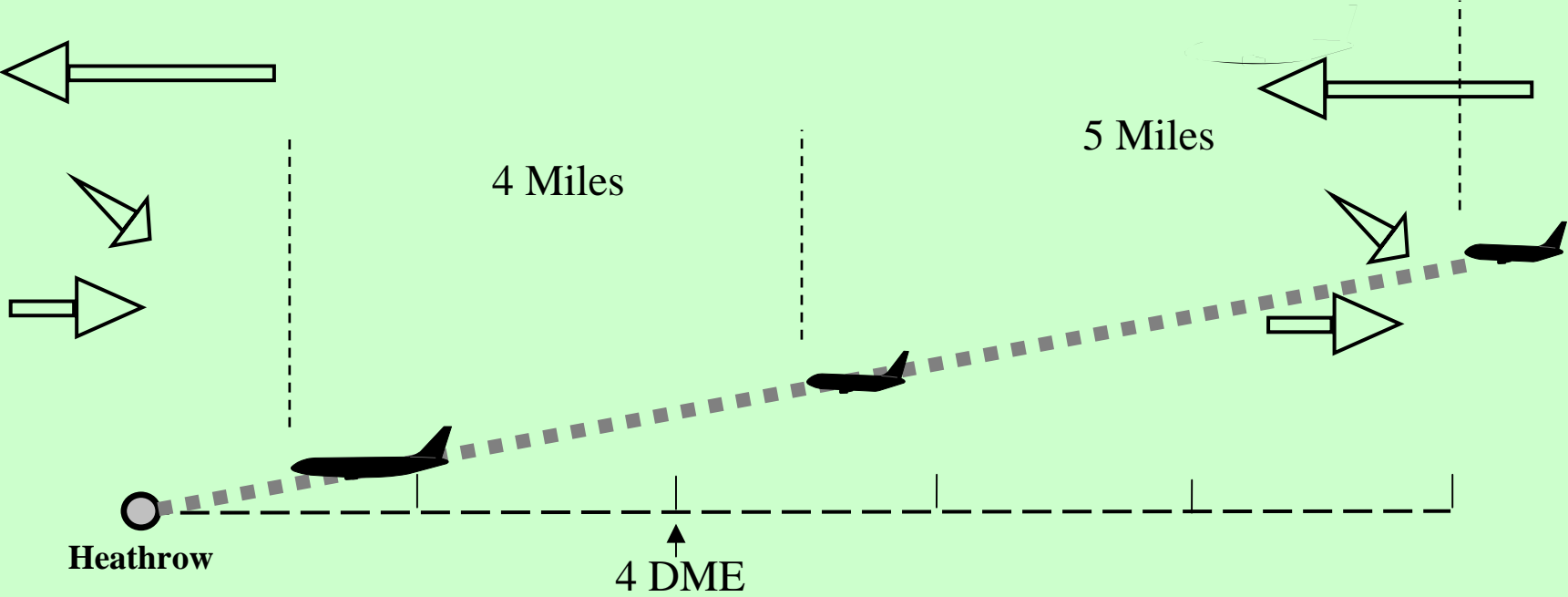


Headwind Wind



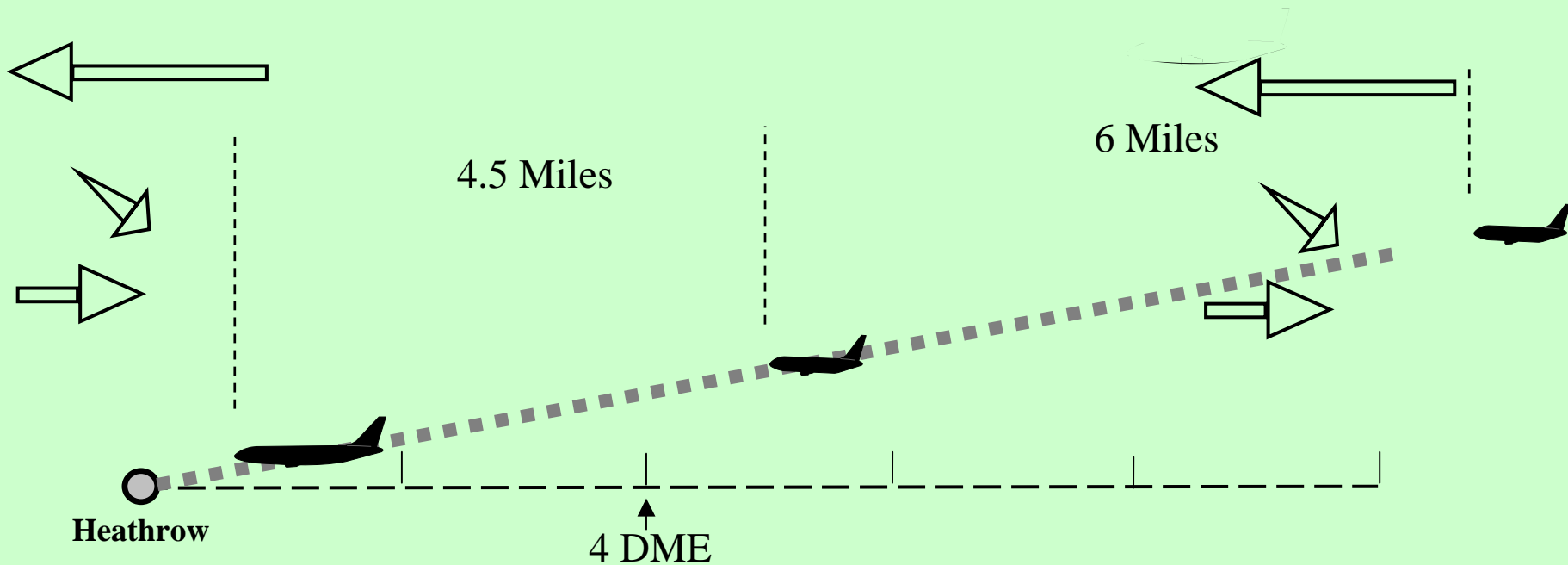
Pull Away situation causes
loss of runway capacity

Tailwind Wind



Catch up situation

Tailwind Wind



Catch up situation requires extra spacing outside 4 DME

Tower Requirements And Responsibilities



- Check Separation provided on ATM
- Inform pilot if catch up more than half a mile
- Monitor separation below 500ft
- Monitor runway occupancy time
- Monitor landing clearance margins
- Consider variation between types
- Provide feedback to radar

This is an interactive process

Tower Requirements And Responsibilities



Go-arounds

Typical go-around rates at Heathrow

Of the order of 50 per month (1-2 per day)

Normally only 1-2 per month due Wake Vortex

Strategies to avoid go-arounds

Approach and Tower controller interaction

Radar aware of type and speed variations

Inform pilot if catch up more than half a mile (visual)

Visual switch

Go-around

Preservation of separation



Departure Separations

Diverging routes

1 minute
(or less using visual separation)

Same Route

2 minutes
(alternatively 5 miles radar separation)

Wake Vortex

2 minutes
(3 minutes when departing from an intersection)

Summary



- Segregated parallel runway operation
- Large numbers of queued pairs
- Small amount of airspace
- Holding enables Batching of wake categories
- Approach pattern and Continuous Descent Approaches creates wake “hotspots” where traffic patterns merge and at 3000ft-4000ft on final approach
- Maximum half a mile catch up permitted inside 4 DME
- Aircraft performance and wind effects taken into account
- Interactive process between Tower and Approach to ensure that separation is preserved



Any Questions?