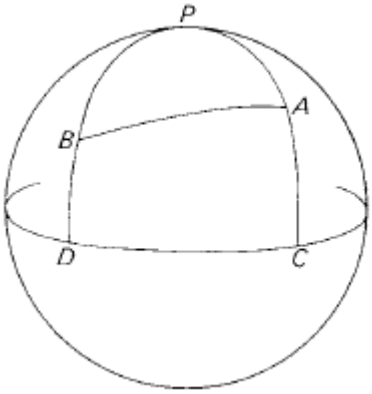
Answer on Question #54949, Physics / Astronomy | Astrophysics

Let A and B represent Prestwick and Gander respectively in figure so that the great circle arc AB is the flight route:



If the meridians PBD and PAC are drawn from the north pole P through B and A to the equator DC, triangle PBA is a spherical triangle. Applying the cosine formula, we may write:

$$\cos AB = \cos AP \cos BP + \sin AP \sin BP \cos APB$$

$$BP = 90^\circ - 48^\circ 34' = 41^\circ 26' = 41^\circ 4333$$

$$AP = 90^\circ - 55^\circ 30' = 34^\circ 30' = 34^\circ 5000$$

$$\angle APB = 54^\circ 24' - 4^\circ 36' = 49^\circ 48' = 49^\circ 8000.$$

Although the data are given to an accuracy of 1 arc minute, it is advisable to carry one or two extra figures to avoid rounding-off error vitiating the results.

The calculation then proceeds:

$$\cos AB = \cos 34^\circ 5000 \cos 41^\circ 4333 + \sin 34^\circ 5000 \sin 41^\circ 4333 \cos 49^\circ 8000$$

giving $AB = 30^\circ 7061 = 30^\circ 42'$ to the nearest minute.

Hence,

$$AB = 30^\circ 42' = 1842'$$

The distance AB is, therefore, 1842 nautical miles.

$$\text{Time taken} = \frac{\text{distance}}{\text{speed}} = \frac{1842}{500}\,hr = 3^h 68 = 3^h 41^m 0$$

Answer: $3^h 41^m 0$