



# *Implications of Biofuel Mandate Design on EU Carriers*

A preliminary assessment for British Airways

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# Study Overview



1. Review potential design options for a biofuel mandate applied to aviation
2. Consider feasibility and implications of different designs for the sector
  - *N.b. no endorsement intended!*
3. Model the impacts of different design options on British Airways on selected routes
4. Consider implications for business overall and for similar EU carriers

# Mandate Design Options



## Fuel Supplier Mandate

- Similar to existing road mandates
- Difficult to see how to apply limited geographic scope
- Fewer obligated entities?
- Point of regulation required, as significant trading occurs
- Innovation incentives?

## Carrier Mandate

- Similar to EU ETS
- Could be on fuel uplift (similar to supplier mandate) or on fuel consumed
- Many carriers
- Many flights, but point of regulation relatively simple
- Possible to reduce tankering

**Target Level** (e.g. 4%, 10%)

**Compliance options** (allowable fuels, trading, offsets, buy-out, etc.)

**Geographical Scope** (Intra-EU only, all EU flights, Global coverage)

# Potential Distortions Due to Selective Mandate Coverage



Depending on mandate design, different carriers will face different incremental costs

Traffic at Risk	Policy:	UK-only Fuel Mandate			EU-only Fuel Mandate		Global Fuel Mandate
		Domestic	Intra-EU	All flights	Intra-EU	All flights	All flights
<b>Point-to-point</b>							
<i>Intra-UK</i>		All	All	All	All	All	All
<i>UK-EU</i>		-	All <sup>1,2</sup>	All <sup>1,2</sup>	All	All	All
<i>UK-non-EU</i>		-	-	All <sup>1,2</sup>	Some EU carriers	All <sup>1,2</sup>	All
<b>Hub / Indirect</b>							
<i>UK-EU</i>		-	BA, others	BA, others	All	All	All
<i>EU-EU</i>		-	BA	BA	All	All	All
<i>non-EU-EU</i>		-	BA	BA	BA, others	All <sup>1,2</sup>	All
<i>non-EU-non-EU</i>		-	-	BA	-	BA, others	All

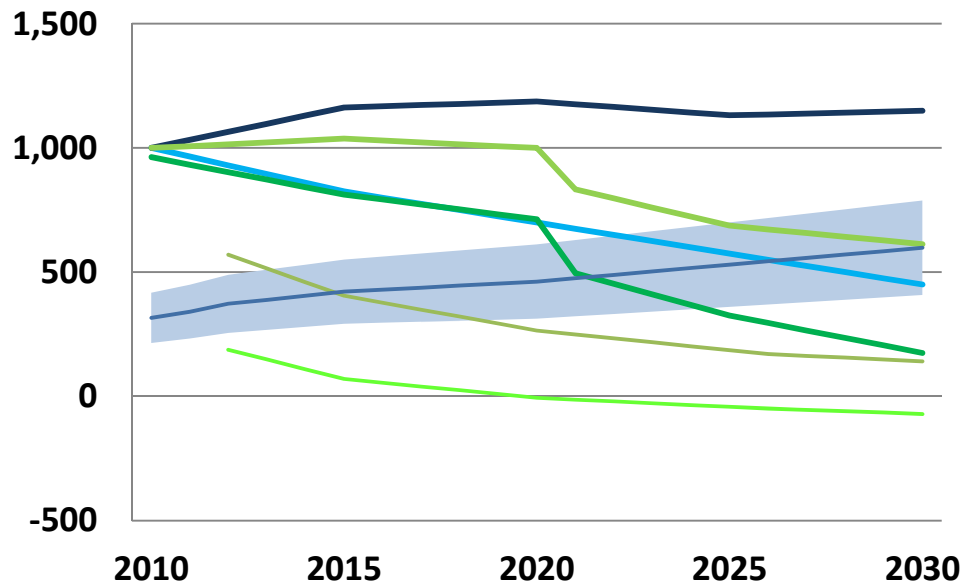
- Notes:** 1. Subject to mandate being enforceable on foreign-flagged carriers under Chicago Convention, etc.  
 2. Carriers offering indirect routes to compete with BA's point-to-point services would acquire a competitive advantage, although they would also face the mandate costs (to a lesser extent).

-	Policy is not relevant for route category
	No impact or positive impact on BA
	Some competitive disadvantage to BA
	Significant competitive disadvantage to BA
	Greatest competitive disadvantage to BA

# Cost of Biojet Fuel



## Biojet Premium (EUR/t)



- HRJ - Middle (E4tech)
- HRJ - High (SWAFEA)
- BTL - Forestry Residue (E4tech)
- BTL - Low (SWAFEA)
- HRJ - High-Low Range (E4tech)
- HRJ - Low (SWAFEA)
- BTL - Energy Crops (E4tech)
- BTL - High (SWAFEA)

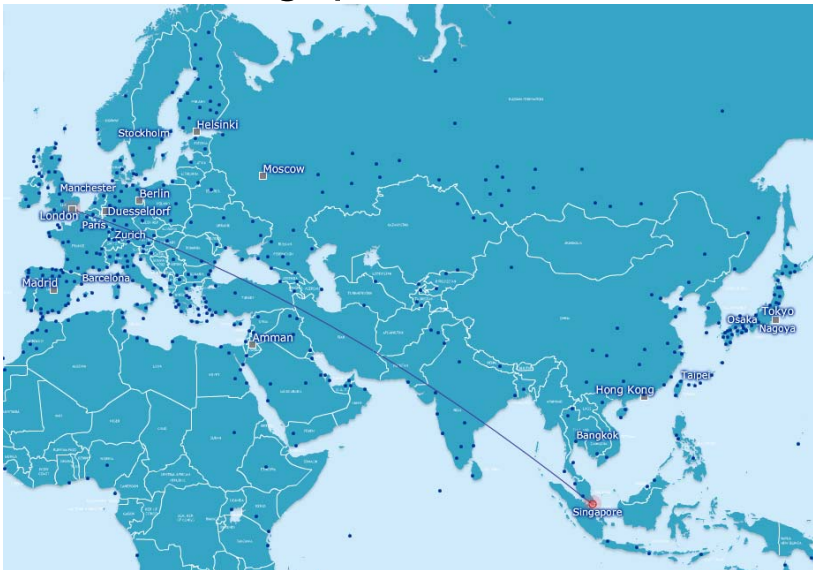
**Source:** Adapted from E4tech (2009) and SWAFEA (2011)

**Note:** Both SWAFEA and E4tech assume jet prices significantly below current levels.

- Conventional jet fuel currently costs around \$1,000 (or €800) per tonne
- Biojet remains costly relative to conventional jet fuel for the foreseeable future
  - The biomass-to-liquids (BTL) pathway may be less expensive, but depends on the cost of the feedstock (availability uncertain)
  - Hydroprocessing of renewable jet (HRJ) is generally more expensive, with costs projected to be linked more closely to energy prices
- For 2020 we assume different cost premium scenarios, ranging from €400-1,200 / t fuel

# Model Framework

## London-Singapore



## New York-Mumbai

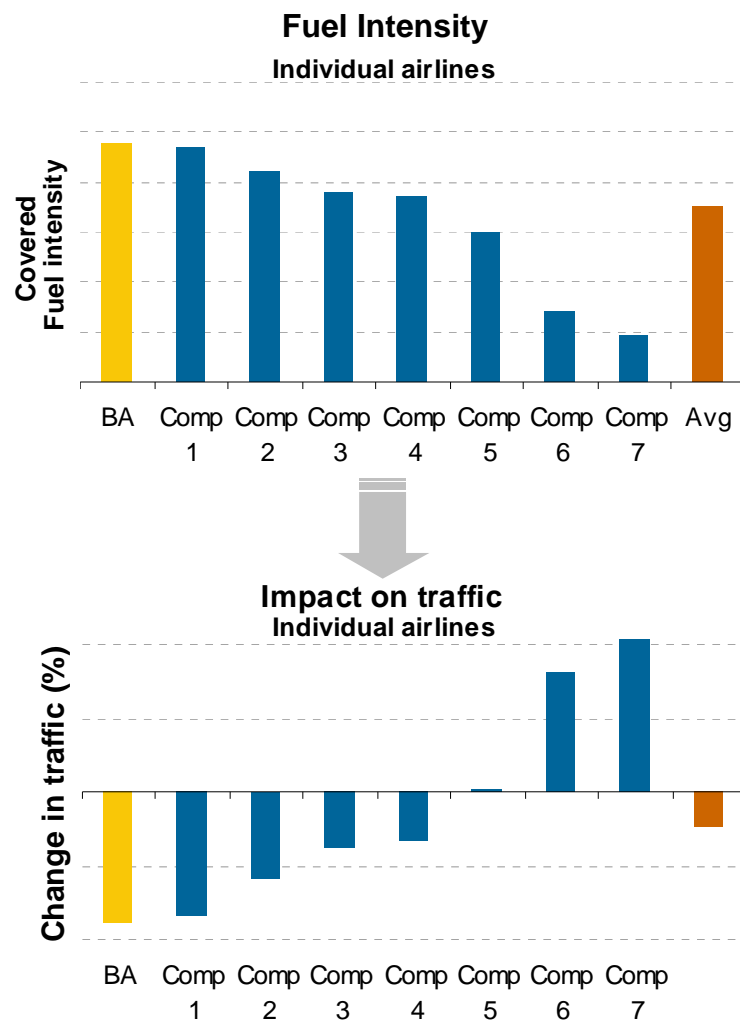


- OD pairs: 4 representative routes
  - London-Edinburgh
  - London-Rome
  - London-Singapore
  - New York-Mumbai
- Focus on 2020 time-frame
- Based on detailed dataset of carrier schedules
  - For simplicity we assume schedules remain fixed
- Estimate market share based on Available Seat Kilometres
- Average fuel consumption based on CORINAIR data
- Consider incremental costs of different biofuel mandate design options
- Elasticity assumptions

# Illustration of Model



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- For simplicity, we assume full cost pass-through of the biojet premium on each route
  - Aviation sector has complicated pricing rules that may involve cross-subsidies between routes or passenger classes

## Indicative increase in ticket costs

	Option 1	Option 2	Option 3	Option 4	Option 5
Biojet Premium (€/t jet)	800	800	800	800	800
Biojet Target	4%	4%	4%	4%	4%
Fuel cost increase	4%	4%	4%	4%	4%
Scope	Intra-UK	UK-All	Intra-EU	EU-All	Global

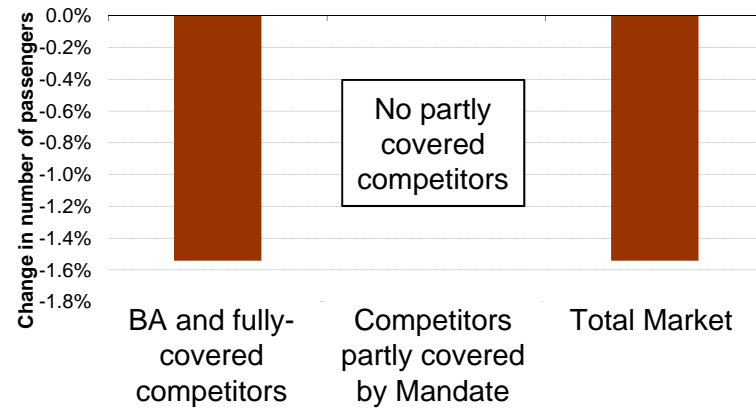
### BA Cost Impacts (€per round-trip fare)

<i>London-Edinburgh</i>	3	3	3	3	3
<i>London-Rome</i>	0	2	5	5	5
<i>London-Singapore</i>	0	29	0	29	58
<i>New York-Mumbai</i>	0	29	0	29	58

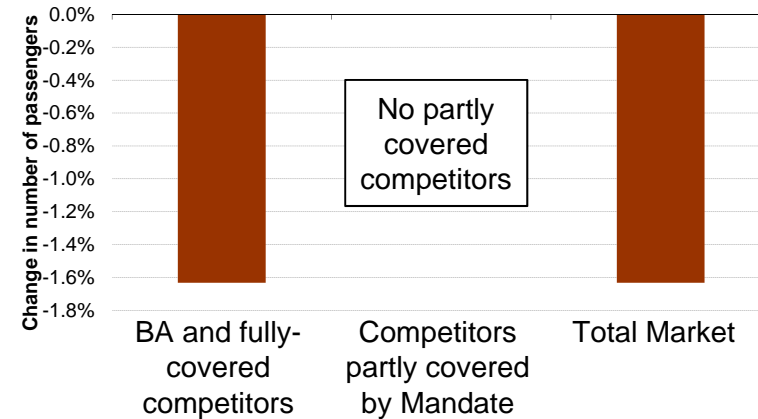
# Preliminary Results for Selected Routes; All EU Flights, 4% Mandate, €800/t premium



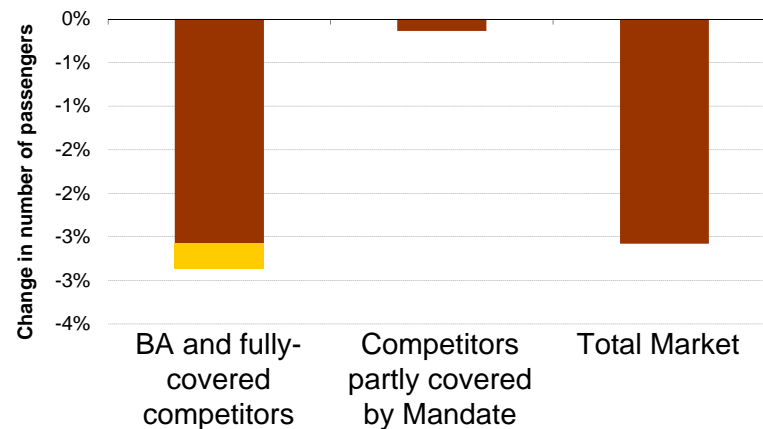
Change in Traffic: London-Edinburgh



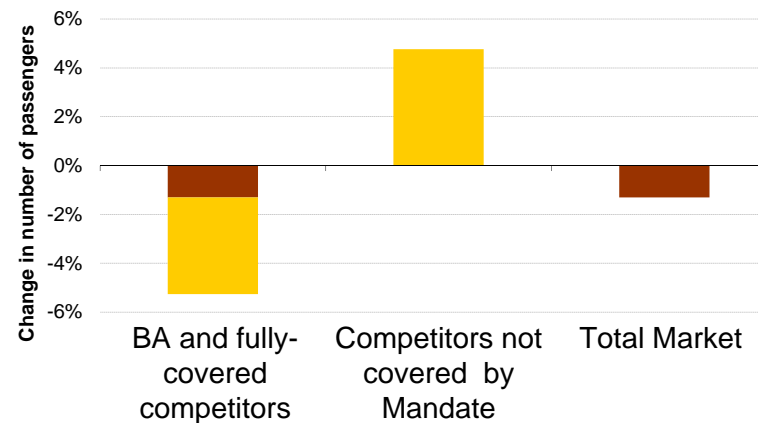
Change in Traffic: London-Rome



Change in Traffic: London-Singapore



Change in Traffic: NYC-Mumbai



■ Loss due to market reduction

■ Loss to / net gain from other carriers



# Preliminary Conclusions



1. Impact is greatest on indirect flights through EU
2. In the absence of a global mandate, covering only intra-EU flights limits competitive distortions, although overall demand is still affected
3. With a relatively high cost premium for biojet, “tankering” may be a viable way to avoid incurring policy costs – unless the policy is designed to prevent it (e.g. through obligation on flights, rather than fuel uplift)
4. Although an obligation on fuel suppliers would be more consistent with existing biofuel mandates for road, it would be difficult to implement a geography-specific (e.g. EU-only) mandate through suppliers
5. Under a supplier obligation it may also be difficult to establish who faces the obligation due to the dynamics of fuel market
6. Prior similar work has suggested that even with an “All-EU” mandate, BA would face at least one competitor with mandate costs half its own on more than 50 percent of routes (representing more than 60% of Revenue Passenger Kilometres)

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