

Épreuve de section européenne

Flight charges

You might be surprised to learn that most countries charge for planes to fly through their airspace, even if they do not land. The charges levied vary considerably. A plane flying from Singapore to London can take a number of routes: the costs levied on each possible route are calculated just before the plane takes off. In theory, the airline will choose the cheapest route for the journey, provided this does not take much longer than its scheduled time of 13 hours 35 minutes.

Formula 1 : Eurocontrol

In Europe, the following formula is used to calculate flying charges:

$$\text{charge} = T \times D \sqrt{\frac{W}{50}}$$

where T is the unit rate (currently £63.96 for the UK), W is the takeoff weight of the plane in metric tonnes and D is the distance flown, in hundreds of km, taken to 2 decimal places.

For example, a Singapore Airlines Boeing 747, flying from Frankfurt to New York with a takeoff weight of 395 tonnes, and flying 765 km across the UK airspace, incurs a charge of £1375 (to the nearest £). You can see that flying charges are not insignificant!

Formula 2 : ASECNA

This is another formula used by other countries: $\text{charge} = U \times \text{coefficient}$, where U is a unit rate (we will take £156.64) and the coefficient depends on the distance traveled and takeoff weight of the plane, according to the table below.

Weight in tonnes	Distance in kilometers			
	0 – 750	750 – 2000	2000 – 3500	Over 3500
14 – 20	1	5	12	20
20 – 50	1.2	6	14.4	24
50 – 90	1.4	7	16.8	28
90 – 140	1.6	8	19.2	32
140 – 200	1.8	9	21.6	36
200 – 270	2	10	24	40
270 – 350	2.15	10.75	25.8	43
350 – 440	2.3	11.5	27.6	46
440 – 540	2.45	12.25	29.4	49
540 – 650	2.6	13	31.2	52

From CIMT, University of Plymouth website

Questions

1. Check the charge of £1375 given by the first formula; then, using the second one, compute the charge incurred for the same plane flying the same distance.
2. If the charge for flying 572 km is £1022 with formula one, what is the takeoff weight of the plane?
3. (a) For a Boeing 747 with a takeoff weight of 395 tonnes, draw the graph of the ASECNA charges for flying a distance up to 5000 km on the grid below.
(b) On the same grid, illustrate the UK charge given by the first formula.
(c) Comment on the two graphs.
4. Does the flight charge levied double when we
 - (a) double the distance traveled ;
 - (b) double the takeoff weight of the plane?

Answer for both Eurocontrol and ASECNA formulae.

