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Reviews in GEOPHYSICS

NO. 3

EQUIVALENT WINDS FOR NORTH AMERICAN AIR ROUTES

at heights of 5000, 10,000, 15,000, 20,000, 30,000, 40,000 and 53,000 feet

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BOEING
TRANSPORT DIVISION

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EQUIVALENT WINDS FOR NORTH AMERICAN AIR ROUTES

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30,000, 40,000 and 53,000 feet

REVIEWS IN GEOPHYSICS NO. 3

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ABSTRACT

Equivalent headwinds or equivalent winds are computed using Sawyer's method for about 2000 routes over strategic air routes. The seasonal mean equivalent wind and its standard deviation and the annual 50-, 75- and 85-per cent reliability equivalent winds are tabulated. Route winds are computed for the 20,000-, 30,000-, 40,000- and 53,000-foot levels. An IBM 7090 program was used to compute the equivalent winds. Input data for the program consist, for each level, of a grid composed of the mean vector wind and the standard vector deviation at the intersection of each 5° of latitude with each 10° of longitude between 60°S and 60°N and at the intersection of each 5° of latitude with each 20° of longitude south and north of 60°S and 60°N respectively. In addition to the equivalent winds, great circle distances are computed and tabulated for each route.

FORWARD

Two years ago, The Boeing Company published three documents on equivalent route winds for domestic, international and military air routes for use in the airline industry. Since that time new and revised summaries of upper wind statistics were published. Boeing meteorologists incorporated these summaries into three new and completely revised and expanded documents on equivalent route winds. The new documents are "Equivalent Winds For North American Air Routes," D6-9176; "Equivalent Winds For World Air Routes," D6-9177; and "Great Circle Equivalent Route Winds For Military Application," D6-9175. These documents replace the three earlier "Wind Documents", "Winds For United States Air Routes," D6-5186; "Winds For World Air Route," D6-5187; and "Great Circle Route Equivalent Headwinds For Military Application," D6-5185.

The efforts of E. Lesford of the Engineering Computing and Analysis Staff for preparing the 7090 program used to compute the route winds is gratefully acknowledged. Thanks are also due to Alice Post for the industry and care shown in tabulating the wind data summaries.

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EQUIVALENT WINDS FOR NORTH AMERICAN AIR ROUTES

at heights of 5000, 10,000, 15,000, 20,000,
30,000, 40,000 and 53,000 feet

I. INTRODUCTION

The development and introduction of high-performance jet aircraft for civil and military use established a requirement for route wind statistics with which to make long-term estimates of the economic and strategic capabilities of these aircraft when operated at new cruising heights and over new route systems. To meet this need for route-wind data, Boeing Meteorologists computed seasonal and annual equivalent winds for the principal strategic air routes.

II. DEFINITIONS

A. EQUIVALENT ROUTE WIND

The equivalent wind for an air route may be defined as a uniform wind, which, directed along the track at all points, results in the same average ground speed as that actually attained. Alternately, the equivalent route wind is the difference between the average airspeed and the average groundspeed throughout the flight.

B. RELIABILITY EQUIVALENT ROUTE WIND

The reliability equivalent wind is in the case of a headwind (tailwind), a route wind which is not exceeded (a route wind which can be relied upon) a given per cent of occasions or time during a given period.

III. COMPUTATIONS

A. EQUATIONS

1. Equivalent Route Wind

Sawyer's theory of equivalent headwinds has been applied extensively to the computation of equivalent route winds[1-9]. This method involves use of the mean vector wind and the standard vector deviation: two parameters which completely define the circular normal distribution of winds generally found in the free atmosphere. Charts and tabulations of the mean vector wind and the standard vector deviation are available in many meteorological publications[10-19].

The principal assumptions of Sawyer's theory are (1) the wind speed does not exceed the speed of the aircraft and (2) the distribution of winds in the free atmosphere during a given season can be approximated by the circular normal distribution. Based on these and other assumtions, the basic equation for the average equivalent headwind, $\bar{w}$, over a route and expressed in terms of the mean vector wind, $\bar{V}$, and the standard vector deviation, σ, at points along the route is

$$\left[\bar{w}\right] = -\left[\bar{u}\right] + \frac{1}{A}\left\{\left[\frac{(\bar{v})^2}{2}\right] + \left[\frac{\sigma^2}{4}\right]^2\right\} \qquad (1)$$

where:

$\bar{u}$ = Mean wind parallel to the track

$\bar{v}$ = Mean wind normal to the track

σ = Standard vector deviation

A = Airspeed.

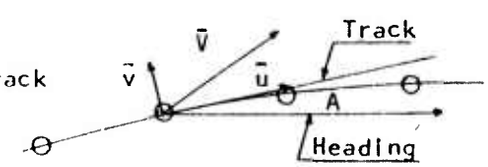


Fig. 1. Airspeed - Wind Vector Relationships

The bar denotes a mean value over a long period of time and the square brackets denote a mean value taken over a number of points along the route (Fig. 1).

Correlation studies and physical considerations reveal that vector winds at points along a route are related to one another[1,21]. For this reason, the mean vector wind and the standard vector deviation at points along a route while sufficient to determine the average value of the route equivalent wind, are insufficient to determine its variability. For example, strong winds at points along a route may or may not occur simultaneously. If they do not occur together, there is a tendency for the headwind components to average out such that the average value of the extreme winds is less than the values of the extreme winds at individual points over the route. Sawyer[1] has shown this to be the case.

2. Route Standard Deviation

The route standard deviation provides a measure of the variability of the equivalent route wind. The relationship between the route standard deviation and the average value of the standard vector deviation at points along the route is

$$\sigma_t = s \left[\sigma^2\right]^{1/2} \qquad (2)$$

where:

σ_t = Route standard deviation (tabulated value)

s = Factor to convert the mean standard vector deviation of wind over a route, $\left[\sigma^2\right]^{1/2}$, into the route standard deviation of the equivalent route wind. The value of s decreases with increasing route length and exhibits some variation with season, latitude and route orientation[1].

The values of s used in preparing Table 4 are those listed in Graystone[6].

3. Great Circle Distance

Route lengths in nautical miles are computed over the great-circle course, i.e. the least distance on a sphere, between terminals. The expression used to compute great circle distances is

$$D = 60 \cos^{-1} \left\{ \sin \psi_1 \sin \psi_2 + \cos \psi_1 \cos \psi_2 \cos (\lambda_1 - \lambda_2) \right\} \quad (3)$$

where:

D = Great circle distance in nautical miles

ψ = Latitude

λ = Longitude

$\cos^{-1}\{\ \}$ = Angle expressed in minutes.

South latitudes and east longitudes are considered negative and north latitudes and west longitudes are considered positive.

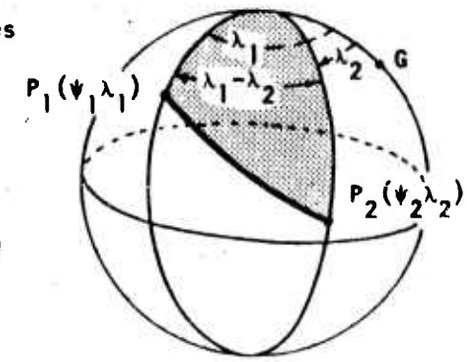


Fig. 2
Great Circle Distance

B. ANNUAL EQUIVALENT ROUTE WINDS

Annual equivalent route winds are computed from the mean seasonal values of equivalent route winds and their standard deviations. The technique involves an iterative procedure by which wind speeds are found such that 50, 75 and 85 per cent of the total area under the four seasonal wind distribution curves, lies to their right. With reference to Figure 3, the 50, 75 and 85 annual equivalent winds are estimated to be -5, -11 and -13 knots respectively.

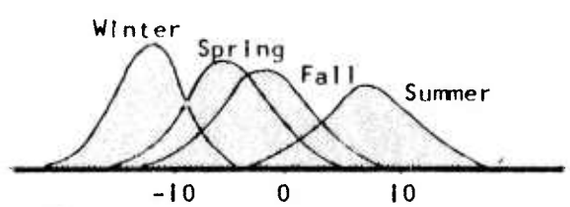


Fig. 3. Hypothetical Seasonal Wind Distribution

C. INPUT DATA

The most recent and internally consistent summaries of statistical wind data available were used. Wind statistics were obtained from Tucker[17] and Heastie and Stephenson[18] for the southern hemisphere and from Crutcher[15] for the northern hemisphere, while the airport coordinates were obtained from standard reference sources. The mean vector wind and the standard vector deviation together with the coordinates of each terminal form the input data for an IBM 7090 program. The wind parameters for the four seasons and for the 5000-(850 mb), 10,000-(700 mb), 15,000-, 20,000-(500 mb), 30,000-(300 mb), 40,000-(200 mb) and 53,000-(100 mb) foot levels, were obtained by computing them at the intersection of each 5° of latitude with each 10° of longitude between 60°N and 60°S and at the intersection of each 5° of latitude with each 20° of longitude north of 60°N and south of 60°S.

D. METHOD

Equivalent route winds are computed by first dividing the route into an integral number of segments of 200 miles or less in length and then calculating the headwind at the mid point of these segments. This is accomplished by weighing the four nearest wind values (at grid points) in proportion to their proximity to the point on the route and then averaging. The averaged values in turn are used to compute the equivalent wind for the entire route.

By convention a positive sign denotes a tailwind, a negative sign a headwind.

E. TABULATIONS

Equivalent winds for over 1300 airline routes between 300 airports in North America including Hawaii, Bermuda and Puerto Rico are computed

(Tables 3 and 4). Table 3 contains equivalent winds for the 5000-, 10,000- and 15,000-foot levels for route lengths less than 400 nautical miles and in Table 4 are listed equivalent winds for the 20,000-, 30,000-, 40,000- and 53,000-foot levels for route lengths greater than 200 nautical miles. The route wind tabulations are organized alphabetically by the terminals identifying each route. Each route is further listed under both of its terminals in the index (Table 6). The tabulations consist of:

1. The direct and return seasonal mean equivalent route wind and its standard deviation and the annual 50-, 75- and 85-per cent reliability equivalent route wind in knots
2. The great circle distance in nautical miles.

An alphabetical listing of terminals with their airport names, geographical coordinates and length of longest runway is also provided (Table 5).

IV. USE OF TABLES

A. NORMAL CURVE

Brooks[10] et al found that in any one season the distribution of equivalent route winds about the mean closely approximates the normal law of errors. According to this law, the mean and its standard deviation completely define the distribution of winds about the mean. In turn, this error distribution very nearly approximates the normal or Gaussian frequency distribution defined as

$$y = \frac{1}{\sigma\sqrt{2\pi}} e^{-x^2/2\sigma^2} \qquad (4)$$

where:

y = The frequency ordinate at distance x from the mean

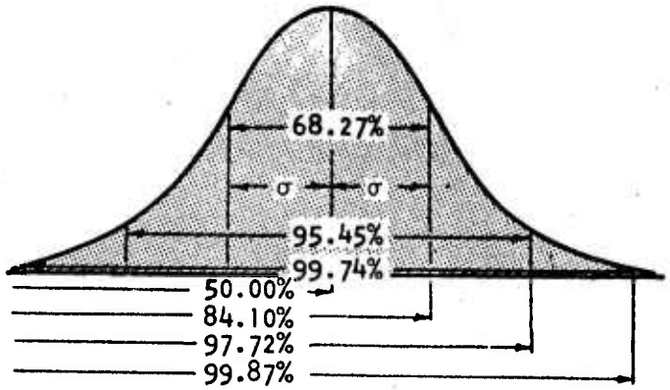
σ = The standard deviation.

With reference to Figure 4, some of the more important properties of the normal curve to be noted in estimating reliability winds are:

1. The mean, median and mode are identical

2. Areas under the normal curve between abscissae $\pm \sigma$, $\pm 2\sigma$ and $\pm 3\sigma$ contain 68.27, 95.45 and 99.74 per cent of the whole sample

3. The value of the standard deviation equals the difference between the ordinate for 50 and 84.13 per cent, i.e. 50 + 68/2 = 84 per cent.



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B. ESTIMATING RELIABILITY EQUIVALENT ROUTE WINDS

Computation of reliability equivalent route winds deserves special attention since deviations of the relative frequency of extreme wind speeds from the assumed normal law of errors may be appreciable, particularly at levels and in regions affected by jet streams. The frequency of extreme values is probably higher than that predicted from the assumed model. For this reason reliability

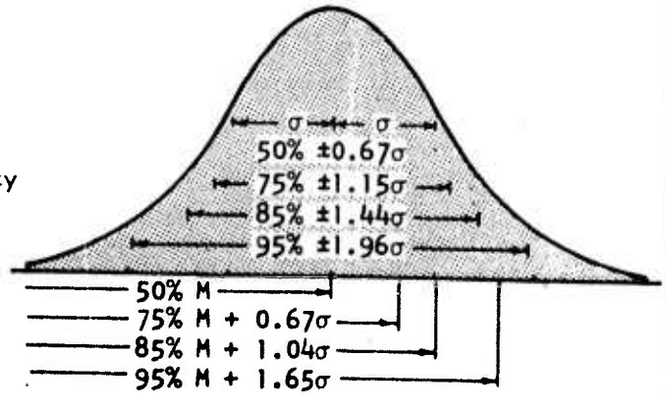

Fig. 4 b. Normal Curve

equivalent winds for percentages less than 5 and greater than 95 are likely unreliable.

Two methods for estimating equivalent winds for reliabilities other than for the tabulated mean values involve use of error factors and secondly, use of arithmetic probability paper.

1. Error Factor Method

For a given route, reliability equivalent winds are computed by subtracting the product of k times the standard deviation from the mean equivalent wind, where k is a factor derivable from the error function. Values of k are given in Table 1.

Table 1. Error Factors

Per Cent	k
50	0.0
60	0.25
70	0.52
80	0.84
85	1.04
90	1.28
95	1.65

The error factors method is illustrated by computing the 85-per cent reliability equivalent route wind over the great circle New York-to-San Francisco route during winter at the 40,000-foot level. From Table 4 the Direct and Return equivalent winds are -61 and 59 knots respectively and the standard deviation, 17 knots. From Table 1, the error factor is 1.04.

a) The DIRECT 85-per cent reliability equivalent wind which should not be exceeded on 85 per cent of occasions is a headwind of -79 knots;

$$-61 - (1.04 \times 17) = -79 \text{ knots.}$$

b) The RETURN 85-per cent reliability equivalent wind which can be relied on 85 per cent of occasions is a tailwind of 41 knots;

$$59 - (1.04 \times 17) = 41 \text{ knots.}$$

2. Arithmetic Probability Paper Method

As previously stated, in any one season the distribution of equivalent route winds about the mean closely approximates the normal law of errors and the normal or Gaussian frequency distribution defined in (4). Arithmetic probability paper is arranged with the per cent cumulative frequency scale printed on the ordinate such that the integral

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-x^2/2}\, dx \qquad (5)$$

of the normal frequency curve plots as a straight line while the absicissa has a linear scale. The sign convention for equivalent wind speeds is + for a tailwind and - for a headwind.

Thus, to obtain a frequency distribution of the equivalent route winds for the great circle New York-to-San Francisco route at 40,000 feet during winter, look up the value of the 50 per cent direct (-61 knots) and return (59 knots) equivalent wind and the standard deviation (17 knots) in Table 4. Next plot -61 on the 50 per cent value of the ordinate scale and -78 (-61 - 17) knots on the 84 per cent ordinate value and draw a straight line through these points. Similarly for the San Francisco-to-New York route, plot 59 knots on the 50 per cent ordinate value and 42 (59 - 17) knots on the 85 per cent value of the ordinate scale and draw a straight line through these points. These two lines give the frequency distribution of equivalent winds over the route.

Use of these curves in Figure 6 is illustrated with three examples.

a) The per cent of equivalent tailwinds that fall in the 50-70 knot range for the San Francisco-to-New York route is 45 per cent (70 - 25).

b) Equivalent winds that should not be exceeded between 50 and 95 per cent of the time on the New York-to-San Francisco

route range from -61 to -89 knots.

c) For the San Francisco-to-New York route an equivalent tailwind of 41 knots can be relied on 85 per cent of the time.

C. VARIATION IN AIRSPEED

The tabulated equivalent wind data were computed for a 450-knot airspeed, but may be used for airspeeds between 300 and 550 knots because the small variation of equivalent wind with airspeed. For airspeeds outside this range, the tabulated values may be modified as follows. If D and R represent the DIRECT and RETURN equivalent wind for a 450 knot airspeed, the corresponding values, D' and R' for the new airspeed, A, are:

$$D' = 1/2\ (D - R) + \frac{225}{A}\ (D + R) \tag{6}$$

$$R' = -\ 1/2\ (D - R) + \frac{225}{A}\ (D + R) \tag{7}$$

These expressions are derived from (1) by setting

$$\left[\bar{w}\right] = -\left[\bar{u}\right] + M\,\frac{1}{A}$$

where:

$$M = \left\{ \frac{\left[(\bar{v})^2\right]}{2} + \left[\frac{\sigma}{4}\right]^2 \right\} .$$

Then for a 450 knot airspeed

$$D = -\left[\bar{u}\right] + \frac{M}{450} \tag{8}$$

$$R = \left[\bar{u}\right] + \frac{M}{450} \tag{9}$$

and for airspeed, A

$$D' = -\left[\bar{u}\right] + \frac{M}{A} \tag{10}$$

$$R' = \left[\bar{u}\right] + \frac{M}{A} \tag{11}$$

Substitute

$$M = 225\ (D + R),$$ obtained from adding (8) and (9) and

$$\left[\bar{u}\right] = -\frac{D - R}{2},$$ obtained from subtracting (9) from (8)

into (10) and (11), thus obtaining (6) and (7).

If D and R are of equal value and of opposite sign, the tabulated values are the same for any airspeed. If $D \neq R$, i.e., a cross wind component is present, D' and R' will differ slightly from D and R.

Per cent reliability equivalent headwinds computed for the new airspeed, A', will differ by the same amount as the mean values, i.e. D - D', because standard deviations are not sufficiently affected by changes in airspeed[2].

For example, to compute the direct and return mean equivalent wind for the December-February season over the Atlanta-to-Detroit route for a 675-knot airspeed and at 40,000 feet, we have from Table 4,

$$D = 3 \text{ knots}$$

$$R = -18 \text{ knots}$$

Then,

$$D' = 1/2\left[3 - (-18)\right] + \frac{225}{675}\left[3 + (-18)\right]$$

$$= 5.5 \text{ knots}$$

$$R' = -1/2\left[3 - (-18)\right] + \frac{225}{675}\left[3 + (-18)\right]$$

$$= -15.5 \text{ knots}$$

D. GREAT CIRCLE ROUTE LENGTH

The route length in nautical miles is computed over the great-circle course, i.e. the least distance on a sphere, between terminals (Fig. 5).

For completeness, a great circle may be defined as the intersection of the surface of a sphere and a plane which passes through the center of the sphere. A nautical mile is the length of one minute of arc along a great circle on the earth's surface, i.e. the earth's circumference is 360 x 60 = 21,600 n. mi. In terms of statute miles, 1 n. mi. = 1.1508 miles. A knot is one nautical mile per hour.

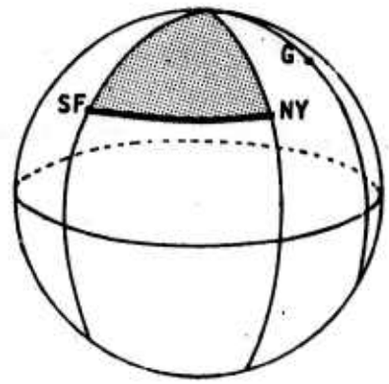

Fig. 5
Great Circle Route Length

For example the great circle distance between New York (+40°38', +73°47') and San Francisco (+37°38', +122°23') may be computed from (3).

$$D = 60 \cos^{-1} \left\{ \sin \psi_1 \sin \psi_2 + \cos \psi_1 \cos \psi_2 \cos (\lambda_1 - \lambda_2) \right\} \qquad (3)$$

With the aid of Table 2,

$$D = 60 \cos^{-1} \left\{ \sin(40°38') \sin(37°38') + \cos 40°38' \cos 37°38' \cos 48°36' \right\}$$

$$= 60 \cos^{-1} \left\{ .7951 \right\}$$

$$= 2240 \text{ n. mi.}$$

Table 2. Reference Trigonometric Relationships

$\sin (90 + \psi) = \cos \psi$	$\cos (90 + \psi) = - \sin \psi$
$\sin (90 - \psi) = \cos \psi$	$\cos (90 - \psi) = \sin \psi$
$\sin (- \psi) = - \sin \psi$	$\cos (- \psi) = \cos \psi$

+ sin	+ sin
- cos	+ cos
- sin	- sin
- cos	+ cos

E. EQUIVALENT ROUTE LENGTH

The equivalent route length, for a given reliability equivalent wind, is the distance that an aircraft would fly in still air on a flight having the same duration as that required to fly the route with given per cent equivalent wind. The equivalent route wind may be expressed as

$$L_x = \frac{DA}{A + W_x} \qquad (11)$$

where:

L_x = Equivalent route length in knots for x per cent reliability equivalent wind W_x

D = Great circle distance in nautical miles

A = Airspeed in knots.

For example, the 85-per cent reliability route length over the great circle New York-to-San Francisco route at 40,000 feet in the December-February season for an airspeed of 450 knots is

$$\text{DIRECT:} \quad L_{85} = \frac{2240 \times 450}{450 + (-79)} = 2717 \text{ n. mi.}$$

$$\text{RETURN:} \quad L_{85} = \frac{2240 \times 450}{450 + (41)} = 2053 \text{ n. mi.}$$

V. OCCURRENCE OF HEADWINDS ON BOTH DIRECT AND RETURN FLIGHTS

Over routes characterized by prevailing light winds or by strong beam winds, the direct and return route winds can both appear as a headwind. This situation occurs when the contribution to the mean equivalent wind from the wind components at right angles to the track exceeds the contribution from the wind components along the track. The effect of beam winds on the ground speed becomes apparent when it is realized than an airplane could make no progress in a beam wind equal to its airspeed.

Reliability equivalent winds for some routes appear as headwinds for the direct and return flight. This situation can occur over routes where the mean equivalent wind is about the same magnitude as its standard deviation. For example, a route having a mean equivalent tailwind of 12 knots, and a standard deviation of 15 knots, has an 85 per cent reliability headwind of -3 knots. In this example a tailwind has not become a headwind, but

rather a headwind of -3 knots is not likely to be exceeded on 85 per cent of occasions and a tailwind of 12 knots can be relied on 50 per cent of occasions.

VI. RELIABILITY OF RESULTS

The reliability of the tabulated equivalent headwinds in being representative of the actual route winds over great circle routes depends largely upon the assumption that wind distributions in the free atmosphere can be treated by the circular normal distribution. This distribution requires that the zonal and meridianal components of wind be uncorrelated and that their standard deviation be equal. From physical considerations, however, some degree of ellipticity must be present, otherwise there would be no mean transport of energy in the atmosphere as is observed. For most conditions, the degree of ellipticity is small and the assumed circular normal distribution acceptable. Brooks[10] pointed out that the assumption of circularity is likely to be weakest in frontal zones, in the vicinity of jet streams and in areas characterized by distinct seasonal wind variation such as the boundary region between a monsoon circulation and the circulation above.

The tabulated values are intended as long term estimates of en route winds and as such the actual winds in any one season may differ appreciably from them. This condition particularly occurs where air routes closely parallel the mean position of the jet stream. Where air routes routinely traverse normal to the jet stream, however, only small differences between the tabulated and observed route winds should occur.

VII. CONCLUSION

The application of equivalent winds can aid agencies concerned with the problems of aircraft logistics to estimate the long term economic

capabilities of carriers over new routes and at the elevated cruise levels of jet aircraft. Considerable effort is still needed to combine the element of temperature with that of wind into one reliability factor which would reflect the effect of the environment of aircraft performance. The solution of this problem involves not only combining and presenting the probabilities that equivalent headwinds and en route and surface temperatures occur but also weighing these factors according to their individual effect on aircraft performance.

While the circular normal distribution adequately describes the distribution of upper air winds, except in some regions as noted, the general bivariate normal distribution appears to provide the best description. Even this elliptical distribution, however, may not adequately describe the winds in some regions. At present, wind statistics based on the bivariate normal distribution are available only for the Northern Hemisphere.

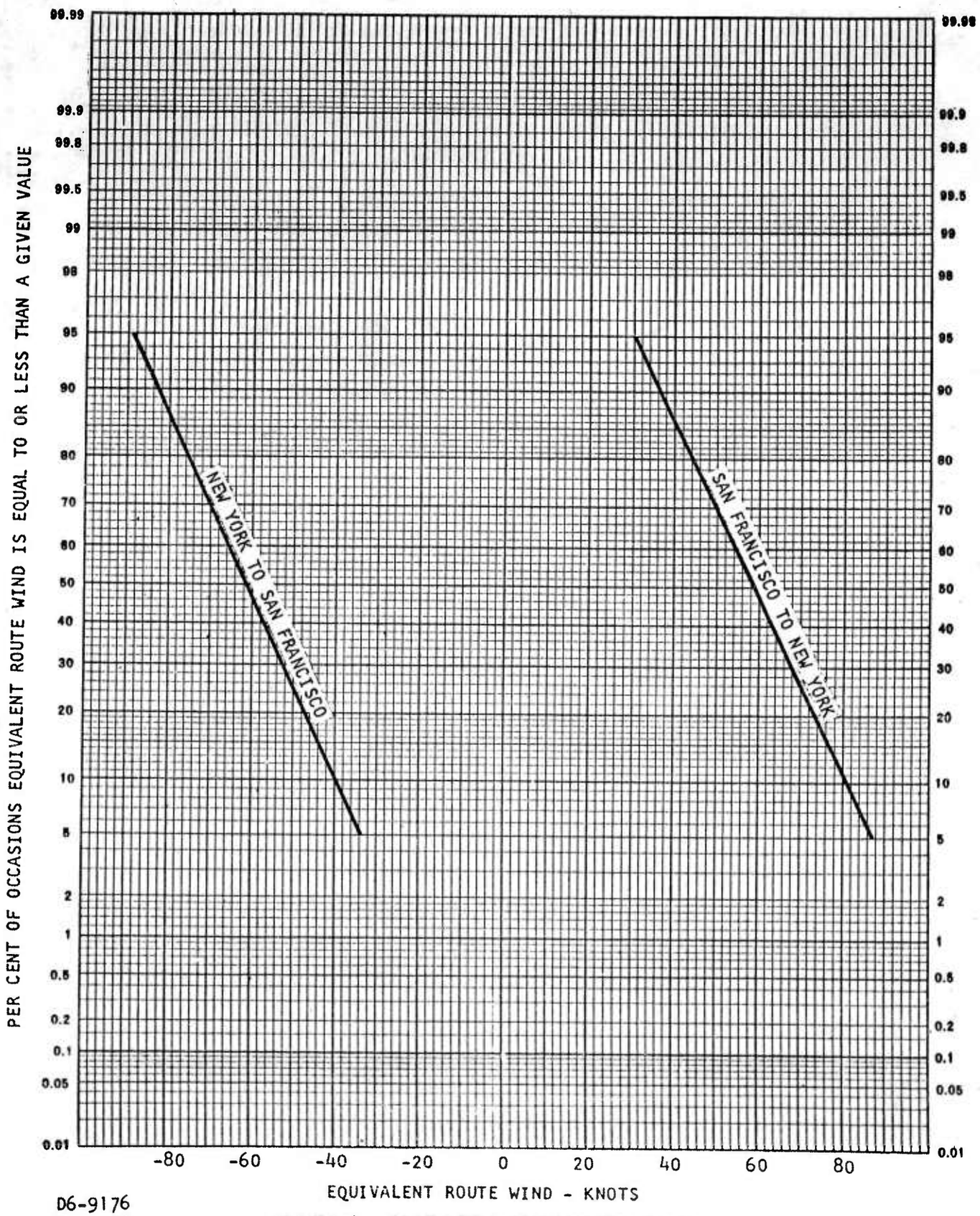

FIGURE 6. ARITHMETIC PROBABILITY PAPER

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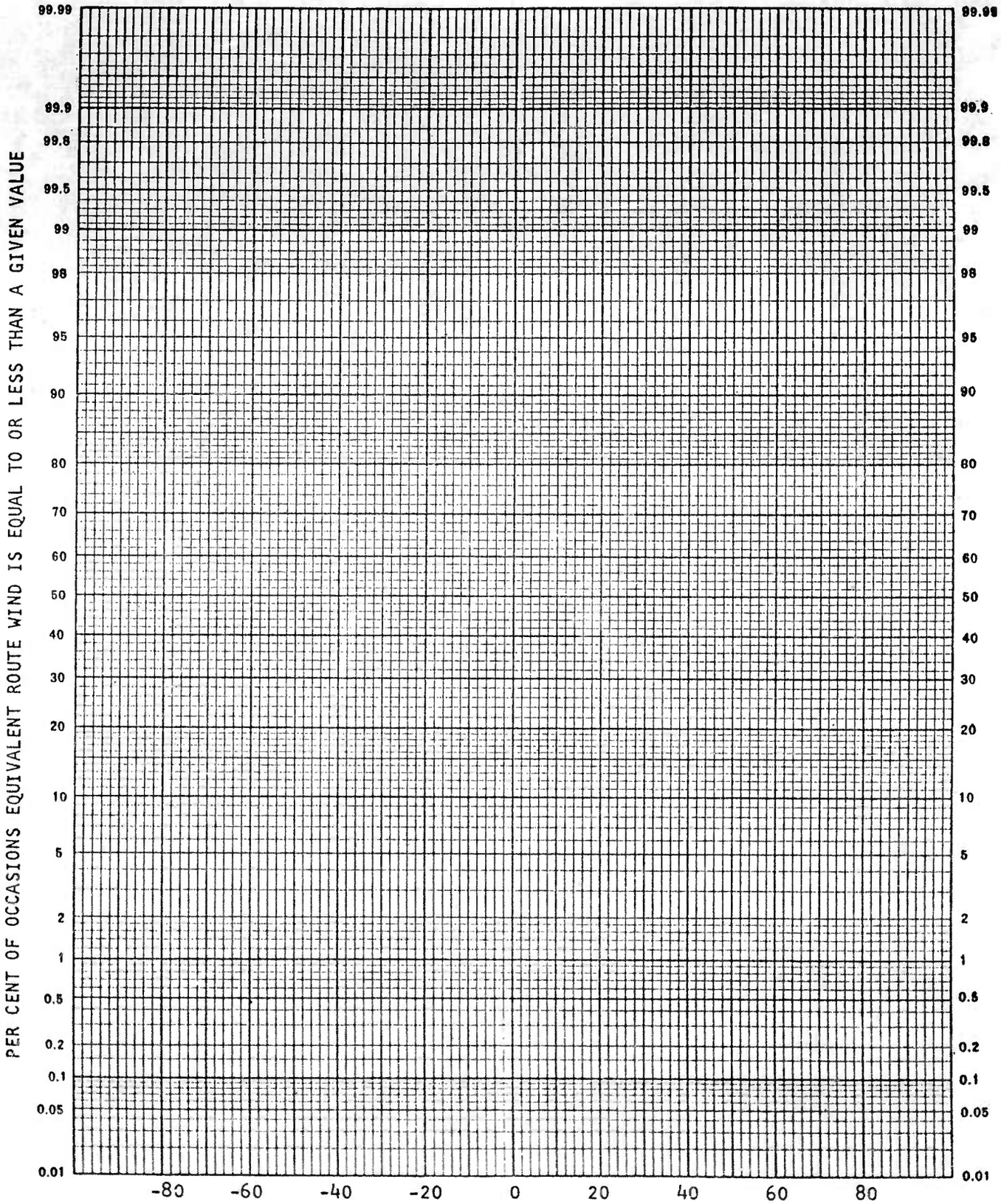

ARITHMETIC PROBABILITY PAPER

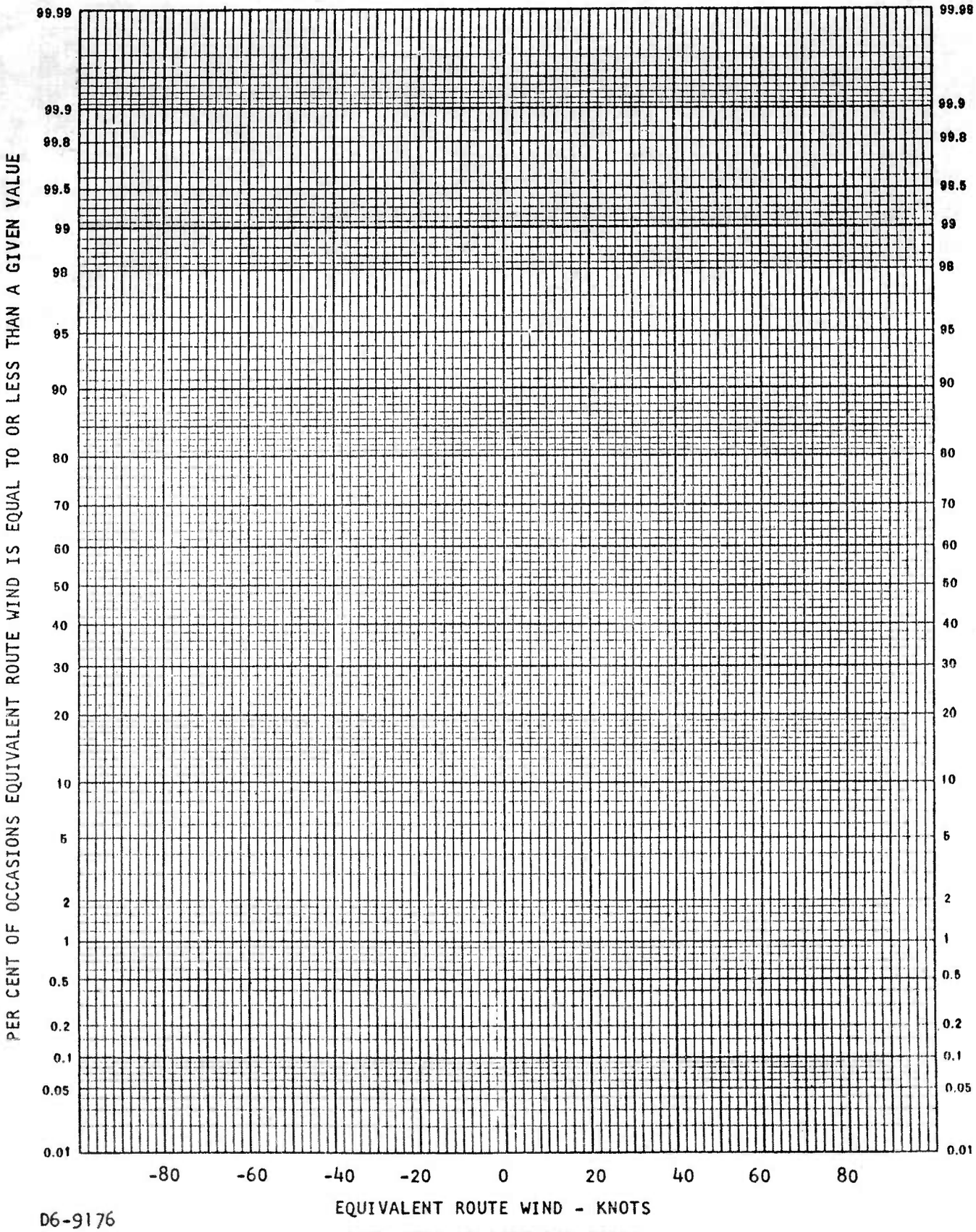

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TABLE 3

EQUIVALENT WINDS AT THE 5000–, 10,000– AND 15,000–FOOT LEVELS FOR ROUTES ≦ 400 NAUTICAL MILES IN LENGTH

TABLE 3. EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ABILENE TO BIG SPRING																	94 N.MI.	
15,000	-30	-25	-5	-12	-16	-30	-38	30	24	4	12	16	4	-2	18	17	11	16
10,000	-20	-15	-4	-8	-11	-21	-26	20	15	4	8	11	2	-2	14	13	10	12
5,000	-9	-6	-5	-4	-6	-14	-18	8	6	4	3	5	-3	-7	14	13	9	12
ABILENE TO DALLAS																	146 N.MI.	
15,000	31	24	5	12	16	5	-1	-31	-25	-6	-13	-17	-31	-39	18	17	11	16
10,000	21	16	5	8	12	3	-2	-21	-16	-5	-9	-12	-22	-27	14	13	10	13
5,000	9	7	6	4	7	-1	-6	-10	-8	-6	-5	-7	-15	-20	14	13	9	12
ABILENE TO EL PASO																	342 N.MI.	
15,000	-29	-24	-4	-11	-16	-29	-36	28	23	4	11	15	4	-1	17	15	10	15
10,000	-19	-14	-4	-7	-10	-19	-24	18	14	4	7	10	2	-2	13	12	9	11
5,000	-6	-5	-2	-1	-3	-10	-14	6	4	2	1	3	-4	-7	12	11	7	10
ABILENE TO HOUSTON																	281 N.MI.	
15,000	21	17	1	9	11	0	-5	-23	-19	-1	-10	-12	-24	-31	17	15	10	15
10,000	13	9	0	5	6	-2	-6	-14	-10	-1	-6	-7	-16	-21	13	13	9	12
5,000	4	1	-3	1	0	-7	-11	-5	-1	3	-1	-1	-9	-13	13	12	8	11
ABILENE TO FT. WORTH																	135 N.MI.	
15,000	31	24	5	12	16	5	-1	-31	-25	-6	-13	-17	-31	-39	18	17	11	16
10,000	21	16	5	8	12	2	-2	-21	-16	-5	-8	-12	-22	-27	14	13	10	13
5,000	9	7	6	4	7	-1	-6	-10	-8	-6	-5	-7	-15	-20	14	13	9	12
ABILENE TO LUBBOCK																	131 N.MI.	
15,000	-24	-19	-2	-11	-13	-26	-33	23	18	2	11	12	1	-4	18	17	11	16
10,000	-15	-11	-2	-7	-8	-17	-22	15	10	2	6	7	-1	-5	14	13	10	12
5,000	-4	-2	2	0	-1	-9	-13	4	1	-3	0	0	-8	-12	13	13	9	12
ABILENE TO MIDLAND																	131 N.MI.	
15,000	-30	-24	-5	-12	-16	-30	-37	29	24	4	11	15	4	-1	18	16	11	16
10,000	-20	-15	-5	-8	-11	-21	-26	20	15	4	7	11	2	-2	14	13	10	12
5,000	-9	-7	-5	-4	-6	-14	-18	8	6	5	3	5	-2	-6	13	13	9	12
AKRON TO CHARLESTON																	153 N.MI.	
15,000	-5	1	-1	-5	-2	-15	-22	0	-4	0	3	0	-12	-19	21	21	12	20
10,000	-3	1	1	-2	-1	-10	-16	0	-3	-2	0	-1	-11	-16	16	17	12	15
5,000	-1	1	0	-1	0	-9	-13	0	-1	-1	0	0	-9	-13	14	14	10	12
AKRON TO CHICAGO																	297 N.MI.	
15,000	-39	-26	-19	-23	-26	-39	-47	38	25	18	22	25	13	6	20	20	13	19
10,000	-28	-20	-15	-18	-20	-30	-36	28	19	14	18	19	9	4	15	16	12	15
5,000	-15	-11	-8	-10	-11	-20	-24	15	10	8	10	10	2	-3	14	14	10	12
AKRON TO CINCINNATI																	185 N.MI.	
15,000	-35	-21	-14	-21	-21	-36	-43	32	19	14	19	20	8	1	21	21	12	20
10,000	-25	-16	-11	-15	-16	-27	-33	23	15	10	15	15	5	0	16	17	12	15
5,000	-13	-9	-6	-8	-9	-17	-22	12	8	6	8	8	0	-5	14	14	10	12
AKRON TO CLEVELAND																	35 N.MI.	
15,000	-24	-18	-11	-12	-15	-29	-37	20	16	10	10	13	1	-6	22	22	13	21
10,000	-16	-14	-10	-11	-12	-23	-29	14	13	9	9	11	1	-5	17	18	12	16
5,000	-9	-8	-5	-5	-7	-15	-21	8	7	5	5	6	-3	-8	15	15	10	13
AKRON TO COLUMBUS																	85 N.MI.	
15,000	-33	-19	-14	-21	-21	-35	-43	31	17	13	19	19	7	0	21	21	13	20
10,000	-24	-15	-10	-15	-15	-26	-32	22	13	10	14	14	4	-2	16	17	12	15
5,000	-12	-8	-6	-8	-8	-17	-22	12	7	5	8	8	-1	-6	15	15	10	13
AKRON TO DAYTON																	140 N.MI.	
15,000	-38	-24	-16	-23	-24	-39	-47	37	22	16	22	23	10	4	21	21	13	20
10,000	-27	-18	-12	-17	-18	-29	-35	26	17	12	17	17	7	2	16	17	12	15
5,000	-14	-10	-7	-9	-10	-19	-24	14	9	7	9	9	1	-4	15	15	10	13
AKRON TO DETROIT																	116 N.MI.	
15,000	-31	-22	-15	-18	-21	-35	-42	29	21	14	16	19	7	0	21	21	13	20
10,000	-22	-17	-13	-14	-16	-27	-33	21	16	12	14	15	5	0	16	17	12	15
5,000	-12	-9	-7	-8	-9	-18	-23	11	9	7	7	8	-1	-5	15	15	10	13

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
AKRON TO NEW YORK																	349 N.MI.	
15,000	41	28	19	24	27	14	8	-43	-29	-19	-25	-27	-42	-50	20	20	12	19
10,000	30	21	15	19	21	11	6	-31	-22	-15	-20	-21	-32	-38	16	17	11	14
5,000	16	12	9	10	11	3	-1	-16	-12	-9	-10	-12	-20	-25	14	14	10	12
AKRON TO PITTSBURGH																	62 N.MI.	
15,000	38	26	17	20	24	11	4	-40	-27	-17	-22	-25	-40	-48	22	22	13	20
10,000	27	20	14	17	19	9	3	-28	-21	-15	-18	-20	-31	-37	17	18	12	15
5,000	14	11	8	9	10	1	-3	-15	-11	-8	-9	-10	-20	-25	15	15	10	13
AKRON TO TOLEDO																	113 N.MI.	
15,000	-39	-26	-18	-23	-25	-40	-48	38	25	18	21	24	12	5	21	21	13	20
10,000	-28	-20	-15	-18	-20	-31	-37	27	19	14	17	19	9	3	16	17	12	15
5,000	-15	-11	-8	-10	-11	-20	-25	14	10	8	9	10	1	-3	15	15	10	13
AKRON TO WASHINGTON, D. C.																	238 N.MI.	
15,000	35	26	15	18	22	10	3	-37	-27	-16	-19	-23	-38	-46	21	21	12	19
10,000	26	20	13	16	18	8	3	-27	-21	-14	-17	-19	-30	-35	16	17	11	15
5,000	13	11	7	8	10	1	-3	-14	-11	-8	-8	-10	-19	-23	14	14	10	12
AKRON TO YOUNGSTOWN																	41 N.MI.	
15,000	35	20	15	22	22	9	2	-37	-22	-16	-23	-23	-38	-46	22	22	13	21
10,000	25	15	11	16	16	6	0	-26	-16	-12	-17	-17	-28	-35	17	18	12	16
5,000	13	8	6	9	9	0	-5	-14	-9	-7	-9	-9	-18	-24	15	15	10	13
ALAMOGORDO TO ALBUQUERQUE																	134 N.MI.	
15,000	-6	-4	4	-3	-1	-12	-18	3	2	-4	2	0	-10	-15	19	17	11	16
10,000	-4	-1	2	0	-1	-8	-13	3	1	-2	0	0	-8	-12	14	12	9	12
5,000	5	5	7	6	6	0	-3	-5	-6	-7	-6	-6	-12	-15	10	10	7	9
ALAMOGORDO TO EL PASO																	65 N.MI.	
15,000	-8	-8	-7	-4	-7	-16	-22	6	6	7	3	5	-5	-10	19	16	11	15
10,000	-5	-5	-5	-4	-5	-12	-17	4	5	5	4	4	-3	-8	14	12	9	11
5,000	-7	-7	-7	-4	-6	-12	-16	7	7	7	4	6	0	-4	11	10	7	9
ALBANY, GA. TO ATLANTA, GA.																	128 N.MI.	
15,000	-1	-4	0	0	-1	-11	-17	-3	1	0	-1	-1	-11	-17	18	18	10	17
10,000	0	-2	2	0	0	-9	-14	-2	0	-2	-1	-1	-10	-14	14	15	10	14
5,000	3	1	1	0	1	-6	-11	-3	-2	-1	0	-2	-9	-14	13	13	9	12
ALBANY, GA. TO MACON																	74 N.MI.	
15,000	14	9	3	6	7	-3	-8	-17	-11	-3	-7	-9	-20	-27	18	18	10	17
10,000	11	7	4	4	6	-2	-7	-12	-8	-5	-5	-7	-16	-21	14	15	10	14
5,000	8	5	3	2	5	-3	-7	-8	-6	-4	-3	-5	-13	-17	13	13	9	12
ALBANY, GA. TO TALLAHASSEE																	68 N.MI.	
15,000	-8	-4	-1	-3	-4	-14	-20	5	2	1	2	2	-7	-13	17	17	10	16
10,000	-6	-3	-4	-2	-4	-12	-17	5	2	3	2	3	-5	-10	14	14	10	13
5,000	-6	-4	-3	-2	-4	-11	-16	6	4	3	1	3	-4	-8	13	12	9	12
ALBANY, GA. TO TAMPA																	231 N.MI.	
15,000	8	8	-1	2	4	-5	-10	-10	-10	0	-3	-5	-15	-21	16	16	9	14
10,000	3	4	-2	1	1	-7	-11	-4	-5	2	-1	-2	-10	-15	13	13	9	12
5,000	-4	-1	-2	-1	-2	-9	-13	3	1	2	1	2	-5	-9	12	11	8	11
ALBANY, N. Y. TO BINGHAMPTON																	102 N.MI.	
15,000	-39	-26	-20	-25	-26	-41	-48	38	24	19	24	25	12	5	22	22	14	21
10,000	-28	-19	-15	-19	-20	-31	-37	27	18	14	18	19	8	3	18	18	12	16
5,000	-15	-10	-9	-11	-11	-20	-26	14	10	9	10	11	2	-3	15	15	11	13
ALBANY, N. Y. TO BOSTON																	126 N.MI.	
15,000	36	27	21	23	26	13	6	-38	-28	-21	-24	-27	-41	-49	22	22	14	21
10,000	28	20	16	18	20	10	4	-29	-21	-16	-19	-21	-32	-38	18	18	12	16
5,000	15	11	10	10	12	3	-2	-16	-12	-11	-11	-12	-21	-27	15	15	11	13
ALBANY, N.Y. TO BUFFALO																	217 N.MI.	
15,000	-40	-27	-21	-25	-27	-41	-49	38	26	21	24	26	13	7	22	21	14	20
10,000	-29	-20	-16	-20	-21	-32	-38	29	19	16	19	20	10	4	17	17	12	15
5,000	-16	-11	-10	-11	-12	-21	-26	16	11	10	11	11	3	-2	15	15	11	13

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ALBANY, N.Y. TO GLENS FALLS																	37 N.MI.	
15,000	10	3	3	8	6	-7	-15	-15	-5	-5	-10	-8	-22	-30	23	22	14	21
10,000	5	1	1	4	3	-8	-14	-8	-3	-2	-6	-4	-15	-21	18	18	12	16
5,000	2	0	1	3	1	-8	-13	-3	-1	-2	-3	-2	-11	-16	16	16	11	13
ALBANY, N.Y. TO HARTFORD																	80 N.MI.	
15,000	20	18	13	12	15	3	-5	-23	-20	-14	-14	-17	-31	-38	22	22	14	21
10,000	18	14	11	11	13	3	-3	-20	-16	-12	-12	-14	-25	-32	18	18	12	16
5,000	10	9	7	6	8	-1	-6	-11	-9	-7	-7	-8	-18	-23	15	15	11	13
ALBANY, N.Y. TO NEW YORK																	127 N.MI.	
15,000	-6	1	0	-5	-2	-15	-23	2	-4	-1	2	0	-13	-20	22	21	14	20
10,000	-1	1	1	-2	0	-10	-16	-2	-3	-2	1	-2	-12	-18	17	18	12	15
5,000	0	2	0	0	0	-8	-13	-1	-3	-1	0	-1	-10	-15	15	15	11	13
ALBANY, N.Y. TO ROCHESTER, N.Y.																	171 N.MI.	
15,000	-39	-27	-21	-25	-27	-41	-49	38	26	21	24	26	13	6	22	21	14	20
10,000	-29	-20	-16	-19	-21	-32	-38	28	19	16	19	20	10	4	17	18	12	15
5,000	-16	-11	-10	-11	-12	-21	-26	15	11	10	10	11	3	-2	15	15	11	13
ALBANY, N.Y. TO SYRACUSE																	104 N.MI.	
15,000	-38	-27	-21	-24	-27	-41	-48	36	26	21	23	26	13	6	22	22	14	21
10,000	-29	-20	-16	-19	-20	-32	-38	28	19	16	18	20	9	4	18	18	12	16
5,000	-16	-12	-10	-11	-12	-21	-26	15	11	10	10	11	2	-3	15	15	11	13
ALBUQUERQUE TO AMARILLO																	241 N.MI.	
15,000	28	22	9	13	17	6	0	-28	-23	-9	-14	-17	-30	-37	19	17	11	16
10,000	18	13	5	9	11	2	-2	-18	-14	-5	-9	-11	-20	-25	14	12	10	12
5,000	5	4	3	1	3	-3	-7	-5	-4	-3	-2	-3	-10	-14	11	11	8	10
ALBUQUERQUE TO DENVER																	295 N.MI.	
15,000	4	5	7	2	4	-6	-12	-6	-6	-7	-3	-6	-16	-22	19	17	11	16
10,000	2	3	4	2	3	-5	-9	-3	-4	-4	-3	-3	-11	-15	13	11	9	12
5,000	6	6	7	6	6	1	-3	-6	-6	-7	-6	-6	-12	-15	9	10	7	9
ALBUQUERQUE TO EL PASO																	195 N.MI.	
15,000	0	-1	-6	0	-2	-12	-17	-2	-1	5	-1	1	-9	-15	18	16	10	15
10,000	0	-1	-3	-2	-2	-9	-13	-1	0	3	1	1	-7	-11	13	11	9	11
5,000	-6	-6	-7	-5	-6	-12	-15	6	6	7	5	6	0	-3	10	10	6	9
ALBUQUERQUE TO LUBBOCK																	251 N.MI.	
15,000	26	21	6	12	15	4	-1	-27	-21	-6	-13	-15	-28	-35	18	17	11	16
10,000	17	12	4	7	9	1	-3	-17	-12	-4	-8	-10	-18	-23	14	12	9	12
5,000	3	1	-1	-2	0	-6	-10	-3	-2	1	1	0	-7	-11	11	11	8	10
ALBUQUERQUE TO PHOENIX																	286 N.MI.	
15,000	-24	-19	-10	-11	-15	-26	-32	23	19	9	10	14	4	-1	18	16	10	15
10,000	-13	-11	-6	-7	-9	-16	-21	13	10	5	7	8	1	-3	13	10	9	11
5,000	-3	-3	-1	3	-1	-6	-8	3	2	1	-3	1	-4	-7	8	8	5	7
ALBUQUERQUE TO ROSWELL																	141 N.MI.	
15,000	18	15	2	9	10	-1	-6	-20	-16	-2	-9	-11	-23	-30	19	17	11	16
10,000	12	8	1	4	6	-2	-6	-13	-9	-2	-5	-7	-15	-20	14	12	9	12
5,000	-1	-2	-5	-5	-4	-10	-13	1	2	5	5	3	-3	-6	10	10	7	9
ALBUQUERQUE TO SANTA FE																	42 N.MI.	
15,000	15	12	9	6	10	0	-6	-16	-13	-9	-7	-11	-22	-29	20	17	11	16
10,000	8	7	5	5	6	-2	-6	-9	-8	-5	-6	-7	-15	-19	14	12	10	12
5,000	6	6	6	4	5	-1	-4	-6	-6	-6	-4	-6	-11	-15	10	10	7	9
ALEXANDRIA TO BATON ROUGE																	87 N.MI.	
15,000	22	19	4	10	13	2	-3	-24	-21	-4	-11	-14	-26	-33	17	17	11	16
10,000	14	11	0	7	7	-2	-6	-15	-12	-1	-7	-8	-18	-23	14	14	10	13
5,000	5	3	0	3	3	-5	-9	-6	-4	-1	-3	-3	-11	-16	14	13	9	12
ALEXANDRIA TO SHREVEPORT																	93 N.MI.	
15,000	-20	-17	-4	-10	-11	-24	-31	17	16	3	9	10	0	-5	18	17	11	17
10,000	-13	-10	0	-6	-7	-16	-21	11	9	0	6	6	-3	-7	14	14	10	13
5,000	-4	-2	0	-2	-2	-10	-15	4	2	-1	2	1	-6	-11	14	13	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ALLENTOWN TO CLEVELAND																	294 N.MI.	
15,000	-42	-29	-19	-24	-27	-41	-50	41	28	19	23	26	14	8	21	20	12	19
10,000	-30	-22	-15	-19	-21	-32	-38	29	21	15	19	20	10	5	16	17	11	15
5,000	-16	-12	-9	-10	-11	-20	-25	16	12	9	10	11	3	-2	14	14	10	12
ALLENTOWN TO HARRISBURG																	70 N.MI.	
15,000	-41	-27	-18	-25	-26	-41	-50	39	25	17	24	25	12	5	22	22	13	20
10,000	-29	-20	-14	-19	-20	-31	-37	28	19	13	18	19	8	3	17	18	12	15
5,000	-15	-11	-8	-10	-11	-20	-25	14	10	8	9	10	1	-3	15	15	10	13
ALLENTOWN TO NEW YORK																	75 N.MI.	
15,000	41	29	19	24	27	14	7	-42	-30	-20	-25	-28	-43	-51	22	22	13	20
10,000	30	22	15	19	21	10	5	-31	-23	-16	-19	-21	-33	-39	18	18	12	15
5,000	16	12	9	10	11	3	-2	-16	-13	-9	-10	-12	-21	-26	15	15	11	13
ALLENTOWN TO PHILADELPHIA																	47 N.MI.	
15,000	2	7	3	0	3	-10	-17	-7	-10	-4	-2	-6	-19	-26	22	22	13	20
10,000	5	6	4	2	4	-6	-12	-7	-8	-5	-3	-6	-16	-22	18	18	12	15
5,000	3	4	2	2	3	-6	-11	-4	-5	-3	-2	-3	-12	-17	15	15	11	13
ALLENTOWN TO PITTSBURGH																	218 N.MI.	
15,000	-43	-29	-19	-25	-27	-42	-51	42	28	19	24	27	14	8	21	21	12	20
10,000	-31	-22	-15	-20	-21	-32	-38	30	21	15	19	21	10	5	17	17	12	15
5,000	-16	-12	-9	-10	-11	-20	-25	16	12	8	10	11	3	-2	14	14	10	12
ALLENTOWN TO READING																	29 N.MI.	
15,000	-38	-24	-16	-23	-24	-39	-47	36	22	16	22	23	10	3	22	22	13	21
10,000	-26	-18	-12	-17	-18	-29	-36	25	17	12	16	17	6	1	18	18	12	16
5,000	-14	-9	-7	-9	-9	-19	-24	13	9	7	8	9	0	-5	15	15	11	13
ALLENTOWN TO SCRANTON																	52 N.MI.	
15,000	-11	-12	-7	-5	-8	-21	-29	7	10	5	2	6	-7	-14	22	22	13	21
10,000	-10	-10	-7	-5	-8	-18	-24	7	8	6	4	6	-4	-10	18	18	12	16
5,000	-5	-6	-4	-3	-4	-13	-18	4	5	3	2	4	-5	-10	15	15	11	13
ALLENTOWN TO SYRACUSE																	151 N.MI.	
15,000	-8	-10	-5	-3	-6	-19	-26	3	7	4	0	4	-9	-16	22	21	13	20
10,000	-7	-8	-6	-4	-6	-16	-22	5	6	5	2	4	-6	-11	17	18	12	15
5,000	-4	-5	-3	-2	-3	-12	-17	3	4	3	1	3	-6	-11	15	15	11	13
ALLENTOWN TO WASHINGTON, D.C.																	131 N.MI.	
15,000	-28	-16	-11	-18	-17	-31	-39	25	13	10	16	15	3	-4	21	21	13	20
10,000	-18	-12	-8	-12	-12	-23	-29	16	10	7	11	11	1	-5	17	17	12	15
5,000	-9	-6	-4	-6	-6	-15	-20	9	5	4	5	6	-3	-8	15	15	10	13
AMARILLO TO COLORADO SPRINGS																	259 N.MI.	
15,000	-18	-13	-5	-11	-11	-22	-29	16	11	4	10	9	-1	-6	19	17	11	16
10,000	-12	-7	-3	-7	-7	-15	-20	11	7	2	6	6	-2	-6	14	12	10	12
5,000	0	1	4	2	2	-5	-9	-1	-2	-4	-3	-3	-9	-13	11	11	8	10
AMARILLO TO DALLAS																	280 N.MI.	
15,000	25	20	5	13	14	3	-2	-27	-22	-5	-13	-15	-28	-35	18	17	10	16
10,000	17	12	3	8	9	1	-4	-18	-12	-3	-8	-10	-19	-24	14	13	10	12
5,000	5	3	1	2	2	-5	-10	-6	-4	-1	-2	-3	-11	-16	13	13	9	12
AMARILLO TO DENVER																	311 N.MI.	
15,000	-16	-11	-4	-10	-10	-21	-27	14	10	4	9	8	-2	-7	19	17	11	16
10,000	-11	-7	-2	-6	-6	-14	-19	10	6	2	6	6	-2	-7	13	12	10	12
5,000	1	2	4	3	3	-4	-8	-1	-3	-5	-3	-3	-10	-13	11	11	8	10
AMARILLO TO LUBBOCK																	94 N.MI.	
15,000	-4	-3	-3	0	-2	-13	-19	1	1	2	-1	1	-10	-16	19	18	11	16
10,000	-2	-4	-2	-1	-2	-11	-15	1	3	2	1	2	-7	-11	14	13	10	13
5,000	-5	-6	-9	-5	-6	-14	-18	4	5	9	5	6	-2	-6	13	13	9	11
AMARILLO TO OKLAHOMA CITY																	200 N.MI.	
15,000	31	24	8	15	18	6	1	-32	-25	-8	-15	-18	-32	-40	19	18	11	16
10,000	21	16	5	10	12	3	-1	-21	-16	-6	-10	-13	-23	-28	14	14	10	13
5,000	8	7	7	5	7	-1	-6	-8	-7	-7	-6	-7	-15	-20	13	14	10	12

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
AMARILLO TO WICHITA																	258 N.MI.	
15,000	24	19	8	12	15	4	-2	-26	-20	-8	-12	-16	-28	-35	19	18	11	17
10,000	17	13	6	8	11	2	-3	-17	-14	-6	-9	-11	-20	-25	14	14	10	13
5,000	7	8	9	6	8	0	-5	-8	-8	-9	-7	-8	-16	-21	13	14	10	12
ANDERSON TO ATLANTA																	99 N.MI.	
15,000	-34	-25	-7	-16	-19	-33	-42	33	23	7	15	18	6	0	19	19	11	18
10,000	-24	-17	-7	-11	-14	-25	-31	23	16	7	10	13	4	-1	15	15	10	14
5,000	-13	-10	-5	-4	-8	-16	-21	12	9	5	4	7	-1	-5	14	13	9	12
ANDERSON TO GREENVILLE																	28 N.MI.	
15,000	28	18	6	12	14	3	-3	-30	-20	-6	-14	-16	-30	-38	20	20	11	19
10,000	18	13	6	9	11	1	-4	-20	-14	-6	-10	-12	-22	-28	15	16	10	15
5,000	10	7	4	3	6	-2	-7	-11	-8	-4	-4	-6	-15	-19	14	13	9	13
ASHEVILLE TO ATLANTA																	142 N.MI.	
15,000	-30	-20	-6	-13	-16	-29	-38	28	18	6	12	14	3	-3	19	19	11	18
10,000	-20	-14	-6	-9	-12	-22	-27	18	13	6	9	11	2	-3	15	15	10	14
5,000	-11	-8	-4	-4	-6	-15	-19	10	8	4	3	6	-2	-6	14	13	9	12
ASHEVILLE TO BRISTOL																	63 N.MI.	
15,000	7	1	1	3	3	-9	-15	-11	-4	-1	-5	-5	-17	-24	20	20	11	19
10,000	3	1	1	2	2	-8	-13	-5	-2	-1	-3	-3	-12	-18	15	16	11	15
5,000	2	1	0	0	1	-8	-12	-3	-2	0	-1	-1	-9	-14	14	13	9	13
ASHEVILLE TO CHARLOTTE																	79 N.MI.	
15,000	36	29	10	17	21	8	2	-37	-30	-10	-18	-22	-37	-46	20	20	11	19
10,000	27	20	9	12	16	6	1	-28	-21	-9	-13	-17	-28	-34	15	16	11	15
5,000	14	11	6	5	9	0	-4	-15	-11	-6	-5	-9	-18	-23	14	13	9	13
ASHEVILLE TO GREENSBORO																	132 N.MI.	
15,000	38	27	10	18	21	9	3	-39	-28	-11	-19	-22	-38	-46	20	20	11	19
10,000	27	19	9	13	16	6	1	-27	-20	-9	-14	-17	-28	-34	15	16	11	15
5,000	14	10	6	5	8	0	-4	-15	-11	-6	-6	-9	-17	-22	14	13	9	12
ASHEVILLE TO KNOXVILLE																	74 N.MI.	
15,000	-35	-28	-10	-17	-21	-36	-44	34	27	10	16	20	8	1	20	20	11	19
10,000	-27	-20	-9	-13	-16	-27	-33	26	19	8	12	16	5	0	15	16	11	15
5,000	-14	-11	-6	-6	-9	-17	-22	14	10	6	5	8	0	-4	14	13	9	13
ATLANTA TO AUGUSTA, GA.																	123 N.MI.	
15,000	34	27	8	15	19	7	1	-35	-28	-8	-16	-20	-35	-43	19	19	11	18
10,000	25	19	7	11	14	5	0	-25	-19	-7	-11	-15	-26	-32	15	15	10	14
5,000	12	10	5	4	8	0	-4	-13	-10	-5	-5	-8	-16	-21	13	13	9	12
ATLANTA TO BIRMINGHAM																	116 N.MI.	
15,000	-36	-28	-8	-16	-20	-35	-43	35	27	7	16	19	7	1	19	19	11	18
10,000	-25	-19	-7	-11	-15	-26	-32	25	18	6	11	14	4	0	15	15	10	14
5,000	-13	-10	-5	-5	-8	-17	-21	13	10	5	5	8	0	-5	14	13	9	12
ATLANTA TO CHARLESTON, S.C.																	225 N.MI.	
15,000	33	27	7	15	18	7	1	-34	-27	-7	-15	-19	-34	-41	18	18	10	17
10,000	24	18	6	10	13	4	-1	-24	-19	-6	-10	-14	-25	-31	14	15	10	13
5,000	11	9	5	4	7	-1	-5	-12	-10	-5	-5	-7	-15	-20	13	12	9	12
ATLANTA TO CHARLESTON, W.VA.																	315 N.MI.	
15,000	20	11	5	9	10	-1	-6	-23	-13	-5	-11	-12	-24	-32	19	19	11	18
10,000	12	8	4	7	7	-1	-6	-14	-9	-5	-8	-8	-18	-23	14	15	10	14
5,000	7	5	2	2	4	-4	-8	-8	-5	-3	-3	-4	-12	-17	13	13	9	12
ATLANTA TO CHARLOTTE																	197 N.MI.	
15,000	34	25	8	16	19	7	1	-36	-26	-8	-16	-20	-34	-43	19	19	11	18
10,000	24	17	7	11	14	4	0	-25	-18	-8	-12	-15	-25	-31	15	15	10	14
5,000	13	10	5	4	7	0	-5	-13	-10	-5	-5	-8	-16	-21	14	13	9	12
ATLANTA TO CHATTANOOGA																	91 N.MI.	
15,000	-12	-13	-4	-6	-8	-20	-26	8	10	3	5	6	-5	-11	19	19	11	18
10,000	-10	-9	-2	-4	-6	-15	-21	8	7	2	4	5	-4	-9	15	15	10	14
5,000	-4	-3	-2	-2	-3	-11	-15	3	3	2	2	2	-6	-10	14	13	9	12

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ATLANTA TO CINCINNATI																	324 N.MI.	
15,000	1	-3	-1	0	-1	-11	-18	-6	0	0	-2	-1	-13	-19	19	19	11	18
10,000	-1	-2	0	0	-1	-10	-15	-2	0	0	-1	-1	-9	-14	14	15	10	14
5,000	0	0	0	0	0	-8	-12	-1	0	0	0	0	-8	-12	14	13	9	12
ATLANTA TO COLUMBIA																	166 N.MI.	
15,000	35	27	8	16	20	8	2	-36	-28	-8	-17	-20	-36	-44	19	18	11	18
10,000	25	19	7	11	15	5	0	-26	-20	-7	-12	-15	-26	-32	15	15	10	14
5,000	13	10	5	5	8	0	-4	-13	-10	-6	-5	-8	-17	-21	13	13	9	12
ATLANTA TO COLUMBUS																	73 N.MI.	
15,000	-18	-11	-3	-7	-9	-21	-28	15	8	3	6	7	-3	-9	19	18	11	17
10,000	-12	-8	-5	-5	-7	-16	-21	11	6	4	4	6	-3	-8	15	15	10	14
5,000	-8	-6	-3	-2	-5	-13	-17	7	5	3	2	4	-4	-8	14	13	9	12
ATLANTA TO GREENSBORO																	265 N.MI.	
15,000	33	23	8	15	18	6	1	-35	-25	-8	-16	-19	-34	-42	19	19	11	18
10,000	23	16	7	11	14	4	0	-24	-17	-8	-12	-14	-25	-31	14	15	10	14
5,000	12	9	5	4	7	-1	-5	-13	-10	-5	-5	-8	-16	-20	13	12	9	12
ATLANTA TO GREENVILLE																	126 N.MI.	
15,000	32	22	7	14	17	5	0	-34	-24	-7	-15	-18	-33	-41	19	19	11	18
10,000	22	16	7	10	13	3	-1	-23	-17	-7	-11	-14	-24	-30	15	15	10	14
5,000	12	9	5	4	7	-1	-5	-13	-9	-5	-4	-7	-16	-21	14	13	9	12
ATLANTA TO INDIANAPOLIS																	376 N.MI.	
15,000	-7	-9	-3	-5	-5	-17	-23	3	6	3	3	3	-7	-13	19	19	11	18
10,000	-6	-6	-2	-3	-4	-13	-18	4	5	2	2	3	-6	-11	14	15	10	14
5,000	-3	-3	-2	-2	-2	-10	-14	2	2	1	1	2	-6	-10	13	13	9	12
ATLANTA TO JACKSONVILLE																	241 N.MI.	
15,000	15	15	2	7	9	-1	-6	-18	-16	-3	-8	-10	-22	-28	17	17	10	16
10,000	10	10	1	4	6	-3	-7	-12	-10	-1	-5	-6	-16	-21	14	14	9	13
5,000	2	3	1	2	2	-5	-9	-3	-4	-1	-2	-2	-10	-14	13	12	9	11
ATLANTA TO KNOXVILLE																	132 N.MI.	
15,000	11	3	1	4	4	-7	-13	-14	-6	-2	-5	-6	-18	-25	19	19	11	18
10,000	6	3	2	3	3	-6	-11	-8	-4	-2	-4	-4	-13	-19	15	15	10	14
5,000	3	2	1	1	2	-6	-11	-4	-3	-1	-1	-2	-10	-15	14	13	9	12
ATLANTA TO LOUISVILLE																	279 N.MI.	
15,000	-6	-8	-3	-4	-5	-16	-22	1	6	2	2	3	-8	-14	19	19	11	18
10,000	-5	-6	-2	-3	-4	-13	-18	3	4	1	2	2	-6	-11	14	15	10	14
5,000	-3	-2	-1	-2	-2	-10	-14	2	1	1	1	1	-7	-11	14	13	9	12
ATLANTA TO MACON																	70 N.MI.	
15,000	14	14	3	7	9	-2	-8	-17	-16	-4	-8	-10	-22	-29	19	19	11	18
10,000	11	9	1	5	6	-3	-8	-12	-11	-2	-5	-7	-17	-22	15	15	10	14
5,000	4	4	2	2	3	-5	-10	-4	-4	-2	-2	-3	-11	-15	14	13	9	12
ATLANTA TO MELBOURNE																	386 N.MI.	
15,000	12	12	1	4	6	-3	-7	-15	-13	-1	-5	-7	-18	-25	16	16	9	14
10,000	7	7	-1	2	3	-4	-9	-8	-8	0	-3	-4	-13	-17	13	13	9	12
5,000	-1	1	0	0	0	-7	-11	0	-2	0	-1	0	-7	-11	12	11	8	11
ATLANTA TO MEMPHIS																	288 N.MI.	
15,000	-34	-27	-8	-16	-19	-34	-42	32	26	8	15	18	7	1	19	18	10	17
10,000	-24	-18	-6	-11	-14	-25	-31	24	18	6	11	14	4	-1	14	15	10	14
5,000	-12	-10	-5	-5	-8	-16	-21	12	9	5	4	7	-1	-5	14	13	9	12
ATLANTA TO MOBILE																	263 N.MI.	
15,000	-28	-20	-4	-12	-14	-28	-35	27	18	4	11	13	2	-3	17	17	10	16
10,000	-19	-14	-6	-7	-11	-20	-26	19	13	5	7	10	2	-3	14	14	9	13
5,000	-11	-9	-5	-4	-7	-15	-19	11	8	5	3	6	-1	-5	13	12	9	11
ATLANTA TO MONTGOMERY																	128 N.MI.	
15,000	-30	-21	-6	-13	-16	-30	-38	29	20	5	12	15	3	-2	18	18	10	17
10,000	-21	-15	-6	-9	-12	-22	-28	20	14	6	8	11	2	-3	14	15	10	14
5,000	-12	-9	-5	-4	-7	-15	-20	11	9	5	4	7	-1	-5	13	13	9	12

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ATLANTA TO NASHVILLE																	186 N.MI.	
15,000	-19	-18	-5	-10	-12	-24	-32	15	16	5	9	10	-1	-6	19	19	11	18
10,000	-15	-12	-4	-7	-9	-19	-24	13	11	4	6	8	-1	-6	15	15	10	14
5,000	-8	-6	-4	-3	-5	-13	-18	7	5	3	3	4	-4	-8	14	13	9	12
ATLANTA TO NEW ORLEANS																	369 N.MI.	
15,000	-30	-21	-4	-12	-15	-29	-36	28	20	4	11	14	3	-2	17	16	10	16
10,000	-20	-15	-5	-7	-11	-21	-26	20	14	5	7	11	2	-2	13	14	9	13
5,000	-12	-9	-5	-4	-7	-15	-19	11	8	5	4	7	-1	-5	13	12	8	11
ATLANTA TO ORLANDO																	345 N.MI.	
15,000	11	11	1	4	6	-3	-8	-13	-12	-1	-5	-7	-18	-24	16	16	9	15
10,000	6	7	-1	2	3	-5	-9	-8	-8	0	-3	-4	-12	-17	13	13	9	12
5,000	-1	1	0	0	0	-7	-11	0	-2	0	-1	0	-7	-11	12	11	8	11
ATLANTA TO RALEIGH																	309 N.MI.	
15,000	35	26	9	16	20	8	2	-37	-27	-9	-17	-21	-35	-43	18	18	10	18
10,000	25	18	8	12	15	5	1	-25	-19	-8	-12	-15	-26	-32	14	15	10	14
5,000	13	10	5	4	8	0	-4	-14	-10	-5	-5	-8	-16	-21	13	12	9	12
ATLANTA TO ROME																	56 N.MI.	
15,000	-21	-19	-5	-10	-13	-25	-33	18	17	5	9	11	0	-6	19	19	11	18
10,000	-16	-13	-3	-7	-9	-19	-25	14	12	3	6	8	-1	-6	15	15	10	14
5,000	-7	-6	-3	-3	-5	-13	-17	6	5	3	3	4	-4	-8	14	13	9	12
ATLANTA TO ST. PETERSBURG																	355 N.MI.	
15,000	4	5	0	1	2	-7	-12	-6	-7	0	-2	-3	-13	-18	16	16	9	15
10,000	1	3	-2	0	0	-8	-12	-3	-4	2	-1	-1	-9	-14	13	13	9	12
5,000	-3	-1	-2	-1	-2	-9	-13	3	1	2	0	1	-6	-9	12	11	8	11
ATLANTA TO SAVANNAH																	193 N.MI.	
15,000	26	23	5	12	15	4	-2	-28	-24	-6	-12	-16	-29	-37	18	18	10	17
10,000	19	15	4	8	11	1	-3	-20	-16	-4	-8	-11	-21	-27	14	15	10	13
5,000	8	7	3	3	5	-2	-6	-8	-7	-4	-4	-6	-13	-18	13	12	9	12
ATLANTA TO TALLAHASSEE																	195 N.MI.	
15,000	-5	-1	-1	-2	-2	-12	-17	2	-2	0	1	0	-10	-15	17	17	10	16
10,000	-3	-1	-3	-1	-2	-11	-15	2	0	3	1	1	-7	-12	14	14	10	13
5,000	-5	-3	-2	-1	-2	-10	-14	4	2	2	0	2	-5	-10	13	12	9	12
ATLANTA TO TAMPA																	355 N.MI.	
15,000	5	6	0	1	2	-6	-11	-7	-8	0	-2	-4	-14	-19	16	16	9	15
10,000	2	3	-2	0	1	-7	-11	-3	-4	2	-1	-1	-9	-14	13	13	9	12
5,000	-3	-1	-2	-1	-2	-9	-12	3	1	1	0	1	-6	-10	12	11	8	11
ATLANTIC CITY TO NEW YORK																	80 N.MI.	
15,000	21	11	8	14	13	0	-6	-25	-13	-9	-16	-15	-29	-36	22	22	13	20
10,000	13	8	6	10	9	-1	-7	-15	-10	-7	-11	-10	-21	-27	18	18	12	15
5,000	7	3	3	4	4	-4	-9	-8	-4	-4	-5	-5	-14	-19	15	15	11	13
ATLANTIC CITY TO WASHINGTON, D.C.																	120 N.MI.	
15,000	-41	-29	-17	-24	-26	-41	-50	40	27	17	23	25	12	6	21	21	12	20
10,000	-29	-22	-14	-18	-20	-31	-37	29	21	13	17	19	9	4	17	17	11	15
5,000	-15	-12	-8	-9	-11	-20	-25	15	11	8	9	10	2	-3	15	14	10	13
AUGUSTA, GA. TO CHARLESTON, S.C.																	101 N.MI.	
15,000	31	26	7	14	18	6	0	-33	-27	-7	-15	-18	-33	-41	18	18	10	17
10,000	23	18	6	9	13	3	-1	-23	-18	-6	-10	-13	-24	-30	15	15	10	14
5,000	10	9	5	4	7	-1	-5	-11	-9	-5	-4	-7	-15	-20	13	12	9	12
AUGUSTA, GA. TO COLUMBIA																	55 N.MI.	
15,000	29	21	7	14	16	4	-1	-31	-22	-7	-14	-17	-31	-39	19	19	11	18
10,000	20	15	7	10	12	3	-2	-21	-15	-7	-10	-13	-23	-29	15	15	10	14
5,000	11	8	4	4	7	-1	-6	-12	-9	-5	-4	-7	-15	-20	14	13	9	12
AUGUSTA, GA. TO JACKSONVILLE																	178 N.MI.	
15,000	-1	1	-1	-1	-1	-10	-16	-2	-4	1	0	-1	-11	-17	17	17	10	16
10,000	-1	1	-2	-1	-1	-10	-14	0	-2	2	1	0	-8	-13	14	14	9	13
5,000	-4	-2	-2	-1	-2	-9	-13	3	1	1	1	2	-6	-10	13	12	9	11

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
AUGUSTA, GA. TO SAVANNAH																	91 N.MI.	
15,000	11	11	2	4	6	-4	-10	-14	-13	-2	-5	-8	-19	-26	18	18	10	17
10,000	8	8	1	2	4	-5	-9	-10	-9	-1	-3	-5	-15	-20	15	15	10	14
5,000	1	2	1	1	1	-6	-10	-2	-3	-1	-1	-2	-10	-14	13	12	9	12
AUGUSTA, ME. TO BANGOR																	50 N.MI.	
15,000	32	20	18	24	23	9	2	-34	-21	-19	-25	-24	-39	-47	23	22	15	22
10,000	23	12	12	16	15	4	-1	-24	-14	-13	-17	-16	-28	-34	18	18	13	16
5,000	10	7	10	9	9	0	-5	-11	-8	-10	-10	-10	-19	-24	16	15	12	13
AUGUSTA, ME. TO LEWISTON																	21 N.MI.	
15,000	-34	-22	-19	-25	-24	-39	-47	33	20	18	23	23	9	2	23	22	15	22
10,000	-24	-14	-13	-17	-16	-28	-34	23	13	12	16	15	5	-1	18	18	13	16
5,000	-11	-8	-10	-10	-10	-19	-24	11	7	9	9	9	0	-6	16	16	12	13
AUGUSTA, ME. TO ROCKLAND																	33 N.MI.	
15,000	28	22	20	20	22	9	1	-31	-23	-20	-22	-24	-38	-46	23	22	15	22
10,000	25	17	16	17	18	7	1	-26	-18	-16	-18	-19	-30	-37	18	18	13	16
5,000	14	10	10	10	11	2	-4	-15	-10	-11	-11	-11	-21	-26	16	16	12	13
AUSTIN TO DALLAS																	159 N.MI.	
15,000	11	8	4	2	6	-4	-9	-14	-10	-4	-3	-7	-18	-24	18	16	10	16
10,000	9	7	4	2	6	-3	-7	-11	-8	-4	-3	-6	-15	-19	14	13	10	12
5,000	7	7	9	4	7	-1	-6	-7	-8	-9	-4	-7	-15	-19	14	13	9	12
AUSTIN TO FT. WORTH																	156 N.MI.	
15,000	9	6	4	2	5	-5	-10	-12	-8	-4	-3	-6	-17	-22	18	16	10	16
10,000	8	7	4	2	5	-3	-8	-9	-7	-4	-2	-6	-14	-19	14	13	10	12
5,000	6	7	9	4	7	-1	-6	-7	-7	-9	-4	-7	-15	-19	14	13	9	12
AUSTIN TO HOUSTON																	132 N.MI.	
15,000	26	22	2	10	14	2	-3	-27	-22	-2	-10	-14	-27	-35	17	16	10	15
10,000	16	12	1	6	8	-1	-5	-17	-13	-1	-6	-9	-18	-23	13	13	10	12
5,000	7	3	-1	2	2	-5	-9	-8	-4	0	-2	-3	-11	-15	14	12	8	12
AUSTIN TO SAN ANGELO																	158 N.MI.	
15,000	-26	-21	-1	-10	-13	-27	-34	25	20	0	10	13	1	-4	17	16	10	15
10,000	-16	-12	-1	-6	-8	-17	-22	15	11	1	6	8	-1	-5	13	13	10	12
5,000	-7	-2	2	-1	-1	-10	-14	6	2	-3	1	1	-7	-11	14	13	9	12
AUSTIN TO SAN ANTONIO																	61 N.MI.	
15,000	-24	-19	-4	-7	-12	-24	-31	22	17	4	7	11	1	-4	17	16	10	15
10,000	-17	-13	-5	-5	-10	-19	-24	17	13	5	4	9	1	-4	13	13	10	12
5,000	-11	-9	-8	-5	-8	-16	-20	10	9	8	5	8	0	-4	14	13	9	12
AUSTIN TO WACO																	83 N.MI.	
15,000	12	9	4	3	6	-4	-9	-14	-10	-4	-3	-7	-18	-24	18	16	11	16
10,000	10	8	4	2	6	-2	-7	-11	-9	-5	-3	-7	-15	-20	14	13	10	12
5,000	7	8	9	4	7	-1	-5	-8	-8	-9	-5	-8	-15	-20	14	13	9	12
BAKERSFIELD TO FRESNO																	86 N.MI.	
15,000	-14	-10	0	-4	-6	-19	-26	13	9	0	3	5	-6	-12	22	19	11	17
10,000	-10	-9	1	-3	-4	-14	-19	9	8	-2	2	4	-5	-10	16	14	9	13
5,000	-4	-4	-2	-4	-4	-10	-13	3	4	2	4	3	-3	-6	11	9	7	9
BAKERSFIELD TO LOS ANGELES																	96 N.MI.	
15,000	12	8	-1	2	4	-7	-12	-13	-9	1	-3	-5	-17	-24	21	18	11	16
10,000	8	8	-2	2	3	-5	-10	-9	-9	2	-2	-4	-13	-18	16	14	9	12
5,000	4	5	1	3	3	-3	-6	-5	-5	-1	-3	-3	-9	-13	11	9	7	9
BAKERSFIELD TO VISALIA																	56 N.MI.	
15,000	-13	-9	0	-3	-5	-18	-25	11	7	-1	3	4	-7	-13	22	19	11	17
10,000	-9	-8	2	-2	-4	-13	-19	8	7	-2	2	3	-6	-10	16	14	9	13
5,000	-4	-4	-2	-4	-3	-9	-13	3	4	2	4	3	-3	-6	11	9	7	9
BALTIMORE TO BOSTON																	321 N.MI.	
15,000	34	22	15	21	22	10	3	-37	-23	-16	-23	-23	-37	-45	21	20	13	19
10,000	24	16	11	16	16	6	1	-25	-18	-12	-17	-17	-28	-34	17	17	11	15
5,000	12	8	7	8	9	0	-4	-13	-9	-7	-9	-9	-18	-23	14	14	10	12

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BALTIMORE TO BUFFALO																	245 N.MI.	
15,000	-17	-15	-8	-7	-11	-24	-31	12	13	7	5	9	-3	-10	21	21	13	20
10,000	-13	-12	-8	-7	-10	-20	-26	10	10	7	6	8	-1	-7	16	17	12	15
5,000	-7	-7	-5	-4	-5	-14	-19	6	6	4	3	5	-4	-8	14	14	10	12
BALTIMORE TO CHARLOTTE																	313 N.MI.	
15,000	-31	-19	-9	-17	-18	-31	-39	28	17	9	16	16	5	-1	19	19	11	18
10,000	-20	-14	-7	-12	-13	-23	-28	18	13	7	11	12	2	-3	15	16	10	14
5,000	-10	-7	-4	-5	-6	-15	-19	10	7	4	5	6	-2	-6	14	13	9	12
BALTIMORE TO DETROIT																	355 N.MI.	
15,000	-37	-27	-16	-20	-24	-37	-45	35	25	16	18	22	10	4	20	20	12	19
10,000	-26	-20	-14	-17	-19	-29	-35	25	19	14	16	18	8	3	16	16	11	14
5,000	-14	-11	-8	-9	-10	-19	-23	13	11	8	8	10	2	-3	14	14	9	12
BALTIMORE TO HARRISBURG																	64 N.MI.	
15,000	-6	-9	-3	0	-4	-17	-24	1	6	2	-2	1	-11	-18	22	22	13	20
10,000	-5	-6	-4	-2	-4	-15	-20	3	5	3	1	3	-7	-13	17	18	12	15
5,000	-3	-4	-2	-2	-3	-11	-16	2	3	2	1	2	-7	-12	15	15	10	13
BALTIMORE TO LANCASTER																	59 N.MI.	
15,000	12	4	5	10	7	-5	-12	-17	-7	-6	-12	-10	-23	-30	22	22	13	20
10,000	7	3	2	6	5	-6	-11	-10	-5	-3	-7	-6	-17	-23	17	18	12	15
5,000	4	1	1	3	2	-6	-11	-5	-2	-2	-3	-3	-12	-17	15	15	10	13
BALTIMORE TO MONTREAL																	399 N.MI.	
15,000	14	5	5	10	8	-4	-10	-18	-8	-7	-12	-11	-23	-30	21	20	13	19
10,000	8	3	3	6	5	-5	-10	-11	-5	-4	-8	-6	-16	-22	16	16	11	14
5,000	4	1	2	4	3	-6	-10	-5	-2	-3	-4	-3	-12	-16	14	14	10	12
BALTIMORE TO NEW YORK																	159 N.MI.	
15,000	36	23	15	22	23	10	4	-38	-25	-16	-23	-24	-39	-47	21	21	13	20
10,000	25	18	12	16	17	7	1	-26	-19	-12	-17	-18	-29	-35	17	17	12	15
5,000	13	9	7	8	9	0	-4	-14	-10	-7	-8	-9	-18	-23	15	15	10	13
BALTIMORE TO NORFOLK																	138 N.MI.	
15,000	1	5	2	-2	2	-10	-17	-6	-8	-3	0	-4	-16	-23	21	20	12	19
10,000	3	4	2	0	2	-7	-13	-6	-5	-3	-1	-4	-14	-19	17	17	11	15
5,000	2	3	1	1	2	-7	-11	-3	-3	-2	-1	-2	-11	-15	14	14	10	13
BALTIMORE TO PHILADELPHIA																	79 N.MI.	
15,000	36	23	15	22	22	10	3	-38	-25	-16	-23	-24	-39	-47	22	21	13	20
10,000	25	18	11	16	17	6	1	-26	-19	-12	-17	-18	-29	-35	17	18	12	15
5,000	13	9	7	8	9	0	-4	-14	-10	-7	-8	-9	-18	-24	15	15	10	13
BALTIMORE TO PITTSBURGH																	182 N.MI.	
15,000	-39	-29	-17	-21	-25	-40	-48	37	27	16	19	24	11	5	21	21	12	20
10,000	-28	-22	-14	-18	-20	-31	-37	27	21	14	17	19	9	4	16	17	12	15
5,000	-15	-12	-8	-9	-11	-19	-24	14	12	8	9	10	2	-3	14	14	10	12
BALTIMORE TO PROVIDENCE																	284 N.MI.	
15,000	36	23	16	22	23	11	4	-38	-25	-17	-23	-24	-38	-46	21	21	12	19
10,000	25	18	12	16	17	7	2	-26	-19	-13	-17	-18	-29	-35	17	17	11	15
5,000	13	9	7	8	9	1	-4	-14	-10	-8	-9	-10	-18	-23	14	14	10	12
BALTIMORE TO RICHMOND																	105 N.MI.	
15,000	-17	-8	-5	-11	-10	-23	-30	13	5	5	10	7	-4	-11	21	21	12	19
10,000	-10	-6	-3	-7	-6	-17	-22	8	4	3	6	5	-5	-10	17	17	11	15
5,000	-5	-3	-2	-3	-3	-12	-16	4	2	2	2	2	-6	-11	15	14	10	13
BALTIMORE TO ROCHESTER, N.Y.																	241 N.MI.	
15,000	-8	-10	-5	-2	-6	-18	-25	3	7	4	0	4	-9	-16	21	21	13	20
10,000	-7	-8	-5	-4	-6	-16	-21	4	6	5	2	4	-6	-11	17	17	12	15
5,000	-4	-5	-3	-2	-3	-12	-16	3	4	3	1	3	-6	-11	14	14	10	12
BALTIMORE TO SYRACUSE																	238 N.MI.	
15,000	4	-2	1	5	2	-10	-17	-9	-1	-2	-7	-5	-17	-24	21	21	13	20
10,000	2	-1	-1	2	0	-10	-15	-4	0	0	-4	-2	-12	-18	17	17	12	15
5,000	1	-1	0	1	0	-8	-13	-2	0	0	-2	-1	-9	-14	14	14	10	12

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BALTIMORE TO WASHINGTON, D.C.																	26 N.MI.	
15,000	-32	-19	-12	-19	-19	-33	-42	29	17	11	18	17	5	-2	22	21	13	20
10,000	-21	-14	-9	-14	-14	-25	-31	19	13	8	13	13	2	-3	17	18	12	15
5,000	-11	-7	-5	-6	-7	-16	-21	10	7	5	6	7	-2	-7	15	15	10	13
BALTIMORE TO WILMINGTON, DEL.																	58 N.MI.	
15,000	36	23	15	22	23	10	3	-38	-25	-16	-23	-24	-39	-47	22	21	13	20
10,000	25	18	12	16	17	7	1	-27	-19	-12	-17	-18	-29	-35	17	18	12	15
5,000	13	9	7	8	9	0	-4	-14	-10	-7	-8	-9	-19	-24	15	15	10	13
BANGOR TO BOSTON																	174 N.MI.	
15,000	-27	-15	-13	-19	-18	-32	-39	24	13	11	17	16	3	-4	22	22	14	21
10,000	-17	-9	-8	-12	-11	-22	-28	15	8	7	11	10	-1	-6	18	18	12	15
5,000	-7	-5	-7	-7	-6	-15	-20	6	4	6	6	6	-4	-9	15	15	11	13
BANGOR TO HOULTON																	90 N.MI.	
15,000	20	11	10	15	14	0	-7	-23	-13	-11	-17	-16	-30	-38	23	22	15	21
10,000	13	5	5	9	8	-3	-9	-15	-7	-6	-10	-9	-20	-26	18	18	13	16
5,000	5	3	6	6	5	-5	-10	-6	-4	-6	-6	-6	-15	-20	16	15	12	13
BANGOR TO PORTLAND, ME.																	94 N.MI.	
15,000	-30	-18	-16	-22	-21	-35	-43	28	16	15	20	19	6	-1	23	22	15	21
10,000	-20	-11	-10	-14	-14	-25	-31	19	10	9	13	12	2	-4	18	18	12	16
5,000	-9	-6	-8	-8	-8	-17	-22	8	6	8	8	7	-2	-7	16	15	12	13
BANGOR TO PRESQUE ISLE																	117 N.MI.	
15,000	13	6	5	10	8	-5	-12	-17	-8	-7	-12	-10	-24	-32	23	22	15	21
10,000	7	2	2	5	4	-7	-13	-9	-3	-3	-6	-5	-16	-22	18	17	13	16
5,000	1	1	3	3	2	-7	-12	-2	-2	-4	-4	-3	-12	-17	16	15	12	13
BATON ROUGE TO LAFAYETTE																	48 N.MI.	
15,000	-30	-23	-4	-11	-16	-29	-37	29	22	3	11	15	3	-2	17	17	11	16
10,000	-20	-15	-4	-6	-11	-21	-26	20	15	4	6	10	1	-4	14	14	10	13
5,000	-11	-8	-5	-4	-7	-15	-20	11	8	4	4	7	-1	-6	14	13	9	12
BATON ROUGE TO LAKE CHARLES																	106 N.MI.	
15,000	-31	-24	-4	-12	-16	-30	-38	30	24	4	11	16	4	-1	17	17	10	16
10,000	-21	-15	-3	-7	-11	-21	-27	20	15	3	7	10	1	-3	14	14	10	13
5,000	-11	-8	-4	-4	-6	-15	-19	10	7	4	4	6	-2	-6	13	13	9	12
BATON ROUGE TO NEW ORLEANS																	57 N.MI.	
15,000	21	19	4	10	12	2	-4	-23	-20	-4	-10	-13	-25	-32	17	17	11	16
10,000	14	10	0	6	7	-2	-7	-15	-11	0	-7	-8	-17	-23	14	14	10	13
5,000	5	3	0	3	3	-5	-9	-5	-4	-1	-3	-3	-11	-15	13	13	9	12
BEAUMONT TO HOUSTON																	68 N.MI.	
15,000	-30	-24	-4	-11	-16	-29	-36	29	23	4	10	15	4	-2	17	16	10	16
10,000	-20	-15	-3	-6	-10	-20	-26	19	15	3	6	10	1	-3	14	13	10	13
5,000	-11	-8	-4	-4	-6	-14	-19	10	7	4	4	6	-2	-6	14	12	9	12
BEAUMONT TO LAKE CHARLES																	47 N.MI.	
15,000	29	23	4	10	15	3	-2	-30	-23	-4	-11	-16	-29	-37	17	16	11	16
10,000	20	15	3	6	10	1	-3	-20	-15	-4	-6	-11	-21	-26	14	14	10	13
5,000	11	8	5	4	6	-1	-6	-11	-8	-5	-5	-7	-15	-20	14	13	9	12
BEAUMONT TO SHREVEPORT																	150 N.MI.	
15,000	6	2	1	0	2	-8	-13	-8	-4	-1	-1	-3	-14	-19	17	17	10	16
10,000	5	4	4	0	3	-5	-10	-6	-5	-4	-1	-4	-12	-17	14	13	10	13
5,000	5	5	6	2	5	-3	-8	-6	-6	-6	-2	-5	-13	-17	13	13	9	12
BIG SPRINGS TO MIDLAND																	38 N.MI.	
15,000	-28	-23	-5	-11	-15	-28	-36	27	22	5	10	15	3	-2	19	17	11	16
10,000	-19	-15	-5	-7	-11	-20	-25	18	14	5	7	10	2	-3	14	13	10	12
5,000	-9	-7	-6	-4	-6	-14	-18	8	7	6	3	6	-2	-6	13	13	9	11
BILLINGS TO BISMARK																	328 N.MI.	
15,000	24	15	18	21	20	9	3	-25	-16	-19	-22	-20	-31	-37	17	17	13	16
10,000	18	10	12	14	13	5	1	-18	-10	-12	-14	-14	-22	-26	13	12	10	12
5,000	13	5	5	8	7	-1	-5	-13	-5	-5	-8	-8	-16	-20	12	12	10	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BILLINGS TO BOZEMAN																	109 N.MI.	
15,000	-26	-16	-17	-20	-20	-31	-37	25	15	17	19	19	8	2	18	17	13	17
10,000	-19	-11	-9	-15	-13	-22	-26	19	11	9	15	13	5	1	13	12	10	11
5,000	-14	-6	-5	-6	-7	-15	-19	13	6	5	6	7	0	-4	12	11	9	11
BILLINGS TO CASPER																	194 N.MI.	
15,000	18	10	5	12	11	0	-6	-19	-11	-6	-13	-12	-23	-30	18	17	13	17
10,000	14	7	3	9	8	0	-4	-14	-8	-4	-9	-8	-17	-21	13	12	10	12
5,000	0	2	0	1	1	-6	-10	0	-2	0	-1	-1	-8	-12	11	11	9	11
BILLINGS TO GREAT FALLS																	154 N.MI.	
15,000	-26	-14	-12	-18	-17	-29	-35	25	13	11	18	16	5	0	18	17	13	16
10,000	-19	-10	-7	-14	-12	-21	-25	19	10	7	14	12	4	0	13	12	10	11
5,000	-7	-4	-3	-4	-4	-12	-16	6	4	3	4	4	-3	-7	12	11	10	11
BILLINGS TO SHERIDAN																	90 N.MI.	
15,000	24	14	11	18	16	5	-1	-25	-15	-12	-19	-17	-29	-36	18	18	13	17
10,000	19	10	7	13	12	3	-1	-19	-10	-7	-14	-12	-21	-26	13	12	10	12
5,000	7	5	3	4	5	-3	-7	-8	-5	-3	-5	-5	-13	-17	12	11	10	11
BINGHAMPTON TO PITTSBURGH																	217 N.MI.	
15,000	-38	-23	-17	-24	-24	-39	-47	36	21	16	23	23	10	4	21	21	13	20
10,000	-27	-17	-13	-18	-18	-29	-35	26	16	12	17	17	7	2	17	17	12	15
5,000	-14	-9	-7	-9	-10	-19	-24	14	9	7	9	9	1	-4	14	15	10	12
BINGHAMPTON TO SCRANTON																	45 N.MI.	
15,000	4	7	4	1	4	-9	-16	-8	-10	-6	-3	-7	-20	-27	22	22	14	21
10,000	5	6	5	3	5	-6	-12	-8	-8	-6	-4	-6	-17	-23	18	18	12	16
5,000	3	4	3	2	3	-6	-11	-4	-5	-3	-2	-4	-13	-18	15	15	11	13
BINGHAMPTON TO SYRACUSE																	54 N.MI.	
15,000	-4	-7	-4	-1	-4	-17	-24	-1	4	3	-1	1	-12	-19	22	22	14	21
10,000	-4	-6	-4	-2	-4	-15	-21	2	4	4	1	3	-8	-14	18	18	12	16
5,000	-3	-4	-2	-1	-2	-11	-16	2	3	2	0	2	-7	-12	15	15	11	13
BIRMINGHAM TO CHARLOTTE																	304 N.MI.	
15,000	36	26	8	16	20	8	2	-37	-27	-8	-17	-20	-35	-44	18	18	10	17
10,000	26	18	7	11	15	5	1	-26	-19	-8	-12	-15	-26	-32	14	15	10	14
5,000	13	10	5	4	8	0	-4	-14	-11	-6	-5	-8	-17	-21	13	12	9	12
BIRMINGHAM TO CHATTANOOGA																	117 N.MI.	
15,000	27	17	5	11	14	2	-4	-29	-19	-6	-12	-15	-29	-37	19	19	11	18
10,000	19	12	6	8	11	1	-4	-20	-13	-6	-9	-11	-22	-27	15	15	10	14
5,000	10	8	4	3	6	-2	-6	-11	-8	-4	-3	-6	-15	-20	14	13	9	12
BIRMINGHAM TO GREENSBORO																	368 N.MI.	
15,000	36	25	8	16	20	8	2	-37	-27	-9	-17	-20	-35	-43	18	18	10	17
10,000	25	18	8	12	15	5	1	-26	-19	-8	-12	-15	-26	-32	14	15	10	14
5,000	13	10	5	5	8	0	-4	-14	-10	-5	-5	-8	-16	-21	13	12	9	12
BIRMINGHAM TO HUNTSVILLE																	68 N.MI.	
15,000	9	2	1	2	3	-8	-14	-12	-5	-1	-4	-5	-16	-23	19	19	11	18
10,000	5	2	2	2	3	-6	-11	-7	-3	-3	-2	-4	-13	-18	15	15	10	14
5,000	4	3	2	1	2	-6	-11	-5	-3	-2	-1	-3	-11	-15	14	14	9	12
BIRMINGHAM TO JACKSON																	190 N.MI.	
15,000	-34	-24	-6	-14	-18	-33	-41	33	23	5	14	17	5	-1	18	18	10	17
10,000	-24	-17	-6	-9	-13	-24	-30	23	16	6	9	13	3	-1	14	14	10	14
5,000	-13	-10	-5	-4	-8	-16	-21	12	10	5	4	7	-1	-5	14	13	9	12
BIRMINGHAM TO KNOXVILLE																	192 N.MI.	
15,000	30	19	6	13	15	4	-2	-32	-21	-6	-14	-16	-31	-39	19	19	11	18
10,000	20	14	6	9	12	2	-3	-22	-15	-6	-10	-12	-23	-28	14	15	10	14
5,000	11	8	4	3	6	-2	-6	-12	-9	-5	-4	-7	-15	-20	14	13	9	12
BIRMINGHAM TO MEMPHIS																	184 N.MI.	
15,000	-30	-24	-7	-15	-17	-31	-39	28	23	7	14	16	5	-1	19	19	11	18
10,000	-21	-17	-5	-10	-13	-23	-29	20	16	5	10	12	2	-2	14	15	10	14
5,000	-11	-8	-4	-4	-7	-15	-20	10	8	4	4	6	-2	-6	14	14	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BIRMINGHAM TO MERIDIAN																	101 N.MI.	
15,000	-36	-27	-7	-16	-20	-35	-43	35	26	7	15	19	6	1	19	19	11	18
10,000	-25	-18	-6	-11	-14	-25	-31	25	18	6	10	14	4	-1	14	15	10	14
5,000	-13	-10	-5	-5	-8	-17	-22	13	10	5	4	8	-1	-5	14	14	9	12
BIRMINGHAM TO MOBILE																	189 N.MI.	
15,000	-19	-11	-2	-7	-8	-20	-27	16	9	2	6	7	-3	-8	18	17	10	17
10,000	-13	-8	-5	-4	-7	-16	-21	12	7	5	3	6	-2	-7	14	14	10	13
5,000	-9	-7	-4	-2	-5	-13	-18	8	6	4	2	5	-3	-7	13	13	9	12
BIRMINGHAM TO MONTGOMERY																	78 N.MI.	
15,000	1	5	2	2	2	-8	-14	-4	-7	-2	-3	-4	-15	-21	19	18	11	17
10,000	1	3	-2	2	1	-8	-13	-3	-4	1	-2	-2	-11	-16	14	15	10	14
5,000	-1	-1	-1	1	-1	-9	-13	1	0	1	-1	0	-8	-12	14	13	9	12
BIRMINGHAM TO MUSCLE SHOALS																	83 N.MI.	
15,000	-15	-15	-4	-8	-10	-22	-29	12	13	4	7	8	-3	-8	19	19	11	18
10,000	-11	-10	-2	-6	-7	-17	-22	10	9	2	5	6	-3	-8	15	15	10	14
5,000	-5	-4	-2	-3	-3	-12	-16	4	3	2	2	3	-5	-10	14	14	9	12
BIRMINGHAM TO NEW ORLEANS																	279 N.MI.	
15,000	-26	-17	-3	-10	-12	-25	-32	24	15	2	9	11	0	-5	17	17	10	16
10,000	-17	-12	-5	-6	-10	-19	-24	17	11	5	5	9	0	-4	14	14	9	13
5,000	-11	-8	-5	-3	-6	-14	-19	10	8	4	3	6	-2	-6	13	12	9	11
BIRMINGHAM TO PENSACOLA																	187 N.MI.	
15,000	-10	-4	0	-3	-4	-15	-21	7	2	0	2	2	-8	-13	18	17	10	16
10,000	-7	-4	-4	-2	-4	-12	-17	5	3	4	1	3	-5	-10	14	14	10	13
5,000	-6	-4	-3	-1	-4	-11	-16	5	4	3	1	3	-5	-9	13	13	9	12
BISBEE TO EL PASO																	166 N.MI.	
15,000	25	21	3	9	13	2	-3	-26	-22	-3	-10	-14	-26	-34	18	16	10	15
10,000	15	13	3	5	8	1	-3	-15	-13	-3	-6	-9	-17	-22	13	11	9	11
5,000	0	1	0	-4	-1	-6	-9	-1	-1	0	4	1	-5	-8	10	9	6	9
BISBEE TO TUCSON																	79 N.MI.	
15,000	-21	-17	1	-7	-10	-22	-30	20	17	-2	6	9	-2	-7	19	16	10	15
10,000	-12	-10	1	-3	-5	-14	-19	12	10	-1	2	5	-3	-7	14	11	9	11
5,000	4	3	3	5	4	-1	-4	-4	-3	-3	-5	-4	-9	-12	9	8	5	8
BISMARK TO FARGO																	162 N.MI.	
15,000	26	17	20	23	21	10	4	-27	-18	-20	-24	-22	-34	-40	18	18	13	18
10,000	20	10	14	15	15	6	0	-20	-11	-14	-16	-15	-25	-30	14	14	12	14
5,000	10	4	5	9	7	-2	-7	-11	-4	-6	-9	-8	-17	-22	14	14	12	14
BISMARK TO JAMESTOWN																	85 N.MI.	
15,000	26	16	20	23	21	9	3	-27	-17	-20	-24	-22	-33	-40	18	18	13	18
10,000	19	10	14	14	14	5	0	-20	-10	-14	-15	-15	-24	-29	14	14	12	14
5,000	10	4	5	8	7	-3	-8	-10	-4	-5	-9	-7	-17	-22	14	14	13	15
BISMARK TO MINNEAPOLIS																	335 N.MI.	
15,000	28	19	19	24	22	11	5	-29	-20	-20	-25	-23	-35	-41	18	18	13	17
10,000	22	13	14	16	16	7	2	-23	-13	-15	-17	-17	-26	-31	14	14	12	14
5,000	12	5	5	10	8	-1	-5	-13	-6	-6	-11	-9	-18	-22	13	14	12	14
BOISE TO PENDLETON																	169 N.MI.	
15,000	-22	-12	-9	-15	-14	-26	-33	20	11	8	14	12	1	-5	20	19	13	18
10,000	-14	-7	-4	-9	-8	-17	-22	13	7	4	8	8	-1	-5	14	13	10	13
5,000	0	-3	-4	0	-2	-8	-11	-1	2	4	0	2	-5	-9	11	10	7	10
BOISE TO PORTLAND, ORE.																	298 N.MI.	
15,000	-26	-16	-13	-20	-18	-30	-37	25	15	13	19	17	6	-1	20	19	13	18
10,000	-17	-11	-7	-11	-11	-20	-25	16	10	7	11	11	2	-2	14	13	10	13
5,000	-3	-4	-3	-2	-3	-9	-12	2	4	3	2	3	-3	-7	11	9	7	9
BOISE TO RENO																	291 N.MI.	
15,000	-10	-8	-12	-9	-10	-21	-27	8	7	11	8	9	-3	-9	20	18	12	18
10,000	-7	-5	-7	-6	-6	-14	-19	6	5	7	5	6	-2	-7	14	13	9	13
5,000	-6	-5	1	-5	-3	-10	-13	6	5	-1	5	3	-3	-6	10	9	7	9

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BOISE TO SALT LAKE CITY																	252 N.MI.	
15,000	20	12	8	13	13	2	-4	-21	-13	-9	-14	-14	-25	-32	19	17	12	17
10,000	13	8	4	8	8	0	-4	-14	-8	-4	-9	-8	-17	-21	13	12	9	12
5,000	-3	0	-1	-2	-1	-7	-10	3	0	0	1	1	-4	-7	9	8	6	8
BOISE TO SEATTLE																	346 N.MI.	
15,000	-23	-13	-10	-16	-15	-27	-34	21	12	9	15	14	2	-4	19	19	13	18
10,000	-14	-8	-5	-10	-9	-18	-23	13	8	5	9	8	0	-4	14	13	10	13
5,000	-1	-3	-4	0	-2	-8	-12	0	3	4	0	2	-4	-8	11	9	7	10
BOSTON TO BUFFALO																	343 N.MI.	
15,000	-39	-27	-21	-25	-27	-41	-48	38	26	21	24	26	14	7	21	20	13	19
10,000	-29	-20	-16	-19	-21	-31	-37	29	20	16	19	20	10	5	16	17	11	15
5,000	-16	-12	-10	-11	-12	-21	-26	15	11	10	10	12	3	-2	14	14	10	12
BOSTON TO BURLINGTON																	157 N.MI.	
15,000	-20	-17	-14	-13	-16	-29	-36	16	15	13	11	14	1	-6	22	22	14	21
10,000	-18	-14	-12	-11	-14	-24	-30	16	13	11	10	12	2	-4	18	18	12	16
5,000	-11	-8	-7	-7	-8	-17	-22	10	8	7	6	7	-2	-6	15	15	11	13
BOSTON TO CONCORD																	55 N.MI.	
15,000	-13	-13	-10	-8	-11	-24	-31	8	11	8	6	8	-5	-12	23	22	14	21
10,000	-13	-11	-9	-7	-10	-21	-27	11	10	8	6	8	-2	-8	18	18	12	16
5,000	-8	-7	-5	-5	-6	-15	-21	7	6	4	4	5	-4	-9	16	15	11	13
BOSTON TO FITCHBURG																	35 N.MI.	
15,000	-36	-27	-21	-23	-26	-40	-48	34	26	20	22	25	11	4	23	22	14	21
10,000	-28	-21	-16	-18	-20	-32	-38	27	20	16	17	20	9	3	18	18	12	16
5,000	-15	-12	-10	-11	-12	-22	-27	15	11	10	10	11	2	-3	16	15	11	13
BOSTON TO HARTFORD																	83 N.MI.	
15,000	-38	-25	-19	-24	-26	-40	-48	36	24	18	23	24	11	4	22	22	14	21
10,000	-27	-19	-14	-18	-19	-30	-36	26	18	13	17	18	7	2	18	18	12	16
5,000	-14	-10	-9	-10	-11	-20	-25	13	9	9	9	10	1	-4	15	15	11	13
BOSTON TO HYANNIS																	53 N.MI.	
15,000	16	16	12	11	14	1	-6	-20	-19	-13	-13	-16	-29	-37	23	22	14	21
10,000	17	14	11	9	12	2	-4	-19	-15	-11	-10	-13	-25	-31	18	18	12	16
5,000	10	9	6	6	8	-2	-7	-11	-9	-7	-7	-8	-18	-23	16	15	11	13
BOSTON TO LEBANON																	95 N.MI.	
15,000	-20	-18	-14	-13	-16	-29	-37	17	16	13	11	14	1	-6	23	22	14	21
10,000	-19	-14	-12	-11	-14	-25	-31	17	13	11	10	13	2	-4	18	18	12	16
5,000	-11	-9	-7	-7	-8	-18	-23	10	8	7	6	8	-2	-7	16	15	11	13
BOSTON TO LEWISTON																	111 N.MI.	
15,000	16	7	6	11	10	-3	-11	-20	-10	-8	-13	-12	-26	-34	23	22	14	21
10,000	8	3	3	7	5	-5	-11	-11	-5	-4	-8	-7	-17	-23	18	18	12	16
5,000	3	1	3	3	3	-6	-12	-4	-2	-4	-4	-3	-13	-18	16	15	11	13
BOSTON TO MANCHESTER																	39 N.MI.	
15,000	-16	-15	-11	-10	-13	-26	-34	12	13	10	8	11	-3	-10	23	22	14	21
10,000	-15	-13	-10	-9	-11	-22	-28	13	11	9	8	10	-1	-6	18	18	12	16
5,000	-9	-8	-6	-6	-7	-16	-22	8	7	5	5	6	-3	-8	16	15	12	13
BOSTON TO MONTREAL																	221 N.MI.	
15,000	-18	-16	-13	-12	-14	-27	-35	14	13	12	10	12	-1	-8	22	21	14	20
10,000	-16	-13	-11	-11	-12	-23	-29	14	12	10	9	11	1	-5	17	17	12	15
5,000	-10	-8	-7	-6	-7	-17	-22	9	7	6	5	7	-2	-7	15	15	11	13
BOSTON TO NEW BEDFORD																	42 N.MI.	
15,000	-7	0	0	-4	-2	-16	-23	2	-3	-2	2	0	-13	-20	23	22	14	21
10,000	0	2	1	-2	0	-10	-16	-2	-3	-2	0	-2	-13	-19	18	18	12	16
5,000	1	2	0	0	1	-8	-13	-2	-3	-1	-1	-2	-11	-16	16	15	11	13
BOSTON TO NEW YORK																	163 N.MI.	
15,000	-35	-22	-16	-22	-23	-37	-45	33	21	15	21	21	9	2	22	21	13	20
10,000	-24	-16	-12	-16	-16	-27	-34	22	15	11	15	15	5	0	17	18	12	15
5,000	-12	-8	-8	-8	-9	-18	-23	11	8	7	8	8	0	-5	15	15	11	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BOSTON TO PHILADELPHIA																	242 N.MI.	
15,000	-36	-23	-16	-22	-23	-37	-45	34	21	15	21	22	9	3	21	21	13	20
10,000	-25	-17	-12	-16	-17	-28	-34	23	16	11	16	16	6	0	17	17	12	15
5,000	-13	-9	-8	-9	-9	-18	-23	12	8	7	8	9	0	-5	15	15	10	13
BOSTON TO PORTLAND, ME.																	83 N.MI.	
15,000	18	8	7	12	11	-2	-10	-21	-11	-8	-14	-13	-27	-35	23	22	14	21
10,000	9	4	4	7	6	-4	-10	-12	-6	-5	-9	-8	-18	-25	18	18	12	16
5,000	4	2	4	4	3	-6	-11	-5	-3	-4	-4	-4	-13	-18	16	15	11	13
BOSTON TO PROVIDENCE																	43 N.MI.	
15,000	-25	-14	-10	-16	-15	-29	-37	21	11	9	14	13	0	-7	23	22	14	21
10,000	-15	-9	-7	-11	-10	-21	-27	12	7	6	9	8	-2	-8	18	18	12	16
5,000	-7	-4	-5	-5	-5	-14	-20	6	3	4	5	4	-5	-10	16	15	11	13
BOSTON TO SYRACUSE																	230 N.MI.	
15,000	-38	-27	-21	-24	-27	-41	-48	36	26	21	23	26	13	6	22	21	14	20
10,000	-29	-20	-16	-19	-21	-32	-38	28	20	16	18	20	10	4	17	17	12	15
5,000	-16	-12	-10	-11	-12	-21	-26	15	11	10	10	12	3	-2	15	15	11	13
BOSTON TO WASHINGTON, D.C.																	346 N.MI.	
15,000	-36	-23	-16	-22	-23	-37	-45	34	21	15	21	22	10	3	21	20	12	19
10,000	-25	-17	-12	-16	-17	-27	-33	23	16	11	15	16	6	1	16	17	11	14
5,000	-13	-9	-7	-8	-9	-18	-22	12	8	7	8	8	0	-4	14	14	10	12
BOSTON TO WORCESTER																	39 N.MI.	
15,000	-40	-28	-21	-26	-28	-42	-50	38	27	21	25	27	13	6	23	22	14	21
10,000	-30	-21	-16	-19	-21	-32	-39	29	20	16	19	20	9	4	18	18	12	16
5,000	-16	-12	-11	-11	-12	-22	-27	15	11	10	11	11	2	-3	16	15	11	13
BOWLING GREEN TO LOUISVILLE																	80 N.MI.	
15,000	17	9	5	8	9	-3	-9	-21	-11	-6	-9	-11	-24	-31	20	20	12	20
10,000	12	7	4	6	7	-3	-8	-14	-8	-5	-7	-8	-18	-24	15	16	11	15
5,000	6	4	3	3	4	-5	-9	-7	-5	-3	-3	-4	-13	-18	15	14	10	13
BOWLING GREEN TO NASHVILLE																	52 N.MI.	
15,000	-16	-8	-3	-6	-7	-20	-27	12	5	3	4	6	-6	-12	20	20	12	19
10,000	-10	-5	-3	-4	-6	-15	-21	8	4	3	4	4	-5	-10	15	16	11	15
5,000	-5	-4	-2	-2	-3	-12	-16	4	3	2	1	2	-6	-11	15	14	10	13
BOZEMAN TO BUTTE																	57 N.MI.	
15,000	-27	-16	-16	-21	-20	-32	-38	26	16	16	20	19	8	2	19	18	13	17
10,000	-20	-12	-9	-15	-13	-22	-27	19	11	9	15	13	5	1	13	12	10	12
5,000	-11	-6	-5	-5	-6	-14	-18	10	5	4	5	6	-1	-5	12	11	9	11
BRISTOL TO CHARLESTON, W. VA.																	119 N.MI.	
15,000	14	6	4	8	7	-4	-10	-18	-9	-5	-10	-10	-22	-29	20	20	12	19
10,000	9	5	3	6	5	-4	-10	-11	-6	-3	-7	-6	-16	-22	16	16	11	15
5,000	5	3	1	2	3	-6	-10	-6	-3	-2	-3	-3	-11	-16	14	14	9	12
BRISTOL TO KNOXVILLE																	87 N.MI.	
15,000	-37	-26	-10	-18	-21	-36	-45	36	24	10	17	20	8	1	20	20	11	19
10,000	-26	-18	-9	-13	-16	-27	-33	25	18	9	13	15	5	0	15	16	11	15
5,000	-14	-10	-6	-6	-8	-17	-22	13	10	5	5	8	0	-5	14	14	9	13
BUFFALO TO CHICAGO																	410 N.MI.	
15,000	-39	-25	-19	-24	-26	-39	-46	37	23	19	23	25	13	6	20	20	13	19
10,000	-28	-18	-15	-18	-19	-30	-35	27	18	14	18	19	9	4	15	16	11	14
5,000	-15	-10	-8	-11	-11	-20	-24	15	9	8	10	10	2	-2	14	14	10	12
BROWNSVILLE TO CORPUS CHRISTI																	93 N.MI.	
15,000	7	4	5	4	5	-3	-8	-9	-5	-5	-4	-6	-14	-19	15	14	9	13
10,000	6	5	6	5	5	-2	-5	-7	-6	-6	-5	-6	-13	-17	12	11	9	11
5,000	9	10	9	4	8	1	-3	-10	-10	-9	-4	-8	-15	-19	13	11	8	11
BRUNSWICK TO JACKSONVILLE																	46 N.MI.	
15,000	-11	-8	-3	-6	-6	-17	-23	9	6	3	5	5	-4	-9	17	17	10	16
10,000	-9	-6	-4	-4	-6	-14	-19	8	5	4	4	5	-4	-8	14	14	9	13
5,000	-7	-5	-3	-3	-4	-12	-16	7	5	3	2	4	-3	-7	12	12	9	12

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BRUNSWICK TO SAVANNAH																	54 N.MI.	
15,000	8	5	3	5	5	-5	-10	-11	-7	-3	-6	-6	-17	-23	18	18	10	16
10,000	7	4	4	4	5	-4	-9	-9	-5	-4	-4	-5	-14	-19	14	15	10	13
5,000	7	4	3	2	4	-4	-8	-7	-5	-3	-2	-4	-12	-16	13	12	9	12
BUFFALO TO CLEVELAND																	166 N.MI.	
15,000	-35	-20	-16	-22	-22	-36	-44	33	18	15	21	21	8	2	21	21	13	20
10,000	-25	-15	-12	-17	-17	-28	-34	24	14	11	16	16	5	0	17	17	12	15
5,000	-14	-8	-7	-9	-9	-18	-23	13	8	6	9	9	0	-5	15	15	10	13
BUFFALO TO DETROIT																	208 N.MI.	
15,000	-39	-24	-19	-24	-26	-40	-48	38	23	19	23	25	12	6	21	21	13	20
10,000	-28	-18	-15	-19	-20	-30	-36	28	17	14	18	19	9	3	16	17	12	15
5,000	-16	-10	-8	-11	-11	-20	-25	15	10	8	10	11	2	-3	15	15	10	13
BUFFALO TO ELMIRA																	94 N.MI.	
15,000	33	24	18	19	23	10	3	-35	-25	-19	-21	-24	-38	-46	22	22	14	21
10,000	25	18	14	16	18	7	2	-26	-19	-15	-17	-19	-30	-36	17	18	12	16
5,000	14	10	9	9	10	1	-4	-14	-11	-9	-9	-11	-20	-25	15	15	11	13
BUFFALO TO NEW YORK																	261 N.MI.	
15,000	32	24	17	18	22	10	3	-34	-26	-18	-20	-23	-37	-44	21	21	13	20
10,000	25	19	14	15	18	8	2	-26	-19	-15	-16	-19	-29	-35	17	17	12	15
5,000	13	11	8	8	10	1	-3	-14	-11	-9	-9	-10	-19	-24	14	15	10	12
BUFFALO TO PHILADELPHIA																	241 N.MI.	
15,000	23	20	13	12	16	4	-2	-27	-22	-14	-14	-18	-32	-39	21	21	13	20
10,000	19	15	11	11	14	4	-1	-20	-16	-12	-13	-15	-26	-31	17	17	12	15
5,000	10	9	7	6	8	-1	-5	-11	-10	-7	-7	-8	-17	-22	14	15	10	12
BUFFALO TO PITTSBURGH																	161 N.MI.	
15,000	-20	-8	-8	-14	-12	-25	-32	15	6	6	12	9	-3	-10	21	21	13	20
10,000	-13	-6	-4	-9	-8	-18	-24	11	4	3	8	6	-4	-9	17	17	12	15
5,000	-7	-3	-2	-5	-4	-13	-18	6	2	2	5	4	-5	-10	15	15	10	13
BUFFALO TO ROCHESTER, N.Y.																	48 N.MI.	
15,000	38	23	19	24	25	12	5	-39	-25	-20	-25	-26	-41	-48	22	22	14	21
10,000	28	17	14	19	19	8	2	-28	-18	-15	-19	-20	-31	-37	17	18	12	16
5,000	15	10	9	10	11	2	-3	-16	-10	-9	-11	-11	-21	-26	15	16	11	13
BUFFALO TO SCRANTON																	158 N.MI.	
15,000	31	23	17	18	22	9	2	-34	-25	-18	-20	-23	-37	-45	22	21	13	20
10,000	24	18	14	15	17	7	2	-25	-19	-14	-16	-18	-29	-35	17	17	12	15
5,000	13	10	8	8	10	1	-4	-14	-11	-9	-9	-10	-19	-24	15	15	10	13
BUFFALO TO SYRACUSE																	115 N.MI.	
15,000	39	25	20	24	26	13	6	-40	-26	-21	-25	-27	-41	-49	22	22	14	21
10,000	28	18	15	19	20	9	3	-29	-19	-16	-20	-20	-31	-38	17	18	12	16
5,000	15	10	9	11	11	2	-3	-16	-11	-10	-11	-12	-21	-26	15	15	11	13
BUFFALO TO TORONTO																	60 N.MI.	
15,000	-27	-20	-16	-16	-19	-33	-40	24	19	15	14	17	4	-3	22	22	14	21
10,000	-20	-15	-12	-13	-15	-26	-32	18	14	12	12	14	3	-2	17	18	12	16
5,000	-11	-9	-7	-6	-8	-17	-23	10	8	7	6	8	-1	-6	15	16	11	13
BUFFALO TO WASHINGTON, D.C.																	257 N.MI.	
15,000	9	11	6	3	7	-5	-12	-13	-13	-7	-5	-9	-22	-29	21	21	13	19
10,000	8	8	6	5	7	-3	-9	-10	-10	-7	-6	-8	-18	-24	16	17	11	15
5,000	4	5	4	2	4	-5	-9	-5	-6	-4	-3	-4	-13	-18	14	14	10	12
BURBANK TO LOS ANGELES																	16 N.MI.	
15,000	2	0	-5	-2	-2	-13	-18	-4	-1	5	1	1	-10	-17	21	18	11	16
10,000	3	3	-4	-1	0	-9	-13	-4	-4	4	1	0	-9	-14	15	14	9	12
5,000	3	4	-1	4	2	-4	-7	-3	-4	1	-4	-2	-9	-12	10	9	7	9
BURBANK TO SAN FRANCISCO																	284 N.MI.	
15,000	-19	-15	-5	-7	-10	-22	-29	18	14	4	6	9	-1	-7	21	18	11	16
10,000	-12	-11	-1	-5	-6	-16	-21	12	10	1	4	6	-2	-7	15	14	9	12
5,000	-5	-5	-4	-3	-4	-10	-14	5	5	3	3	4	-2	-5	11	9	7	9

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BURLINGTON TO MONTPELIER																	30 N.MI.	
15,000	27	21	19	19	21	8	0	-30	-22	-20	-21	-23	-37	-44	23	22	15	21
10,000	23	16	15	16	17	6	1	-24	-17	-15	-17	-18	-29	-35	18	18	13	16
5,000	13	9	10	9	10	1	-4	-14	-10	-10	-10	-11	-20	-26	16	16	12	13
BUTTE TO GREAT FALLS																	103 N.MI.	
15,000	3	5	9	5	6	-6	-12	-5	-6	-10	-6	-7	-18	-24	18	17	13	17
10,000	3	3	5	4	4	-4	-9	-4	-4	-5	-5	-4	-12	-17	13	12	10	12
5,000	11	3	2	5	5	-2	-6	-11	-4	-2	-5	-5	-13	-17	12	11	9	11
BUTTE TO HELENA																	45 N.MI.	
15,000	4	5	10	6	6	-5	-11	-6	-6	-10	-7	-8	-19	-25	19	18	14	17
10,000	4	4	5	4	4	-4	-8	-5	-4	-5	-5	-5	-13	-17	13	12	10	12
5,000	11	3	2	5	5	-2	-6	-12	-4	-2	-5	-5	-13	-17	12	11	9	11
BUTTE TO IDAHO FALLS																	147 N.MI.	
15,000	10	3	-1	4	4	-8	-13	-12	-5	0	-6	-5	-17	-23	19	18	13	17
10,000	7	2	-1	3	3	-5	-9	-8	-3	0	-4	-3	-11	-16	13	12	10	12
5,000	-7	0	0	-2	-2	-9	-13	6	0	-1	2	2	-5	-8	11	10	8	10
CALGARY TO CRANBROOK																	115 N.MI.	
15,000	-10	-9	-10	-9	-9	-21	-27	8	7	9	8	8	-3	-9	19	17	14	17
10,000	-9	-6	-5	-7	-7	-15	-20	7	6	5	6	6	-2	-7	14	12	11	12
5,000	-11	-6	-3	-7	-7	-15	-19	11	5	3	7	6	-2	-6	13	11	10	12
CALGARY TO EDMONTON																	134 N.MI.	
15,000	-6	0	1	-3	-2	-13	-19	4	-1	-2	1	1	-10	-16	18	16	14	16
10,000	-4	-1	-1	-2	-2	-10	-15	3	0	0	1	1	-7	-11	14	12	11	12
5,000	4	3	1	2	3	-6	-10	-5	-3	-1	-3	-3	-11	-16	14	12	11	13
CALGARY TO GREAT FALLS																	240 N.MI.	
15,000	17	8	6	12	10	0	-6	-19	-9	-7	-14	-12	-23	-29	18	16	13	16
10,000	12	7	5	10	8	0	-4	-13	-7	-5	-10	-9	-17	-22	13	12	10	12
5,000	1	0	1	2	1	-7	-11	-2	0	-1	-2	-1	-9	-13	13	11	10	12
CALGARY TO LETHBRIDGE																	100 N.MI.	
15,000	17	8	6	13	11	0	-6	-19	-9	-7	-14	-12	-24	-30	18	17	14	17
10,000	13	7	6	10	9	0	-4	-14	-8	-6	-11	-9	-18	-23	14	12	11	12
5,000	2	0	1	2	1	-7	-11	-3	0	-1	-3	-2	-10	-14	13	12	10	12
CALGARY TO REGINA																	357 N.MI.	
15,000	25	16	17	20	19	9	3	-26	-16	-17	-21	-20	-30	-36	16	15	13	15
10,000	19	11	11	16	14	6	2	-20	-11	-11	-16	-15	-23	-27	13	11	10	11
5,000	13	4	4	9	7	-1	-5	-13	-4	-4	-10	-8	-16	-21	13	11	11	12
CALGARY TO SASKATOON																	280 N.MI.	
15,000	21	14	15	17	17	6	1	-22	-15	-16	-18	-17	-28	-33	17	15	13	15
10,000	16	10	9	14	12	4	0	-17	-10	-10	-14	-12	-21	-25	13	11	10	12
5,000	13	4	4	9	7	-1	-5	-13	-5	-4	-10	-8	-16	-21	13	12	11	12
CALGARY TO VANCOUVER																	370 N.MI.	
15,000	-22	-16	-14	-19	-17	-29	-35	21	15	13	19	17	6	0	18	17	14	17
10,000	-17	-13	-8	-14	-13	-21	-26	17	12	8	14	12	4	0	14	12	10	12
5,000	-12	-6	-4	-8	-7	-15	-19	12	6	4	8	7	0	-4	12	11	9	11
CARLSBAD TO EL PASO																	115 N.MI.	
15,000	-26	-22	-6	-10	-15	-27	-34	25	21	5	10	14	3	-2	18	16	10	15
10,000	-17	-13	-5	-7	-10	-18	-23	16	13	4	7	9	1	-3	14	12	9	11
5,000	-5	-4	-3	0	-3	-9	-13	5	4	3	0	3	-4	-7	11	11	7	10
CARLSBAD TO HOBBS																	55 N.MI.	
15,000	27	22	6	11	15	4	-2	-28	-23	-6	-11	-15	-28	-36	19	17	11	16
10,000	18	14	5	7	10	2	-3	-18	-14	-5	-7	-10	-20	-24	14	12	10	12
5,000	6	5	3	1	4	-3	-7	-6	-5	-4	-2	-4	-11	-15	12	12	8	11
CASPER TO CHEYENNE																	129 N.MI.	
15,000	18	11	7	13	11	1	-5	-20	-12	-7	-14	-13	-25	-31	19	18	12	17
10,000	13	8	4	9	8	0	-5	-13	-8	-4	-10	-9	-17	-22	13	12	10	12
5,000	-2	0	-2	-1	-1	-8	-12	2	0	2	0	1	-6	-9	10	11	9	10

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CASPER TO DENVER																	202 N.MI.	
15,000	13	7	3	9	7	-4	-9	-14	-8	-3	-10	-8	-20	-26	19	17	12	17
10,000	9	5	1	6	5	-3	-7	-10	-6	-2	-7	-6	-14	-18	13	12	10	12
5,000	-5	-3	-4	-4	-4	-10	-14	5	3	4	3	4	-3	-6	10	10	8	10
CASPER TO RAPID CITY																	164 N.MI.	
15,000	20	14	16	17	17	6	0	-22	-15	-17	-18	-18	-29	-35	19	18	13	17
10,000	14	9	10	11	11	3	-2	-15	-9	-10	-12	-11	-20	-24	13	13	11	13
5,000	11	6	5	7	7	0	-4	-12	-6	-6	-8	-8	-15	-20	11	12	10	11
CASPER TO SALT LAKE CITY																	277 N.MI.	
15,000	-19	-14	-15	-14	-15	-26	-32	17	14	15	13	15	4	-1	18	16	12	16
10,000	-12	-9	-9	-10	-10	-17	-21	11	8	9	9	9	2	-2	12	11	9	11
5,000	-4	-4	-4	-4	-4	-9	-12	4	4	3	4	4	-2	-4	9	8	7	8
CASPER TO SHERIDAN																	114 N.MI.	
15,000	-13	-7	-1	-8	-7	-18	-25	11	6	0	7	5	-6	-12	19	18	13	17
10,000	-10	-5	-1	-6	-5	-13	-18	9	4	0	5	4	-4	-8	13	12	10	12
5,000	4	0	2	1	2	-5	-9	-4	0	-2	-2	-2	-9	-13	11	11	9	11
CASTLEGAR TO CRANBROOK																	74 N.MI.	
15,000	22	15	15	19	18	6	0	-23	-16	-15	-20	-18	-30	-37	19	18	14	18
10,000	18	12	9	14	13	4	-1	-18	-13	-9	-14	-13	-22	-27	15	13	11	13
5,000	12	5	4	7	7	-1	-5	-12	-6	-4	-8	-7	-15	-20	13	11	10	12
CASTLEGAR TO PENTICTON																	77 N.MI.	
15,000	-25	-16	-14	-21	-18	-31	-38	24	15	13	20	18	6	-1	20	19	14	18
10,000	-19	-13	-8	-14	-13	-22	-28	18	12	8	14	13	4	-1	16	13	11	13
5,000	-10	-4	-4	-6	-6	-13	-18	9	4	4	5	5	-2	-6	13	11	9	12
CEDAR RAPIDS TO CHICAGO																	170 N.MI.	
15,000	35	23	18	21	24	11	5	-36	-24	-19	-22	-24	-38	-45	20	20	13	20
10,000	26	18	14	16	18	8	3	-27	-18	-14	-17	-19	-29	-35	15	16	13	15
5,000	14	8	7	10	10	1	-4	-14	-9	-8	-11	-10	-19	-25	15	15	11	13
CEDAR RAPIDS TO DES MOINES																	90 N.MI.	
15,000	-33	-22	-18	-21	-23	-36	-43	32	21	17	20	22	9	3	20	20	13	20
10,000	-24	-16	-13	-15	-17	-27	-33	23	16	13	15	16	6	1	15	16	12	15
5,000	-12	-8	-7	-10	-9	-18	-23	12	8	7	9	9	0	-5	14	15	11	13
CEDAR RAPIDS TO MINNEAPOLIS																	192 N.MI.	
15,000	-17	-11	-9	-12	-12	-24	-31	14	9	8	11	10	-2	-8	20	20	13	19
10,000	-13	-9	-7	-9	-9	-19	-24	11	8	6	8	8	-2	-7	15	16	12	15
5,000	-7	-5	-2	-5	-5	-14	-19	7	5	2	4	4	-5	-10	14	15	11	13
CEDAR RAPIDS TO MOLINE																	59 N.MI.	
15,000	32	21	16	21	22	9	3	-33	-22	-17	-22	-23	-36	-44	21	21	13	20
10,000	24	16	12	15	17	6	1	-25	-17	-13	-15	-17	-28	-33	15	17	13	15
5,000	13	8	6	9	9	0	-5	-13	-9	-6	-10	-9	-19	-24	15	15	11	14
CHARLESTON, S.C. TO CHARLOTTE																	146 N.MI.	
15,000	-8	-10	-2	-3	-5	-16	-23	4	8	1	2	3	-7	-13	19	19	11	18
10,000	-8	-7	-2	-2	-4	-14	-19	6	5	1	1	3	-6	-11	15	15	10	14
5,000	-3	-3	-2	-1	-2	-10	-14	2	2	2	1	2	-6	-10	13	12	9	12
CHARLESTON, S.C. TO COLUMBIA																	83 N.MI.	
15,000	-21	-19	-4	-9	-12	-25	-32	18	17	4	8	11	0	-6	19	19	11	17
10,000	-16	-13	-4	-6	-9	-19	-24	15	12	3	5	8	-1	-6	15	15	10	14
5,000	-6	-6	-3	-3	-4	-12	-17	6	5	3	2	4	-4	-8	13	12	9	12
CHARLESTON, S.C. TO FLORENCE																	79 N.MI.	
15,000	10	4	3	5	5	-5	-11	-13	-7	-3	-7	-7	-18	-25	19	19	11	18
10,000	5	3	3	4	4	-5	-10	-7	-5	-3	-5	-5	-14	-19	15	15	10	14
5,000	5	3	1	1	2	-5	-9	-5	-3	-2	-2	-3	-11	-15	13	12	9	12
CHARLESTON, S.C. TO JACKSONVILLE																	170 N.MI.	
15,000	-18	-13	-5	-9	-10	-21	-28	16	12	5	8	9	0	-6	17	17	10	16
10,000	-13	-9	-5	-6	-8	-17	-22	12	8	5	6	7	-1	-6	14	14	9	13
5,000	-9	-6	-4	-3	-5	-13	-17	8	6	4	3	5	-2	-6	12	12	8	11

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CHARLESTON, S.C. TO NORFOLK																	305 N.MI.	
15,000	25	17	7	13	14	3	-2	-27	-19	-7	-14	-16	-28	-36	18	18	10	17
10,000	16	13	6	9	11	2	-3	-18	-14	-7	-10	-11	-21	-26	15	15	10	14
5,000	9	7	4	4	6	-2	-6	-10	-8	-4	-4	-6	-14	-19	13	12	9	12
CHARLESTON, S.C. TO SAVANNAH																	77 N.MI.	
15,000	-27	-20	-6	-13	-15	-28	-36	25	19	6	12	14	3	-2	18	18	10	17
10,000	-19	-14	-6	-9	-11	-21	-26	18	13	6	8	11	2	-3	15	15	10	14
5,000	-11	-8	-5	-4	-7	-15	-19	10	8	4	4	6	-1	-5	13	12	9	12
CHARLESTON, S.C. TO WILMINGTON, N.C.																	135 N.MI.	
15,000	29	22	8	14	16	5	0	-31	-23	-8	-15	-18	-31	-39	18	18	10	17
10,000	20	16	7	10	12	3	-2	-21	-16	-7	-10	-13	-23	-29	15	15	10	14
5,000	11	9	5	4	7	-1	-5	-12	-9	-5	-4	-7	-15	-20	13	12	9	12
CHARLESTON, W.VA. TO CHARLOTTE																	192 N.MI.	
15,000	0	5	2	0	2	-10	-16	-4	-8	-2	-1	-4	-15	-22	20	20	11	19
10,000	3	4	2	1	2	-7	-12	-6	-5	-3	-2	-4	-13	-18	15	16	11	14
5,000	2	2	2	1	2	-6	-11	-3	-3	-2	-1	-2	-10	-15	14	13	9	12
CHARLESTON, W.VA. TO CINCINNATI																	149 N.MI.	
15,000	-40	-28	-15	-22	-24	-39	-48	38	27	15	20	24	11	5	20	21	12	20
10,000	-29	-21	-13	-17	-19	-30	-36	28	20	12	16	19	8	3	16	17	11	15
5,000	-15	-11	-7	-9	-10	-19	-24	15	11	7	8	10	1	-3	14	14	10	12
CHARLESTON, W.VA. TO CLEVELAND																	183 N.MI.	
15,000	-5	-7	-2	0	-3	-15	-22	0	4	1	-2	1	-11	-18	21	21	12	20
10,000	-3	-5	-3	-2	-3	-13	-19	1	4	3	0	2	-8	-14	16	17	12	15
5,000	-2	-3	-2	-1	-2	-10	-15	0	2	1	0	1	-7	-12	14	14	10	12
CHARLESTON, W.VA. TO COLUMBUS, OHIO																	115 N.MI.	
15,000	-23	-18	-9	-11	-14	-28	-35	19	16	8	9	12	0	-6	21	21	12	20
10,000	-16	-14	-9	-10	-12	-22	-28	14	12	8	9	11	1	-5	16	17	12	15
5,000	-8	-7	-5	-5	-6	-15	-20	8	7	4	5	6	-3	-7	15	14	10	13
CHARLESTON, W.VA. TO GREENSBORO																	157 N.MI.	
15,000	15	15	6	7	10	-1	-8	-19	-18	-7	-8	-12	-25	-32	20	20	12	19
10,000	13	11	6	6	9	-1	-6	-15	-13	-7	-7	-10	-20	-26	16	16	11	15
5,000	7	6	4	3	5	-3	-7	-8	-7	-4	-4	-6	-14	-18	14	13	9	12
CHARLESTON, W.VA. TO HUNTINGTON																	45 N.MI.	
15,000	-42	-29	-15	-23	-25	-40	-49	41	28	15	22	25	12	5	21	21	12	20
10,000	-30	-21	-13	-17	-20	-31	-37	29	21	12	17	19	9	3	16	17	12	15
5,000	-16	-12	-7	-9	-10	-19	-24	15	11	7	8	10	1	-3	15	14	10	13
CHARLESTON, W.VA. TO HUNTSVILLE																	326 N.MI.	
15,000	-33	-21	-9	-16	-18	-32	-40	31	19	8	15	17	5	0	19	19	11	18
10,000	-22	-15	-8	-12	-14	-24	-29	21	14	7	11	13	3	-1	14	15	10	14
5,000	-12	-9	-5	-5	-7	-15	-20	11	8	5	5	7	-1	-5	14	13	9	12
CHARLESTON, W.VA. TO KNOXVILLE																	191 N.MI.	
15,000	-28	-17	-8	-15	-16	-29	-37	25	15	7	13	14	2	-4	20	20	11	19
10,000	-19	-12	-7	-10	-11	-22	-27	17	11	6	10	10	1	-4	15	16	11	15
5,000	-10	-7	-4	-4	-6	-14	-19	9	6	3	4	5	-3	-7	14	13	9	12
CHARLESTON, W.VA. TO LEXINGTON																	143 N.MI.	
15,000	-41	-28	-15	-22	-25	-40	-48	40	27	14	21	24	11	5	20	20	12	19
10,000	-29	-21	-12	-17	-19	-30	-36	29	20	12	16	19	8	3	16	16	11	15
5,000	-15	-11	-7	-8	-10	-19	-24	15	11	7	8	10	1	-3	14	14	10	12
CHARLESTON, W.VA. TO LOUISVILLE																	195 N.MI.	
15,000	-41	-28	-15	-22	-25	-40	-48	40	27	15	21	24	12	5	20	20	12	19
10,000	-29	-21	-12	-17	-19	-30	-36	29	20	12	16	19	9	3	15	16	11	15
5,000	-16	-11	-7	-8	-10	-19	-24	15	11	7	8	10	2	-3	14	14	9	12
CHARLESTON, W.VA. TO NEW YORK																	386 N.MI.	
15,000	40	26	16	23	25	13	7	-41	-27	-17	-24	-26	-40	-48	20	20	12	19
10,000	28	20	13	18	19	9	4	-29	-20	-13	-18	-20	-30	-36	16	16	11	14
5,000	15	10	7	9	10	2	-2	-15	-11	-7	-9	-10	-19	-23	14	13	9	12

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CHARLESTON, W.VA. TO PITTSBURGH																	142 N.MI.	
15,000	18	8	7	13	11	-1	-8	-22	-11	-8	-15	-13	-26	-33	21	21	12	20
10,000	13	6	4	8	7	-2	-8	-15	-8	-5	-9	-9	-19	-25	16	17	12	15
5,000	7	3	2	4	4	-4	-9	-8	-4	-3	-5	-4	-13	-18	14	14	10	12
CHARLESTON, W.VA. TO ROANOKE																	100 N.MI.	
15,000	28	23	11	14	18	6	0	-31	-25	-11	-15	-19	-33	-42	21	21	12	20
10,000	22	17	10	12	15	5	0	-23	-18	-10	-13	-16	-26	-32	16	17	11	15
5,000	12	9	6	6	8	0	-5	-12	-10	-6	-6	-8	-17	-22	14	14	9	13
CHARLESTON, W.VA. TO WASHINGTON, D.C.																	216 N.MI.	
15,000	41	28	16	22	25	13	6	-42	-29	-16	-23	-26	-41	-50	20	20	12	19
10,000	29	21	13	18	19	9	4	-30	-22	-13	-18	-20	-31	-37	16	17	11	15
5,000	15	11	7	8	10	2	-2	-16	-12	-7	-9	-10	-19	-24	14	14	9	12
CHARLOTTE TO CHATTANOOGA																	210 N.MI.	
15,000	-38	-29	-10	-18	-22	-37	-46	37	29	9	17	21	9	3	19	19	11	18
10,000	-28	-21	-9	-13	-17	-28	-34	27	20	8	13	16	6	1	15	15	10	14
5,000	-15	-11	-6	-5	-9	-17	-22	14	11	6	5	9	1	-4	14	13	9	12
CHARLOTTE TO CLEVELAND																	374 N.MI.	
15,000	-5	-7	-2	-1	-3	-15	-21	0	5	1	-1	1	-10	-16	19	19	11	18
10,000	-4	-5	-3	-2	-4	-13	-18	2	4	2	1	2	-7	-12	15	16	11	14
5,000	-2	-3	-2	-1	-2	-10	-14	1	2	2	1	1	-6	-11	13	13	9	12
CHARLOTTE TO COLUMBIA																	77 N.MI.	
15,000	-12	-5	-2	-5	-5	-17	-24	8	2	1	4	3	-7	-13	19	19	11	18
10,000	-5	-3	-2	-4	-3	-13	-18	3	2	1	3	2	-7	-12	15	16	10	14
5,000	-3	-2	0	-1	-2	-9	-14	2	1	0	1	1	-7	-11	14	13	9	12
CHARLOTTE TO COLUMBUS, OHIO																	302 N.MI.	
15,000	-11	-12	-5	-5	-8	-19	-26	7	9	4	3	6	-5	-12	19	19	11	18
10,000	-10	-9	-5	-4	-7	-16	-21	7	7	4	3	5	-4	-9	15	16	11	14
5,000	-5	-4	-3	-3	-4	-12	-16	4	4	3	2	3	-5	-9	14	13	9	12
CHARLOTTE TO DANVILLE																	112 N.MI.	
15,000	30	19	8	15	16	4	-2	-32	-21	-8	-16	-18	-32	-40	20	20	11	19
10,000	19	14	7	11	12	2	-3	-21	-15	-7	-12	-13	-23	-29	15	16	11	15
5,000	10	7	3	4	6	-2	-6	-11	-8	-4	-4	-6	-15	-19	14	13	9	12
CHARLOTTE TO GREENSBORO																	71 N.MI.	
15,000	29	18	7	14	16	4	-2	-31	-20	-8	-15	-17	-31	-40	20	20	11	19
10,000	18	13	6	10	11	2	-3	-20	-14	-7	-11	-12	-23	-28	16	16	11	15
5,000	10	7	3	4	6	-2	-7	-11	-8	-4	-4	-6	-15	-19	14	13	9	13
CHARLOTTE TO GREENVILLE																	73 N.MI.	
15,000	-38	-29	-9	-18	-22	-37	-46	37	28	9	17	21	8	2	20	20	11	19
10,000	-27	-20	-9	-13	-16	-28	-34	27	19	8	13	16	6	1	15	16	10	15
5,000	-15	-11	-6	-5	-9	-17	-22	14	10	5	5	8	0	-4	14	13	9	13
CHARLOTTE TO JACKSONVILLE																	290 N.MI.	
15,000	-9	-4	-3	-5	-5	-15	-21	6	2	2	4	3	-6	-12	17	17	10	16
10,000	-6	-3	-3	-4	-4	-12	-17	4	2	3	3	3	-5	-10	14	14	9	13
5,000	-5	-3	-2	-2	-3	-10	-14	4	2	2	1	2	-5	-9	12	12	8	11
CHARLOTTE TO PHILADELPHIA																	389 N.MI.	
15,000	30	18	10	17	17	6	0	-32	-20	-11	-18	-19	-32	-40	19	19	11	18
10,000	20	14	8	12	13	4	-1	-21	-15	-8	-13	-14	-24	-29	15	16	10	14
5,000	10	7	4	5	7	-1	-5	-11	-8	-5	-6	-7	-15	-20	13	13	9	12
CHARLOTTE TO RALEIGH																	112 N.MI.	
15,000	37	27	10	18	21	9	3	-38	-28	-10	-19	-22	-37	-46	20	20	11	19
10,000	26	19	9	13	16	6	1	-27	-20	-9	-14	-17	-28	-34	15	16	11	15
5,000	14	10	5	5	8	0	-4	-14	-11	-5	-5	-8	-17	-22	14	13	9	12
CHARLOTTE TO RICHMOND																	222 N.MI.	
15,000	33	22	10	17	19	7	1	-35	-24	-10	-18	-20	-34	-42	19	19	11	18
10,000	22	16	8	12	14	4	-1	-23	-17	-8	-13	-15	-25	-31	15	16	10	14
5,000	12	9	5	5	7	-1	-5	-12	-9	-5	-5	-7	-16	-21.	14	13	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CHARLOTTE TO SPARTANBURG																	53 N.MI.	
15,000	-38	-28	-9	-18	-21	-37	-46	37	27	9	17	21	8	2	20	20	11	19
10,000	-27	-20	-8	-13	-16	-27	-34	26	19	8	12	16	5	0	15	16	11	15
5,000	-14	-11	-5	-5	-8	-17	-22	14	10	5	5	8	0	-5	14	13	9	13
CHARLOTTE TO WASHINGTON, D.C.																	287 N.MI.	
15,000	28	17	9	16	16	5	-1	-31	-19	-9	-17	-17	-31	-39	19	19	11	18
10,000	18	13	7	11	12	2	-3	-20	-14	-7	-12	-13	-23	-28	15	16	10	14
5,000	10	7	4	4	6	-2	-6	-10	-7	-4	-5	-6	-14	-19	14	13	9	12
CHATTANOOGA TO CINCINNATI																	242 N.MI.	
15,000	6	1	1	2	2	-9	-15	-10	-3	-2	-4	-4	-16	-23	19	19	11	19
10,000	3	1	1	2	2	-8	-13	-6	-2	-1	-3	-3	-12	-17	15	16	11	14
5,000	2	1	1	1	1	-7	-12	-3	-2	-1	-1	-1	-10	-14	14	14	9	12
CHATTANOOGA TO GREENVILLE																	141 N.MI.	
15,000	36	28	9	17	21	8	2	-37	-29	-9	-18	-21	-37	-45	19	19	11	18
10,000	27	20	8	12	16	6	1	-28	-20	-8	-13	-16	-27	-34	15	16	10	14
5,000	14	11	6	5	8	0	-4	-15	-11	-6	-5	-9	-17	-22	14	13	9	12
CHATTANOOGA TO KNOXVILLE																	76 N.MI.	
15,000	33	21	8	15	17	5	-1	-34	-23	-8	-16	-18	-33	-42	20	20	11	19
10,000	22	15	7	11	13	3	-2	-23	-16	-7	-11	-14	-25	-30	15	16	11	15
5,000	12	9	5	4	7	-1	-6	-12	-9	-5	-4	-7	-16	-21	14	14	9	13
CHATTANOOGA TO LEXINGTON																	182 N.MI.	
15,000	9	2	2	3	4	-7	-14	-13	-5	-2	-5	-6	-18	-24	20	20	11	19
10,000	5	2	2	3	3	-6	-12	-7	-3	-2	-4	-4	-13	-18	15	16	11	14
5,000	3	2	1	1	1	-7	-11	-4	-2	-1	-1	-2	-10	-15	14	14	9	12
CHATTANOOGA TO MEMPHIS																	235 N.MI.	
15,000	-38	-28	-9	-18	-21	-37	-45	37	27	8	17	20	8	2	19	19	11	18
10,000	-27	-20	-8	-13	-16	-27	-33	27	19	7	12	15	6	1	14	15	10	14
5,000	-14	-11	-6	-5	-9	-17	-22	14	11	6	5	8	0	-4	14	14	9	12
CHATTANOOGA TO NASHVILLE																	98 N.MI.	
15,000	-25	-22	-7	-13	-16	-29	-37	23	20	7	12	14	3	-3	20	20	11	19
10,000	-19	-15	-6	-9	-12	-22	-28	18	14	6	9	11	1	-3	15	16	11	15
5,000	-10	-8	-5	-4	-6	-15	-20	9	7	4	4	6	-2	-7	14	14	10	13
CHATTANOOGA TO ROME																	41 N.MI.	
15,000	-7	0	0	-1	-2	-13	-20	3	-2	-1	0	0	-11	-18	20	20	11	19
10,000	-3	0	-1	-1	-1	-10	-15	0	-1	1	0	0	-9	-14	15	16	10	15
5,000	-2	-1	0	0	-1	-9	-14	1	0	0	0	0	-8	-13	14	14	9	13
CHEYENNE TO DENVER																	83 N.MI.	
15,000	3	-1	-3	2	-1	-11	-18	-5	-1	3	-3	-1	-13	-19	20	18	12	17
10,000	2	1	-3	1	0	-8	-12	-3	-1	2	-2	-1	-9	-14	14	13	10	13
5,000	-6	-6	-6	-6	-6	-12	-16	6	5	6	6	6	-1	-4	10	11	8	10
CHICAGO TO CINCINNATI																	230 N.MI.	
15,000	24	17	11	15	16	4	-2	-27	-19	-12	-16	-18	-31	-38	20	20	13	19
10,000	18	14	9	11	13	3	-2	-19	-15	-10	-12	-14	-24	-30	15	16	12	15
5,000	9	7	4	6	7	-2	-7	-10	-8	-5	-7	-7	-16	-21	14	15	10	13
CHICAGO TO CLEVELAND																	273 N.MI.	
15,000	38	25	19	23	25	13	6	-39	-26	-19	-24	-26	-40	-47	20	20	13	19
10,000	28	19	15	18	19	9	4	-28	-20	-15	-18	-20	-30	-36	15	16	12	15
5,000	15	10	8	10	10	2	-3	-15	-10	-8	-10	-11	-20	-25	14	15	10	12
CHICAGO TO COLUMBUS, OHIO																	256 N.MI.	
15,000	34	23	16	20	23	10	4	-36	-25	-17	-21	-24	-37	-45	20	20	13	19
10,000	25	18	13	16	18	8	2	-26	-19	-14	-16	-18	-29	-34	15	16	12	15
5,000	13	10	7	9	9	1	-4	-14	-10	-7	-9	-10	-19	-24	14	15	10	12
CHICAGO TO DAYTON																	209 N.MI.	
15,000	31	21	15	18	20	8	2	-33	-23	-15	-20	-22	-35	-43	20	20	13	20
10,000	23	16	12	14	16	6	1	-24	-17	-12	-15	-17	-27	-33	15	17	12	15
5,000	12	9	6	8	8	0	-5	-13	-9	-6	-8	-9	-18	-23	15	15	10	13

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CHICAGO TO DES MOINES																	259 N.MI.	
15,000	-35	-23	-18	-22	-24	-37	-44	34	22	18	21	23	11	5	20	20	13	19
10,000	-26	-18	-14	-16	-18	-28	-34	25	17	13	16	18	8	2	15	16	12	15
5,000	-14	-9	-7	-10	-10	-19	-24	13	8	7	10	9	1	-4	14	15	11	13
CHICAGO TO DETROIT																	203 N.MI.	
15,000	37	24	19	22	25	12	6	-38	-25	-19	-23	-25	-39	-46	20	20	13	20
10,000	27	18	14	17	19	9	3	-28	-19	-15	-18	-19	-30	-36	16	17	12	15
5,000	15	9	8	10	10	1	-3	-15	-10	-8	-11	-11	-20	-25	15	15	10	13
CHICAGO TO EVANSVILLE																	237 N.MI.	
15,000	0	2	1	2	1	-10	-17	-5	-4	-2	-4	-4	-16	-22	20	20	12	19
10,000	1	2	1	1	1	-8	-14	-3	-3	-2	-2	-3	-12	-17	15	16	12	15
5,000	1	1	0	0	0	-8	-13	-2	-2	0	-1	-1	-10	-14	14	15	10	13
CHICAGO TO GRAND RAPIDS																	113 N.MI.	
15,000	30	19	16	18	20	8	1	-32	-20	-16	-20	-21	-35	-42	21	21	13	20
10,000	22	14	12	14	15	5	0	-23	-15	-12	-15	-16	-27	-33	16	17	13	15
5,000	12	7	7	9	8	-1	-5	-13	-7	-7	-10	-9	-18	-23	15	15	11	13
CHICAGO TO INDIANAPOLIS																	154 N.MI.	
15,000	17	13	9	12	12	0	-6	-21	-15	-10	-13	-14	-27	-34	20	21	13	20
10,000	13	10	7	8	9	-1	-6	-15	-11	-8	-9	-11	-21	-26	15	17	12	15
5,000	7	5	3	4	5	-4	-9	-8	-6	-3	-5	-5	-14	-19	15	15	10	13
CHICAGO TO KANSAS CITY																	350 N.MI.	
15,000	-31	-21	-15	-18	-20	-33	-40	30	20	15	16	19	8	2	19	19	12	19
10,000	-23	-16	-11	-14	-16	-26	-31	22	15	11	13	15	5	0	14	15	12	14
5,000	-12	-8	-7	-9	-9	-17	-22	11	8	7	8	8	0	-5	14	14	10	12
CHICAGO TO LOUISVILLE																	249 N.MI.	
15,000	14	11	7	9	10	-2	-8	-17	-13	-8	-11	-12	-24	-31	20	20	12	19
10,000	10	8	6	6	8	-2	-7	-12	-10	-6	-7	-9	-19	-24	15	16	12	15
5,000	6	5	2	4	4	-5	-9	-7	-5	-3	-4	-4	-13	-18	14	14	10	13
CHICAGO TO MADISON																	94 N.MI.	
15,000	-27	-18	-15	-18	-19	-32	-39	25	17	14	16	17	5	-2	21	21	14	20
10,000	-20	-14	-11	-13	-14	-25	-30	18	13	11	12	13	3	-2	16	17	13	15
5,000	-11	-8	-5	-7	-7	-17	-22	10	7	5	7	7	-2	-7	15	16	11	13
CHICAGO TO MILWAUKEE																	58 N.MI.	
15,000	-4	-3	-2	-3	-3	-15	-23	0	1	1	1	1	-12	-19	21	21	14	20
10,000	-2	-2	-2	-2	-2	-12	-18	0	1	1	0	1	-9	-15	16	17	13	15
5,000	-1	-2	0	0	-1	-10	-15	0	2	-1	-1	0	-9	-14	15	16	11	14
CHICAGO TO MINNEAPOLIS																	290 N.MI.	
15,000	-30	-20	-17	-20	-21	-34	-41	28	19	17	19	20	8	2	20	19	13	19
10,000	-22	-15	-13	-15	-16	-26	-31	21	14	13	14	15	6	0	15	16	12	14
5,000	-12	-8	-6	-9	-9	-18	-23	12	7	6	8	8	-1	-5	14	15	11	13
CHICAGO TO MOLINE																	121 N.MI.	
15,000	-35	-23	-18	-21	-23	-37	-44	34	22	17	20	22	10	3	20	21	13	20
10,000	-26	-18	-14	-16	-18	-29	-34	25	17	13	15	17	7	2	15	17	13	15
5,000	-14	-9	-7	-10	-10	-19	-24	13	8	7	10	9	0	-4	15	15	11	13
CHICAGO TO MUSKEGON																	103 N.MI.	
15,000	23	14	12	14	15	3	-4	-26	-16	-13	-15	-17	-30	-37	21	21	14	20
10,000	17	11	9	11	12	2	-4	-19	-12	-10	-12	-13	-23	-29	16	17	13	15
5,000	9	4	6	7	7	-2	-7	-10	-5	-6	-8	-7	-16	-21	15	15	11	13
CHICAGO TO NASHVILLE																	356 N.MI.	
15,000	3	4	2	4	3	-8	-14	-7	-6	-3	-6	-5	-17	-23	19	19	12	19
10,000	3	3	2	2	2	-7	-12	-5	-5	-2	-3	-4	-13	-18	14	15	11	14
5,000	2	2	0	1	1	-7	-11	-3	-2	-1	-2	-2	-10	-14	14	14	9	12
CHICAGO TO PITTSBURGH																	358 N.MI.	
15,000	38	25	18	22	25	13	7	-39	-26	-18	-23	-26	-39	-47	20	20	12	19
10,000	28	19	14	18	19	9	4	-28	-20	-15	-18	-20	-30	-36	15	16	11	14
5,000	15	10	8	10	10	2	-2	-15	-11	-8	-10	-11	-19	-24	14	14	10	12

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CHICAGO TO ROCHESTER, N.Y.																	457 N.MI.	
15,000	37	23	19	23	25	13	7	-39	-24	-20	-24	-26	-39	-46	20	19	12	19
10,000	27	18	14	18	19	9	4	-28	-18	-15	-19	-19	-30	-35	15	16	11	14
5,000	15	9	8	10	10	2	-2	-15	-10	-9	-11	-11	-19	-24	14	14	10	12
CHICAGO TO ST. LOUIS																	224 N.MI.	
15,000	-20	-13	-9	-9	-12	-25	-32	17	11	8	7	10	-1	-8	20	20	13	19
10,000	-15	-10	-7	-8	-10	-20	-25	13	9	6	7	8	-1	-6	15	16	12	15
5,000	-8	-5	-5	-5	-5	-14	-19	7	4	4	5	5	-4	-8	15	15	10	13
CHICAGO TO SAGINAW																	192 N.MI.	
15,000	30	19	16	19	20	8	1	-32	-20	-17	-20	-21	-35	-42	21	20	13	20
10,000	22	14	12	15	15	5	0	-23	-15	-12	-15	-16	-27	-33	16	17	12	15
5,000	12	7	7	9	9	0	-5	-13	-7	-7	-10	-9	-18	-23	15	15	11	13
CHICAGO TO SOUTH BEND																	73 N.MI.	
15,000	36	24	18	22	24	11	5	-37	-25	-19	-23	-25	-39	-46	21	21	13	20
10,000	27	18	14	17	19	8	3	-27	-19	-15	-17	-19	-30	-36	16	17	13	15
5,000	14	9	7	10	10	1	-4	-15	-10	-8	-10	-10	-20	-25	15	15	11	13
CHICAGO TO SPRINGFIELD, ILL.																	183 N.MI.	
15,000	-18	-11	-8	-8	-11	-23	-30	14	9	7	6	9	-3	-10	20	20	13	20
10,000	-13	-9	-6	-8	-9	-19	-24	11	7	5	6	7	-2	-8	15	16	12	15
5,000	-7	-4	-4	-5	-5	-14	-18	6	3	4	4	4	-4	-9	15	15	10	13
CHICAGO TO TOLEDO																	185 N.MI.	
15,000	37	24	19	23	25	12	6	-39	-25	-19	-24	-26	-40	-47	20	20	13	20
10,000	27	19	14	17	19	9	3	-28	-19	-15	-18	-20	-30	-36	16	17	12	15
5,000	15	10	8	10	10	1	-3	-15	-10	-8	-10	-11	-20	-25	15	15	10	13
CHICAGO TO TORONTO																	378 N.MI.	
15,000	35	22	18	22	23	11	5	-37	-23	-19	-23	-24	-38	-45	20	20	13	19
10,000	26	16	14	17	18	8	3	-27	-17	-14	-18	-19	-29	-34	15	16	12	14
5,000	14	8	8	10	10	2	-3	-15	-9	-8	-11	-10	-19	-24	14	14	10	12
CHICAGO TO WATERLOO																	203 N.MI.	
15,000	-35	-24	-19	-23	-24	-38	-45	34	23	19	22	24	11	5	20	20	13	19
10,000	-26	-18	-14	-17	-19	-29	-34	26	17	14	16	18	8	3	15	16	12	15
5,000	-14	-9	-7	-10	-10	-19	-24	14	8	7	10	9	1	-4	14	15	11	13
CINCINNATI TO CLEVELAND																	192 N.MI.	
15,000	26	15	12	16	16	4	-2	-30	-17	-12	-18	-18	-32	-39	21	21	12	20
10,000	19	12	8	12	12	2	-3	-21	-13	-9	-13	-13	-24	-30	16	17	12	15
5,000	10	6	5	7	7	-2	-6	-11	-7	-5	-7	-7	-16	-21	14	15	10	12
CINCINNATI TO COLUMBUS, OHIO																	100 N.MI.	
15,000	33	20	14	19	20	8	1	-36	-22	-14	-20	-22	-36	-44	21	21	13	20
10,000	24	16	10	14	16	5	0	-25	-17	-11	-15	-16	-27	-33	16	17	12	15
5,000	12	8	6	8	8	0	-5	-13	-9	-6	-8	-9	-18	-23	15	15	10	13
CINCINNATI TO DAYTON																	55 N.MI.	
15,000	14	7	6	8	8	-4	-10	-18	-9	-7	-10	-11	-24	-31	21	21	13	20
10,000	10	5	4	6	6	-4	-9	-12	-7	-4	-7	-8	-18	-24	16	17	12	15
5,000	5	3	2	3	3	-5	-10	-6	-4	-3	-4	-4	-13	-18	15	15	10	13
CINCINNATI TO DETROIT																	200 N.MI.	
15,000	10	4	4	6	6	-6	-13	-14	-6	-5	-9	-8	-21	-28	20	21	13	20
10,000	7	3	2	5	4	-6	-11	-10	-5	-3	-6	-6	-16	-21	16	17	12	15
5,000	4	2	2	3	3	-6	-11	-5	-2	-2	-3	-3	-12	-16	14	15	10	13
CINCINNATI TO INDIANAPOLIS																	85 N.MI.	
15,000	-36	-25	-15	-21	-23	-37	-45	34	24	14	19	22	9	3	21	21	13	20
10,000	-26	-19	-12	-15	-18	-29	-34	25	18	12	15	17	7	1	16	17	12	15
5,000	-14	-10	-6	-8	-9	-18	-24	13	10	6	8	9	0	-4	15	15	10	13
CINCINNATI TO KNOXVILLE																	197 N.MI.	
15,000	1	5	2	1	2	-9	-16	-5	-7	-3	-3	-4	-16	-23	20	20	12	19
10,000	2	4	2	1	2	-7	-12	-5	-5	-2	-2	-3	-13	-18	15	16	11	15
5,000	1	2	1	1	1	-7	-11	-2	-2	-1	-1	-2	-10	-15	14	14	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CINCINNATI TO LEXINGTON																	61 N.MI.	
15,000	-2	2	0	-1	0	-12	-19	-2	-5	-1	-1	-2	-14	-21	21	21	12	20
10,000	0	2	1	0	0	-9	-15	-2	-3	-1	-1	-2	-12	-17	16	17	12	15
5,000	0	1	0	0	0	-8	-13	-1	-1	-1	-1	-1	-9	-14	15	15	10	13
CINCINNATI TO LOUISVILLE																	72 N.MI.	
15,000	-30	-19	-11	-16	-18	-32	-40	28	17	10	15	16	4	-2	21	21	12	20
10,000	-21	-14	-8	-12	-13	-24	-30	20	13	8	11	13	2	-3	16	17	12	15
5,000	-11	-8	-5	-6	-7	-16	-21	10	7	5	6	7	-2	-7	15	15	10	13
CINCINNATI TO NASHVILLE																	200 N.MI.	
15,000	-23	-13	-7	-11	-13	-25	-33	20	11	6	9	11	-1	-7	20	20	12	19
10,000	-16	-10	-6	-8	-9	-19	-25	14	8	5	7	8	-1	-6	15	16	11	15
5,000	-8	-6	-4	-4	-5	-13	-18	7	5	3	3	5	-4	-8	14	14	10	12
CINCINNATI TO PITTSBURGH																	222 N.MI.	
15,000	38	24	16	22	24	11	5	-40	-25	-16	-23	-25	-39	-47	20	21	12	19
10,000	27	18	12	17	18	8	3	-28	-19	-13	-18	-19	-30	-35	16	17	12	15
5,000	14	10	7	9	9	1	-3	-15	-10	-7	-9	-10	-19	-24	14	14	10	12
CINCINNATI TO ST. LOUIS																	267 N.MI.	
15,000	-40	-27	-16	-22	-24	-39	-47	39	26	15	21	24	11	5	20	20	12	19
10,000	-29	-20	-12	-16	-19	-30	-35	28	20	12	16	18	8	3	15	16	11	14
5,000	-15	-11	-7	-9	-10	-19	-24	15	10	7	9	10	1	-3	14	14	10	12
CINCINNATI TO WASHINGTON, D.C.																	356 N.MI.	
15,000	41	28	16	22	25	13	7	-42	-29	-17	-23	-26	-40	-49	20	20	12	19
10,000	30	21	13	18	20	10	5	-30	-22	-14	-18	-20	-31	-37	15	16	11	14
5,000	15	11	7	9	10	2	-2	-16	-12	-8	-9	-11	-19	-24	14	13	9	12
CLEVELAND TO COLUMBUS, OHIO																	97 N.MI.	
15,000	-22	-11	-9	-14	-13	-27	-34	18	9	8	12	11	-1	-8	21	21	13	20
10,000	-15	-8	-6	-10	-9	-20	-26	13	7	5	9	8	-2	-8	16	17	12	15
5,000	-8	-4	-3	-5	-5	-14	-19	7	4	3	5	4	-4	-9	15	15	10	13
CLEVELAND TO DAYTON																	141 N.MI.	
15,000	-33	-19	-14	-20	-20	-34	-42	30	17	13	18	19	6	0	21	21	13	20
10,000	-23	-15	-10	-15	-15	-26	-32	22	13	10	14	14	4	-1	16	17	12	15
5,000	-12	-8	-6	-8	-8	-17	-22	11	7	5	8	8	-1	-6	15	15	10	13
CLEVELAND TO DETROIT																	83 N.MI.	
15,000	-34	-24	-17	-20	-22	-37	-44	32	22	16	18	21	8	2	21	21	13	20
10,000	-24	-18	-14	-16	-17	-28	-34	23	17	13	15	17	6	1	17	17	12	15
5,000	-13	-10	-7	-8	-9	-19	-24	12	9	7	8	9	0	-5	15	15	10	13
CLEVELAND TO FT. WAYNE																	153 N.MI.	
15,000	-40	-26	-18	-24	-26	-40	-48	39	25	18	23	25	12	6	21	21	13	20
10,000	-29	-20	-14	-18	-20	-31	-37	28	19	14	18	19	9	3	16	17	12	15
5,000	-15	-10	-8	-10	-11	-20	-25	15	10	8	10	10	2	-3	15	15	10	13
CLEVELAND TO GRAND RAPIDS																	192 N.MI.	
15,000	-36	-24	-18	-22	-24	-38	-45	34	23	18	20	23	10	4	21	21	13	20
10,000	-26	-18	-14	-17	-18	-29	-35	25	18	14	16	18	8	2	16	17	12	15
5,000	-14	-10	-8	-9	-10	-19	-24	13	10	7	9	10	1	-4	15	15	10	13
CLEVELAND TO INDIANAPOLIS																	226 N.MI.	
15,000	-37	-23	-16	-22	-23	-38	-45	35	22	16	21	22	10	4	20	21	13	20
10,000	-27	-18	-12	-17	-18	-29	-34	26	17	12	16	17	7	2	16	17	12	15
5,000	-14	-9	-7	-9	-10	-18	-23	14	9	7	9	9	1	-4	14	15	10	12
CLEVELAND TO KNOXVILLE																	351 N.MI.	
15,000	-16	-7	-5	-9	-9	-21	-27	11	4	4	7	6	-5	-11	19	19	11	19
10,000	-10	-5	-3	-6	-6	-15	-21	8	3	2	5	4	-5	-10	15	16	11	14
5,000	-5	-3	-2	-3	-3	-11	-15	4	2	1	2	2	-6	-10	14	13	9	12
CLEVELAND TO MILWAUKEE																	284 N.MI.	
15,000	-37	-25	-19	-23	-25	-38	-46	36	24	18	22	24	12	5	20	20	13	19
10,000	-27	-19	-15	-18	-19	-30	-35	26	18	14	17	19	9	3	15	16	12	15
5,000	-15	-10	-8	-10	-10	-19	-24	14	10	8	10	10	1	-3	14	15	10	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CLEVELAND TO NEW YORK																	368 N.MI.	
15,000	41	28	19	23	26	14	8	-42	-29	-19	-24	-27	-41	-49	20	20	12	19
10,000	30	21	15	19	21	11	5	-30	-22	-16	-19	-21	-32	-38	16	16	11	14
5,000	16	12	9	10	11	3	-1	-16	-12	-9	-10	-12	-20	-25	14	14	10	12
CLEVELAND TO PHILADELPHIA																	315 N.MI.	
15,000	40	28	18	22	25	13	7	-41	-29	-18	-23	-26	-41	-49	21	20	12	19
10,000	29	21	15	18	20	10	5	-30	-22	-15	-19	-21	-31	-37	16	17	11	15
5,000	15	12	8	9	11	3	-2	-16	-12	-9	-10	-11	-20	-25	14	14	10	12
CLEVELAND TO PITTSBURGH																	93 N.MI.	
15,000	32	24	15	17	21	8	2	-35	-25	-16	-19	-22	-37	-45	22	21	13	20
10,000	23	18	13	15	17	7	1	-25	-19	-13	-16	-18	-29	-35	17	17	12	15
5,000	12	10	7	8	9	0	-4	-13	-10	-7	-8	-9	-18	-23	15	15	10	13
CLEVELAND TO ROCHESTER, N.Y.																	212 N.MI.	
15,000	35	20	16	22	22	10	3	-37	-22	-17	-23	-23	-38	-45	21	21	13	20
10,000	25	15	12	17	17	6	1	-26	-16	-12	-17	-17	-28	-34	16	17	12	15
5,000	14	8	7	9	9	1	-4	-14	-9	-7	-10	-10	-19	-24	15	15	10	12
CLEVELAND TO TOLEDO																	88 N.MI.	
15,000	-41	-27	-19	-24	-26	-41	-49	40	26	19	23	26	13	6	21	21	13	20
10,000	-29	-20	-15	-19	-20	-31	-38	28	20	15	18	20	9	4	16	17	12	15
5,000	-16	-11	-8	-10	-11	-20	-25	15	10	8	10	11	2	-3	15	15	10	13
CLEVELAND TO TORONTO																	168 N.MI.	
15,000	21	10	10	15	13	1	-6	-25	-12	-11	-16	-15	-29	-36	21	21	13	20
10,000	16	8	6	11	10	0	-6	-18	-9	-7	-12	-11	-22	-28	17	17	12	15
5,000	9	4	4	7	6	-3	-8	-10	-5	-4	-7	-6	-15	-20	15	15	10	13
CLEVELAND TO WASHINGTON, D.C.																	269 N.MI.	
15,000	33	25	15	17	21	9	3	-36	-26	-15	-18	-23	-37	-45	21	20	12	19
10,000	24	19	13	15	17	7	2	-26	-20	-13	-16	-18	-29	-34	16	17	11	15
5,000	13	10	7	8	9	1	-3	-13	-11	-7	-8	-10	-18	-23	14	14	10	12
CLOVIS TO LUBBOCK																	77 N.MI.	
15,000	23	18	4	11	12	1	-4	-24	-19	-4	-12	-13	-26	-34	19	17	11	16
10,000	15	10	2	6	8	-1	-5	-16	-11	-3	-7	-8	-18	-23	14	13	10	12
5,000	2	0	-3	-1	-1	-8	-12	-2	-1	2	1	0	-7	-12	12	13	9	11
CLOVIS TO SANTA FE																	164 N.MI.	
15,000	-26	-20	-7	-13	-15	-27	-35	24	20	6	12	14	3	-2	19	17	11	16
10,000	-17	-12	-4	-8	-9	-18	-23	16	11	4	7	9	1	-3	14	12	10	12
5,000	-2	-1	2	2	0	-6	-10	2	1	-2	-2	-1	-7	-11	11	11	8	10
COLLEGE STATION TO HOUSTON																	80 N.MI.	
15,000	17	15	1	7	9	-1	-7	-19	-16	-1	-8	-10	-22	-28	17	16	10	16
10,000	9	7	-1	4	4	-4	-8	-11	-8	1	-5	-5	-14	-19	14	13	10	12
5,000	3	0	-4	0	-1	-8	-13	-3	0	3	-1	0	-8	-12	14	13	9	12
COLLEGE STATION TO TEMPLE																	64 N.MI.	
15,000	-24	-20	-2	-10	-13	-25	-33	22	19	1	10	12	1	-5	18	16	11	16
10,000	-15	-11	-1	-6	-7	-17	-22	14	10	0	6	7	-2	-6	14	13	10	13
5,000	-6	-2	2	-1	-1	-10	-14	5	2	-2	1	1	-7	-11	14	13	9	12
COLORADO SPRINGS TO DENVER																	58 N.MI.	
15,000	-8	-3	0	-5	-4	-15	-22	6	2	-1	4	2	-9	-15	20	18	12	17
10,000	-5	-3	1	-3	-2	-11	-15	4	2	-1	3	2	-7	-11	14	13	10	13
5,000	5	5	6	5	5	-1	-4	-5	-5	-6	-6	-6	-12	-16	10	11	8	10
COLORADO SPRINGS TO OKLAHOMA CITY																	397 N.MI.	
15,000	25	19	9	15	16	5	0	-27	-20	-9	-16	-17	-29	-35	18	17	11	16
10,000	17	12	5	10	11	2	-2	-18	-12	-6	-10	-11	-20	-25	13	13	10	12
5,000	5	3	1	3	3	-4	-8	-5	-4	-1	-3	-3	-11	-15	12	12	9	11
COLORADO SPRINGS TO PUEBLO																	33 N.MI.	
15,000	10	5	1	7	5	-6	-12	-12	-7	-2	-8	-7	-18	-25	20	18	12	17
10,000	7	4	0	4	4	-5	-9	-8	-5	-1	-5	-4	-13	-18	14	13	10	13
5,000	-4	-5	-6	-5	-5	-11	-15	4	4	6	5	5	-2	-6	10	11	8	10

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
COLUMBIA TO FLORENCE																	71 N.MI.	
15,000	36	28	9	16	20	8	2	-37	-29	-9	-17	-21	-36	-45	19	19	11	18
10,000	26	19	8	12	15	5	0	-26	-20	-8	-12	-16	-27	-33	15	16	10	14
5,000	13	10	5	5	8	0	-4	-14	-11	-6	-5	-8	-17	-22	14	13	9	12
COLUMBIA TO GREENVILLE																	82 N.MI.	
15,000	-25	-22	-7	-12	-15	-28	-36	22	21	6	10	14	2	-4	19	19	11	18
10,000	-20	-15	-6	-8	-11	-22	-28	19	15	5	7	11	1	-4	15	16	10	14
5,000	-10	-8	-4	-4	-6	-14	-19	9	7	4	3	6	-2	-7	14	13	9	12
COLUMBIA,S.C. TO JACKSONVILLE																	214 N.MI.	
15,000	-9	-4	-3	-4	-5	-15	-21	5	2	2	3	3	-6	-12	17	17	10	16
10,000	-6	-3	-3	-4	-4	-12	-17	4	2	3	3	3	-5	-10	14	14	9	13
5,000	-6	-3	-2	-2	-3	-11	-15	5	3	2	1	3	-5	-9	12	12	8	11
COLUMBIA TO MERIDIAN																	395 N.MI.	
15,000	-35	-27	-7	-16	-19	-34	-41	34	26	7	15	19	7	2	17	17	10	16
10,000	-25	-18	-7	-11	-14	-24	-30	24	18	6	10	14	5	0	13	14	9	13
5,000	-13	-10	-5	-5	-8	-16	-20	13	10	5	4	8	0	-4	13	12	8	11
COLUMBIA TO MONTGOMERY																	283 N.MI.	
15,000	-34	-26	-7	-15	-19	-33	-41	34	25	7	15	18	6	1	18	18	10	17
10,000	-24	-18	-7	-10	-14	-24	-30	24	17	7	10	13	4	0	14	14	10	13
5,000	-13	-10	-5	-5	-8	-16	-20	12	10	5	4	7	0	-4	13	12	9	12
COLUMBIA TO PENSACOLA																	373 N.MI.	
15,000	-30	-22	-6	-13	-16	-29	-37	29	21	5	12	15	5	-1	17	17	10	16
10,000	-21	-15	-6	-9	-12	-22	-27	20	15	6	8	11	3	-2	13	14	9	13
5,000	-12	-9	-5	-4	-7	-15	-19	11	9	5	4	7	-1	-4	12	12	8	11
COLUMBIA,S.C. TO RALEIGH																	162 N.MI.	
15,000	30	20	7	14	16	4	-1	-32	-22	-7	-15	-17	-32	-40	19	19	11	18
10,000	19	14	6	10	12	2	-2	-20	-15	-7	-11	-13	-23	-29	15	16	10	14
5,000	10	8	3	3	6	-2	-6	-11	-8	-4	-4	-6	-14	-19	14	12	9	12
COLUMBIA TO SAVANNAH																	116 N.MI.	
15,000	-6	-1	-2	-3	-3	-13	-19	3	-1	2	2	1	-9	-15	18	18	10	17
10,000	-3	-1	-2	-3	-2	-11	-16	1	0	2	2	1	-7	-12	15	15	10	14
5,000	-4	-2	-1	-1	-2	-10	-14	3	1	1	1	1	-6	-10	13	12	9	12
COLUMBIA TO WASHINGTON, D.C.																	354 N.MI.	
15,000	24	14	7	13	13	2	-3	-27	-17	-7	-15	-15	-28	-36	19	19	11	18
10,000	15	11	5	9	10	1	-4	-17	-12	-6	-10	-11	-20	-26	15	15	10	14
5,000	8	6	3	3	5	-3	-7	-9	-6	-3	-4	-5	-13	-18	13	12	9	12
COLUMBUS,GA. TO MONTGOMERY																	75 N.MI.	
15,000	-34	-26	-6	-15	-19	-33	-41	33	25	6	14	18	6	0	18	18	10	17
10,000	-24	-18	-6	-10	-13	-24	-30	23	17	5	9	13	3	-2	14	15	10	14
5,000	-12	-10	-5	-5	-7	-16	-20	12	9	5	4	7	-1	-5	13	13	9	12
COLUMBUS,GA. TO PENSACOLA																	168 N.MI.	
15,000	-26	-18	-4	-10	-13	-26	-33	24	17	3	10	12	1	-4	17	17	10	16
10,000	-18	-13	-5	-6	-10	-19	-25	17	12	5	6	9	1	-4	14	14	10	13
5,000	-11	-8	-5	-4	-6	-14	-19	10	8	4	3	6	-2	-6	13	12	9	12
COLUMBUS,GA. TO TALLAHASSEE																	131 N.MI.	
15,000	3	5	1	1	2	-8	-13	-6	-7	-1	-2	-3	-14	-20	17	17	10	16
10,000	1	2	-2	1	0	-8	-13	-3	-4	2	-1	-1	-10	-15	14	14	10	13
5,000	-3	-1	-2	0	-1	-9	-13	2	1	1	0	1	-7	-11	13	12	9	12
COLUMBUS, OHIO TO DAYTON																	62 N.MI.	
15,000	-42	-28	-18	-24	-26	-41	-50	41	26	17	23	26	13	6	21	21	13	20
10,000	-30	-21	-14	-19	-20	-32	-38	29	20	14	18	20	9	4	16	17	12	15
5,000	-16	-11	-8	-10	-11	-20	-25	15	11	7	10	10	2	-3	15	15	10	13
COLUMBUS, OHIO TO DETROIT																	136 N.MI.	
15,000	-9	-9	-4	-4	-6	-19	-26	5	6	3	2	4	-8	-15	21	21	13	20
10,000	-6	-7	-5	-4	-5	-15	-21	4	5	4	2	4	-6	-12	16	17	12	15
5,000	-3	-4	-2	-2	-3	-11	-16	2	3	2	1	2	-7	-12	15	15	10	13

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COLUMBUS, OHIO TO INDIANAPOLIS																	157 N.MI.	
15,000	-41	-27	-17	-24	-26	-41	-49	40	26	17	23	25	13	6	21	21	13	20
10,000	-30	-21	-14	-18	-20	-31	-37	29	20	14	18	20	9	4	16	17	12	15
5,000	-16	-11	-8	-10	-11	-20	-25	15	11	7	10	10	2	-3	15	15	10	13
COLUMBUS, OHIO TO LOUISVILLE																	172 N.MI.	
15,000	-33	-21	-13	-19	-20	-34	-42	31	19	12	17	19	7	0	20	20	12	19
10,000	-24	-16	-10	-14	-15	-26	-32	22	14	9	13	14	4	-1	16	16	12	15
5,000	-12	-8	-6	-7	-8	-17	-22	12	8	5	7	8	-1	-5	14	14	10	12
COLUMBUS, OHIO TO PHILADELPHIA																	352 N.MI.	
15,000	43	28	18	24	27	14	8	-44	-30	-18	-25	-27	-42	-51	20	20	12	19
10,000	30	22	15	19	21	11	6	-31	-23	-15	-20	-21	-32	-38	16	16	11	14
5,000	16	12	8	10	11	3	-1	-16	-12	-8	-10	-11	-20	-25	14	14	9	12
COLUMBUS, OHIO TO PITTSBURGH																	126 N.MI.	
15,000	41	25	17	24	25	13	6	-42	-27	-18	-25	-26	-41	-50	21	21	13	20
10,000	29	19	13	19	20	9	4	-30	-20	-14	-19	-20	-31	-37	16	17	12	15
5,000	15	10	7	10	10	2	-3	-16	-11	-8	-10	-11	-20	-25	15	15	10	13
COLUMBUS, OHIO TO TOLEDO																	104 N.MI.	
15,000	-19	-15	-8	-10	-12	-25	-33	15	13	7	8	10	-2	-9	21	21	13	20
10,000	-13	-11	-8	-8	-10	-20	-26	11	10	7	7	9	-1	-7	16	17	12	15
5,000	-7	-6	-4	-4	-5	-14	-19	6	5	3	4	4	-4	-9	15	15	10	13
COLUMBUS, OHIO TO WASHINGTON, D.C.																	280 N.MI.	
15,000	40	28	16	21	25	13	6	-42	-29	-17	-23	-26	-41	-49	20	20	12	19
10,000	29	21	14	18	20	10	5	-30	-22	-14	-18	-20	-31	-37	16	16	11	15
5,000	15	12	8	9	10	2	-2	-16	-12	-8	-9	-11	-19	-24	14	14	9	12
CONCORD TO FITCHBURG																	40 N.MI.	
15,000	-17	-7	-6	-11	-10	-24	-32	13	5	4	9	7	-6	-13	23	22	14	21
10,000	-9	-4	-3	-7	-5	-16	-22	6	2	2	5	4	-7	-13	18	18	12	16
5,000	-3	-1	-3	-3	-3	-12	-17	2	1	2	3	2	-7	-13	16	15	11	13
CONCORD TO LACONIA																	22 N.MI.	
15,000	10	2	3	7	5	-8	-16	-14	-5	-4	-9	-8	-22	-29	23	22	15	21
10,000	4	0	0	3	2	-9	-15	-6	-2	-1	-5	-3	-14	-20	18	18	12	16
5,000	0	0	1	2	1	-9	-14	-2	0	-2	-2	-2	-11	-16	16	16	12	13
COMOX TO PORT HARDY																	111 N.MI.	
15,000	-21	-14	-12	-16	-15	-29	-36	19	12	11	15	14	1	-6	22	20	16	20
10,000	-14	-9	-8	-11	-10	-20	-26	13	8	8	10	9	0	-6	18	15	12	14
5,000	-5	0	-3	-2	-3	-11	-15	4	0	3	2	2	-6	-10	14	12	10	13
COMOX TO VANCOUVER																	75 N.MI.	
15,000	22	14	12	17	16	3	-4	-23	-15	-12	-18	-17	-30	-37	22	20	15	19
10,000	15	10	8	12	11	1	-4	-16	-11	-8	-12	-11	-21	-27	17	14	12	14
5,000	6	1	3	3	3	-5	-9	-6	-2	-4	-3	-4	-11	-16	14	12	9	12
CORPUS CHRISTI TO HOUSTON																	163 N.MI.	
15,000	23	17	4	8	11	2	-3	-24	-18	-4	-8	-12	-23	-30	16	15	10	14
10,000	15	12	4	5	9	1	-3	-16	-12	-4	-6	-9	-17	-22	12	12	9	11
5,000	10	8	6	4	7	0	-4	-11	-9	-6	-4	-7	-15	-19	13	12	8	11
CORPUS CHRISTI TO SAN ANTONIO																	118 N.MI.	
15,000	-7	-7	4	-2	-2	-13	-18	5	6	-4	2	1	-8	-12	16	15	10	14
10,000	-2	-1	4	1	1	-7	-11	1	1	-4	-2	-1	-9	-13	12	12	9	11
5,000	3	6	9	4	6	-2	-6	-4	-6	-9	-4	-6	-13	-17	13	12	8	11
DALLAS TO FT. WORTH																	10 N.MI.	
15,000	-32	-25	-6	-14	-18	-32	-40	31	25	6	13	17	5	-1	19	18	11	17
10,000	-22	-16	-5	-9	-12	-22	-28	21	16	5	9	12	2	-2	14	14	10	13
5,000	-10	-8	-6	-5	-7	-16	-20	10	7	6	5	7	-2	-6	14	14	10	12
DALLAS TO HOUSTON																	208 N.MI.	
15,000	6	7	0	5	4	-6	-11	-9	-9	0	-5	-5	-16	-21	17	16	10	16
10,000	3	2	-2	3	1	-7	-11	-4	-3	2	-3	-2	-10	-15	13	13	10	12
5,000	-1	-3	-6	-1	-3	-11	-15	0	3	5	1	3	-5	-10	13	13	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DALLAS TO JACKSON																	336 N.MI.	
15,000	31	25	6	14	17	6	0	-32	-25	-6	-14	-18	-32	-39	17	17	10	16
10,000	21	16	4	9	12	3	-2	-22	-16	-4	-9	-12	-22	-28	13	13	9	13
5,000	10	7	5	4	6	-1	-5	-10	-8	-5	-5	-7	-15	-19	13	13	9	11
DALLAS TO KANSAS CITY																	392 N.MI.	
15,000	9	6	3	2	5	-6	-11	-12	-8	-3	-3	-6	-17	-23	18	17	11	16
10,000	7	5	3	2	4	-4	-9	-8	-6	-3	-3	-5	-13	-18	14	14	10	13
5,000	4	5	6	3	5	-3	-8	-5	-6	-7	-3	-5	-13	-17	13	13	9	12
DALLAS TO LAWTON																	129 N.MI.	
15,000	-18	-15	-3	-10	-10	-23	-30	16	14	2	9	9	-1	-7	19	18	11	17
10,000	-12	-8	-1	-6	-6	-15	-20	10	7	1	5	6	-3	-8	14	14	10	13
5,000	-3	-1	2	-1	0	-9	-14	2	0	-3	0	0	-8	-13	14	14	10	12
DALLAS TO LITTLE ROCK																	256 N.MI.	
15,000	31	23	6	13	16	5	-1	-32	-24	-6	-13	-17	-31	-39	18	17	11	17
10,000	22	16	6	9	12	3	-1	-22	-16	-6	-9	-13	-23	-28	14	14	10	13
5,000	11	9	8	5	8	0	-4	-11	-10	-8	-5	-8	-16	-21	14	14	9	12
DALLAS TO LUBBOCK																	254 N.MI.	
15,000	-30	-24	-5	-14	-17	-30	-38	29	24	5	13	16	5	-1	18	17	10	16
10,000	-20	-15	-4	-9	-11	-21	-26	20	14	4	8	11	2	-2	14	13	10	12
5,000	-8	-6	-3	-3	-5	-13	-17	7	5	3	3	4	-3	-8	13	13	9	12
DALLAS TO MCALESTER																	133 N.MI.	
15,000	14	10	3	4	7	-3	-9	-17	-12	-4	-5	-8	-20	-27	19	18	11	17
10,000	11	8	4	4	6	-2	-7	-12	-9	-4	-4	-7	-16	-21	14	14	10	13
5,000	7	7	8	4	7	-2	-7	-7	-7	-8	-4	-7	-15	-20	14	14	10	12
DALLAS TO MEMPHIS																	367 N.MI.	
15,000	33	24	6	14	17	6	0	-34	-25	-7	-14	-18	-32	-40	18	17	10	16
10,000	23	16	6	9	13	4	-1	-24	-17	-6	-10	-13	-24	-29	13	14	10	13
5,000	12	9	7	5	8	0	-4	-12	-10	-7	-5	-8	-16	-21	13	13	9	12
DALLAS TO MIDLAND																	276 N.MI.	
15,000	-31	-25	-5	-12	-17	-30	-37	30	24	5	12	16	5	-1	18	16	10	15
10,000	-21	-16	-5	-8	-12	-21	-26	20	15	4	8	11	3	-2	13	13	10	12
5,000	-9	-7	-6	-4	-6	-14	-19	9	7	5	4	6	-1	-6	13	13	9	11
DALLAS TO MONROE																	244 N.MI.	
15,000	31	25	6	13	17	5	0	-32	-25	-6	-14	-18	-32	-39	18	17	10	16
10,000	21	16	4	9	12	3	-2	-22	-16	-4	-9	-12	-22	-28	14	13	10	13
5,000	10	7	5	4	6	-2	-6	-10	-8	-5	-5	-7	-15	-19	13	13	9	12
DALLAS TO NEW ORLEANS																	379 N.MI.	
15,000	25	21	4	11	14	3	-2	-26	-22	-4	-12	-15	-27	-34	17	16	10	15
10,000	16	12	1	7	9	0	-4	-17	-13	-2	-7	-9	-19	-24	13	13	9	12
5,000	6	4	1	3	3	-4	-8	-7	-5	-1	-3	-4	-11	-16	13	12	9	11
DALLAS TO OKLAHOMA CITY																	158 N.MI.	
15,000	-7	-7	-1	-6	-5	-15	-22	4	5	0	4	3	-7	-13	19	18	11	17
10,000	-4	-2	0	-3	-2	-11	-15	3	1	-1	2	1	-7	-12	14	14	10	13
5,000	1	2	5	1	2	-6	-11	-1	-3	-5	-1	-3	-11	-15	14	14	10	12
DALLAS TO SAN ANTONIO																	216 N.MI.	
15,000	-17	-12	-4	-5	-9	-19	-25	15	11	4	4	8	-2	-7	17	16	10	15
10,000	-13	-10	-5	-3	-7	-16	-21	12	9	5	3	7	-1	-6	13	13	10	12
5,000	-8	-8	-9	-5	-8	-15	-20	8	8	9	4	8	0	-5	13	13	9	12
DALLAS TO SHREVEPORT																	155 N.MI.	
15,000	31	24	5	13	17	5	-1	-31	-25	-6	-14	-17	-31	-39	18	17	11	16
10,000	21	15	4	9	11	2	-3	-21	-16	-4	-9	-12	-22	-27	14	14	10	13
5,000	9	6	4	4	6	-2	-7	-10	-7	-4	-4	-6	-14	-19	14	13	9	12
DALLAS TO TULSA																	207 N.MI.	
15,000	8	5	2	1	4	-6	-12	-11	-7	-2	-3	-5	-16	-23	19	18	11	17
10,000	6	5	3	2	4	-5	-9	-8	-6	-3	-3	-5	-13	-18	14	14	10	13
5,000	5	5	7	3	5	-3	-8	-6	-6	-7	-3	-6	-14	-18	14	14	10	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DALLAS TO WACO																	77 N.MI.	
15,000	-13	-9	-4	-3	-7	-17	-24	10	7	3	2	5	-5	-10	18	17	11	16
10,000	-10	-8	-4	-3	-6	-14	-19	9	7	4	2	5	-3	-8	14	14	10	13
5,000	-7	-7	-9	-4	-7	-15	-19	6	7	9	4	7	-2	-6	14	13	9	12
DALLAS TO WICHITA FALLS																	107 N.MI.	
15,000	-24	-19	-4	-12	-13	-26	-34	22	18	3	11	12	1	-4	19	17	11	17
10,000	-15	-11	-2	-7	-8	-18	-23	14	10	2	7	8	-1	-6	14	14	10	13
5,000	-5	-3	0	-2	-2	-11	-15	4	2	-1	1	2	-7	-11	14	14	10	12
DANVILLE TO GREENSBORO																	41 N.MI.	
15,000	-32	-21	-9	-17	-18	-32	-41	30	19	8	16	17	5	-1	20	20	12	19
10,000	-21	-15	-7	-12	-13	-24	-30	20	14	7	11	12	2	-3	16	17	11	15
5,000	-11	-8	-4	-5	-7	-15	-20	10	7	4	4	6	-2	-6	14	13	9	13
DANVILLE TO RICHMOND																	112 N.MI.	
15,000	36	24	12	19	21	9	3	-37	-26	-12	-20	-22	-37	-45	20	20	12	19
10,000	25	18	10	14	16	6	1	-26	-19	-10	-15	-17	-28	-34	16	17	11	15
5,000	13	10	6	6	8	0	-4	-14	-10	-6	-6	-9	-17	-22	14	13	9	13
DAYTON TO FT. WAYNE																	79 N.MI.	
15,000	-25	-18	-11	-14	-16	-30	-37	22	16	10	12	14	2	-5	21	21	13	20
10,000	-18	-14	-10	-11	-13	-23	-29	16	13	9	10	12	1	-4	16	17	12	15
5,000	-9	-7	-5	-6	-7	-15	-21	8	7	4	5	6	-3	-7	15	15	10	13
DAYTON TO INDIANAPOLIS																	96 N.MI.	
15,000	-41	-27	-17	-24	-26	-41	-49	40	26	17	23	25	12	6	21	21	13	20
10,000	-30	-21	-14	-18	-20	-31	-37	29	20	13	17	19	9	3	16	17	12	15
5,000	-16	-11	-8	-10	-11	-20	-25	15	11	7	10	10	2	-3	15	15	10	13
DAYTON TO PITTSBURGH																	187 N.MI.	
15,000	41	26	17	24	25	13	6	-42	-27	-18	-25	-26	-41	-50	21	21	12	20
10,000	29	20	14	18	20	9	4	-30	-21	-14	-19	-20	-31	-37	16	17	12	15
5,000	15	11	7	10	10	2	-3	-16	-11	-8	-10	-11	-20	-25	14	14	10	12
DAYTON TO ST. LOUIS																	294 N.MI.	
15,000	-39	-26	-16	-22	-24	-38	-46	38	25	15	21	23	11	5	19	20	12	19
10,000	-28	-20	-13	-16	-19	-29	-35	28	19	12	16	18	8	3	15	16	11	14
5,000	-15	-11	-7	-9	-10	-19	-24	15	10	7	9	10	1	-3	14	14	10	12
DAYTON TO WASHINGTON, D.C.																	339 N.MI.	
15,000	41	28	17	22	25	13	7	-42	-29	-17	-23	-26	-40	-49	20	20	12	19
10,000	29	21	14	18	20	10	5	-30	-22	-14	-18	-21	-31	-37	15	16	11	14
5,000	15	12	8	9	10	2	-2	-16	-12	-8	-9	-11	-19	-24	14	14	9	12
DAYTONA BEACH TO JACKSONVILLE																	80 N.MI.	
15,000	-11	-10	1	-3	-5	-16	-22	9	8	-1	2	4	-5	-10	17	17	9	15
10,000	-5	-6	2	-1	-2	-11	-15	3	5	-2	0	1	-7	-11	14	14	9	13
5,000	3	0	1	0	1	-6	-10	-3	0	-2	-1	-1	-9	-13	12	12	8	11
DAYTONA BEACH TO LAKELAND																	87 N.MI.	
15,000	-15	-12	-4	-8	-9	-19	-25	14	11	4	7	8	-1	-5	16	16	9	14
10,000	-11	-9	-4	-6	-7	-15	-20	11	8	4	5	7	-1	-5	13	13	9	12
5,000	-8	-7	-4	-4	-6	-13	-17	7	7	4	4	5	-1	-5	12	11	8	11
DAYTONA BEACH TO MELBOURNE																	69 N.MI.	
15,000	8	7	-3	0	2	-7	-11	-9	-9	3	-1	-3	-13	-19	16	16	9	14
10,000	2	4	-3	-1	0	-8	-12	-3	-4	3	1	0	-9	-13	13	13	9	12
5,000	-6	-2	-3	-3	-4	-10	-14	5	2	3	3	3	-4	-8	12	11	8	11
DAYTONA BEACH TO MIAMI																	207 N.MI.	
15,000	5	5	-4	-1	0	-8	-12	-6	-6	4	1	-1	-10	-16	15	14	8	13
10,000	0	2	-4	-3	-2	-9	-13	-1	-2	4	3	1	-6	-10	12	12	8	11
5,000	-6	-4	-4	-4	-5	-11	-15	6	4	4	4	4	-2	-6	11	11	7	10
DAYTONA BEACH TO ORLANDO																	41 N.MI.	
15,000	-10	-8	-4	-6	-7	-16	-21	8	7	4	6	6	-3	-8	16	16	9	14
10,000	-9	-6	-4	-5	-6	-14	-18	8	5	4	5	5	-2	-7	14	13	9	12
5,000	-8	-6	-4	-4	-5	-13	-17	7	6	4	4	5	-2	-6	12	12	8	11

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
DAYTONA BEACH TO TAMPA																	107 N.MI.	
15,000	-19	-16	-4	-9	-11	-21	-27	17	15	4	8	10	1	-3	16	15	9	14
10,000	-13	-10	-4	-6	-8	-16	-21	13	10	4	6	7	0	-4	13	13	9	12
5,000	-7	-7	-4	-4	-6	-13	-17	7	7	4	4	5	-2	-5	12	11	8	11
DAYTONA BEACH TO WEST PALM BEACH																	158 N.MI.	
15,000	8	7	-3	0	2	-7	-11	-9	-8	3	0	-3	-12	-18	15	15	8	13
10,000	1	3	-4	-2	-1	-8	-12	-2	-4	4	2	0	-8	-12	13	12	8	11
5,000	-6	-3	-4	-4	-4	-11	-15	6	3	4	3	4	-3	-6	11	11	8	10
DENVER TO GRAND JUNCTION																	174 N.MI.	
15,000	-23	-18	-14	-15	-17	-28	-34	22	17	14	14	16	6	0	19	17	12	17
10,000	-13	-11	-8	-10	-10	-18	-22	13	10	8	10	10	2	-2	13	12	10	12
5,000	-1	-2	-2	-2	-2	-7	-10	1	2	1	2	2	-4	-7	9	9	7	8
DENVER TO LINCOLN																	377 N.MI.	
15,000	26	20	16	18	19	9	3	-27	-20	-16	-19	-20	-32	-38	19	18	12	17
10,000	18	13	10	12	13	4	0	-18	-13	-10	-12	-13	-22	-27	13	13	10	13
5,000	7	7	6	8	7	0	-4	-8	-7	-6	-8	-7	-15	-19	11	12	10	11
DENVER TO LUBBOCK																	395 N.MI.	
15,000	11	7	2	7	6	-4	-9	-13	-9	-2	-8	-7	-18	-24	18	17	11	16
10,000	8	4	1	4	4	-4	-8	-9	-5	-1	-4	-4	-12	-17	13	12	9	12
5,000	-2	-3	-6	-4	-4	-11	-14	2	3	6	4	4	-3	-7	10	11	8	10
DENVER TO OMAHA																	377 N.MI.	
15,000	26	20	16	18	19	9	3	-27	-20	-16	-19	-20	-32	-38	19	18	12	17
10,000	18	13	10	12	13	4	0	-18	-13	-10	-12	-13	-22	-27	13	13	10	13
5,000	7	7	6	8	7	0	-4	-8	-7	-6	-8	-7	-15	-19	11	12	10	11
DENVER TO RAPID CITY																	270 N.MI.	
15,000	2	3	6	2	4	-7	-14	-4	-4	-7	-3	-5	-16	-21	19	18	12	17
10,000	1	1	4	1	2	-7	-11	-2	-1	-4	-1	-2	-10	-15	13	13	10	12
5,000	6	4	5	5	5	-2	-6	-6	-5	-5	-5	-5	-12	-16	11	11	9	11
DENVER TO SALT LAKE CITY																	330 N.MI.	
15,000	-23	-17	-13	-16	-17	-27	-34	22	16	13	15	16	6	0	18	16	11	16
10,000	-13	-10	-7	-10	-10	-17	-21	13	10	7	10	10	2	-1	12	11	9	11
5,000	3	1	2	2	2	-3	-5	-3	-1	-2	-2	-2	-7	-9	8	8	6	7
DENVER TO WICHITA																	379 N.MI.	
15,000	27	20	12	17	18	8	2	-28	-21	-13	-18	-19	-31	-37	19	17	11	16
10,000	19	13	8	12	12	4	0	-19	-14	-8	-12	-13	-22	-26	13	13	10	13
5,000	6	5	3	6	5	-2	-6	-7	-5	-3	-6	-5	-13	-17	11	12	9	11
DES MOINES TO KANSAS CITY																	151 N.MI.	
15,000	-9	-7	-5	-3	-6	-18	-25	5	5	4	2	4	-8	-14	20	20	13	19
10,000	-6	-4	-4	-3	-4	-14	-19	4	3	3	2	3	-7	-12	15	16	12	15
5,000	-2	-3	-4	-2	-3	-12	-16	1	3	4	2	2	-6	-11	14	15	11	13
DES MOINES TO MINNEAPOLIS																	202 N.MI.	
15,000	-3	-2	0	-3	-2	-14	-20	0	0	-1	1	0	-12	-18	20	20	13	19
10,000	-3	-2	-1	-2	-2	-11	-17	1	1	0	1	1	-9	-14	15	16	12	15
5,000	-2	-2	1	-1	-1	-10	-15	1	1	-2	0	0	-9	-13	14	15	11	13
DES MOINES TO OMAHA																	147 N.MI.	
15,000	-31	-21	-17	-20	-22	-34	-41	29	20	16	19	21	9	3	20	20	13	19
10,000	-22	-15	-12	-14	-15	-25	-31	21	14	11	13	15	5	0	15	15	12	15
5,000	-11	-8	-7	-9	-9	-17	-22	10	8	7	9	8	0	-5	14	14	11	13
DES MOINES TO ST. LOUIS																	225 N.MI.	
15,000	24	16	11	16	16	4	-2	-26	-17	-12	-17	-17	-30	-37	20	20	13	19
10,000	18	13	8	11	12	2	-3	-19	-13	-9	-12	-13	-23	-28	15	16	12	15
5,000	9	6	3	6	6	-3	-7	-10	-7	-4	-7	-7	-15	-20	14	15	10	13
DES MOINES TO WATERLOO																	83 N.MI.	
15,000	18	13	11	11	13	1	-6	-21	-14	-12	-13	-15	-27	-34	20	20	13	20
10,000	13	9	8	8	10	0	-6	-15	-10	-9	-9	-10	-20	-26	15	16	12	15
5,000	6	4	5	6	5	-4	-9	-7	-5	-6	-6	-6	-15	-20	14	15	11	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DETROIT TO FLINT																	47 N.MI.	
15,000	-17	-14	-10	-10	-12	-25	-33	14	11	8	8	10	-2	-9	22	21	14	21
10,000	-12	-10	-8	-8	-9	-20	-26	10	9	7	7	8	-2	-8	17	18	13	16
5,000	-7	-6	-4	-4	-5	-14	-19	6	5	4	3	4	-5	-10	15	16	11	13
DETROIT TO GRAND RAPIDS																	110 N.MI.	
15,000	-37	-24	-19	-23	-25	-39	-46	35	23	19	21	24	11	4	21	21	14	20
10,000	-26	-18	-15	-17	-19	-30	-36	26	18	14	17	18	8	2	16	17	12	15
5,000	-15	-10	-8	-10	-10	-20	-25	14	9	8	9	10	1	-4	15	15	11	13
DETROIT TO INDIANAPOLIS																	200 N.MI.	
15,000	-27	-16	-12	-16	-17	-30	-38	24	14	11	14	15	3	-3	20	21	13	20
10,000	-20	-12	-9	-12	-13	-23	-29	18	11	8	11	12	2	-4	16	17	12	15
5,000	-10	-6	-5	-7	-7	-16	-21	10	6	5	7	6	-2	-7	15	15	10	13
DETROIT TO LAND O LAKES																	344 N.MI.	
15,000	-29	-19	-17	-19	-20	-33	-40	26	18	17	17	19	7	1	20	19	13	19
10,000	-21	-14	-13	-14	-16	-25	-31	20	13	13	14	15	5	0	15	16	12	15
5,000	-12	-8	-7	-8	-8	-17	-22	11	7	6	7	8	-1	-5	14	15	11	13
DETROIT TO LANSING																	64 N.MI.	
15,000	-34	-23	-18	-21	-23	-37	-45	33	22	17	20	22	9	3	21	21	14	20
10,000	-25	-18	-14	-16	-18	-29	-35	24	17	14	16	17	7	1	16	17	13	16
5,000	-14	-10	-8	-9	-10	-19	-24	13	9	7	8	9	0	-5	15	16	11	13
DETROIT TO LOUISVILLE																	266 N.MI.	
15,000	-19	-10	-7	-11	-11	-23	-30	15	7	6	9	9	-3	-9	20	20	12	19
10,000	-13	-7	-5	-8	-8	-18	-23	11	6	4	7	7	-3	-8	15	16	12	15
5,000	-7	-4	-3	-4	-4	-13	-17	6	3	3	4	4	-5	-9	14	14	10	12
DETROIT TO MILWAUKEE																	206 N.MI.	
15,000	-37	-25	-20	-23	-25	-39	-46	36	24	19	22	24	12	6	21	20	13	20
10,000	-27	-19	-15	-18	-19	-30	-36	27	18	15	17	19	9	3	16	17	12	15
5,000	-15	-10	-8	-10	-11	-20	-25	14	9	8	10	10	1	-3	15	15	11	13
DETROIT TO PHILADELPHIA																	393 N.MI.	
15,000	38	27	18	21	25	12	6	-39	-28	-18	-22	-26	-39	-47	20	20	12	19
10,000	28	20	15	18	19	10	5	-28	-21	-15	-18	-20	-31	-36	16	16	11	14
5,000	15	11	8	9	10	2	-2	-15	-12	-9	-10	-11	-19	-24	14	14	10	12
DETROIT TO PITTSBURGH																	176 N.MI.	
15,000	32	23	15	18	21	9	2	-34	-24	-16	-19	-22	-36	-44	21	21	13	20
10,000	23	17	13	15	17	7	1	-24	-18	-13	-16	-18	-28	-34	16	17	12	15
5,000	12	10	7	8	9	0	-4	-13	-10	-7	-8	-9	-18	-23	15	15	10	13
DETROIT TO ROCHESTER, N.Y.																	256 N.MI.	
15,000	38	23	19	23	25	12	6	-39	-24	-19	-24	-26	-40	-48	21	21	13	20
10,000	28	17	14	18	19	9	3	-28	-18	-15	-19	-20	-30	-36	16	17	12	15
5,000	15	10	8	10	11	2	-3	-16	-10	-9	-11	-11	-20	-25	14	15	10	12
DETROIT TO ST. LOUIS																	382 N.MI.	
15,000	-33	-21	-15	-19	-21	-34	-41	31	20	14	17	20	8	2	19	19	12	19
10,000	-24	-16	-11	-15	-16	-26	-32	23	15	11	14	15	6	1	15	16	11	14
5,000	-13	-8	-7	-9	-9	-17	-22	12	8	6	8	8	0	-4	14	14	10	12
DETROIT TO TOLEDO																	44 N.MI.	
15,000	-19	-10	-8	-12	-12	-25	-32	15	7	7	10	9	-3	-10	22	21	14	21
10,000	-13	-7	-5	-9	-8	-19	-25	11	6	5	7	7	-3	-9	17	17	12	16
5,000	-7	-3	-3	-5	-5	-14	-19	6	3	3	5	4	-5	-10	15	15	11	13
DETROIT TO WASHINGTON, D.C.																	352 N.MI.	
15,000	33	24	15	17	21	9	3	-35	-26	-16	-19	-23	-36	-44	20	20	12	19
10,000	24	19	13	15	17	8	2	-25	-19	-14	-16	-18	-28	-34	16	16	11	14
5,000	13	10	7	8	9	1	-3	-13	-11	-7	-8	-10	-18	-23	14	14	9	12
DOTHAN TO MONTGOMERY																	80 N.MI.	
15,000	-17	-16	-4	-8	-10	-22	-29	15	15	3	7	9	-1	-7	18	18	10	17
10,000	-11	-10	0	-5	-6	-16	-21	10	9	0	5	5	-3	-8	14	15	10	14
5,000	-3	-3	-1	-2	-2	-10	-14	2	3	0	2	2	-6	-10	13	13	9	12

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
EDMONTON TO GRAND PRAIRIE																	217 N.MI.	
15,000	-23	-12	-10	-19	-16	-27	-33	22	12	10	18	15	4	-1	17	16	14	15
10,000	-17	-10	-9	-15	-12	-21	-25	16	9	8	15	12	4	-1	14	12	10	12
5,000	-8	-2	-3	-8	-5	-13	-17	7	1	3	7	4	-4	-8	13	12	10	12
EDMONTON TO REGINA																	372 N.MI.	
15,000	25	15	14	20	18	8	3	-26	-15	-15	-21	-19	-29	-35	16	15	13	15
10,000	19	11	11	16	14	6	2	-20	-11	-11	-17	-14	-22	-27	12	11	10	11
5,000	10	3	3	9	6	-2	-6	-11	-3	-4	-9	-7	-15	-20	13	12	11	12
EDMONTON TO SASKATOON																	260 N.MI.	
15,000	25	15	15	20	18	8	3	-26	-16	-15	-21	-19	-29	-35	16	15	13	15
10,000	19	11	10	16	14	6	2	-19	-11	-11	-16	-14	-22	-27	13	12	10	12
5,000	11	3	4	10	7	-2	-6	-12	-4	-4	-10	-7	-16	-21	14	12	11	13
ELKO TO ELY																	102 N.MI.	
15,000	12	8	1	6	6	-5	-11	-14	-9	-2	-7	-7	-19	-26	21	18	12	18
10,000	8	5	-1	4	3	-5	-9	-8	-5	0	-4	-4	-13	-17	14	13	10	12
5,000	-5	-4	-1	-4	-3	-8	-11	4	4	1	4	3	-2	-5	9	8	6	8
ELKO TO RENO																	199 N.MI.	
15,000	-20	-14	-14	-13	-15	-26	-33	18	13	14	12	14	3	-4	21	18	12	18
10,000	-13	-9	-8	-9	-9	-18	-23	12	8	8	8	9	1	-4	15	13	9	13
5,000	-4	-4	0	-5	-3	-9	-12	4	4	0	4	3	-3	-5	10	8	6	8
ELMIRA TO ROCHESTER, N.Y.																	67 N.MI.	
15,000	-20	-17	-12	-11	-15	-28	-36	16	15	11	9	12	0	-7	22	22	14	21
10,000	-16	-13	-10	-10	-12	-23	-29	14	12	10	9	11	0	-5	17	18	12	16
5,000	-9	-8	-6	-5	-7	-16	-21	8	7	6	4	6	-3	-8	15	15	11	13
ELMIRA TO WILLIAMSPORT																	55 N.MI.	
15,000	-5	1	0	-5	-2	-15	-22	1	-4	-1	3	-1	-13	-21	22	22	14	21
10,000	-2	2	1	-2	0	-10	-16	-1	-3	-2	0	-2	-12	-18	17	18	12	16
5,000	-1	1	1	-1	0	-9	-14	-1	-2	-1	0	-1	-10	-15	15	15	11	13
EL PASO TO MIDLAND																	213 N.MI.	
15,000	27	23	3	10	14	3	-2	-28	-23	-4	-11	-15	-28	-35	18	16	10	15
10,000	17	14	3	6	9	1	-3	-18	-14	-3	-7	-10	-19	-24	13	12	9	11
5,000	4	3	1	-1	1	-5	-9	-4	-3	-1	1	-2	-8	-12	11	11	7	10
EL PASO TO PHOENIX																	301 N.MI.	
15,000	-24	-19	-2	-9	-12	-24	-32	23	19	1	9	11	1	-4	18	15	10	14
10,000	-14	-11	-2	-5	-7	-15	-20	14	11	1	4	7	-1	-4	13	11	8	10
5,000	2	2	3	5	3	-2	-5	-2	-2	-3	-5	-3	-8	-11	8	8	5	8
EL PASO TO ROSWELL																	134 N.MI.	
15,000	19	16	7	8	11	2	-4	-20	-17	-7	-8	-12	-23	-30	18	16	10	15
10,000	12	10	5	6	8	0	-4	-13	-11	-5	-6	-8	-17	-21	14	12	9	11
5,000	6	6	6	2	5	-1	-5	-7	-6	-6	-2	-5	-12	-15	11	10	7	10
EL PASO TO TUCSON																	233 N.MI.	
15,000	-25	-21	-2	-10	-13	-26	-33	24	21	2	9	13	2	-3	18	15	10	14
10,000	-15	-12	-2	-5	-8	-16	-21	14	12	2	5	8	0	-4	13	11	8	11
5,000	1	0	1	5	2	-3	-6	-1	-1	-2	-5	-2	-7	-10	9	9	5	8
ELY TO SALT LAKE CITY																	160 N.MI.	
15,000	15	12	13	10	13	2	-4	-16	-13	-14	-11	-14	-24	-31	20	17	12	17
10,000	9	7	8	7	8	0	-4	-10	-8	-8	-8	-8	-16	-20	13	12	10	11
5,000	1	3	0	2	1	-3	-6	-1	-3	0	-2	-2	-6	-9	8	8	6	7
EUGENE TO MEDFORD																	106 N.MI.	
15,000	6	2	1	1	2	-10	-17	-8	-3	-2	-3	-4	-16	-23	22	20	13	20
10,000	2	0	0	0	1	-9	-14	-4	-1	0	-1	-1	-11	-16	17	15	11	14
5,000	-3	-2	4	-3	-1	-8	-12	3	2	-4	2	0	-7	-10	13	10	8	10
EUGENE TO SALEM																	48 N.MI.	
15,000	0	3	3	4	3	-10	-17	-3	-5	-4	-6	-4	-17	-24	23	21	14	20
10,000	4	4	2	3	3	-6	-12	-5	-5	-3	-4	-4	-14	-19	17	15	11	15
5,000	6	3	-3	5	2	-5	-9	-6	-4	3	-5	-2	-10	-15	13	11	8	11

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
EVANSVILLE TO INDIANAPOLIS																	117 N.MI.	
15,000	19	11	7	9	11	-1	-7	-23	-13	-8	-11	-13	-26	-33	20	21	12	20
10,000	14	9	6	8	9	-1	-6	-16	-10	-6	-9	-10	-20	-26	15	16	12	15
5,000	7	5	4	4	5	-4	-8	-8	-6	-4	-5	-5	-14	-19	15	15	10	13
EVANSVILLE TO LOUISVILLE																	85 N.MI.	
15,000	39	26	14	20	23	10	4	-40	-27	-14	-21	-24	-39	-47	20	20	12	20
10,000	28	20	11	15	18	8	2	-29	-20	-12	-16	-18	-30	-35	15	16	12	15
5,000	15	11	7	8	10	1	-4	-15	-11	-7	-8	-10	-19	-24	15	15	10	13
EVANSVILLE TO NASHVILLE																	122 N.MI.	
15,000	7	8	4	6	6	-5	-12	-11	-11	-4	-7	-8	-20	-27	20	20	12	19
10,000	6	6	3	4	5	-5	-10	-8	-8	-3	-5	-6	-15	-21	15	16	11	15
5,000	3	3	2	2	2	-6	-11	-4	-3	-2	-3	-3	-11	-16	15	14	10	13
EVANSVILLE TO OWENSBORO																	25 N.MI.	
15,000	23	18	9	14	15	3	-3	-26	-20	-10	-15	-17	-30	-38	21	21	12	20
10,000	18	14	7	10	12	2	-4	-19	-15	-8	-11	-13	-23	-29	16	17	12	15
5,000	9	7	4	5	6	-3	-7	-10	-8	-4	-6	-7	-16	-21	15	15	10	13
EVANSVILLE TO PADUCAH																	83 N.MI.	
15,000	-31	-19	-9	-14	-17	-31	-39	28	18	9	13	16	4	-3	20	20	12	20
10,000	-22	-14	-8	-11	-13	-24	-30	20	13	8	10	12	2	-3	15	16	11	15
5,000	-11	-8	-5	-6	-7	-16	-21	11	8	5	5	7	-2	-6	15	15	10	13
EVANSVILLE TO ST. LOUIS																	140 N.MI.	
15,000	-37	-25	-14	-21	-23	-37	-45	35	24	13	20	22	9	3	20	20	12	19
10,000	-27	-19	-11	-15	-17	-28	-34	26	19	10	14	17	7	1	15	16	12	15
5,000	-14	-10	-6	-8	-9	-18	-24	14	10	6	8	9	0	-4	15	15	10	13
FARGO TO GRAND FORKS																	62 N.MI.	
15,000	-13	-10	-6	-10	-9	-21	-28	10	8	5	9	8	-4	-10	19	19	14	18
10,000	-11	-8	-6	-8	-8	-18	-23	10	7	5	7	7	-2	-7	14	15	12	15
5,000	-7	-4	-1	-6	-4	-14	-19	6	3	1	5	4	-6	-11	14	15	12	15
FARGO TO JAMESTOWN																	76 N.MI.	
15,000	-28	-18	-21	-24	-22	-34	-41	27	17	20	23	22	10	4	19	19	14	18
10,000	-21	-12	-15	-16	-16	-26	-31	20	11	14	16	15	6	1	14	15	12	15
5,000	-11	-5	-6	-10	-8	-17	-23	11	4	6	9	7	-2	-7	14	14	12	15
FARGO TO MINNEAPOLIS																	194 N.MI.	
15,000	25	17	17	20	20	8	2	-27	-18	-18	-22	-21	-33	-39	19	19	13	18
10,000	20	13	13	15	15	6	0	-21	-13	-13	-15	-16	-25	-31	14	15	12	14
5,000	12	6	5	9	8	-1	-6	-12	-6	-5	-10	-8	-18	-23	14	14	12	14
FARGO TO WINNIPEG																	180 N.MI.	
15,000	-11	-8	-4	-9	-8	-19	-25	8	7	3	7	6	-5	-11	18	18	14	18
10,000	-9	-7	-4	-7	-7	-16	-21	8	6	4	6	6	-3	-8	14	14	12	14
5,000	-5	-3	-1	-5	-3	-12	-17	5	2	0	4	3	-6	-11	14	14	12	14
FLINT TO GRAND RAPIDS																	84 N.MI.	
15,000	-38	-24	-20	-24	-25	-40	-47	37	23	19	23	25	12	5	21	21	14	20
10,000	-27	-18	-15	-18	-19	-30	-36	27	17	15	18	19	8	3	16	17	13	16
5,000	-15	-10	-9	-11	-11	-20	-25	15	9	8	10	10	1	-4	15	16	11	13
FLINT TO SAGINAW																	37 N.MI.	
15,000	-18	-14	-11	-11	-13	-26	-33	14	12	9	9	11	-2	-9	22	21	14	21
10,000	-13	-10	-8	-9	-10	-20	-26	11	9	8	7	9	-2	-7	17	18	13	16
5,000	-7	-6	-4	-4	-5	-14	-20	6	5	4	3	5	-5	-10	15	16	11	13
FLORENCE TO RALEIGH																	111 N.MI.	
15,000	19	11	4	10	10	-1	-7	-23	-14	-5	-11	-12	-25	-32	19	19	11	19
10,000	11	8	4	7	7	-2	-7	-13	-10	-4	-8	-8	-18	-23	15	16	10	15
5,000	6	4	2	2	3	-5	-9	-7	-5	-2	-2	-4	-12	-16	14	13	9	13
FT. LAUDERDALE TO MIAMI																	17 N.MI.	
15,000	-4	-4	-3	-5	-4	-12	-16	3	3	3	4	3	-4	-9	15	14	8	12
10,000	-4	-3	-3	-5	-4	-11	-14	4	3	3	4	3	-3	-7	12	11	7	10
5,000	-3	-5	-4	-3	-4	-10	-14	3	5	3	3	3	-3	-7	11	10	7	10

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
FT. LAUDERDALE TO WEST PALM BEACH																	37 N.MI.	
15,000	-1	-1	4	3	2	-7	-11	0	0	-4	-4	-2	-10	-14	15	14	8	12
10,000	2	1	4	4	3	-4	-8	-3	-1	-4	-4	-3	-10	-14	13	12	8	11
5,000	5	5	4	4	4	-2	-6	-5	-5	-5	-4	-5	-11	-15	11	10	7	10
FT. MEYERS TO SARASOTA																	61 N.MI.	
15,000	-13	-13	3	-3	-5	-16	-22	12	12	-3	2	4	-5	-9	15	14	8	13
10,000	-5	-6	4	0	-1	-9	-14	4	5	-4	-1	1	-7	-11	13	12	8	11
5,000	6	2	4	4	4	-3	-7	-6	-2	-4	-4	-4	-11	-14	11	11	8	10
FT. MEYERS TO WEST PALM BEACH																	95 N.MI.	
15,000	18	17	-1	7	9	0	-5	-19	-18	0	-7	-9	-21	-27	15	14	8	12
10,000	9	10	-1	3	5	-3	-7	-10	-10	1	-4	-5	-13	-18	12	12	8	11
5,000	-2	3	-1	-1	0	-7	-10	1	-3	0	1	0	-7	-10	11	10	7	10
FT. NELSON TO FT. ST. JOHN																	167 N.MI.	
15,000	9	3	4	6	5	-5	-10	-11	-3	-4	-7	-6	-16	-22	17	15	13	15
10,000	7	2	4	4	4	-4	-8	-8	-3	-4	-5	-5	-13	-17	14	11	10	12
5,000	-2	-2	-1	1	-1	-9	-13	1	2	1	-1	1	-7	-11	13	11	10	13
FT. ST. JOHN TO GRAND PRAIRIE																	89 N.MI.	
15,000	17	8	6	14	11	0	-5	-17	-9	-7	-14	-12	-23	-29	17	16	14	16
10,000	13	7	6	12	9	1	-3	-13	-7	-7	-12	-10	-18	-23	14	12	10	12
5,000	3	-1	1	5	2	-6	-10	-3	1	-2	-5	-2	-10	-15	13	12	10	13
FT. ST. JOHN TO PRINCE GEORGE																	156 N.MI.	
15,000	-7	-7	-4	-11	-7	-18	-24	6	6	3	9	6	-5	-11	18	16	14	16
10,000	-6	-6	-3	-9	-6	-14	-19	5	5	2	9	5	-3	-8	15	12	10	13
5,000	-9	-6	-3	-8	-6	-14	-19	9	6	3	7	6	-2	-6	13	12	10	12
FT. SMITH TO LITTLE ROCK																	111 N.MI.	
15,000	31	24	7	15	18	6	0	-33	-25	-7	-16	-19	-33	-41	20	19	11	18
10,000	22	16	5	11	13	3	-2	-23	-17	-6	-11	-13	-24	-30	15	15	10	14
5,000	10	8	6	5	7	-2	-6	-10	-8	-6	-5	-7	-16	-21	14	15	10	12
FT. SMITH TO TEXARKANA																	114 N.MI.	
15,000	0	3	1	3	2	-9	-15	-3	-5	-1	-4	-3	-14	-20	19	18	11	18
10,000	0	1	-1	1	0	-9	-13	-2	-2	1	-2	-1	-10	-15	14	14	10	14
5,000	-2	-2	-3	-1	-2	-10	-15	1	2	3	0	2	-7	-12	14	14	10	12
FT. SMITH TO TULSA																	90 N.MI.	
15,000	-28	-22	-7	-15	-16	-30	-38	26	20	7	14	15	4	-2	20	19	11	18
10,000	-19	-14	-5	-10	-12	-21	-27	18	13	5	9	11	1	-3	15	15	11	14
5,000	-8	-6	-4	-4	-5	-14	-19	7	5	3	4	5	-4	-8	14	15	10	13
FT. WAYNE TO INDIANAPOLIS																	90 N.MI.	
15,000	-24	-14	-10	-13	-14	-28	-35	20	12	9	11	12	0	-6	21	21	13	20
10,000	-17	-11	-7	-10	-11	-21	-27	15	9	6	9	10	0	-6	16	17	12	15
5,000	-9	-5	-4	-6	-6	-15	-20	8	5	4	5	5	-3	-8	15	15	10	13
FT. WAYNE TO SOUTH BEND																	66 N.MI.	
15,000	-31	-22	-15	-19	-21	-35	-42	29	20	14	18	19	7	0	21	21	13	20
10,000	-23	-17	-12	-14	-16	-27	-33	21	16	12	13	15	5	-1	16	17	12	15
5,000	-12	-9	-6	-8	-8	-18	-23	11	8	6	7	8	-1	-6	15	15	11	13
FT. WAYNE TO TOLEDO																	73 N.MI.	
15,000	33	20	15	20	21	8	2	-35	-22	-16	-21	-22	-37	-44	21	21	13	20
10,000	24	15	11	15	16	6	0	-25	-16	-12	-16	-17	-28	-34	16	17	12	15
5,000	13	8	7	9	9	0	-5	-13	-8	-7	-9	-9	-18	-24	15	15	10	13
FT. WILLIAM TO SAULT STE. MARIE																	227 N.MI.	
15,000	28	18	21	20	21	9	3	-29	-19	-21	-21	-22	-34	-41	19	19	14	19
10,000	21	13	15	16	16	6	1	-22	-13	-15	-16	-17	-27	-32	15	16	13	15
5,000	12	7	8	10	9	0	-5	-12	-7	-8	-10	-9	-19	-24	14	15	12	14
FT. WILLIAM TO WINNIPEG																	322 N.MI.	
15,000	-28	-18	-21	-22	-22	-33	-40	27	17	21	21	22	10	4	18	17	13	17
10,000	-21	-12	-16	-17	-17	-26	-31	21	12	15	17	16	7	2	13	14	12	14
5,000	-11	-5	-7	-11	-9	-18	-23	10	4	7	11	8	-1	-6	14	14	12	14

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
FT. WORTH TO HOUSTON																	212 N.MI.	
15,000	8	8	0	5	4	-5	-10	-10	-10	0	-6	-6	-16	-22	17	16	10	16
10,000	4	3	-2	3	2	-6	-11	-5	-4	2	-3	-2	-11	-15	13	13	10	12
5,000	-1	-3	-5	-1	-3	-10	-14	0	2	5	1	2	-6	-10	13	13	9	12
FT. WORTH TO LITTLE ROCK																	266 N.MI.	
15,000	31	23	6	13	16	5	-1	-32	-24	-6	-13	-17	-31	-39	18	17	10	17
10,000	22	16	6	9	12	3	-1	-22	-16	-6	-9	-13	-23	-28	14	14	10	13
5,000	11	9	8	5	8	0	-4	-11	-10	-8	-5	-8	-16	-21	13	13	9	12
FT. WORTH TO NEW ORLEANS																	387 N.MI.	
15,000	25	21	4	11	14	3	-2	-27	-22	-4	-12	-15	-27	-34	16	16	10	15
10,000	17	12	1	7	9	0	-4	-17	-13	-2	-7	-9	-19	-24	13	13	9	12
5,000	7	4	1	3	3	-4	-8	-7	-5	-1	-3	-4	-12	-16	13	12	8	11
FT. WORTH TO OKLAHOMA CITY																	157 N.MI.	
15,000	-5	-5	0	-5	-3	-14	-20	2	3	0	4	2	-8	-14	19	18	11	17
10,000	-3	-1	1	-2	-1	-10	-14	1	0	-1	1	0	-8	-13	14	14	10	13
5,000	1	3	5	1	3	-6	-10	-2	-3	-6	-2	-3	-12	-16	14	14	10	12
FT. WORTH TO SHREVEPORT																	165 N.MI.	
15,000	31	24	5	13	17	5	-1	-32	-25	-6	-14	-17	-31	-39	18	17	11	16
10,000	21	15	4	9	11	2	-2	-21	-16	-4	-9	-12	-22	-27	14	14	10	13
5,000	9	7	4	4	6	-2	-7	-10	-7	-4	-4	-6	-14	-19	14	13	9	12
FT. WORTH TO WACO																	74 N.MI.	
15,000	-9	-6	-3	-1	-5	-15	-21	6	4	3	0	3	-7	-13	18	17	11	16
10,000	-7	-6	-4	-2	-4	-13	-18	6	5	3	1	4	-5	-9	14	14	10	13
5,000	-6	-7	-9	-4	-6	-14	-19	5	6	8	3	6	-2	-7	14	13	9	12
FT. WORTH TO WICHITA FALLS																	100 N.MI.	
15,000	-22	-18	-3	-11	-12	-25	-32	20	17	3	10	11	0	-5	19	17	11	17
10,000	-14	-10	-2	-7	-8	-17	-22	13	9	2	6	7	-2	-6	14	14	10	13
5,000	-4	-2	1	-1	-1	-10	-15	4	2	-1	1	1	-7	-12	14	14	10	12
FREDERICTON TO MONTREAL																	303 N.MI.	
15,000	-35	-23	-23	-27	-27	-40	-47	34	22	22	26	26	13	6	21	21	15	20
10,000	-27	-16	-17	-20	-19	-30	-36	26	15	16	19	19	9	3	17	17	12	15
5,000	-15	-10	-12	-12	-12	-21	-26	14	9	12	12	12	3	-2	15	15	11	13
FREDERICTON TO QUEBEC																	209 N.MI.	
15,000	-31	-21	-23	-25	-25	-38	-46	30	20	22	23	24	10	3	22	21	15	21
10,000	-25	-15	-17	-19	-19	-30	-35	24	14	16	19	18	8	2	18	16	12	16
5,000	-15	-9	-12	-12	-12	-21	-26	14	9	11	12	12	2	-3	16	15	12	13
FREDERICTON TO ST. JOHN																	43 N.MI.	
15,000	16	12	14	12	14	0	-8	-19	-14	-15	-15	-16	-30	-37	24	23	16	22
10,000	15	10	12	12	12	1	-5	-17	-11	-13	-13	-14	-25	-31	19	18	13	17
5,000	10	7	7	8	8	-2	-7	-11	-7	-8	-8	-8	-18	-23	16	16	12	14
FRESNO TO LOS ANGELES																	182 N.MI.	
15,000	12	8	0	3	5	-6	-12	-14	-10	0	-4	-6	-18	-25	21	18	11	16
10,000	9	8	-2	2	3	-5	-9	-10	-9	1	-2	-4	-13	-19	15	14	9	12
5,000	4	4	2	4	3	-3	-6	-4	-4	-2	-4	-3	-9	-13	10	9	7	9
FRESNO TO MERCED																	49 N.MI.	
15,000	-21	-16	-6	-9	-12	-24	-32	19	15	6	8	11	-1	-7	22	19	12	18
10,000	-13	-11	-2	-6	-7	-17	-23	13	10	2	5	7	-2	-7	16	15	9	13
5,000	-5	-5	-4	-4	-5	-11	-14	5	5	4	4	4	-2	-5	11	10	7	9
FRESNO TO OAKLAND																	132 N.MI.	
15,000	-22	-17	-8	-10	-13	-26	-33	21	16	8	9	13	1	-5	22	19	12	17
10,000	-14	-11	-4	-7	-8	-18	-23	14	11	4	7	8	-1	-5	16	15	9	13
5,000	-6	-5	-4	-4	-5	-11	-14	5	5	4	4	5	-1	-5	11	10	7	9
FRESNO TO SAN FRANCISCO																	138 N.MI.	
15,000	-22	-17	-9	-10	-14	-26	-33	21	16	8	10	13	2	-4	22	19	12	17
10,000	-14	-11	-4	-7	-8	-18	-23	14	11	4	7	8	-1	-5	16	15	9	13
5,000	-6	-5	-4	-4	-5	-11	-14	5	5	4	4	5	-1	-5	11	10	7	9

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
FRESNO TO VISALIA																	31 N.MI.	
15,000	15	11	2	5	7	-4	-10	-17	-12	-2	-6	-8	-21	-28	22	19	12	18
10,000	10	9	-1	3	5	-4	-9	-11	-9	0	-4	-5	-15	-20	16	15	9	13
5,000	4	4	3	4	4	-2	-6	-4	-4	-3	-4	-4	-10	-13	11	10	7	9
GAINESVILLE TO JACKSONVILLE																	54 N.MI.	
15,000	18	14	4	8	10	0	-5	-20	-15	-4	-9	-11	-22	-29	17	17	9	15
10,000	14	10	4	5	8	-1	-5	-15	-10	-4	-6	-8	-17	-22	14	14	9	13
5,000	8	7	4	3	5	-2	-6	-9	-7	-4	-4	-6	-13	-17	12	12	9	11
GAINESVILLE TO OCALA																	32 N.MI.	
15,000	3	4	-2	0	1	-8	-13	-6	-6	2	-1	-2	-12	-17	17	16	9	15
10,000	0	2	-3	-1	-1	-9	-13	-1	-3	3	1	0	-8	-13	14	14	9	13
5,000	-5	-3	-3	-2	-3	-10	-14	5	2	3	2	3	-4	-8	12	12	8	11
GANDER TO ST. JOHNS																	86 N.MI.	
15,000	3	-1	7	6	4	-11	-19	-6	-1	-8	-8	-6	-20	-28	25	23	17	22
10,000	4	0	4	7	4	-8	-15	-6	-1	-5	-9	-5	-17	-24	20	19	15	18
5,000	5	0	3	5	3	-7	-13	-6	-1	-3	-6	-4	-15	-20	18	17	14	14
GANDER TO STEPHENVILLE																	199 N.MI.	
15,000	-32	-17	-22	-28	-25	-39	-47	31	16	22	26	23	9	2	23	22	16	21
10,000	-24	-13	-17	-21	-19	-30	-37	23	12	17	20	18	6	0	19	18	14	18
5,000	-14	-6	-12	-15	-12	-22	-28	14	6	12	14	11	1	-5	18	16	14	13
GRAND FORKS TO WINNIPEG																	118 N.MI.	
15,000	-10	-7	-3	-8	-7	-18	-25	7	6	2	6	5	-6	-12	18	18	14	18
10,000	-9	-6	-4	-6	-6	-15	-20	7	5	3	5	5	-4	-9	14	14	12	14
5,000	-5	-2	0	-4	-3	-12	-17	4	2	0	3	2	-7	-12	14	14	12	14
GRAND JUNCTION TO LAS VEGAS																	363 N.MI.	
15,000	-18	-15	-13	-10	-14	-24	-30	17	14	13	10	13	3	-2	19	16	11	15
10,000	-10	-8	-7	-7	-8	-15	-19	9	8	7	7	8	1	-3	13	10	9	10
5,000	-2	-3	-1	2	-1	-5	-8	2	3	1	-2	1	-4	-6	7	7	5	7
GRAND RAPIDS TO LAND O LAKES																	247 N.MI.	
15,000	-25	-17	-16	-17	-18	-31	-38	22	15	15	15	17	5	-2	20	20	13	19
10,000	-18	-12	-12	-13	-14	-24	-29	17	11	11	12	13	3	-3	15	16	12	15
5,000	-10	-7	-6	-7	-7	-16	-21	9	7	5	6	7	-2	-7	14	15	11	13
GRAND RAPIDS TO LANSING																	48 N.MI.	
15,000	37	24	20	23	25	12	5	-38	-25	-20	-24	-26	-40	-47	21	21	14	21
10,000	27	18	15	18	19	8	3	-27	-18	-15	-18	-19	-30	-36	16	17	13	16
5,000	15	9	8	10	10	1	-4	-15	-10	-8	-11	-11	-20	-25	15	16	11	13
GRAND RAPIDS TO MILWAUKEE																	98 N.MI.	
15,000	-37	-24	-20	-23	-25	-39	-46	36	23	19	22	24	12	5	21	21	14	20
10,000	-27	-18	-15	-18	-19	-30	-36	26	17	15	17	19	8	3	16	17	13	15
5,000	-15	-9	-8	-11	-11	-20	-25	14	9	8	10	10	1	-4	15	16	11	13
GRAND RAPIDS TO MUSKEGON																	30 N.MI.	
15,000	-32	-22	-18	-21	-22	-36	-44	30	21	17	19	21	8	2	21	21	14	21
10,000	-24	-16	-14	-16	-17	-28	-34	23	15	13	15	16	6	0	16	17	13	16
5,000	-13	-9	-7	-9	-9	-19	-24	12	8	7	8	9	0	-5	15	16	11	14
GRAND RAPIDS TO SAGINAW																	79 N.MI.	
15,000	30	18	16	19	20	8	1	-32	-20	-17	-20	-22	-35	-43	21	21	14	20
10,000	22	14	12	15	15	5	-1	-23	-15	-12	-16	-16	-27	-33	16	17	13	16
5,000	12	7	7	9	9	0	-5	-13	-7	-7	-10	-9	-19	-24	15	16	11	13
GREAT FALLS TO HELENA																	59 N.MI.	
15,000	-4	-5	-9	-6	-6	-17	-23	2	4	9	4	5	-6	-13	18	17	14	17
10,000	-4	-3	-5	-4	-4	-12	-16	2	3	4	3	3	-5	-9	13	12	10	12
5,000	-11	-4	-2	-5	-5	-13	-17	11	3	2	5	5	-3	-7	12	11	10	11
GREAT FALLS TO MISSOULA																	116 N.MI.	
15,000	-23	-15	-17	-19	-18	-29	-36	21	14	16	18	17	6	0	18	17	14	17
10,000	-17	-11	-9	-14	-12	-21	-25	17	10	9	13	12	4	0	13	12	10	12
5,000	-13	-6	-4	-7	-7	-15	-19	13	6	4	7	7	0	-4	12	11	9	11

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
GREAT FALLS TO SALT LAKE CITY																	403 N.MI.	
15,000	4	0	-5	1	0	-10	-16	-7	-1	4	-3	-1	-12	-18	17	16	12	16
10,000	3	0	-3	0	0	-7	-11	-4	-1	2	-1	-1	-8	-12	12	11	9	11
5,000	-9	-3	-2	-4	-4	-10	-14	8	3	2	4	4	-2	-5	10	9	7	9
GREAT FALLS TO SPOKANE																	254 N.MI.	
15,000	-26	-16	-16	-21	-19	-31	-37	25	16	16	20	19	8	2	18	17	13	17
10,000	-19	-12	-9	-15	-13	-22	-27	19	12	9	14	13	5	1	14	12	10	12
5,000	-11	-5	-4	-6	-7	-14	-18	11	5	4	6	6	-1	-4	12	10	9	11
GREENSBORO TO GREENVILLE																	139 N.MI.	
15,000	-36	-25	-9	-17	-20	-35	-43	35	24	9	16	19	7	1	19	19	11	19
10,000	-24	-18	-8	-13	-15	-26	-32	23	17	8	12	14	4	0	15	16	10	14
5,000	-13	-10	-5	-5	-8	-16	-21	12	9	5	4	7	-1	-5	14	13	9	12
GREENSBORO TO LOUISVILLE																	305 N.MI.	
15,000	-35	-27	-12	-18	-22	-36	-44	33	26	12	17	21	9	3	19	19	11	18
10,000	-26	-20	-10	-14	-17	-27	-33	25	19	10	13	16	7	2	15	16	11	14
5,000	-14	-11	-6	-7	-9	-17	-22	13	10	6	6	9	1	-3	14	13	9	12
GREENSBORO TO NEW YORK																	397 N.MI.	
15,000	31	19	12	18	19	7	1	-34	-21	-12	-20	-20	-34	-41	19	19	11	18
10,000	21	15	9	13	14	4	0	-23	-16	-9	-14	-15	-25	-31	15	16	11	14
5,000	11	8	5	6	7	-1	-5	-12	-8	-5	-6	-8	-16	-21	13	13	9	12
GREENSBORO TO PITTSBURGH																	263 N.MI.	
15,000	-2	-6	-1	2	-2	-13	-20	-3	3	0	-4	-1	-12	-19	20	20	12	19
10,000	-3	-4	-2	0	-2	-12	-17	0	3	2	-1	1	-8	-14	16	16	11	14
5,000	-1	-2	-2	-1	-1	-9	-14	0	2	1	0	1	-7	-12	14	13	9	12
GREENSBORO TO RALEIGH																	58 N.MI.	
15,000	36	29	11	17	21	9	3	-37	-30	-12	-18	-22	-37	-46	20	20	11	19
10,000	27	21	10	13	17	7	1	-28	-21	-10	-14	-17	-29	-35	16	16	11	15
5,000	15	11	6	6	9	1	-4	-15	-11	-7	-6	-9	-18	-23	14	13	9	13
GREENSBORO TO RICHMOND																	152 N.MI.	
15,000	35	23	11	18	20	8	2	-36	-25	-11	-19	-21	-36	-44	20	20	11	19
10,000	24	17	9	13	15	5	0	-25	-18	-9	-14	-16	-27	-33	16	16	11	15
5,000	12	9	5	6	8	0	-5	-13	-10	-5	-6	-8	-17	-22	14	13	9	13
GREENSBORO TO ROANOKE																	73 N.MI.	
15,000	2	-4	-1	2	0	-12	-18	-6	1	0	-4	-2	-14	-21	20	20	12	19
10,000	-2	-2	-1	1	-1	-11	-16	-1	1	1	-2	0	-10	-15	16	17	11	15
5,000	-1	-1	-1	0	-1	-9	-13	0	0	1	0	0	-8	-12	14	13	9	13
GREENSBORO TO WASHINGTON, D.C.																	216 N.MI.	
15,000	28	16	9	16	16	4	-2	-30	-19	-10	-17	-18	-31	-39	20	20	11	19
10,000	18	12	7	11	12	2	-3	-20	-14	-8	-12	-13	-23	-29	16	16	11	14
5,000	10	7	4	5	6	-2	-6	-10	-7	-4	-5	-6	-15	-20	14	13	9	12
GREENVILLE TO RICHMOND																	291 N.MI.	
15,000	35	23	10	17	20	8	2	-36	-25	-10	-18	-21	-35	-43	19	19	11	18
10,000	24	17	8	13	15	5	0	-25	-18	-9	-13	-15	-26	-32	15	16	10	14
5,000	12	9	5	5	8	0	-4	-13	-10	-5	-5	-8	-16	-21	13	13	9	12
GREENVILLE TO SPARTANBURG																	19 N.MI.	
15,000	37	28	9	17	21	8	2	-38	-29	-9	-18	-22	-37	-46	20	20	11	19
10,000	27	20	8	12	16	6	1	-27	-20	-8	-13	-16	-28	-34	15	16	11	15
5,000	14	11	6	5	8	0	-4	-15	-11	-6	-5	-9	-17	-22	14	13	9	13
GREENVILLE TO WINSTON-SALEM																	129 N.MI.	
15,000	34	23	8	16	18	6	0	-35	-24	-9	-17	-19	-34	-43	20	19	11	19
10,000	23	16	7	12	14	4	-1	-24	-17	-8	-12	-14	-25	-31	15	16	10	15
5,000	12	9	4	4	7	-1	-5	-13	-9	-5	-5	-7	-16	-21	14	13	9	12
HALIFAX TO MONCTON																	89 N.MI.	
15,000	-16	-12	-13	-12	-13	-27	-35	12	9	12	10	11	-3	-11	24	23	15	21
10,000	-13	-9	-11	-12	-11	-22	-29	11	8	10	11	10	-1	-7	19	18	13	17
5,000	-9	-6	-6	-7	-7	-17	-22	8	6	6	7	7	-3	-8	16	16	12	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
HALIFAX TO ST. JOHN																	104 N.MI.	
15,000	-33	-23	-23	-26	-26	-40	-48	32	22	22	24	25	11	3	24	23	15	21
10,000	-26	-17	-17	-20	-20	-31	-37	25	16	17	20	19	8	2	19	18	13	16
5,000	-15	-11	-12	-12	-12	-22	-27	14	10	12	12	12	2	-3	16	16	12	13
HALIFAX TO SYDNEY																	165 N.MI.	
15,000	33	21	20	26	24	11	3	-34	-22	-21	-27	-25	-40	-48	23	23	15	21
10,000	24	15	15	18	18	7	1	-25	-16	-16	-19	-18	-30	-36	19	18	13	16
5,000	12	9	12	11	11	1	-4	-13	-9	-13	-12	-12	-21	-26	16	16	12	13
HARRISBURG TO PITTSBURGH																	155 N.MI.	
15,000	-43	-29	-19	-24	-27	-42	-51	42	28	18	23	26	14	7	21	21	13	20
10,000	-31	-22	-15	-20	-21	-33	-39	30	22	15	19	21	10	5	17	17	12	15
5,000	-16	-12	-9	-10	-11	-20	-25	16	12	8	10	11	3	-2	15	15	10	12
HARRISBURG TO READING																	42 N.MI.	
15,000	41	27	18	24	26	13	6	-42	-28	-19	-25	-27	-42	-51	22	22	13	20
10,000	29	21	14	19	20	9	4	-30	-22	-15	-19	-21	-32	-39	17	18	12	16
5,000	15	11	8	10	11	2	-3	-16	-12	-8	-10	-11	-20	-26	15	15	10	13
HARRISBURG TO WASHINGTON, D.C.																	82 N.MI.	
15,000	-9	-1	-2	-8	-5	-18	-25	4	-2	1	6	2	-10	-17	22	21	13	20
10,000	-5	-1	0	-4	-2	-12	-18	2	-1	0	2	1	-9	-15	17	17	12	15
5,000	-2	0	0	-1	-1	-9	-14	1	-1	0	1	0	-8	-13	15	15	10	13
HARRISBURG TO WILLIAMSPORT																	61 N.MI.	
15,000	-2	-6	-2	1	-2	-15	-22	-3	3	1	-4	0	-13	-21	22	22	13	20
10,000	-3	-5	-3	-1	-3	-13	-19	0	3	2	-1	1	-9	-15	17	18	12	15
5,000	-1	-3	-2	-1	-2	-10	-15	0	2	1	0	1	-8	-13	15	15	10	13
HARTFORD TO NEW HAVEN																	30 N.MI.	
15,000	-21	-10	-8	-13	-12	-26	-34	17	7	6	11	10	-3	-10	23	22	14	21
10,000	-12	-7	-5	-9	-8	-19	-25	9	5	4	8	6	-4	-10	18	18	12	16
5,000	-6	-3	-3	-4	-4	-13	-18	4	2	3	4	3	-6	-11	16	15	11	13
HARTFORD TO NEW YORK																	84 N.MI.	
15,000	-30	-18	-13	-19	-19	-33	-41	27	15	12	17	17	4	-3	22	22	13	20
10,000	-20	-13	-9	-13	-13	-24	-30	18	11	8	12	12	2	-4	18	18	12	15
5,000	-10	-6	-6	-7	-7	-16	-21	9	5	5	6	6	-3	-8	15	15	11	13
HARTFORD TO PHILADELPHIA																	161 N.MI.	
15,000	-34	-21	-15	-21	-22	-36	-44	32	19	14	20	20	7	1	22	21	13	20
10,000	-23	-16	-11	-15	-16	-27	-33	21	14	10	14	15	4	-1	17	18	12	15
5,000	-12	-8	-7	-8	-8	-17	-22	11	7	6	7	8	-1	-6	15	15	11	13
HARTFORD TO PITTSBURGH																	350 N.MI.	
15,000	-42	-28	-19	-25	-27	-41	-49	40	26	19	24	26	14	8	21	20	12	19
10,000	-30	-21	-15	-19	-20	-31	-37	29	20	14	19	20	10	5	16	17	11	14
5,000	-16	-11	-9	-10	-11	-20	-25	15	11	9	10	11	3	-2	14	14	10	12
HARTFORD TO PITTSFIELD																	51 N.MI.	
15,000	-20	-18	-13	-12	-15	-29	-36	16	16	12	10	13	0	-7	23	22	14	21
10,000	-18	-14	-11	-10	-13	-24	-30	16	13	10	9	12	1	-5	18	18	12	16
5,000	-10	-9	-6	-6	-8	-17	-22	9	8	6	6	7	-2	-7	16	15	11	13
HARTFORD TO PROVIDENCE																	54 N.MI.	
15,000	39	28	20	24	27	14	7	-40	-29	-21	-25	-28	-42	-50	23	22	14	21
10,000	30	21	16	19	21	10	4	-30	-22	-16	-19	-21	-33	-39	18	18	12	16
5,000	15	12	10	10	12	3	-2	-16	-12	-10	-11	-12	-22	-27	16	15	11	13
HARTFORD TO WASHINGTON, D.C.																	265 N.MI.	
15,000	-35	-22	-15	-22	-22	-36	-44	33	20	14	20	21	8	2	21	21	12	19
10,000	-24	-17	-11	-16	-16	-27	-33	22	15	10	15	15	5	0	17	17	11	15
5,000	-12	-8	-7	-8	-9	-17	-22	12	8	6	7	8	0	-5	14	14	10	12
HELENA TO MISSOULA																	88 N.MI.	
15,000	-27	-16	-16	-21	-20	-31	-38	26	16	15	20	19	8	2	19	18	14	17
10,000	-20	-12	-9	-15	-13	-22	-27	19	11	9	15	13	5	0	14	12	10	12
5,000	-10	-5	-5	-6	-6	-14	-18	10	5	4	5	6	-1	-5	12	11	9	11

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HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
HOBBS TO MIDLANO, TEX.																	71 N.MI.	
15,000	19	15	0	8	9	-2	-7	-20	-16	0	-9	-10	-22	-30	19	16	11	16
10,000	11	8	0	4	5	-3	-7	-12	-8	0	-4	-6	-15	-20	14	13	10	12
5,000	0	-2	-5	-3	-3	-10	-14	0	1	5	3	3	-5	-9	12	12	8	11
HOBBS TO ROSWELL																	78 N.MI.	
15,000	-24	-19	-2	-11	-13	-26	-33	23	18	2	10	12	1	-4	19	17	11	16
10,000	-15	-11	-2	-6	-8	-17	-22	15	10	2	5	7	-1	-5	14	12	10	12
5,000	-1	0	3	3	1	-6	-10	1	0	-3	-3	-2	-8	-12	12	11	8	10
HOT SPRINGS TO LITTLE ROCK																	45 N.MI.	
15,000	34	24	7	15	18	6	0	-35	-25	-7	-15	-19	-34	-43	20	19	11	18
10,000	24	17	6	10	14	4	-1	-25	-18	-6	-11	-14	-25	-31	15	15	10	14
5,000	12	10	7	5	8	0	-5	-12	-10	-7	-5	-9	-17	-22	14	15	10	13
HOT SPRINGS TO SHREVEPORT																	127 N.MI.	
15,000	-15	-9	-2	-4	-7	-18	-25	12	7	2	3	5	-5	-11	19	18	11	17
10,000	-11	-7	-4	-3	-6	-15	-20	9	6	4	2	5	-4	-8	14	14	10	14
5,000	-7	-6	-6	-3	-6	-14	-18	6	6	6	2	5	-3	-8	14	14	10	12
HOULTON TO PRESQUE ISLE																	36 N.MI.	
15,000	-6	-6	-8	-5	-7	-20	-28	2	4	7	3	4	-9	-17	23	22	16	22
10,000	-8	-6	-8	-6	-7	-18	-24	6	5	7	5	6	-5	-11	18	17	13	17
5,000	-7	-4	-4	-4	-4	-14	-19	6	3	3	3	4	-6	-11	16	16	12	14
HOUSTON TO LAKE CHARLES																	114 N.MI.	
15,000	29	23	4	10	15	4	-2	-30	-24	-4	-11	-16	-29	-36	17	16	10	16
10,000	20	15	3	6	10	1	-3	-20	-15	-3	-6	-10	-20	-26	13	13	10	13
5,000	10	7	4	4	6	-1	-5	-11	-8	-5	-4	-7	-15	-19	13	12	9	12
HOUSTON TO NEW ORLEANS																	262 N.MI.	
15,000	29	23	4	11	15	4	-1	-30	-24	-4	-12	-16	-29	-36	16	16	10	15
10,000	19	14	2	6	10	1	-3	-20	-15	-2	-7	-10	-20	-25	13	13	9	12
5,000	9	7	3	4	5	-2	-6	-10	-7	-3	-4	-6	-13	-18	13	12	8	11
HOUSTON TO SAN ANTONIO																	167 N.MI.	
15,000	-29	-24	-3	-10	-15	-28	-36	28	23	2	10	15	3	-2	17	15	10	15
10,000	-19	-14	-2	-6	-10	-19	-24	18	14	2	6	9	1	-4	13	12	9	12
5,000	-9	-6	-2	-3	-4	-12	-17	9	5	2	3	4	-3	-7	13	12	8	11
HOUSTON TO SHREVEPORT																	184 N.MI.	
15,000	16	10	3	4	7	-2	-8	-18	-12	-3	-5	-9	-20	-26	17	16	10	16
10,000	12	9	4	3	7	-2	-6	-13	-10	-5	-3	-7	-16	-21	13	13	10	13
5,000	8	8	7	4	7	-1	-5	-9	-8	-7	-4	-7	-15	-19	13	13	9	12
HOUSTON TO TULSA																	394 N.MI.	
15,000	0	-2	0	-2	-1	-11	-16	-3	0	-1	1	-1	-10	-16	17	16	10	16
10,000	1	1	2	-1	1	-7	-12	-2	-2	-2	0	-2	-9	-14	13	13	9	12
5,000	3	4	6	2	4	-4	-8	-4	-4	-6	-2	-4	-12	-16	13	13	9	11
HUNTINGTON TO LEXINGTON																	99 N.MI.	
15,000	-41	-28	-15	-22	-24	-39	-48	40	26	14	21	24	11	5	21	21	12	20
10,000	-29	-20	-12	-16	-19	-30	-36	28	20	12	16	18	8	3	16	17	11	15
5,000	-15	-11	-7	-8	-10	-19	-24	15	11	7	8	10	1	-3	15	14	10	13
HUNTINGTON TO LOUISVILLE																	150 N.MI.	
15,000	-41	-28	-15	-22	-25	-39	-48	40	27	14	21	24	11	5	20	20	12	19
10,000	-29	-21	-12	-17	-19	-30	-36	29	20	12	16	19	8	3	15	16	11	15
5,000	-15	-11	-7	-8	-10	-19	-24	15	11	7	8	10	1	-3	14	14	10	13
HUNTSVILLE TO KNOXVILLE																	144 N.MI.	
15,000	36	24	8	16	19	7	1	-37	-26	-8	-17	-20	-35	-44	20	19	11	19
10,000	25	17	7	11	14	5	0	-26	-18	-8	-12	-15	-26	-32	15	15	10	14
5,000	13	10	5	4	8	0	-5	-14	-10	-5	-5	-8	-17	-22	14	13	9	12
HUNTSVILLE TO LEXINGTON																	223 N.MI.	
15,000	19	10	5	8	10	-2	-7	-23	-13	-5	-10	-11	-24	-32	19	19	11	19
10,000	13	8	4	6	7	-2	-7	-15	-9	-5	-7	-8	-18	-24	15	15	11	14
5,000	7	5	3	3	4	-4	-8	-8	-6	-3	-3	-5	-13	-17	14	14	9	12

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
HUNTSVILLE TO LOUISVILLE																	214 N.MI.	
15,000	10	3	2	4	4	-7	-13	-14	-6	-2	-5	-6	-18	-25	20	19	11	19
10,000	6	3	2	3	3	-6	-11	-9	-4	-3	-4	-5	-14	-19	15	15	11	14
5,000	3	2	1	1	2	-6	-11	-4	-3	-2	-1	-2	-11	-15	14	14	9	12
HUNTSVILLE TO MEMPHIS																	169 N.MI.	
15,000	-37	-28	-8	-17	-20	-36	-44	35	27	8	16	20	7	1	20	19	11	18
10,000	-26	-19	-7	-12	-15	-26	-32	26	19	7	12	15	5	0	14	15	10	14
5,000	-14	-11	-6	-5	-8	-17	-22	13	10	6	5	8	0	-5	14	14	9	12
HUNTSVILLE TO NASHVILLE																	87 N.MI.	
15,000	2	-3	-1	-1	-1	-12	-18	-6	0	0	-1	-1	-13	-19	20	20	11	19
10,000	0	-2	0	0	0	-10	-15	-2	0	-1	0	-1	-10	-15	15	16	11	15
5,000	0	0	0	-1	0	-8	-13	-1	-1	0	0	-1	-9	-13	14	14	10	13
HUNTSVILLE TO WASHINGTON, D.C.																	522 N.MI.	
15,000	36	24	11	18	21	9	4	-38	-25	-11	-19	-22	-36	-44	18	18	10	17
10,000	25	17	9	14	16	6	2	-26	-18	-10	-14	-16	-26	-32	14	15	10	13
5,000	13	10	6	6	8	1	-3	-14	-10	-6	-6	-8	-16	-21	13	12	9	11
HURON TO PIERRE																	88 N.MI.	
15,000	-28	-19	-20	-26	-23	-35	-42	28	18	19	25	22	11	4	19	20	13	18
10,000	-21	-12	-14	-15	-15	-25	-30	21	12	13	15	15	5	0	15	15	12	15
5,000	-11	-6	-6	-9	-8	-17	-22	11	5	5	9	8	-2	-7	13	14	12	14
HURON TO SIOUX FALLS																	80 N.MI.	
15,000	26	18	16	21	20	8	2	-27	-19	-16	-23	-21	-33	-40	20	20	13	19
10,000	21	13	12	15	15	5	0	-21	-14	-12	-15	-15	-25	-31	15	15	12	15
5,000	12	6	4	9	8	-1	-6	-12	-7	-5	-10	-8	-18	-23	14	14	12	14
HYANNIS TO NANTUCKET																	26 N.MI.	
15,000	6	10	7	4	7	-6	-14	-11	-13	-9	-6	-9	-23	-30	23	22	14	21
10,000	10	9	7	4	7	-3	-9	-13	-10	-7	-6	-9	-20	-26	18	18	12	16
5,000	6	6	4	4	5	-4	-9	-7	-7	-4	-4	-6	-15	-20	16	16	11	13
IDAHO FALLS TO POCATELLO																	43 N.MI.	
15,000	-9	-8	-12	-8	-9	-21	-27	7	7	11	7	8	-3	-10	19	18	13	17
10,000	-6	-5	-7	-6	-6	-14	-18	5	5	6	6	5	-2	-7	13	12	10	12
5,000	-10	-5	-4	-6	-6	-12	-16	10	5	4	5	6	0	-3	10	9	7	9
IDAHO FALLS TO SALT LAKE CITY																	164 N.MI.	
15,000	5	1	-4	2	1	-10	-16	-7	-2	3	-3	-2	-13	-20	19	17	12	17
10,000	3	1	-3	1	0	-7	-11	-4	-1	3	-1	-1	-9	-13	13	11	10	11
5,000	-9	-5	-4	-5	-5	-11	-14	8	4	4	5	5	0	-3	9	8	7	8
INDIANAPOLIS TO LOUISVILLE																	96 N.MI.	
15,000	7	7	4	5	6	-6	-13	-11	-10	-5	-7	-8	-20	-27	20	21	13	20
10,000	6	6	3	4	5	-5	-11	-8	-7	-4	-5	-6	-16	-21	16	17	12	15
5,000	3	3	1	2	2	-6	-11	-4	-4	-2	-3	-3	-12	-16	15	15	10	13
INDIANAPOLIS TO MEMPHIS																	331 N.MI.	
15,000	-25	-15	-7	-11	-13	-26	-33	22	13	6	9	12	0	-5	19	19	11	18
10,000	-17	-11	-6	-8	-10	-20	-25	16	10	6	7	9	0	-5	14	15	11	14
5,000	-9	-7	-4	-4	-6	-14	-19	8	6	4	4	5	-3	-7	14	14	9	12
INDIANAPOLIS TO NASHVILLE																	217 N.MI.	
15,000	-8	-3	-2	-3	-3	-15	-22	4	0	1	1	1	-10	-16	20	20	12	19
10,000	-5	-2	-1	-2	-2	-12	-17	3	0	1	1	1	-8	-13	15	16	11	15
5,000	-2	-1	-1	-1	-1	-10	-14	2	1	1	0	1	-7	-12	14	14	10	12
INDIANAPOLIS TO PITTSBURGH																	282 N.MI.	
15,000	41	26	17	23	25	13	7	-42	-27	-18	-24	-26	-41	-49	20	20	12	19
10,000	29	20	14	18	20	10	4	-30	-21	-14	-19	-20	-31	-37	15	16	11	15
5,000	15	11	7	10	10	2	-2	-16	-11	-8	-10	-11	-20	-24	14	14	10	12
INDIANAPOLIS TO ST. LOUIS																	199 N.MI.	
15,000	-38	-25	-15	-21	-23	-38	-46	37	24	15	19	23	10	4	20	20	12	19
10,000	-28	-19	-12	-16	-18	-29	-35	27	19	12	15	18	7	2	15	16	12	15
5,000	-15	-10	-7	-9	-10	-19	-24	14	10	7	9	9	1	-4	15	15	10	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
INDIANAPOLIS TO TERRE HAUTE																	51 N.MI.	
15,000	-38	-25	-16	-21	-24	-39	-47	37	24	15	20	23	10	3	21	21	13	20
10,000	-28	-19	-12	-16	-18	-30	-35	27	19	12	16	18	7	2	16	17	12	15
5,000	-15	-10	-7	-9	-10	-19	-24	14	10	7	9	9	1	-4	15	15	10	13
JACKSON TO MEMPHIS																	164 N.MI.	
15,000	7	1	-1	1	1	-9	-15	-11	-3	0	-2	-3	-15	-21	19	18	11	18
10,000	5	2	3	0	2	-6	-11	-7	-3	-3	-1	-3	-12	-17	14	15	10	14
5,000	4	3	2	0	2	-6	-10	-5	-4	-2	-1	-3	-11	-16	14	14	9	12
JACKSON TO MERIDIAN																	75 N.MI.	
15,000	33	25	6	14	18	5	0	-34	-26	-6	-15	-18	-33	-41	18	18	11	17
10,000	23	17	4	9	12	3	-2	-23	-17	-5	-10	-13	-24	-30	14	15	10	14
5,000	11	9	4	4	7	-1	-6	-12	-9	-4	-5	-7	-16	-20	14	13	9	12
JACKSON TO MONROE																	92 N.MI.	
15,000	-33	-26	-6	-14	-18	-32	-40	32	25	6	14	17	5	0	18	18	11	17
10,000	-22	-17	-4	-9	-12	-23	-29	22	16	4	9	12	2	-3	14	14	10	14
5,000	-11	-8	-4	-5	-7	-15	-20	11	8	4	4	6	-2	-6	14	14	9	12
JACKSON TO NEW ORLEANS																	140 N.MI.	
15,000	-7	-1	2	-1	-1	-12	-18	4	-1	-2	0	0	-10	-15	17	17	10	16
10,000	-5	-3	-4	1	-3	-11	-16	3	2	3	-1	2	-7	-11	14	14	10	13
5,000	-5	-4	-3	0	-3	-11	-15	5	4	3	0	3	-5	-9	13	13	9	12
JACKSON TO SHREVEPORT																	182 N.MI.	
15,000	-33	-26	-6	-14	-18	-32	-40	32	25	6	14	17	5	0	18	17	11	17
10,000	-23	-17	-4	-9	-12	-23	-29	22	16	4	9	12	3	-2	14	14	10	13
5,000	-11	-8	-5	-5	-7	-15	-20	11	8	5	4	7	-1	-6	14	13	9	12
JACKSONVILLE TO MACON																	171 N.MI.	
15,000	-18	-16	-2	-7	-10	-22	-29	16	15	2	6	9	-1	-7	17	17	10	16
10,000	-11	-10	-1	-4	-6	-15	-20	10	9	0	4	5	-3	-8	14	14	9	13
5,000	-2	-3	-1	-2	-2	-9	-14	2	3	1	1	2	-6	-10	13	12	9	11
JACKSONVILLE TO MELBOURNE																	149 N.MI.	
15,000	8	8	-2	1	3	-6	-11	-10	-9	2	-2	-4	-14	-20	16	16	9	14
10,000	3	4	-3	-1	1	-7	-11	-4	-5	2	0	-1	-9	-14	13	13	9	12
5,000	-5	-1	-2	-2	-3	-9	-13	4	1	2	1	2	-5	-9	12	11	8	11
JACKSONVILLE TO MIAMI																	286 N.MI.	
15,000	6	6	-3	0	1	-7	-11	-7	-7	3	0	-2	-11	-17	15	14	8	13
10,000	1	2	-4	-2	-1	-8	-12	-1	-3	4	2	1	-7	-11	12	12	8	11
5,000	-6	-3	-4	-3	-4	-10	-14	6	3	4	3	4	-3	-6	11	11	7	10
JACKSONVILLE TO ORLANDO																	113 N.MI.	
15,000	2	3	-2	-1	0	-9	-14	-5	-4	2	0	-1	-11	-16	16	16	9	14
10,000	-1	1	-3	-2	-1	-9	-14	0	-2	3	1	1	-7	-12	14	13	9	12
5,000	-6	-3	-3	-2	-3	-10	-14	5	2	3	2	3	-4	-8	12	12	8	11
JACKSONVILLE TO SARASOTA																	187 N.MI.	
15,000	-8	-6	-4	-5	-5	-14	-19	6	4	4	4	4	-4	-9	16	15	9	14
10,000	-7	-5	-4	-4	-5	-13	-17	7	4	4	4	5	-3	-7	13	13	9	12
5,000	-8	-6	-4	-4	-5	-12	-16	8	5	4	4	5	-2	-6	12	11	8	11
JACKSONVILLE TO SAVANNAH																	99 N.MI.	
15,000	9	6	3	5	5	-4	-10	-11	-8	-3	-6	-6	-17	-23	17	17	10	16
10,000	8	4	4	4	5	-4	-8	-9	-5	-4	-4	-5	-14	-19	14	14	9	13
5,000	7	4	3	2	4	-3	-7	-7	-5	-3	-3	-4	-12	-16	12	12	9	11
JACKSONVILLE TO TALLAHASSEE																	141 N.MI.	
15,000	-30	-25	-4	-13	-16	-30	-37	30	24	4	12	16	4	-1	17	17	9	15
10,000	-20	-16	-3	-8	-11	-21	-27	20	16	3	7	11	1	-3	14	14	9	13
5,000	-8	-8	-3	-4	-6	-13	-17	8	8	3	4	5	-2	-6	12	12	8	11
JACKSONVILLE TO TAMPA																	154 N.MI.	
15,000	-10	-7	-4	-6	-6	-15	-21	8	6	3	5	5	-4	-9	16	16	9	14
10,000	-9	-5	-4	-4	-5	-13	-18	8	5	4	4	5	-3	-7	13	13	9	12
5,000	-8	-6	-4	-4	-5	-12	-16	8	5	4	3	5	-2	-6	12	11	8	11

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
JACKSONVILLE TO WAYCROSS																	64 N.MI.	
15,000	-19	-16	-2	-7	-9	-21	-29	17	15	1	6	8	-2	-7	17	17	10	16
10,000	-11	-10	0	-4	-6	-15	-20	10	9	0	3	5	-4	-8	14	14	9	13
5,000	-1	-3	0	-1	-1	-9	-13	1	3	0	1	1	-6	-10	12	12	9	12
JACKSONVILLE TO WEST PALM BEACH																	238 N.MI.	
15,000	8	7	-3	1	2	-6	-10	-10	-9	2	-1	-3	-13	-19	15	15	8	13
10,000	2	4	-3	-1	0	-8	-11	-3	-5	3	1	0	-8	-13	13	12	8	11
5,000	-5	-2	-3	-3	-3	-10	-14	5	2	3	2	3	-4	-7	11	11	8	10
JOPLIN TO SPRINGFIELD, MO.																	54 N.MI.	
15,000	34	24	11	18	20	8	2	-35	-25	-12	-18	-21	-35	-44	20	20	12	19
10,000	24	17	9	13	15	5	0	-25	-18	-9	-13	-16	-26	-32	15	15	11	15
5,000	12	9	7	7	9	0	-5	-12	-10	-7	-7	-9	-18	-23	14	15	10	13
JOPLIN TO TULSA																	88 N.MI.	
15,000	-27	-20	-8	-13	-16	-29	-37	25	18	8	11	14	3	-3	20	19	12	18
10,000	-19	-14	-7	-9	-12	-22	-27	18	13	6	9	11	2	-3	15	15	11	14
5,000	-9	-9	-8	-6	-8	-17	-21	9	8	8	6	8	-1	-6	14	15	10	13
KANSAS CITY TO MINNEAPOLIS																	351 N.MI.	
15,000	0	1	2	-1	1	-11	-17	-4	-3	-3	-1	-3	-14	-20	19	19	12	18
10,000	0	0	1	-1	0	-9	-14	-2	-1	-2	0	-1	-10	-15	14	15	11	14
5,000	-1	0	2	0	1	-8	-13	0	-1	-3	-1	-1	-9	-14	13	14	11	13
KANSAS CITY TO OMAHA																	144 N.MI.	
15,000	-26	-16	-12	-17	-17	-30	-37	24	15	11	16	16	4	-2	20	20	13	19
10,000	-18	-13	-8	-13	-13	-23	-28	17	12	8	12	12	2	-3	15	15	12	15
5,000	-9	-6	-3	-7	-6	-15	-20	9	5	2	7	6	-3	-8	14	14	11	13
KANSAS CITY TO ST. LOUIS																	199 N.MI.	
15,000	35	24	15	20	22	10	4	-36	-25	-15	-21	-23	-37	-44	20	20	12	19
10,000	26	18	11	14	17	7	2	-26	-19	-11	-15	-17	-28	-33	15	15	11	15
5,000	13	9	6	9	9	0	-4	-13	-10	-7	-9	-9	-18	-23	14	14	10	13
KANSAS CITY TO SPRINGFIELD, MO.																	126 N.MI.	
15,000	14	10	6	10	10	-2	-8	-18	-12	-6	-12	-11	-24	-31	20	20	12	19
10,000	11	8	4	7	7	-2	-7	-12	-9	-4	-8	-8	-18	-23	15	15	11	15
5,000	5	3	1	3	3	-6	-10	-6	-3	-1	-4	-3	-12	-17	14	15	10	13
KANSAS CITY TO TULSA																	185 N.MI.	
15,000	-12	-9	-4	-4	-7	-19	-25	9	7	4	3	5	-6	-12	20	19	12	18
10,000	-8	-6	-4	-3	-5	-14	-20	7	5	3	3	4	-5	-10	14	15	11	14
5,000	-4	-5	-6	-3	-5	-13	-18	4	4	5	3	4	-4	-9	14	14	10	12
KANSAS CITY TO WICHITA																	154 N.MI.	
15,000	-27	-20	-11	-14	-17	-30	-37	25	19	11	13	16	5	-2	20	19	12	18
10,000	-19	-14	-8	-10	-12	-22	-28	18	13	8	9	12	2	-3	15	15	11	14
5,000	-9	-8	-8	-7	-8	-16	-21	8	8	7	7	8	-1	-6	14	14	10	12
KEENE TO NEW YORK																	152 N.MI.	
15,000	-24	-13	-9	-15	-15	-28	-36	20	10	8	14	12	0	-7	22	21	14	20
10,000	-14	-9	-6	-10	-10	-20	-26	12	7	5	9	8	-2	-8	17	18	12	15
5,000	-7	-4	-4	-5	-5	-14	-19	6	3	4	5	4	-5	-9	15	15	11	13
KEENE TO PITTSFIELD																	54 N.MI.	
15,000	-36	-23	-18	-24	-24	-39	-47	35	22	17	23	23	10	3	23	22	14	21
10,000	-26	-17	-13	-17	-18	-29	-35	24	15	12	17	17	6	0	18	18	12	16
5,000	-13	-9	-9	-10	-10	-19	-25	12	8	8	9	9	0	-5	16	15	11	13
KEY WEST TO MIAMI																	109 N.MI.	
15,000	9	9	0	5	5	-2	-6	-9	-10	0	-5	-5	-14	-19	14	13	8	11
10,000	5	5	0	4	3	-3	-7	-5	-6	0	-4	-3	-10	-14	12	10	7	10
5,000	-1	4	1	0	1	-5	-9	0	-4	-1	0	-1	-7	-11	11	10	7	10
KNOXVILLE TO LEXINGTON																	136 N.MI.	
15,000	-7	-8	-3	-4	-5	-17	-24	2	6	2	2	3	-8	-15	20	20	12	19
10,000	-6	-6	-2	-3	-4	-14	-19	4	4	2	2	3	-6	-12	15	16	11	15
5,000	-3	-3	-2	-2	-2	-10	-15	2	2	1	1	2	-7	-11	14	14	9	12

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KNOXVILLE TO LOUISVILLE																	165 N.MI.	
15,000	-18	-16	-7	-10	-12	-24	-31	14	14	6	8	10	-1	-7	20	20	12	19
10,000	-14	-12	-5	-7	-9	-19	-25	12	10	5	6	8	-1	-6	15	16	11	15
5,000	-7	-6	-4	-4	-5	-13	-18	6	5	3	3	4	-4	-8	14	14	9	12
KNOXVILLE TO MEMPHIS																	297 N.MI.	
15,000	-39	-28	-9	-18	-22	-37	-45	38	27	9	17	21	8	3	19	19	11	18
10,000	-28	-20	-8	-13	-16	-27	-33	27	19	8	12	16	6	1	14	15	10	14
5,000	-15	-11	-6	-6	-9	-18	-22	14	11	6	5	9	1	-4	14	13	9	12
KNOXVILLE TO NASHVILLE																	132 N.MI.	
15,000	-38	-28	-11	-19	-22	-37	-46	36	27	10	18	21	9	3	20	20	11	19
10,000	-27	-20	-9	-13	-17	-28	-34	27	20	9	13	16	6	1	15	16	11	15
5,000	-15	-11	-6	-6	-9	-18	-23	14	11	6	6	9	0	-4	14	14	9	12
KNOXVILLE TO PITTSBURG																	332 N.MI.	
15,000	22	12	8	13	13	2	-4	-26	-14	-8	-15	-15	-28	-35	19	19	11	18
10,000	15	9	5	9	9	0	-5	-17	-10	-6	-10	-10	-20	-26	15	16	11	14
5,000	8	5	3	4	5	-3	-7	-9	-6	-3	-5	-5	-14	-18	14	13	9	12
KNOXVILLE TO WASHINGTON, D.C.																	378 N.MI.	
15,000	36	24	12	19	21	9	4	-38	-25	-12	-20	-22	-36	-45	19	19	11	18
10,000	25	18	10	14	16	7	2	-26	-19	-10	-15	-17	-27	-33	15	15	10	14
5,000	13	10	6	6	8	1	-4	-14	-10	-6	-7	-9	-17	-22	13	13	9	12
LAFAYETTE TO LAKE CHARLES																	60 N.MI.	
15,000	-30	-24	-4	-12	-16	-30	-37	29	24	4	11	16	4	-2	17	17	11	16
10,000	-20	-15	-2	-7	-10	-21	-26	20	15	2	7	10	1	-4	14	14	10	13
5,000	-10	-7	-3	-4	-6	-14	-18	9	6	3	4	5	-2	-7	14	13	9	12
LAFAYETTE TO NEW ORLEANS																	92 N.MI.	
15,000	28	23	4	11	15	4	-2	-29	-24	-4	-12	-16	-29	-37	17	17	10	16
10,000	19	14	2	7	9	0	-4	-19	-15	-2	-7	-10	-20	-26	14	14	10	13
5,000	8	6	2	4	5	-3	-7	-9	-6	-2	-4	-5	-13	-18	13	13	9	12
LAKELAND TO TAMPA																	27 N.MI.	
15,000	-23	-20	-2	-9	-12	-24	-31	23	20	2	9	12	2	-3	16	15	9	14
10,000	-14	-12	-1	-5	-7	-16	-21	13	12	1	5	7	-1	-5	13	13	8	12
5,000	-2	-5	-1	-2	-3	-10	-14	2	5	1	2	2	-5	-8	12	11	8	11
LANCASTER TO READING																	22 N.MI.	
15,000	30	17	13	19	19	6	-1	-33	-19	-13	-20	-20	-35	-43	22	22	13	21
10,000	20	13	9	14	14	3	-3	-22	-15	-10	-15	-15	-26	-32	18	18	12	16
5,000	11	7	5	7	7	-2	-7	-11	-7	-6	-7	-8	-17	-22	15	15	10	13
LANCASTER TO WASHINGTON																	83 N.MI.	
15,000	-22	-11	-8	-14	-13	-26	-34	18	8	7	13	11	-2	-8	22	21	13	20
10,000	-14	-8	-5	-9	-9	-19	-25	11	6	4	8	7	-3	-8	17	17	12	15
5,000	-7	-4	-3	-4	-4	-13	-18	6	3	2	4	4	-5	-10	15	15	10	13
LAS VEGAS TO LOS ANGELES																	205 N.MI.	
15,000	-14	-13	-10	-8	-11	-22	-28	13	12	10	7	10	0	-6	20	17	11	16
10,000	-7	-6	-6	-5	-6	-14	-18	6	5	5	5	5	-2	-7	15	13	9	12
5,000	-4	-3	-4	4	-2	-8	-11	4	3	4	-5	2	-4	-8	9	9	6	8
LAS VEGAS TO PALM SPRINGS																	150 N.MI.	
15,000	-6	-7	-8	-5	-7	-17	-23	4	6	8	4	6	-5	-11	20	18	11	16
10,000	-1	-2	-5	-3	-3	-11	-15	1	1	5	3	3	-5	-10	15	13	9	12
5,000	-3	-3	-4	4	-2	-7	-10	3	2	4	-4	1	-4	-8	9	8	6	8
LAS VEGAS TO PHOENIX																	222 N.MI.	
15,000	17	13	1	7	8	-2	-7	-18	-14	-2	-7	-9	-21	-28	19	17	11	16
10,000	11	8	1	4	5	-2	-6	-12	-9	-1	-4	-6	-14	-19	14	12	9	11
5,000	-1	0	-2	-3	-2	-6	-9	0	0	2	3	1	-3	-6	8	8	6	7
LAS VEGAS TO SACRAMENTO																	336 N.MI.	
15,000	-22	-17	-8	-10	-13	-25	-32	21	16	8	10	12	2	-4	20	18	11	16
10,000	-14	-11	-3	-7	-8	-17	-22	13	10	3	6	8	0	-5	15	13	9	12
5,000	-4	-4	-3	0	-3	-8	-12	4	4	3	0	3	-3	-6	10	8	6	8

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
LAS VEGAS TO SALT LAKE CITY																	320 N.MI.	
15,000	6	6	10	4	7	-4	-10	-8	-8	-10	-5	-8	-18	-24	19	17	11	16
10,000	3	3	6	4	4	-3	-7	-4	-4	-6	-4	-5	-12	-16	13	11	9	11
5,000	4	4	2	2	3	-1	-4	-4	-5	-2	-2	-3	-8	-11	8	7	5	7
LAS VEGAS TO SAN FRANCISCO																	359 N.MI.	
15,000	-22	-18	-9	-11	-14	-26	-32	21	17	9	10	13	3	-3	20	17	11	16
10,000	-14	-11	-4	-7	-8	-17	-22	13	11	4	7	8	0	-4	15	13	9	12
5,000	-5	-5	-4	0	-3	-9	-12	5	5	3	0	3	-2	-6	10	9	7	8
LAWRENCE TO MANCHESTER																	19 N.MI.	
15,000	-25	-21	-16	-16	-19	-33	-40	21	19	15	14	17	4	-3	23	22	15	21
10,000	-22	-16	-13	-13	-16	-27	-33	20	15	13	12	15	4	-2	18	18	12	16
5,000	-12	-10	-8	-8	-9	-19	-24	12	9	8	8	9	0	-5	16	16	12	13
LAWRENCE TO WORCESTER																	42 N.MI.	
15,000	-34	-22	-17	-23	-23	-37	-45	32	20	16	21	21	8	1	23	22	14	21
10,000	-23	-15	-12	-16	-16	-28	-34	22	14	11	15	15	4	-1	18	18	12	16
5,000	-12	-8	-8	-9	-9	-18	-24	11	7	8	8	9	-1	-6	16	15	11	13
LAWTON TO OKLAHOMA CITY																	63 N.MI.	
15,000	20	15	4	7	10	-1	-6	-22	-16	-5	-8	-11	-24	-32	20	18	11	17
10,000	14	11	4	6	8	-1	-5	-15	-12	-4	-7	-9	-19	-24	15	14	10	14
5,000	7	7	10	5	7	-1	-6	-8	-8	-10	-5	-8	-17	-21	14	15	10	13
LAWTON TO WICHITA FALLS																	35 N.MI.	
15,000	-8	-5	-2	-1	-4	-15	-21	5	3	2	0	2	-9	-15	19	18	11	17
10,000	-5	-6	-2	-2	-4	-12	-17	4	5	2	1	3	-6	-11	15	14	10	13
5,000	-5	-6	-9	-4	-6	-14	-19	4	5	8	3	5	-3	-8	14	14	10	13
LEBANON TO MANCHESTER																	57 N.MI.	
15,000	20	18	15	13	16	3	-4	-23	-19	-16	-15	-18	-32	-39	23	22	15	21
10,000	19	14	12	12	14	3	-2	-20	-15	-13	-13	-15	-26	-32	18	18	12	16
5,000	11	9	7	7	8	-1	-6	-12	-9	-8	-8	-9	-18	-24	16	15	11	13
LEBANON TO MONTPELIER																	36 N.MI.	
15,000	-9	-10	-8	-6	-8	-21	-29	4	8	7	3	5	-8	-15	23	22	15	21
10,000	-10	-9	-8	-6	-8	-19	-25	7	7	7	5	7	-4	-10	18	18	13	16
5,000	-7	-5	-4	-3	-5	-14	-19	6	5	4	3	4	-5	-10	16	16	12	13
LEWISTON, TO PORTLAND, ME.																	29 N.MI.	
15,000	-16	-6	-5	-11	-9	-23	-31	12	4	4	8	6	-7	-14	23	22	15	22
10,000	-7	-2	-2	-5	-4	-15	-21	5	1	1	4	2	-8	-14	18	18	13	16
5,000	-2	-1	-3	-3	-2	-11	-16	1	0	2	2	1	-8	-13	16	16	12	13
LEXINGTON TO LOUISVILLE																	54 N.MI.	
15,000	-39	-28	-14	-21	-24	-39	-48	38	27	14	20	23	10	4	21	21	12	20
10,000	-28	-21	-12	-16	-19	-30	-36	28	20	11	15	18	8	2	16	17	12	15
5,000	-15	-11	-7	-8	-10	-19	-24	15	11	7	8	10	1	-4	15	15	10	13
LINCOLN TO OMAHA																	0 N.MI.	
15,000	31	21	17	21	22	10	3	-32	-22	-17	-22	-22	-36	-43	21	20	13	19
10,000	22	15	11	14	15	6	0	-23	-16	-12	-15	-16	-26	-32	15	16	12	15
5,000	10	8	6	9	8	-1	-5	-11	-8	-7	-10	-9	-18	-23	14	15	11	13
LITTLE ROCK TO MEMPHIS																	113 N.MI.	
15,000	37	26	8	16	19	7	1	-38	-27	-8	-17	-20	-36	-44	20	19	11	18
10,000	26	18	7	11	15	5	0	-26	-19	-7	-12	-15	-26	-32	14	15	10	14
5,000	13	10	6	5	8	0	-5	-14	-11	-7	-5	-9	-18	-23	14	14	10	12
LITTLE ROCK TO ST. LOUIS																	257 N.MI.	
15,000	14	8	4	4	7	-4	-10	-18	-10	-4	-6	-9	-21	-28	19	19	11	18
10,000	11	6	4	4	6	-3	-8	-12	-7	-4	-5	-7	-16	-21	14	15	11	14
5,000	6	5	4	2	4	-4	-9	-7	-5	-4	-3	-5	-13	-18	14	14	10	12
LITTLE ROCK TO SHREVEPORT																	158 N.MI.	
15,000	-22	-14	-4	-8	-11	-23	-30	20	12	3	6	9	-1	-7	19	18	11	17
10,000	-15	-11	-5	-5	-8	-18	-23	14	10	5	5	8	-1	-6	14	14	10	14
5,000	-9	-8	-6	-4	-7	-15	-20	8	7	6	3	6	-2	-6	14	14	9	12

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
LITTLE ROCK TO SPRINGFIELD, MD.																	161 N.MI.	
15,000	-11	-10	-4	-8	-7	-19	-26	8	8	3	7	6	-5	-11	20	19	11	18
10,000	-8	-6	-2	-5	-5	-14	-19	6	5	1	4	4	-5	-10	14	15	11	14
5,000	-3	-2	0	-2	-1	-10	-15	2	1	0	1	1	-7	-12	14	14	10	12
LONG BEACH TO LOS ANGELES																	14 N.MI.	
15,000	-21	-17	-5	-8	-11	-24	-31	20	16	4	7	11	0	-6	21	18	11	16
10,000	-12	-11	-2	-5	-7	-16	-21	12	11	1	4	6	-2	-6	15	14	9	12
5,000	-6	-5	-3	0	-3	-9	-13	5	4	3	0	3	-3	-6	10	9	7	9
LONG BEACH TO SAN DIEGO																	81 N.MI.	
15,000	15	12	0	4	6	-4	-10	-17	-13	0	-5	-7	-19	-27	20	17	11	15
10,000	10	9	-1	2	4	-4	-8	-10	-10	1	-3	-5	-14	-19	15	13	9	12
5,000	5	5	1	1	3	-3	-6	-6	-5	-1	-1	-3	-9	-12	10	9	6	8
LOS ANGELES TO ONTARIO																	40 N.MI.	
15,000	19	17	8	8	12	1	-4	-20	-18	-9	-9	-13	-25	-31	21	18	11	16
10,000	10	9	4	6	7	-1	-6	-11	-10	-5	-6	-7	-16	-21	15	14	9	12
5,000	4	2	4	-3	2	-4	-8	-4	-2	-4	3	-2	-8	-11	10	9	7	9
LOS ANGELES TO PALM SPRINGS																	95 N.MI.	
15,000	20	18	7	8	12	2	-4	-21	-19	-7	-9	-13	-25	-32	20	18	11	16
10,000	12	10	3	6	7	-1	-5	-12	-11	-4	-6	-7	-16	-21	15	13	9	12
5,000	5	3	4	-3	2	-4	-7	-5	-3	-4	3	-2	-8	-12	10	9	7	8
LOS ANGELES TO PHOENIX																	320 N.MI.	
15,000	21	18	6	9	12	2	-3	-22	-19	-7	-9	-13	-25	-32	19	16	10	15
10,000	12	11	3	6	7	0	-4	-13	-11	-4	-6	-8	-16	-20	14	12	8	11
5,000	3	3	2	-4	1	-4	-7	-3	-3	-2	4	-1	-6	-9	9	8	6	8
LOS ANGELES TO SACRAMENTO																	309 N.MI.	
15,000	-16	-11	-2	-5	-7	-19	-26	14	10	1	4	6	-4	-10	20	18	11	16
10,000	-11	-9	1	-3	-5	-14	-19	10	9	-1	3	4	-4	-8	15	14	9	12
5,000	-4	-4	-3	-4	-4	-9	-13	4	4	3	3	3	-2	-5	10	9	7	9
LOS ANGELES TO SAN DIEGO																	94 N.MI.	
15,000	16	13	0	4	7	-3	-9	-17	-14	-1	-5	-8	-20	-27	20	17	11	15
10,000	10	10	-1	3	5	-4	-8	-11	-10	1	-3	-5	-14	-19	15	13	9	12
5,000	5	5	1	1	3	-3	-6	-6	-5	-1	-1	-3	-9	-12	10	9	6	8
LOS ANGELES TO SAN FRANCISCO																	295 N.MI.	
15,000	-19	-14	-4	-7	-10	-22	-29	18	13	4	6	9	-2	-7	20	18	11	16
10,000	-12	-11	-1	-5	-6	-16	-21	11	10	1	4	6	-3	-7	15	14	9	12
5,000	-5	-5	-3	-3	-4	-10	-13	5	5	3	3	4	-2	-5	11	9	7	9
LOS ANGELES TO SANTA BARBARA																	77 N.MI.	
15,000	-21	-18	-6	-8	-12	-24	-32	20	17	6	7	11	0	-5	21	18	11	16
10,000	-12	-12	-2	-5	-7	-16	-22	12	11	2	5	7	-2	-6	15	14	9	12
5,000	-6	-4	-4	0	-3	-9	-13	5	4	4	0	3	-3	-6	11	9	7	9
LOS ANGELES TO TUCSON																	390 N.MI.	
15,000	21	18	4	8	11	1	-4	-22	-19	-4	-8	-12	-24	-31	18	16	10	14
10,000	13	11	2	5	7	-1	-4	-13	-11	-2	-5	-7	-15	-20	13	11	8	11
5,000	1	1	1	-4	0	-5	-8	-1	-1	-1	4	0	-5	-8	9	8	5	8
LOUISVILLE TO MEMPHIS																	277 N.MI.	
15,000	-32	-21	-9	-15	-17	-31	-40	30	19	8	13	16	5	-1	19	19	11	18
10,000	-23	-15	-8	-11	-13	-24	-29	22	14	7	10	13	3	-2	14	15	11	14
5,000	-12	-9	-5	-5	-7	-16	-21	11	8	5	5	7	-1	-6	14	14	9	12
LOUISVILLE TO NASHVILLE																	131 N.MI.	
15,000	-19	-10	-5	-8	-9	-22	-29	15	8	4	6	8	-4	-10	20	20	12	19
10,000	-12	-7	-4	-6	-7	-17	-22	10	6	4	5	6	-3	-9	15	16	11	15
5,000	-6	-4	-3	-3	-4	-12	-17	6	4	2	2	3	-5	-10	14	14	10	13
LOUISVILLE TO OWENSBORO																	73 N.MI.	
15,000	-38	-26	-13	-20	-23	-37	-46	37	24	13	19	22	9	3	20	21	12	20
10,000	-27	-19	-11	-15	-17	-28	-34	27	18	10	14	17	6	1	15	16	12	15
5,000	-14	-10	-7	-8	-9	-18	-24	14	10	6	7	9	0	-4	15	15	10	13

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LOUISVILLE TO ST. LOUIS																	220 N.MI.	
15,000	-39	-27	-15	-21	-24	-38	-46	37	26	14	20	23	11	4	20	20	12	19
10,000	-28	-20	-12	-15	-18	-29	-35	27	20	11	15	18	8	2	15	16	11	15
5,000	-15	-11	-7	-9	-10	-19	-24	14	10	6	8	9	1	-3	14	14	10	12
LUBBOCK TO MIDLAND																	105 N.MI.	
15,000	-8	-7	-5	-2	-5	-16	-22	6	5	5	1	4	-6	-12	19	17	11	16
10,000	-6	-6	-4	-3	-5	-13	-17	5	5	4	2	4	-4	-8	14	13	10	12
5,000	-7	-7	-10	-6	-8	-15	-19	6	7	10	5	7	0	-5	13	12	9	11
LUBBOCK TO WICHITA FALLS																	166 N.MI.	
15,000	30	24	6	13	17	5	0	-31	-25	-6	-14	-17	-31	-39	19	17	11	16
10,000	20	15	5	9	12	3	-2	-21	-16	-5	-9	-12	-22	-27	14	13	10	13
5,000	8	7	6	5	6	-2	-6	-8	-7	-7	-5	-7	-15	-19	14	14	10	12
MACON TO SAVANNAH																	134 N.MI.	
15,000	30	25	6	13	17	5	0	-31	-26	-6	-14	-17	-32	-39	18	18	10	17
10,000	21	17	4	8	12	2	-2	-22	-17	-5	-9	-12	-23	-29	14	15	10	13
5,000	9	8	4	4	6	-2	-6	-9	-8	-4	-4	-6	-14	-18	13	12	9	12
MACON TO WAYCROSS																	107 N.MI.	
15,000	15	15	2	7	9	-2	-7	-18	-16	-3	-8	-10	-22	-29	18	18	10	16
10,000	10	10	1	4	6	-3	-8	-12	-10	-1	-4	-6	-16	-21	14	15	10	13
5,000	2	3	1	2	2	-6	-10	-3	-4	-1	-2	-2	-10	-14	13	12	9	12
MADISON TO MILWAUKEE																	64 N.MI.	
15,000	34	22	19	22	24	11	4	-35	-23	-20	-23	-25	-38	-46	21	21	14	20
10,000	26	17	15	17	18	8	2	-26	-18	-15	-17	-19	-29	-35	16	17	13	15
5,000	14	8	7	10	10	0	-4	-14	-9	-8	-11	-10	-20	-25	15	16	11	14
MADISON TO ROCHESTER, MINN.																	145 N.MI.	
15,000	-33	-22	-20	-22	-24	-37	-44	32	21	19	22	23	11	4	20	20	13	20
10,000	-25	-16	-15	-17	-18	-28	-34	24	16	14	16	17	7	2	15	16	13	15
5,000	-13	-8	-7	-10	-10	-19	-24	13	7	7	10	9	0	-5	14	15	11	14
MANCHESTER TO WORCESTER																	51 N.MI.	
15,000	-20	-10	-8	-13	-12	-26	-34	17	7	6	11	10	-3	-10	23	22	14	21
10,000	-11	-6	-4	-8	-7	-18	-24	9	4	4	7	6	-5	-11	18	18	12	16
5,000	-5	-2	-4	-4	-4	-13	-18	4	2	3	4	3	-6	-11	16	15	11	13
MARTHAS VINEYARD TO NEW BEDFORD																	22 N.MI.	
15,000	-25	-22	-15	-15	-19	-32	-40	21	20	14	13	17	4	-3	23	22	14	21
10,000	-22	-17	-12	-12	-15	-27	-33	20	16	12	11	14	4	-2	18	18	12	16
5,000	-12	-11	-8	-8	-9	-19	-24	11	10	7	7	9	-1	-6	16	16	11	13
MEDFORD TO SACRAMENTO																	243 N.MI.	
15,000	10	6	2	4	5	-7	-13	-12	-8	-2	-5	-6	-18	-25	22	19	12	18
10,000	7	4	0	2	3	-6	-11	-8	-5	0	-3	-3	-13	-18	16	15	10	14
5,000	-1	-1	4	0	1	-6	-9	0	1	-4	0	-1	-7	-10	12	9	7	9
MEDFORD TO SAN FRANCISCO																	286 N.MI.	
15,000	5	3	-1	0	1	-10	-16	-7	-4	0	-2	-3	-15	-21	21	19	12	18
10,000	4	2	-2	0	1	-8	-13	-5	-3	1	-1	-1	-11	-16	16	15	9	13
5,000	-2	-1	3	0	0	-6	-10	1	1	-3	0	-1	-7	-10	12	9	7	9
MELBOURNE TO MIAMI																	139 N.MI.	
15,000	4	4	-4	-2	0	-8	-13	-5	-5	4	2	0	-9	-14	15	14	8	12
10,000	-1	1	-5	-4	-2	-9	-13	0	-2	5	3	2	-5	-10	12	12	8	11
5,000	-6	-4	-5	-5	-5	-11	-15	6	4	5	4	5	-2	-5	11	10	7	10
MELBOURNE TO ORLANDO																	46 N.MI.	
15,000	-20	-18	1	-6	-9	-22	-28	19	17	-1	6	9	-1	-6	16	15	9	14
10,000	-10	-10	1	-2	-5	-14	-19	10	10	-2	2	4	-4	-8	13	13	8	12
5,000	2	-2	1	1	1	-6	-10	-3	1	-1	-1	-1	-8	-12	12	11	8	11
MELBOURNE TO TAMPA																	101 N.MI.	
15,000	-23	-21	-2	-9	-12	-24	-31	23	20	2	9	12	2	-3	15	15	9	13
10,000	-14	-13	-1	-5	-7	-16	-21	13	12	1	5	7	-1	-5	13	12	8	11
5,000	-2	-5	-2	-2	-3	-10	-13	2	5	1	2	2	-4	-8	11	11	8	11

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
MELBOURNE TO VERO BEACH																	29 N.MI.	
15,000	9	9	-3	1	3	-6	-11	-11	-10	3	-1	-3	-14	-20	16	15	9	13
10,000	3	4	-4	-2	0	-8	-12	-3	-5	4	1	0	-8	-13	13	13	8	12
5,000	-6	-3	-4	-4	-4	-11	-15	6	2	4	3	4	-3	-7	11	11	8	11
MELBOURNE TO WEST PALM BEACH																	90 N.MI.	
15,000	7	7	-4	0	2	-7	-11	-9	-8	4	0	-2	-12	-18	15	15	8	13
10,000	1	3	-4	-3	-1	-8	-12	-2	-4	4	2	1	-7	-12	13	12	8	11
5,000	-7	-3	-4	-4	-5	-11	-15	6	3	4	4	4	-2	-6	11	11	8	10
MEMPHIS TO NASHVILLE																	173 N.MI.	
15,000	37	25	9	16	20	7	1	-38	-26	-9	-17	-20	-36	-44	20	19	11	19
10,000	26	18	8	12	15	5	0	-27	-18	-8	-12	-16	-27	-33	15	15	10	14
5,000	14	10	6	5	8	0	-5	-14	-11	-6	-5	-9	-17	-23	14	14	9	12
MEMPHIS TO NEW ORLEANS																	304 N.MI.	
15,000	-9	-2	1	-1	-2	-13	-19	6	0	-1	0	1	-9	-15	17	17	10	16
10,000	-6	-3	-3	0	-3	-11	-16	4	2	3	-1	2	-6	-11	13	14	10	13
5,000	-5	-4	-3	0	-3	-11	-15	4	3	3	0	2	-5	-9	13	13	9	12
MEMPHIS TO PADUCAH																	134 N.MI.	
15,000	20	11	4	7	9	-2	-8	-23	-13	-5	-8	-11	-24	-32	20	20	11	19
10,000	14	8	4	5	8	-2	-7	-16	-9	-5	-6	-9	-19	-24	15	15	11	15
5,000	7	6	3	2	5	-4	-8	-8	-6	-4	-3	-5	-14	-19	15	14	10	13
MEMPHIS TO ST. LOUIS																	222 N.MI.	
15,000	-1	-3	-1	-4	-2	-14	-20	-3	1	1	2	0	-11	-17	19	19	12	19
10,000	0	-2	0	-2	-1	-10	-15	-2	1	0	1	0	-9	-14	14	15	11	14
5,000	0	0	0	-1	0	-8	-13	-1	-1	-1	0	-1	-9	-13	14	14	10	12
MEMPHIS TO SHREVEPORT																	247 N.MI.	
15,000	-31	-21	-5	-12	-16	-30	-38	29	20	5	11	15	3	-2	19	18	11	17
10,000	-22	-15	-6	-8	-12	-22	-27	21	14	6	8	11	2	-2	14	14	10	13
5,000	-12	-10	-6	-4	-8	-16	-21	11	9	6	4	7	-1	-5	14	14	9	12
MERCED TO MODESTO																	29 N.MI.	
15,000	-20	-14	-6	-8	-11	-24	-31	18	13	5	7	10	-2	-8	22	19	12	18
10,000	-13	-10	-2	-6	-7	-17	-22	12	10	1	5	6	-3	-7	16	15	10	13
5,000	-5	-4	-4	-5	-4	-11	-14	4	4	4	4	4	-2	-6	12	10	7	9
MERIDIAN TO MONROE																	167 N.MI.	
15,000	-33	-26	-6	-15	-18	-33	-41	32	25	6	14	18	6	0	18	18	11	17
10,000	-23	-17	-4	-10	-13	-23	-29	22	16	4	9	12	3	-2	14	14	10	14
5,000	-12	-9	-4	-5	-7	-15	-20	11	8	4	4	7	-1	-6	14	13	9	12
MERIDIAN TO MONTGOMERY																	119 N.MI.	
15,000	33	25	6	14	18	6	0	-33	-26	-6	-15	-18	-33	-41	18	18	10	17
10,000	23	17	5	9	12	3	-2	-23	-17	-5	-10	-13	-24	-30	14	15	10	14
5,000	11	9	4	4	7	-1	-6	-11	-9	-4	-5	-7	-15	-20	13	13	9	12
MIAMI TO ORLANDO																	174 N.MI.	
15,000	-8	-8	4	0	-2	-12	-17	7	7	-4	0	1	-7	-11	15	14	8	12
10,000	-2	-3	4	2	1	-7	-11	1	3	-5	-3	-1	-8	-12	12	12	8	11
5,000	6	3	4	4	5	-2	-5	-7	-4	-5	-4	-5	-11	-15	11	10	7	10
MIAMI TO ST. PETERSBURG																	181 N.MI.	
15,000	-15	-15	3	-4	-6	-17	-23	14	14	-3	3	6	-3	-8	15	14	8	12
10,000	-6	-7	4	0	-2	-10	-14	6	7	-4	0	1	-6	-10	12	11	8	11
5,000	5	1	4	3	3	-3	-7	-6	-1	-4	-4	-4	-10	-14	11	10	7	10
MIAMI TO TALLAHASSEE																	350 N.MI.	
15,000	-15	-14	1	-4	-7	-17	-23	14	13	-2	4	6	-3	-7	15	14	8	13
10,000	-7	-7	3	-1	-2	-11	-15	6	7	-3	1	2	-5	-9	12	12	8	11
5,000	4	0	3	2	2	-4	-8	-4	-1	-3	-2	-2	-9	-12	11	10	7	10
MIAMI TO TAMPA																	177 N.MI.	
15,000	-14	-14	3	-3	-6	-17	-23	13	13	-3	3	5	-4	-8	15	14	8	12
10,000	-6	-7	4	0	-1	-10	-14	5	6	-4	0	1	-6	-10	12	11	8	11
5,000	5	1	4	4	4	-3	-6	-6	-2	-4	-4	-4	-10	-14	11	10	7	10

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MIAMI TO WEST PALM BEACH																	54 N.MI.	
15,000	0	0	3	4	2	-6	-10	-2	-1	-4	-4	-3	-11	-15	15	14	8	12
10,000	3	2	4	4	3	-4	-8	-3	-2	-4	-5	-4	-10	-14	12	11	8	11
5,000	4	5	4	4	4	-2	-6	-4	-5	-4	-4	-4	-11	-14	11	10	7	10
MIDLAND TO SAN ANGELO																	94 N.MI.	
15,000	26	21	1	10	13	1	-4	-27	-21	-1	-11	-14	-27	-35	18	16	11	16
10,000	16	12	2	6	8	0	-5	-17	-12	-2	-6	-9	-18	-23	14	13	10	12
5,000	4	1	-2	-1	0	-7	-11	-5	-2	2	0	-1	-9	-13	13	13	8	11
MILWAUKEE TO MINNEAPOLIS																	257 N.MI.	
15,000	-32	-21	-19	-22	-23	-36	-43	31	20	19	21	22	10	4	20	19	13	19
10,000	-24	-16	-15	-16	-17	-27	-33	23	15	14	16	17	7	2	15	16	12	15
5,000	-13	-8	-7	-10	-9	-18	-23	13	7	7	9	9	0	-5	14	15	11	13
MILWAUKEE TO MUSKEGON																	74 N.MI.	
15,000	34	22	19	21	23	10	4	-35	-23	-19	-22	-24	-38	-45	21	21	14	20
10,000	25	16	14	17	18	7	2	-26	-17	-15	-17	-18	-29	-35	16	17	13	15
5,000	14	8	8	10	10	1	-4	-14	-8	-8	-11	-10	-19	-25	15	16	11	13
MILWAUKEE TO TOLEDO																	200 N.MI.	
15,000	34	23	18	21	23	11	4	-36	-24	-18	-22	-24	-38	-45	20	20	13	20
10,000	25	17	14	16	18	8	2	-26	-18	-14	-17	-18	-29	-35	16	17	12	15
5,000	14	9	7	9	10	1	-4	-14	-10	-8	-10	-10	-19	-24	15	15	10	13
MINNEAPOLIS TO OMAHA																	288 N.MI.	
15,000	-14	-10	-10	-10	-11	-22	-29	12	8	9	8	9	-2	-9	19	19	13	18
10,000	-10	-6	-6	-6	-7	-16	-21	8	5	6	5	6	-3	-8	14	15	12	14
5,000	-4	-3	-5	-4	-4	-12	-17	3	2	4	4	3	-5	-10	13	14	11	13
MINNEAPOLIS TO ROCHESTER, MINN.																	66 N.MI.	
15,000	18	12	11	13	13	1	-5	-20	-14	-12	-15	-15	-27	-35	20	20	14	20
10,000	14	10	9	10	11	1	-5	-16	-10	-9	-11	-12	-22	-27	15	16	13	15
5,000	8	5	3	6	6	-4	-9	-9	-6	-3	-7	-6	-16	-21	14	15	12	14
MINNEAPOLIS TO SIOUX FALLS																	171 N.MI.	
15,000	-25	-16	-17	-20	-19	-32	-38	24	15	17	18	18	7	0	20	19	13	19
10,000	-18	-11	-12	-13	-13	-23	-28	17	10	11	12	13	3	-2	15	15	12	15
5,000	-9	-5	-6	-8	-7	-16	-21	9	4	6	8	6	-3	-7	14	15	12	14
MINNEAPOLIS TO WINNIPEG																	342 N.MI.	
15,000	-20	-14	-13	-16	-15	-27	-33	18	13	11	14	14	3	-3	18	18	13	17
10,000	-16	-10	-10	-12	-12	-21	-26	15	10	9	11	11	2	-3	14	14	12	14
5,000	-9	-5	-3	-8	-6	-15	-20	8	4	3	7	6	-3	-8	13	14	12	14
MISSOULA TO SPOKANE																	151 N.MI.	
15,000	-26	-16	-15	-21	-19	-31	-38	25	15	14	20	18	7	1	19	18	13	18
10,000	-19	-12	-8	-14	-13	-22	-27	19	11	8	14	13	4	0	14	13	10	12
5,000	-8	-5	-4	-5	-5	-12	-16	7	4	4	4	5	-2	-6	12	10	9	11
MOBILE TO MONTGOMERY																	135 N.MI.	
15,000	25	17	3	9	12	1	-4	-26	-18	-3	-10	-13	-26	-34	17	17	10	16
10,000	17	12	5	6	9	1	-4	-18	-13	-5	-6	-10	-20	-25	14	14	10	13
5,000	10	8	4	3	6	-2	-6	-11	-8	-5	-3	-7	-15	-19	13	13	9	12
MOBILE TO NEW ORLEANS																	112 N.MI.	
15,000	-30	-23	-3	-12	-16	-29	-37	29	22	3	11	15	3	-2	17	17	10	16
10,000	-20	-15	-4	-7	-11	-21	-26	20	15	3	6	10	1	-3	14	14	10	13
5,000	-11	-8	-4	-4	-6	-15	-19	11	8	4	4	6	-2	-6	13	13	9	12
MOBILE TO PENSACOLA																	55 N.MI.	
15,000	28	23	4	12	15	4	-2	-29	-24	-5	-12	-16	-30	-37	17	17	10	16
10,000	19	14	2	7	10	0	-4	-19	-15	-2	-8	-10	-21	-26	14	14	10	13
5,000	8	6	2	4	5	-3	-7	-8	-7	-2	-4	-5	-13	-18	13	13	9	12
MODESTO TO STOCKTON																	21 N.MI.	
15,000	-19	-14	-5	-8	-11	-23	-31	18	13	5	7	10	-2	-8	22	20	12	18
10,000	-13	-10	-2	-5	-7	-17	-22	12	9	2	5	6	-3	-8	17	15	10	14
5,000	-4	-4	-4	-5	-4	-11	-14	4	4	4	4	4	-2	-6	12	10	7	9

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MONCTON TO MONTREAL																	376 N.MI.	
15,000	-35	-23	-23	-27	-26	-40	-47	34	22	22	26	26	13	6	21	20	14	20
10,000	-27	-16	-17	-20	-19	-30	-36	26	15	16	19	19	9	3	17	16	12	15
5,000	-15	-10	-12	-13	-12	-21	-26	14	9	12	12	12	3	-2	15	14	11	13
MONCTON TO ST. JOHN																	70 N.MI.	
15,000	-30	-19	-17	-23	-22	-36	-44	28	17	16	22	20	6	-1	23	23	16	22
10,000	-21	-12	-12	-15	-15	-26	-33	20	11	11	14	14	3	-3	19	18	13	17
5,000	-10	-7	-10	-10	-9	-19	-24	9	6	10	9	8	-1	-7	16	16	12	14
MONROE TO SHREVEPORT																	90 N.MI.	
15,000	-33	-26	-6	-14	-18	-33	-40	32	25	6	14	17	5	0	18	18	11	17
10,000	-23	-17	-5	-9	-12	-23	-29	22	16	4	9	12	3	-2	14	14	10	13
5,000	-11	-9	-5	-5	-7	-16	-20	11	8	5	4	7	-1	-6	14	14	9	12
MONTEREY TO SALINAS																	13 N.MI.	
15,000	16	14	10	9	12	0	-6	-17	-15	-10	-10	-13	-25	-32	22	19	12	18
10,000	9	8	6	6	7	-2	-7	-10	-8	-6	-7	-7	-17	-22	17	15	10	13
5,000	4	3	3	1	3	-4	-7	-5	-3	-3	-1	-3	-9	-13	12	10	8	10
MONTEREY TO SAN FRANCISCO																	68 N.MI.	
15,000	-14	-10	-3	-5	-7	-19	-26	12	8	2	4	6	-6	-12	22	19	12	18
10,000	-10	-8	0	-3	-5	-14	-20	9	7	0	3	4	-5	-10	17	15	10	13
5,000	-3	-4	-4	-4	-4	-10	-14	3	4	4	4	4	-3	-6	12	10	8	10
MONTEREY TO SANTA BARBARA																	162 N.MI.	
15,000	17	12	3	5	8	-3	-8	-18	-13	-4	-6	-9	-21	-29	21	18	11	17
10,000	11	10	0	4	5	-3	-8	-12	-11	-1	-4	-6	-16	-21	16	14	9	13
5,000	5	5	3	3	4	-2	-5	-6	-5	-4	-4	-4	-11	-14	11	10	7	9
MONTGOMERY TO PENSACOLA																	117 N.MI.	
15,000	-16	-10	-2	-6	-7	-19	-25	14	8	1	5	6	-4	-9	17	17	10	16
10,000	-11	-8	-4	-3	-6	-15	-20	10	7	4	3	6	-3	-7	14	14	10	13
5,000	-8	-6	-4	-2	-5	-13	-17	8	6	4	2	5	-3	-7	13	13	9	12
MONTREAL TO NEW YORK																	290 N.MI.	
15,000	-7	0	0	-5	-2	-15	-22	2	-3	-1	2	0	-13	-19	21	21	14	20
10,000	-1	2	2	-2	0	-10	-16	-1	-3	-3	0	-2	-12	-17	17	17	12	15
5,000	0	1	0	-1	0	-8	-13	-1	-2	-1	0	-1	-10	-15	15	15	11	12
MONTREAL TO OTTAWA																	81 N.MI.	
15,000	-36	-23	-22	-26	-26	-40	-48	35	22	22	25	25	12	5	22	22	15	21
10,000	-27	-16	-16	-20	-19	-31	-37	26	15	16	19	19	8	2	18	18	13	16
5,000	-15	-10	-11	-12	-12	-21	-27	15	9	11	11	11	2	-3	16	16	12	13
MONTREAL TO QUEBEC																	130 N.MI.	
15,000	28	15	15	20	19	6	-1	-30	-16	-17	-22	-21	-35	-42	22	21	15	21
10,000	19	9	10	14	13	2	-4	-20	-10	-11	-15	-14	-25	-31	18	17	13	16
5,000	9	5	8	10	8	-1	-6	-10	-6	-9	-10	-9	-18	-23	16	15	12	13
MONTREAL TO SAGUENAY																	214 N.MI.	
15,000	20	9	9	14	12	0	-7	-22	-11	-11	-16	-14	-28	-35	21	20	15	20
10,000	12	4	5	9	7	-3	-8	-13	-5	-6	-10	-9	-19	-25	17	16	12	16
5,000	5	3	5	7	5	-4	-9	-6	-3	-6	-8	-6	-15	-20	15	15	12	13
MONTREAL TO ST. JOHN																	331 N.MI.	
15,000	34	22	23	26	26	13	6	-35	-24	-23	-27	-27	-40	-47	21	21	14	20
10,000	27	16	17	20	19	9	4	-27	-17	-17	-20	-20	-31	-36	17	17	12	15
5,000	14	9	12	12	12	3	-2	-15	-10	-12	-12	-12	-21	-26	15	15	11	13
MONTREAL TO TORONTO																	273 N.MI.	
15,000	-36	-21	-20	-24	-24	-38	-46	34	20	19	23	23	11	4	21	21	14	20
10,000	-26	-15	-14	-18	-18	-29	-35	25	14	13	17	17	7	1	17	17	12	15
5,000	-14	-9	-9	-11	-11	-20	-25	14	8	9	11	10	1	-3	15	15	11	13
MUSCLE SHOALS TO NASHVILLE																	95 N.MI.	
15,000	22	12	4	8	11	-1	-7	-25	-14	-5	-10	-12	-26	-34	20	20	11	19
10,000	15	9	4	6	8	-1	-6	-17	-10	-5	-7	-9	-19	-25	15	16	11	15
5,000	8	6	3	2	5	-4	-8	-9	-7	-3	-3	-5	-14	-19	14	14	10	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
NASHVILLE TO ST. LOUIS																	235 N.MI.	
15,000	-28	-21	-10	-16	-17	-30	-38	25	19	9	15	16	4	-2	19	19	12	19
10,000	-20	-15	-7	-11	-13	-23	-29	19	14	7	10	12	3	-2	15	15	11	14
5,000	-11	-8	-4	-6	-7	-15	-20	10	7	4	5	6	-2	-6	14	14	10	12
NEW BEDFORD TO NEW YORK																	142 N.MI.	
15,000	-39	-27	-18	-24	-26	-40	-49	38	25	18	23	25	12	5	22	21	13	20
10,000	-28	-20	-14	-18	-19	-31	-37	27	19	14	17	18	8	3	18	18	12	15
5,000	-14	-11	-9	-10	-11	-20	-25	14	10	9	9	10	1	-4	15	15	11	13
NEW BERN TO NORFOLK																	117 N.MI.	
15,000	16	9	5	10	9	-2	-8	-19	-11	-5	-11	-11	-23	-30	20	20	11	19
10,000	9	8	4	6	6	-3	-8	-11	-9	-4	-7	-7	-17	-23	16	16	11	15
5,000	5	4	2	2	3	-5	-9	-6	-5	-3	-3	-4	-12	-17	14	13	10	13
NEW HAVEN TO NEW YORK																	56 N.MI.	
15,000	-34	-21	-15	-21	-22	-36	-44	32	19	14	20	20	7	0	22	22	13	21
10,000	-23	-16	-11	-15	-16	-27	-33	21	15	10	15	15	4	-1	18	18	12	16
5,000	-12	-8	-7	-8	-8	-18	-23	11	7	7	7	8	-1	-6	15	15	11	13
NEW ORLEANS TO SHREVEPORT																	235 N.MI.	
15,000	-22	-19	-4	-10	-13	-25	-32	20	18	4	10	12	2	-4	17	16	10	16
10,000	-14	-11	0	-7	-8	-17	-22	13	10	0	6	7	-2	-6	13	13	10	13
5,000	-5	-3	0	-3	-3	-11	-15	5	3	0	3	2	-5	-9	13	13	9	12
NEWPORT NEWS TO NEW YORK																	245 N.MI.	
15,000	23	13	9	15	14	2	-4	-26	-15	-10	-16	-16	-29	-36	21	20	12	19
10,000	15	10	6	10	10	0	-5	-17	-12	-7	-11	-11	-21	-27	16	17	11	15
5,000	8	5	4	5	5	-3	-8	-9	-6	-4	-5	-6	-14	-19	14	14	10	12
NEWPORT NEWS TO NORFOLK																	20 N.MI.	
15,000	24	22	9	11	15	3	-3	-27	-24	-10	-12	-17	-31	-39	21	21	12	19
10,000	20	16	8	9	13	3	-3	-22	-17	-9	-10	-14	-25	-31	17	17	11	15
5,000	11	9	5	4	7	-2	-6	-11	-9	-5	-5	-7	-16	-21	15	14	10	13
NEWPORT NEWS TO WASHINGTON, D.C.																	106 N.MI.	
15,000	-9	-11	-4	-2	-6	-18	-25	4	8	3	0	4	-8	-15	21	21	12	19
10,000	-8	-7	-4	-3	-5	-15	-21	6	6	3	2	4	-6	-11	17	17	11	15
5,000	-4	-4	-2	-2	-3	-12	-16	3	4	2	1	3	-6	-11	14	14	10	13
NEW YORK TO NORFOLK																	251 N.MI.	
15,000	-24	-13	-8	-15	-14	-27	-34	20	11	8	13	12	0	-6	20	20	12	19
10,000	-15	-10	-6	-10	-10	-20	-26	12	9	5	9	8	-1	-6	16	17	11	15
5,000	-8	-5	-4	-4	-5	-13	-18	7	4	3	4	4	-4	-8	14	14	10	12
NEW YORK TO PHILADELPHIA																	80 N.MI.	
15,000	-38	-25	-16	-23	-24	-39	-47	36	23	16	22	23	10	3	22	22	13	20
10,000	-26	-19	-12	-17	-18	-29	-35	25	18	12	16	17	6	1	17	18	12	15
5,000	-14	-10	-7	-9	-10	-19	-24	13	9	7	8	9	0	-5	15	15	11	13
NEW YORK TO PROVIDENCE																	125 N.MI.	
15,000	36	23	17	22	23	11	4	-38	-25	-17	-23	-25	-39	-47	22	21	13	20
10,000	25	18	13	17	17	7	1	-26	-19	-13	-17	-18	-29	-36	18	18	12	15
5,000	13	9	8	9	9	1	-4	-14	-10	-8	-9	-10	-19	-24	15	15	11	13
NEW YORK TO PITTSBURGH																	293 N.MI.	
15,000	-43	-29	-19	-25	-28	-42	-50	42	28	19	24	27	14	8	21	20	12	19
10,000	-31	-22	-15	-20	-21	-32	-38	30	22	15	19	21	11	5	16	17	11	15
5,000	-16	-12	-9	-10	-12	-20	-25	16	12	9	10	11	3	-2	14	14	10	12
NEW YORK TO PORTLAND, ME.																	238 N.MI.	
15,000	28	16	13	18	18	6	-1	-31	-18	-14	-20	-20	-34	-41	22	21	13	20
10,000	18	11	9	13	12	2	-3	-20	-13	-10	-14	-14	-24	-30	17	17	12	15
5,000	9	6	6	7	7	-2	-7	-10	-6	-7	-7	-8	-16	-21	15	15	11	13
NEW YORK TO RALEIGH																	370 N.MI.	
15,000	-30	-19	-11	-18	-18	-31	-39	27	16	10	16	16	5	-1	20	19	11	18
10,000	-20	-14	-8	-13	-13	-23	-29	18	13	8	12	12	3	-2	16	16	11	14
5,000	-10	-7	-5	-6	-7	-15	-20	10	7	5	5	6	-2	-6	14	13	9	12

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
NEW YORK TO READING																	101 N.MI.	
15,000	-42	-30	-19	-25	-28	-43	-51	41	28	19	24	27	14	7	22	22	13	20
10,000	-31	-23	-15	-19	-21	-33	-39	30	22	15	19	21	10	5	17	18	12	15
5,000	-16	-12	-9	-10	-12	-21	-26	15	12	9	10	11	2	-2	15	15	11	13
NEW YORK TO RICHMOND																	250 N.MI.	
15,000	-32	-19	-12	-19	-19	-33	-41	29	17	11	18	18	6	-1	21	20	12	19
10,000	-21	-15	-9	-13	-14	-25	-30	19	13	8	13	13	3	-2	16	17	11	15
5,000	-11	-7	-5	-6	-7	-16	-21	10	7	5	6	7	-2	-6	14	14	10	12
NEW YORK TO ROCHESTER, N.Y.																	229 N.MI.	
15,000	-30	-24	-16	-17	-21	-34	-42	27	22	15	16	19	7	0	21	21	13	20
10,000	-23	-18	-13	-14	-17	-27	-33	22	17	13	13	16	6	0	17	17	12	15
5,000	-13	-10	-8	-8	-10	-18	-23	12	10	8	7	9	0	-4	15	15	10	13
NEW YORK TO SCRANTON																	103 N.MI.	
15,000	-35	-27	-18	-20	-24	-38	-46	33	26	17	19	23	10	3	22	22	13	20
10,000	-27	-21	-15	-16	-19	-30	-36	26	20	14	15	18	8	2	17	18	12	15
5,000	-14	-12	-9	-9	-11	-20	-25	14	11	8	9	10	1	-3	15	15	11	13
NEW YORK TO SYRACUSE																	182 N.MI.	
15,000	-22	-19	-13	-12	-16	-29	-36	18	17	12	10	14	1	-5	22	21	13	20
10,000	-18	-15	-11	-11	-13	-24	-30	16	13	10	10	12	2	-4	17	17	12	15
5,000	-10	-9	-6	-6	-8	-17	-22	9	8	6	5	7	-2	-7	15	15	11	13
NEW YORK TO TORONTO																	318 N.MI.	
15,000	-33	-25	-18	-19	-23	-36	-43	30	23	17	18	21	9	3	21	20	13	19
10,000	-25	-19	-14	-16	-18	-28	-34	23	18	14	15	17	7	2	16	17	11	15
5,000	-14	-11	-9	-9	-10	-19	-24	13	10	8	8	10	1	-3	14	14	10	12
NEW YORK TO WASHINGTON, D.C.																	184 N.MI.	
15,000	-37	-24	-15	-22	-23	-38	-46	35	22	15	21	22	10	3	21	21	12	20
10,000	-26	-18	-12	-17	-17	-28	-35	24	17	11	16	16	6	1	17	17	11	15
5,000	-13	-9	-7	-8	-9	-18	-23	13	9	7	8	9	0	-4	15	14	10	13
NEW YORK TO WILMINGTON, DEL.																	101 N.MI.	
15,000	-38	-25	-16	-23	-24	-39	-47	36	23	15	22	23	10	3	22	21	13	20
10,000	-26	-19	-12	-17	-18	-29	-35	25	17	12	16	17	6	1	17	18	12	15
5,000	-14	-10	-7	-9	-9	-19	-24	13	9	7	8	9	0	-5	15	15	10	13
NEW YORK TO WORCESTER																	131 N.MI.	
15,000	29	17	13	18	18	6	-1	-31	-19	-14	-20	-20	-34	-42	22	21	13	20
10,000	19	12	9	13	13	3	-3	-21	-14	-10	-14	-14	-25	-31	18	18	12	15
5,000	10	6	6	7	7	-2	-7	-10	-7	-6	-7	-8	-17	-22	15	15	11	13
NEW YORK TO YOUNGSTOWN																	315 N.MI.	
15,000	-42	-29	-19	-24	-27	-41	-50	41	28	19	23	26	14	8	21	20	12	19
10,000	-30	-22	-16	-19	-21	-32	-38	30	21	15	19	21	11	5	16	17	11	15
5,000	-16	-12	-9	-10	-12	-20	-25	16	12	9	10	11	3	-2	14	14	10	12
NORFOLK TO PHILADELPHIA																	185 N.MI.	
15,000	11	4	4	9	6	-5	-11	-16	-7	-5	-11	-9	-21	-28	21	20	12	19
10,000	6	4	2	5	4	-5	-11	-9	-6	-3	-6	-6	-16	-21	17	17	11	15
5,000	3	2	2	2	2	-6	-11	-4	-2	-2	-3	-3	-11	-16	14	14	10	13
NORFOLK TO WASHINGTON, D.C.																	123 N.MI.	
15,000	-12	-13	-5	-4	-8	-20	-27	8	10	4	2	6	-6	-13	21	20	12	19
10,000	-11	-9	-5	-4	-7	-17	-23	8	7	4	3	5	-4	-10	17	17	11	15
5,000	-5	-5	-3	-2	-4	-12	-17	4	4	3	2	3	-5	-10	14	14	10	13
NORTH BAY TO SUDBURY																	59 N.MI.	
15,000	-34	-21	-22	-23	-25	-38	-46	33	20	22	22	24	11	4	22	21	15	21
10,000	-25	-15	-16	-18	-18	-29	-35	24	15	16	18	18	7	1	17	18	13	16
5,000	-15	-9	-10	-11	-11	-21	-26	14	9	10	10	11	1	-4	15	16	11	14
NORTH BAY TO TORONTO																	161 N.MI.	
15,000	-4	1	2	-3	-1	-14	-21	0	-4	-3	0	-2	-14	-21	22	21	14	21
10,000	-3	1	1	-2	0	-11	-17	0	-3	-2	0	-1	-12	-17	17	18	12	16
5,000	-1	1	1	-3	-1	-10	-15	0	-2	-1	2	0	-9	-14	15	16	11	13

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OAKLAND TO RENO																	157 N.MI.	
15,000	12	10	11	8	10	-1	-8	-14	-11	-11	-9	-11	-23	-29	22	19	12	18
10,000	7	5	7	6	6	-2	-7	-8	-6	-7	-6	-7	-16	-21	16	15	9	13
5,000	4	4	0	3	3	-3	-7	-5	-4	0	-3	-3	-9	-13	11	9	7	9
OAKLAND TO SAN FRANCISCO																	9 N.MI.	
15,000	-16	-13	-10	-10	-12	-24	-31	14	12	10	9	11	-1	-7	23	20	12	18
10,000	-10	-8	-7	-7	-7	-17	-22	9	7	6	6	7	-2	-7	17	15	10	14
5,000	-5	-4	-2	-2	-3	-10	-13	4	4	2	2	3	-4	-7	12	10	8	10
OCALA TO VERO BEACH																	130 N.MI.	
15,000	17	15	-1	5	7	-2	-7	-18	-16	1	-5	-8	-20	-26	16	15	9	13
10,000	8	9	-2	1	3	-5	-9	-9	-9	2	-2	-4	-12	-17	13	13	8	12
5,000	-3	0	-2	-1	-2	-8	-12	3	-1	2	1	1	-6	-9	11	11	8	11
OKLAHOMA CITY TO TULSA																	97 N.MI.	
15,000	28	21	7	13	16	4	-1	-30	-22	-8	-14	-17	-30	-39	20	19	11	18
10,000	20	15	6	9	12	3	-2	-21	-16	-6	-10	-12	-23	-28	15	14	11	14
5,000	9	9	9	6	8	0	-5	-10	-9	-9	-6	-9	-17	-22	14	15	10	13
OKLAHOMA CITY TO WICHITA																	135 N.MI.	
15,000	2	2	1	-1	1	-10	-16	-5	-4	-2	0	-3	-14	-20	20	19	11	17
10,000	2	2	2	0	1	-7	-12	-3	-3	-2	-1	-2	-11	-16	14	14	11	14
5,000	2	4	6	2	4	-5	-10	-3	-4	-6	-3	-4	-12	-17	14	14	10	12
OMAHA TO SIOUX CITY																	95 N.MI.	
15,000	0	1	2	-1	1	-11	-18	-3	-3	-3	-1	-3	-14	-21	20	20	13	19
10,000	-1	-1	1	-2	0	-10	-15	-1	0	-2	0	-1	-10	-15	15	15	12	15
5,000	-2	0	3	0	0	-8	-13	1	-1	-3	0	-1	-10	-14	14	14	11	13
ONTARIO TO PALM SPRINGS																	57 N.MI.	
15,000	21	18	6	8	12	1	-4	-22	-19	-6	-9	-13	-25	-32	20	18	11	16
10,000	12	11	3	5	7	-1	-5	-13	-11	-3	-6	-7	-16	-21	15	13	9	12
5,000	5	4	3	-2	3	-3	-7	-5	-4	-3	2	-3	-9	-12	10	9	7	8
ONTARIO TO SAN FRANCISCO																	316 N.MI.	
15,000	-20	-15	-5	-8	-11	-23	-30	19	14	5	7	10	-1	-6	20	18	11	16
10,000	-13	-11	-2	-5	-7	-16	-21	12	11	1	5	6	-2	-6	15	14	9	12
5,000	-6	-5	-4	-3	-4	-10	-13	5	5	3	3	4	-2	-5	10	9	7	9
ORLANDO TO SARASOTA																	94 N.MI.	
15,000	-16	-14	-4	-8	-9	-19	-25	15	12	4	8	9	0	-4	15	15	9	13
10,000	-11	-9	-4	-6	-7	-15	-20	11	9	4	5	7	-1	-5	13	12	8	11
5,000	-6	-7	-4	-4	-5	-12	-16	6	7	4	4	5	-2	-5	12	11	8	11
ORLANDO TO TALLAHASSEE																	193 N.MI.	
15,000	-23	-20	-2	-8	-12	-24	-31	21	19	1	8	11	1	-4	16	16	9	14
10,000	-13	-12	0	-4	-7	-16	-21	12	11	0	4	6	-2	-6	13	13	9	12
5,000	-1	-4	0	-2	-2	-9	-13	1	3	0	1	1	-6	-9	12	11	8	11
ORLANDO TO TAMPA																	72 N.MI.	
15,000	-21	-18	-3	-10	-12	-23	-29	20	17	3	9	11	2	-3	16	15	9	14
10,000	-14	-12	-3	-6	-8	-17	-21	14	11	3	6	8	0	-4	13	13	8	12
5,000	-6	-7	-3	-4	-5	-12	-16	5	7	3	3	4	-2	-6	12	11	8	11
ORLANDO TO WEST PALM BEACH																	130 N.MI.	
15,000	11	11	-3	2	4	-5	-9	-13	-12	3	-2	-5	-15	-21	15	15	8	13
10,000	4	5	-4	-1	0	-7	-11	-5	-6	4	1	-1	-9	-14	13	12	8	11
5,000	-6	-2	-4	-4	-4	-10	-14	6	2	4	3	4	-3	-7	11	11	8	10
OTTAWA TO SYRACUSE																	133 N.MI.	
15,000	-10	-2	-2	-7	-5	-18	-26	6	0	1	5	2	-10	-18	22	22	14	21
10,000	-5	0	0	-4	-2	-13	-19	3	-1	-1	2	1	-10	-15	17	18	12	16
5,000	-2	0	-1	-3	-1	-10	-15	1	-1	0	2	1	-8	-13	15	15	11	13
OTTAWA TO TORONTO																	196 N.MI.	
15,000	-34	-20	-18	-23	-23	-37	-45	32	18	17	21	21	9	2	22	21	14	20
10,000	-24	-14	-13	-17	-17	-28	-34	23	13	12	16	16	5	0	17	18	12	15
5,000	-14	-8	-8	-10	-10	-19	-24	13	8	8	10	9	1	-4	15	15	11	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
OTTAWA TO VAL-DOR																	186 N.MI.	
15,000	-16	-12	-14	-11	-13	-26	-33	12	11	12	9	11	-1	-8	21	20	15	20
10,000	-13	-10	-11	-10	-11	-21	-27	12	9	10	9	10	0	-6	17	17	12	16
5,000	-9	-6	-6	-4	-6	-15	-21	8	5	6	4	6	-4	-9	15	15	11	13
PALM SPRINGS TO SAN DIEGO																	74 N.MI.	
15,000	-7	-7	-8	-5	-7	-17	-23	5	6	8	5	6	-4	-10	20	17	11	15
10,000	-3	-2	-5	-4	-4	-11	-16	2	1	5	3	3	-5	-10	15	13	9	12
5,000	2	4	-4	4	1	-5	-8	-2	-4	4	-4	-1	-8	-11	10	9	6	8
PANAMA CITY TO PENSACOLA																	80 N.MI.	
15,000	-29	-24	-4	-12	-16	-30	-37	28	23	4	12	15	4	-1	17	17	10	16
10,000	-19	-15	-2	-7	-10	-20	-26	19	15	2	7	10	1	-4	14	14	10	13
5,000	-8	-7	-3	-4	-5	-13	-17	7	6	2	4	5	-3	-7	13	12	9	12
PANAMA CITY TO TALLAHASSEE																	70 N.MI.	
15,000	30	24	4	12	16	4	-1	-30	-24	-4	-13	-16	-30	-37	17	17	10	16
10,000	20	16	3	7	11	1	-3	-20	-16	-3	-8	-11	-21	-27	14	14	9	13
5,000	9	8	3	4	6	-2	-6	-9	-8	-4	-4	-6	-14	-18	13	12	9	12
PANAMA CITY TO TAMPA																	213 N.MI.	
15,000	19	17	1	7	10	0	-5	-20	-18	-1	-8	-10	-22	-29	16	15	9	14
10,000	10	10	-1	4	5	-3	-7	-11	-10	1	-4	-5	-14	-19	13	13	9	12
5,000	0	2	-1	1	0	-7	-10	0	-2	1	-1	-1	-8	-12	12	11	8	11
PHILADELPHIA TO PITTSBURGH																	231 N.MI.	
15,000	-43	-30	-19	-24	-27	-42	-51	42	29	18	23	26	14	8	21	21	12	19
10,000	-31	-23	-15	-19	-21	-32	-39	30	22	15	19	21	11	5	16	17	11	15
5,000	-16	-13	-9	-10	-11	-20	-25	16	12	8	10	11	3	-2	14	14	10	12
PHILADELPHIA TO RICHMOND																	173 N.MI.	
15,000	-28	-16	-10	-17	-17	-30	-38	24	14	9	15	15	3	-3	21	21	12	19
10,000	-18	-12	-7	-12	-12	-22	-28	16	11	7	11	11	1	-4	17	17	11	15
5,000	-9	-6	-4	-5	-6	-15	-20	8	6	4	5	6	-3	-7	14	14	10	13
PHILADELPHIA TO ROCHESTER, N.Y.																	223 N.MI.	
15,000	-20	-18	-11	-10	-14	-27	-34	16	15	10	8	12	0	-7	21	21	13	20
10,000	-16	-13	-10	-9	-12	-22	-28	14	12	9	8	10	0	-5	17	17	12	15
5,000	-9	-8	-6	-5	-7	-15	-20	8	7	5	4	6	-3	-7	15	15	10	12
PHILADELPHIA TO SCRANTON																	99 N.MI.	
15,000	-9	-11	-6	-3	-7	-20	-27	5	9	4	1	5	-8	-15	22	22	13	20
10,000	-9	-9	-6	-4	-7	-17	-23	6	7	5	3	5	-5	-11	17	18	12	15
5,000	-5	-6	-3	-3	-4	-13	-18	4	5	3	2	3	-6	-10	15	15	10	13
PHILADELPHIA TO SYRACUSE																	198 N.MI.	
15,000	-8	-10	-5	-3	-6	-19	-26	3	7	4	0	3	-9	-16	21	21	13	20
10,000	-7	-8	-5	-4	-6	-16	-22	5	6	5	2	4	-6	-11	17	17	12	15
5,000	-4	-5	-3	-2	-3	-12	-17	3	4	3	1	3	-6	-11	15	15	10	13
PHILADELPHIA TO WASHINGTON, D.C.																	104 N.MI.	
15,000	-37	-23	-15	-22	-23	-37	-45	34	21	14	21	21	9	2	21	21	13	20
10,000	-25	-18	-11	-16	-17	-28	-34	24	17	11	15	16	6	0	17	17	12	15
5,000	-13	-9	-7	-8	-9	-18	-23	12	9	6	7	8	0	-5	15	15	10	13
PHILADELPHIA TO WILLIAMSPORT																	112 N.MI.	
15,000	-29	-23	-14	-15	-19	-33	-41	25	21	13	13	17	5	-2	22	21	13	20
10,000	-22	-18	-12	-13	-16	-27	-33	20	17	12	12	15	4	-1	17	18	12	15
5,000	-11	-10	-7	-7	-9	-18	-23	11	10	7	7	8	0	-5	15	15	10	13
PHILADELPHIA TO YOUNGSTOWN																	262 N.MI.	
15,000	-41	-29	-18	-23	-26	-41	-49	39	28	18	21	25	13	6	21	21	12	19
10,000	-29	-22	-15	-19	-21	-32	-37	29	21	15	18	20	10	5	16	17	11	15
5,000	-15	-12	-9	-10	-11	-20	-25	15	12	8	9	11	2	-2	14	14	10	12
PHOENIX TO SAN DIEGO																	263 N.MI.	
15,000	-22	-19	-7	-9	-13	-24	-31	21	18	7	9	12	3	-3	19	16	10	15
10,000	-12	-10	-4	-6	-8	-16	-20	12	10	4	6	7	0	-4	14	12	8	11
5,000	-2	-3	-3	5	-1	-6	-9	2	2	3	-5	1	-5	-8	9	8	6	8

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
PHOENIX TO TUCSON																	96 N.MI.	
15,000	13	10	-4	4	4	-6	-11	-15	-11	3	-4	-5	-17	-24	19	16	10	15
10,000	8	6	-2	1	3	-5	-9	-9	-7	2	-1	-3	-11	-16	14	11	9	11
5,000	-5	-5	-4	-3	-4	-9	-12	4	4	4	3	4	-1	-3	9	8	5	8
PIERRE TO RAPID CITY																	121 N.MI.	
15,000	-26	-17	-19	-24	-21	-33	-40	25	17	19	23	21	9	3	19	19	13	18
10,000	-19	-11	-12	-14	-14	-23	-28	18	10	12	13	13	4	0	14	14	11	14
5,000	-11	-6	-5	-8	-8	-16	-21	11	5	5	8	7	-1	-6	13	13	12	13
PIERRE TO SIOUX FALLS																	160 N.MI.	
15,000	28	19	18	24	22	11	4	-29	-20	-19	-25	-23	-35	-42	19	19	13	18
10,000	22	13	13	16	16	6	1	-22	-14	-14	-16	-16	-26	-31	14	15	12	14
5,000	12	6	5	10	8	-1	-6	-12	-7	-5	-10	-9	-18	-23	13	14	12	14
PITTSBURGH TO RALEIGH																	285 N.MI.	
15,000	5	9	3	0	4	-7	-14	-10	-11	-4	-2	-6	-18	-25	20	20	11	19
10,000	6	6	4	2	5	-5	-10	-8	-8	-5	-4	-6	-15	-21	15	16	11	14
5,000	3	4	3	2	3	-5	-10	-4	-4	-3	-2	-3	-11	-16	14	13	9	12
PITTSBURGH TO ROANOKE																	190 N.MI.	
15,000	-2	4	1	-4	0	-12	-19	-4	-7	-1	2	-2	-14	-21	21	21	12	19
10,000	1	3	2	0	2	-8	-14	-3	-5	-3	-1	-3	-13	-18	16	17	11	15
5,000	0	2	2	0	1	-7	-12	-1	-3	-2	-1	-2	-10	-14	14	14	9	12
PITTSBURGH TO TOLEDO																	175 N.MI.	
15,000	-39	-27	-18	-22	-25	-40	-48	38	26	17	21	24	12	5	21	21	13	20
10,000	-28	-20	-15	-18	-20	-31	-36	27	20	14	17	19	9	3	16	17	12	15
5,000	-15	-11	-8	-10	-11	-19	-24	14	11	8	9	10	2	-3	15	15	10	13
PITTSBURGH TO WASHINGTON, D.C.																	177 N.MI.	
15,000	34	26	14	17	21	9	3	-36	-27	-15	-18	-23	-37	-45	21	21	12	20
10,000	25	20	13	15	18	8	2	-26	-21	-14	-16	-18	-29	-35	16	17	11	15
5,000	13	11	7	8	9	1	-3	-14	-11	-7	-8	-10	-19	-23	14	14	10	12
PITTSBURGH TO WILLIAMSPORT																	156 N.MI.	
15,000	40	25	18	24	25	13	6	-42	-26	-18	-25	-26	-41	-50	21	21	13	20
10,000	29	19	14	19	19	9	3	-29	-20	-14	-19	-20	-31	-37	17	17	12	15
5,000	15	10	8	10	10	2	-3	-16	-11	-8	-10	-11	-20	-25	15	15	10	13
PITTSBURGH TO YOUNGSTOWN																	52 N.MI.	
15,000	-20	-17	-9	-8	-13	-26	-34	15	14	8	6	10	-2	-9	22	22	13	20
10,000	-14	-12	-9	-9	-11	-21	-27	11	11	8	7	9	-1	-7	17	18	12	16
5,000	-7	-7	-5	-4	-6	-14	-19	6	6	4	4	5	-4	-8	15	15	10	13
POCATELLO TO SALT LAKE CITY																	131 N.MI.	
15,000	9	4	-1	5	4	-7	-13	-11	-5	1	-6	-5	-17	-23	19	17	12	17
10,000	6	2	-2	3	2	-6	-10	-7	-3	1	-3	-3	-11	-15	13	12	10	11
5,000	-8	-4	-4	-5	-5	-11	-14	8	4	4	5	5	0	-3	9	8	6	8
PORTLAND, ME. TO WATERVILLE																	60 N.MI.	
15,000	21	11	10	15	14	0	-7	-24	-13	-11	-17	-16	-30	-38	23	22	15	21
10,000	12	6	5	9	8	-3	-9	-14	-7	-6	-10	-9	-20	-26	18	18	12	16
5,000	5	3	5	5	4	-5	-10	-6	-4	-6	-6	-5	-15	-20	16	15	12	13
PORTLAND, ORE. TO RENO																	386 N.MI.	
15,000	11	6	2	5	5	-6	-12	-13	-7	-3	-6	-6	-18	-25	20	19	12	18
10,000	6	3	0	3	3	-6	-10	-7	-4	-1	-4	-3	-12	-17	15	14	10	13
5,000	-2	-1	4	-2	0	-6	-10	2	1	-4	1	0	-6	-10	11	9	7	9
PORTLAND, ORE. TO SALEM																	43 N.MI.	
15,000	-9	-8	-7	-10	-8	-21	-28	6	7	6	8	7	-6	-13	22	21	14	20
10,000	-9	-8	-4	-6	-7	-16	-22	8	7	4	6	6	-4	-9	17	15	11	15
5,000	-7	-5	2	-6	-3	-11	-15	7	4	-3	5	3	-4	-8	13	11	8	11
PORTLAND, ORE. TO SEATTLE																	113 N.MI.	
15,000	-2	2	2	2	1	-11	-18	-1	-4	-3	-4	-3	-15	-22	22	20	14	19
10,000	2	4	1	2	2	-7	-12	-4	-4	-2	-3	-3	-12	-17	16	14	11	14
5,000	6	4	-2	5	3	-5	-8	-6	-4	2	-5	-3	-11	-15	13	11	8	11

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PORTLAND, ORE. TO SPOKANE																	239 N.MI.	
15,000	19	14	14	18	16	4	-2	-20	-15	-14	-19	-17	-29	-35	20	19	13	18
10,000	15	11	7	11	11	2	-2	-16	-12	-8	-11	-11	-21	-26	15	13	10	13
5,000	9	6	1	6	5	-2	-5	-9	-6	-1	-6	-5	-12	-16	12	10	8	10
PORTLAND, ORE. TO YAKIMA																	104 N.MI.	
15,000	18	14	13	17	15	3	-4	-20	-15	-14	-19	-16	-29	-36	21	20	14	19
10,000	15	12	7	11	11	2	-3	-16	-12	-7	-11	-11	-21	-26	16	14	11	14
5,000	8	6	0	6	4	-2	-6	-8	-6	0	-6	-5	-12	-16	13	10	8	11
PRINCE GEORGE TO QUESNEL																	48 N.MI.	
15,000	4	-1	1	-1	1	-11	-17	-5	0	-2	-1	-2	-13	-20	20	18	15	17
10,000	1	-2	1	-1	0	-9	-14	-3	1	-2	0	-1	-10	-14	16	13	11	13
5,000	-5	-6	-1	-4	-4	-12	-17	5	5	1	4	4	-4	-9	14	12	10	13
PRINCE GEORGE TO SMITHERS																	167 N.MI.	
15,000	-20	-11	-8	-16	-13	-25	-32	18	10	7	16	12	1	-5	20	17	14	17
10,000	-14	-8	-7	-13	-10	-20	-25	14	8	7	12	10	1	-4	16	13	11	13
5,000	-5	-1	-3	-5	-3	-11	-15	4	0	3	4	3	-5	-9	14	12	10	12
PRINCE GEORGE TO VANCOUVER																	283 N.MI.	
15,000	-1	-4	-2	-4	-3	-14	-20	-1	2	1	3	1	-10	-17	20	18	14	17
10,000	-3	-4	-1	-4	-3	-12	-16	2	4	0	3	2	-7	-11	16	13	11	13
5,000	-7	-6	-2	-6	-5	-13	-17	6	6	2	6	5	-3	-7	13	11	9	12
PRINCE RUPERT TO SANDSPIT																	79 N.MI.	
15,000	-15	-15	-4	-18	-13	-27	-34	14	14	4	17	12	-1	-8	23	19	16	19
10,000	-13	-12	-6	-16	-12	-22	-28	13	12	6	16	11	1	-4	18	15	12	14
5,000	-9	-8	-5	-9	-8	-16	-21	8	8	5	9	7	-1	-6	15	12	10	13
PRINCE RUPERT TO TERRACE																	66 N.MI.	
15,000	18	13	6	17	13	0	-6	-20	-14	-6	-18	-14	-27	-34	22	19	15	18
10,000	14	9	7	14	11	1	-4	-15	-10	-8	-15	-11	-21	-27	18	14	11	14
5,000	6	3	4	5	5	-4	-8	-6	-3	-5	-6	-5	-13	-18	15	12	10	13
PROVIDENCE TO WASHINGTON, D.C.																	309 N.MI.	
15,000	-37	-24	-16	-23	-24	-38	-46	36	23	16	22	23	10	4	21	20	12	19
10,000	-26	-18	-12	-17	-18	-28	-34	25	17	12	16	17	7	2	17	17	11	15
5,000	-13	-10	-7	-9	-10	-18	-23	13	9	7	8	9	1	-4	14	14	10	12
PUEBLO TO SANTA FE																	178 N.MI.	
15,000	-11	-9	-8	-5	-8	-19	-25	8	8	8	4	7	-3	-9	19	17	11	16
10,000	-6	-6	-5	-4	-5	-13	-17	5	5	5	4	5	-3	-8	14	12	10	12
5,000	-6	-7	-7	-6	-7	-13	-16	6	6	7	6	6	0	-3	10	10	7	9
QUEBEC TO SAGUENAY																	103 N.MI.	
15,000	8	2	0	4	3	-10	-17	-11	-3	-2	-7	-5	-19	-26	22	21	16	21
10,000	2	-1	-1	2	0	-10	-15	-4	0	0	-3	-2	-12	-18	18	16	13	16
5,000	-1	-1	1	3	1	-9	-14	0	0	-2	-4	-1	-11	-16	16	15	12	14
QUEBEC TO SEVEN ISLANDS																	285 N.MI.	
15,000	24	12	13	17	16	4	-3	-25	-13	-15	-19	-18	-31	-38	21	20	15	20
10,000	15	6	9	13	10	1	-5	-17	-7	-10	-14	-11	-22	-28	17	14	13	16
5,000	8	4	8	10	7	-2	-7	-9	-5	-8	-11	-8	-17	-23	15	15	12	14
QUESNEL TO WILLIAM LAKE																	57 N.MI.	
15,000	8	2	3	3	4	-8	-14	-10	-3	-3	-5	-5	-17	-24	20	18	15	18
10,000	4	1	3	2	2	-7	-11	-6	-1	-3	-3	-3	-12	-17	16	13	11	13
5,000	-3	-5	-1	-3	-3	-11	-15	3	4	0	3	2	-5	-10	13	12	10	12
RALEIGH TO RICHMOND																	121 N.MI.	
15,000	25	15	8	14	14	3	-3	-28	-18	-8	-15	-16	-29	-37	20	20	12	19
10,000	16	12	6	10	10	1	-4	-18	-13	-7	-11	-12	-22	-28	16	16	11	15
5,000	9	6	3	4	5	-3	-7	-9	-7	-4	-4	-6	-14	-19	14	13	9	13
RALEIGH TO WASHINGTON, D.C.																	197 N.MI.	
15,000	18	9	6	12	10	-1	-7	-22	-12	-7	-13	-12	-25	-33	20	20	12	19
10,000	11	8	4	8	7	-2	-7	-13	-9	-5	-9	-9	-19	-24	16	16	11	15
5,000	6	4	2	3	4	-4	-9	-7	-5	-3	-4	-4	-13	-17	14	13	9	12

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
READING TO SYRACUSE																	164 N.MI.	
15,000	-1	-5	-2	1	-2	-14	-21	-4	3	1	-4	-1	-13	-21	22	21	13	20
10,000	-3	-4	-3	-1	-3	-13	-19	0	3	2	-1	1	-9	-15	17	17	12	15
5,000	-2	-3	-2	0	-2	-10	-15	0	2	1	0	1	-8	-13	15	15	10	13
REGINA TO SWIFT CURRENT																	116 N.MI.	
15,000	-25	-16	-19	-19	-20	-30	-36	24	15	18	19	19	8	2	17	16	14	17
10,000	-19	-10	-12	-16	-14	-23	-27	19	10	12	15	14	5	1	13	13	11	13
5,000	-13	-4	-5	-9	-8	-17	-22	13	4	4	9	7	-2	-6	14	13	12	13
REGINA TO WINNIPEG																	287 N.MI.	
15,000	26	16	19	20	20	10	4	-26	-17	-20	-21	-21	-32	-37	17	16	13	16
10,000	20	10	14	16	15	7	2	-20	-11	-15	-17	-16	-24	-29	13	13	11	13
5,000	10	3	5	10	7	-2	-7	-11	-3	-5	-10	-7	-16	-21	14	13	12	14
REGINA TO YORKTON																	97 N.MI.	
15,000	15	11	15	12	13	3	-3	-17	-12	-16	-14	-15	-25	-31	17	16	14	17
10,000	12	6	10	10	9	1	-4	-13	-6	-10	-11	-10	-19	-23	13	13	11	13
5,000	8	2	4	7	5	-4	-9	-9	-3	-4	-7	-6	-15	-20	14	14	12	14
RENO TO SACRAMENTO																	93 N.MI.	
15,000	-15	-11	-12	-10	-12	-24	-31	13	10	12	9	11	-1	-7	22	19	12	18
10,000	-10	-7	-7	-7	-8	-16	-22	9	6	7	6	7	-2	-7	16	15	10	14
5,000	-5	-5	0	-4	-3	-10	-13	5	5	0	4	3	-3	-6	11	9	7	9
RENO TO SALT LAKE CITY																	366 N.MI.	
15,000	20	15	14	13	15	5	-1	-21	-16	-14	-14	-16	-27	-33	20	17	11	17
10,000	13	9	8	9	9	2	-2	-13	-9	-8	-9	-10	-18	-22	14	12	9	12
5,000	2	3	0	3	2	-3	-6	-2	-3	0	-3	-2	-7	-10	9	8	6	7
RENO TO SAN FRANCISCO																	166 N.MI.	
15,000	-14	-11	-11	-9	-11	-23	-29	12	10	11	8	10	-1	-8	22	19	12	18
10,000	-8	-6	-7	-6	-7	-16	-21	8	5	7	6	6	-2	-7	16	15	9	13
5,000	-5	-4	-1	-3	-3	-9	-13	4	4	0	3	3	-3	-7	11	9	7	9
RICHMOND TO WASHINGTON, D.C.																	82 N.MI.	
15,000	8	1	2	7	4	-8	-14	-12	-4	-3	-9	-7	-19	-26	21	21	12	20
10,000	4	1	1	4	2	-8	-13	-6	-3	-2	-5	-4	-14	-20	17	17	11	15
5,000	2	0	1	1	1	-7	-12	-3	-1	-1	-2	-2	-10	-15	15	14	10	13
ROANOKE TO WASHINGTON, D.C.																	166 N.MI.	
15,000	35	22	13	20	21	9	3	-37	-24	-13	-21	-22	-37	-45	20	20	12	19
10,000	24	17	10	15	16	6	1	-25	-18	-10	-15	-16	-27	-33	16	17	11	15
5,000	13	9	6	7	8	0	-5	-13	-10	-6	-7	-9	-17	-22	14	14	9	12
ROANOKE TO WINSTON-SALEM																	72 N.MI.	
15,000	-13	-5	-2	-8	-6	-19	-26	9	2	2	6	4	-7	-14	20	20	12	19
10,000	-6	-3	-1	-5	-4	-13	-19	4	1	1	4	2	-7	-12	16	17	11	15
5,000	-3	-2	0	-1	-1	-10	-14	2	1	0	1	1	-7	-12	14	13	9	13
ROCHESTER, MINN. TO WATERLOO																	81 N.MI.	
15,000	4	3	2	4	3	-9	-15	-8	-5	-3	-6	-5	-18	-25	20	20	14	20
10,000	4	3	2	3	3	-7	-12	-6	-4	-3	-4	-4	-14	-20	15	16	13	15
5,000	3	3	0	1	1	-8	-13	-4	-3	0	-2	-2	-11	-16	14	15	12	14
ROCHESTER, N.Y. TO SYRACUSE																	68 N.MI.	
15,000	38	25	21	24	26	13	6	-40	-26	-21	-25	-27	-41	-49	22	22	14	21
10,000	28	19	16	19	20	9	3	-29	-19	-16	-20	-20	-32	-38	17	18	12	16
5,000	16	11	10	11	11	2	-3	-16	-11	-10	-11	-12	-21	-26	15	15	11	13
ROCHESTER, N.Y. TO WASHINGTON, D.C.																	258 N.MI.	
15,000	0	5	2	-2	1	-11	-18	-5	-8	-3	0	-4	-16	-23	21	21	13	19
10,000	2	4	3	1	3	-7	-13	-5	-6	-4	-2	-4	-14	-20	16	17	11	15
5,000	1	3	2	1	2	-7	-11	-2	-4	-2	-1	-2	-11	-15	14	14	10	12
ROUYN-NORANDA TO VAL-DOR																	53 N.MI.	
15,000	30	17	22	22	23	10	3	-31	-18	-22	-23	-24	-37	-44	21	20	15	20
10,000	22	12	16	18	17	6	1	-23	-13	-16	-18	-17	-28	-34	17	17	13	16
5,000	14	8	10	11	11	1	-4	-14	-8	-11	-12	-11	-21	-26	15	16	12	14

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
SACRAMENTO TO SAN FRANCISCO																	73 N.MI.	
15,000	-12	-10	-10	-9	-10	-22	-28	10	9	9	8	9	-3	-9	22	19	12	18
10,000	-7	-5	-6	-6	-6	-15	-20	6	5	6	5	5	-3	-9	17	15	10	14
5,000	-4	-4	-1	-2	-2	-9	-12	4	3	0	1	2	-4	-8	12	10	7	10
SACRAMENTO TO STOCKTON																	37 N.MI.	
15,000	6	3	-2	0	1	-10	-17	-8	-5	1	-2	-2	-15	-22	22	20	12	18
10,000	5	4	-3	0	1	-8	-13	-6	-4	2	-1	-2	-11	-17	17	15	10	14
5,000	0	0	3	2	1	-5	-9	0	0	-3	-2	-2	-8	-11	12	10	7	9
SAGUENAY TO SEVEN ISLANDS																	207 N.MI.	
15,000	27	13	18	21	19	6	-1	-26	-14	-19	-22	-20	-34	-41	21	20	16	20
10,000	18	8	12	16	13	3	-3	-19	-8	-13	-17	-14	-25	-30	17	14	13	16
5,000	11	5	9	12	9	0	-5	-11	-6	-10	-13	-10	-20	-25	16	15	12	14
ST. JOHN TO YARMOUTH																	89 N.MI.	
15,000	-11	-5	-3	-8	-7	-21	-29	8	3	1	6	4	-9	-17	23	23	15	21
10,000	-6	-2	-1	-3	-3	-14	-20	3	1	0	1	1	-10	-16	19	18	13	16
5,000	-1	0	-2	-2	-1	-11	-16	-1	0	2	1	1	-9	-14	16	16	12	13
ST. JOHNS TO SYDNEY																	312 N.MI.	
15,000	-34	-21	-22	-28	-26	-40	-48	33	20	21	26	25	11	4	23	22	15	20
10,000	-26	-15	-18	-20	-19	-31	-37	25	14	17	20	19	8	2	19	18	13	17
5,000	-14	-9	-13	-14	-12	-22	-28	14	8	13	13	12	2	-3	17	16	13	13
ST. LOUIS TO SPRINGFIELD, MO.																	169 N.MI.	
15,000	-32	-22	-11	-16	-19	-33	-40	31	21	11	15	18	6	0	20	20	12	19
10,000	-23	-16	-9	-12	-15	-25	-31	22	15	9	11	14	4	-1	15	15	11	15
5,000	-12	-9	-7	-7	-9	-17	-22	11	9	7	7	8	0	-5	14	15	10	13
ST. LOUIS TO TULSA																	304 N.MI.	
15,000	-32	-22	-11	-16	-19	-32	-40	30	21	10	15	18	6	0	19	19	11	18
10,000	-23	-16	-9	-12	-14	-24	-30	22	15	8	11	14	4	-1	14	15	11	14
5,000	-11	-9	-7	-7	-9	-17	-22	11	9	7	7	8	0	-4	14	14	10	12
SALINAS TO SAN FRANCISCO																	69 N.MI.	
15,000	-17	-12	-4	-6	-9	-22	-29	15	11	4	6	8	-3	-9	22	19	12	18
10,000	-12	-9	-1	-4	-6	-16	-21	11	9	1	4	5	-3	-8	17	15	10	13
5,000	-4	-4	-4	-5	-4	-11	-14	4	4	4	4	4	-2	-6	12	10	8	10
SALINAS TO SANTA BARBARA																	159 N.MI.	
15,000	16	11	2	5	8	-3	-9	-17	-13	-3	-6	-8	-21	-28	21	18	11	17
10,000	11	10	0	3	5	-4	-8	-11	-10	0	-4	-5	-15	-21	16	14	9	13
5,000	5	5	3	4	4	-2	-5	-5	-5	-3	-4	-4	-11	-14	11	10	7	9
SAN DIEGO TO SAN FRANCISCO																	389 N.MI.	
15,000	-18	-14	-3	-6	-9	-21	-28	17	13	3	6	8	-2	-7	20	17	10	15
10,000	-12	-11	-1	-4	-6	-15	-20	11	10	0	4	5	-3	-7	15	13	8	12
5,000	-5	-5	-3	-3	-4	-10	-13	5	5	3	3	4	-2	-5	10	9	7	8
SAN FRANCISCO TO STOCKTON																	56 N.MI.	
15,000	18	15	11	11	13	2	-5	-20	-16	-11	-11	-14	-26	-33	22	19	12	18
10,000	11	9	7	7	8	-1	-5	-12	-9	-7	-8	-9	-18	-23	17	15	10	14
5,000	5	5	3	3	4	-3	-6	-6	-5	-3	-3	-4	-10	-14	12	10	7	10
SARASOTA TO TAMPA																	34 N.MI.	
15,000	0	-1	4	2	2	-7	-12	-2	0	-4	-3	-3	-11	-16	16	15	9	13
10,000	3	1	5	3	3	-5	-9	-4	-2	-5	-3	-3	-11	-15	13	12	8	11
5,000	7	5	5	4	5	-2	-5	-7	-5	-5	-4	-5	-12	-16	12	11	8	11
SARASOTA TO WEST PALM BEACH																	138 N.MI.	
15,000	19	18	-1	6	9	-1	-5	-20	-18	1	-6	-9	-21	-27	15	14	8	12
10,000	9	10	-2	2	4	-4	-7	-10	-10	2	-3	-4	-13	-18	12	12	8	11
5,000	-3	1	-2	-2	-1	-8	-12	3	-2	2	1	1	-5	-9	11	11	7	10
SASKATOON TO WINNIPEG																	381 N.MI.	
15,000	26	16	18	20	20	10	4	-27	-17	-18	-21	-20	-31	-37	16	15	13	16
10,000	20	11	14	16	15	7	2	-20	-11	-14	-17	-16	-24	-29	12	12	11	12
5,000	10	3	4	10	7	-2	-7	-11	-3	-5	-10	-7	-16	-21	13	13	11	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
SAULT STE. MARIE TO TORONTO																	266 N.MI.	
15,000	27	19	18	18	20	8	1	-30	-20	-19	-19	-22	-34	-42	21	20	14	20
10,000	20	14	14	14	15	5	0	-22	-15	-14	-15	-16	-27	-32	16	17	12	15
5,000	12	8	8	7	9	0	-5	-13	-9	-8	-8	-9	-18	-23	14	15	11	13
SCRANTON TO SYRACUSE																	99 N.MI.	
15,000	-6	-8	-5	-2	-5	-18	-25	1	6	4	0	2	-10	-18	22	22	14	21
10,000	-6	-7	-5	-3	-5	-15	-21	3	5	4	2	4	-7	-13	17	18	12	16
5,000	-4	-4	-3	-1	-3	-12	-17	2	3	2	1	2	-7	-12	15	15	11	13
SCRANTON TO WILLIAMSPORT																	54 N.MI.	
15,000	-41	-27	-19	-25	-27	-42	-50	40	25	19	24	26	12	6	22	22	13	21
10,000	-29	-20	-15	-19	-20	-32	-38	28	19	14	18	19	9	3	17	18	12	16
5,000	-15	-11	-9	-10	-11	-20	-26	15	10	8	10	11	2	-3	15	15	11	13
SEATTLE TO SPOKANE																	190 N.MI.	
15,000	24	16	14	21	18	6	0	-25	-16	-15	-21	-19	-31	-38	20	19	14	18
10,000	18	12	8	13	12	3	-1	-18	-13	-8	-13	-13	-22	-27	15	13	11	13
5,000	8	5	3	5	5	-2	-5	-8	-5	-3	-5	-5	-12	-16	12	10	8	11
SEATTLE TO VANCOUVER																	109 N.MI.	
15,000	-11	-5	-4	-6	-6	-19	-26	9	3	3	4	5	-8	-15	21	20	15	19
10,000	-5	-1	-3	-3	-3	-12	-17	4	1	2	2	2	-7	-12	17	14	11	14
5,000	2	3	-2	3	1	-6	-10	-3	-3	2	-3	-2	-9	-14	13	11	9	12
SEATTLE TO VICTORIA																	85 N.MI.	
15,000	-16	-9	-7	-10	-10	-23	-31	14	7	6	9	9	-4	-11	22	20	15	19
10,000	-9	-5	-5	-6	-6	-15	-21	8	4	4	5	5	-4	-9	17	14	11	14
5,000	0	1	-3	1	0	-8	-12	-1	-1	3	-2	0	-8	-12	13	11	9	12
SEATTLE TO YAKIMA																	90 N.MI.	
15,000	22	13	11	16	15	2	-4	-23	-14	-11	-17	-16	-29	-36	21	20	14	19
10,000	14	8	6	10	9	0	-5	-15	-9	-6	-10	-10	-19	-25	16	14	11	14
5,000	2	2	4	1	2	-5	-9	-3	-3	-4	-1	-3	-10	-13	13	11	8	11
SHREVEPORT TO TEXARKANA																	61 N.MI.	
15,000	-2	-4	-1	-3	-2	-13	-19	-1	2	0	2	1	-10	-16	19	18	11	17
10,000	-1	-1	2	-2	0	-9	-14	-1	0	-2	1	-1	-9	-14	14	14	10	14
5,000	2	3	4	1	2	-6	-11	-3	-3	-4	-1	-3	-11	-16	14	14	10	12
SHREVEPORT TO TULSA																	247 N.MI.	
15,000	-12	-11	-3	-8	-8	-19	-25	9	9	2	7	6	-4	-9	19	18	11	17
10,000	-8	-6	-1	-5	-5	-13	-18	7	5	1	4	4	-5	-9	14	14	10	13
5,000	-2	-1	1	-1	0	-8	-13	1	0	-2	1	0	-8	-13	14	14	9	12
SIOUX CITY TO SIOUX FALLS																	73 N.MI.	
15,000	-12	-9	-5	-10	-9	-21	-28	10	7	4	8	7	-5	-11	20	20	13	19
10,000	-10	-8	-5	-8	-7	-17	-23	9	7	4	7	6	-3	-8	15	15	12	15
5,000	-7	-4	-1	-5	-4	-13	-18	6	3	0	4	3	-6	-11	14	15	12	14
SIOUX CITY TO WATERLOO																	177 N.MI.	
15,000	31	21	18	22	22	11	4	-32	-22	-19	-23	-23	-36	-43	20	20	13	19
10,000	23	15	13	15	16	7	1	-24	-16	-13	-16	-17	-27	-32	15	15	12	15
5,000	12	7	7	10	9	0	-5	-12	-8	-7	-10	-9	-18	-23	14	15	11	13
SMITHERS TO TERRACE																	53 N.MI.	
15,000	-19	-14	-6	-19	-14	-27	-34	18	13	5	18	13	1	-6	22	18	15	18
10,000	-15	-11	-7	-16	-12	-22	-27	14	10	7	16	11	2	-3	17	14	11	14
5,000	-8	-5	-5	-8	-6	-14	-19	7	5	5	7	6	-2	-7	14	12	10	13
SPOKANE TO YAKIMA																	135 N.MI.	
15,000	-20	-14	-14	-19	-17	-29	-36	19	13	14	18	16	4	-2	20	19	14	18
10,000	-16	-12	-8	-12	-11	-21	-26	15	11	7	11	11	2	-2	15	13	11	13
5,000	-10	-6	-2	-6	-6	-13	-17	9	6	2	6	5	-2	-5	12	10	8	11
STEPHENVILLE TO SYDNEY																	155 N.MI.	
15,000	-19	-13	-10	-16	-14	-28	-36	16	11	8	14	12	-2	-9	23	23	16	21
10,000	-14	-8	-7	-9	-9	-21	-27	12	7	6	7	8	-3	-9	19	18	14	17
5,000	-6	-4	-6	-6	-6	-16	-21	5	4	6	5	5	-5	-11	17	16	13	14

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
SUDBURY TO TIMMINS																	119 N.MI.	
15,000	-8	-8	-9	-6	-8	-20	-27	5	6	7	4	6	-7	-14	21	20	14	20
10,000	-8	-6	-7	-6	-7	-17	-23	6	5	7	5	6	-5	-10	16	17	13	15
5,000	-5	-4	-3	-1	-3	-12	-17	4	3	2	0	2	-7	-12	15	15	11	14
SUDBURY TO TORONTO																	183 N.MI.	
15,000	8	9	9	5	8	-5	-12	-12	-11	-10	-8	-10	-23	-30	22	21	14	20
10,000	6	7	7	5	6	-4	-10	-9	-8	-7	-6	-7	-18	-23	17	18	12	16
5,000	4	4	4	1	3	-6	-11	-5	-5	-4	-1	-4	-13	-18	15	16	11	13
SYRACUSE TO WASHINGTON, D.C.																	259 N.MI.	
15,000	-11	-3	-3	-9	-6	-19	-26	7	0	2	7	4	-8	-15	21	21	13	19
10,000	-6	-2	-1	-5	-3	-13	-19	4	0	0	3	2	-8	-14	17	17	11	15
5,000	-3	0	-1	-2	-1	-10	-15	2	-1	0	2	1	-8	-12	14	14	10	12
TALLAHASSEE TO TAMPA																	174 N.MI.	
15,000	13	12	0	4	6	-3	-8	-14	-13	0	-5	-7	-18	-24	16	16	9	14
10,000	6	6	-2	2	2	-5	-10	-7	-7	2	-2	-3	-12	-16	13	13	9	12
5,000	-3	0	-2	-1	-1	-8	-12	2	0	2	0	1	-6	-10	12	11	8	11
TEMPLE TO WACO																	30 N.MI.	
15,000	13	9	4	3	7	-3	-9	-15	-11	-4	-4	-8	-19	-25	18	17	11	16
10,000	10	8	4	3	6	-2	-7	-12	-9	-5	-3	-7	-15	-20	14	13	10	13
5,000	7	8	9	4	7	-1	-5	-8	-8	-9	-5	-8	-16	-20	14	13	9	12
TERRACE TO VANCOUVER																	375 N.MI.	
15,000	11	4	6	6	6	-5	-12	-12	-5	-6	-7	-8	-19	-26	20	18	14	17
10,000	6	1	4	3	4	-5	-10	-7	-2	-5	-4	-4	-13	-18	16	13	11	13
5,000	-1	-4	0	-2	-2	-9	-13	0	3	-1	2	1	-6	-10	13	11	9	12
TOLEDO TO WASHINGTON, D.C.																	351 N.MI.	
15,000	36	26	16	19	23	11	5	-38	-27	-16	-20	-24	-38	-46	20	20	12	19
10,000	26	20	14	16	18	9	4	-27	-21	-14	-17	-19	-30	-35	16	16	11	14
5,000	14	11	7	8	10	2	-3	-14	-11	-8	-9	-10	-19	-23	14	14	9	12
TORONTO TO WASHINGTON, D.C.																	313 N.MI.	
15,000	12	13	7	5	9	-3	-9	-17	-15	-9	-7	-11	-24	-31	21	20	12	19
10,000	10	10	7	6	8	-1	-7	-12	-11	-8	-7	-10	-20	-25	16	17	11	15
5,000	6	6	4	3	5	-4	-8	-7	-7	-5	-4	-5	-14	-18	14	14	10	12
TORONTO TO WINDSOR																	210 N.MI.	
15,000	-26	-19	-17	-17	-20	-33	-40	24	17	17	15	18	6	-1	21	21	14	20
10,000	-19	-14	-13	-13	-15	-25	-31	18	13	12	13	14	4	-2	16	17	12	15
5,000	-11	-8	-8	-7	-8	-17	-22	10	8	7	6	8	-1	-6	15	15	11	13
TULSA TO WICHITA																	109 N.MI.	
15,000	-21	-16	-7	-13	-13	-26	-33	19	14	6	12	12	1	-5	20	19	12	18
10,000	-15	-10	-4	-9	-9	-19	-24	14	9	4	8	8	-1	-6	15	15	11	14
5,000	-6	-3	-1	-4	-3	-12	-17	5	3	1	3	3	-6	-10	14	14	10	13
WASHINGTON, D.C. TO WILMINGTON, DEL.																	83 N.MI.	
15,000	34	21	14	21	21	9	2	-37	-23	-14	-22	-23	-37	-45	21	21	13	20
10,000	24	17	11	15	16	6	0	-25	-18	-11	-16	-17	-28	-34	17	17	12	15
5,000	12	9	6	7	8	0	-5	-13	-9	-6	-8	-9	-18	-23	15	15	10	13

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

TABLE 4

EQUIVALENT WINDS AT THE 20,000–, 30,000–, 40,000– AND 53,000–FOOT LEVELS FOR ROUTES ≧ 200 NAUTICAL MILES IN LENGTH

TABLE 4. EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ABILENE TO EL PASO																	342 N.MI.	
53,000	-44	-36	0	-19	-24	-41	-49	43	35	-1	19	24	7	-1	18	16	12	16
40,000	-68	-59	-14	-43	-45	-68	-81	66	57	13	41	44	21	11	29	26	20	24
30,000	-57	-48	-9	-32	-35	-57	-69	55	47	9	31	33	13	5	29	25	15	23
20,000	-35	-29	-4	-16	-19	-35	-43	34	29	4	15	19	5	0	20	17	10	17
ABILENE TO HOUSTON																	281 N.MI.	
53,000	32	26	-2	14	17	3	-3	-35	-28	1	-15	-19	-34	-42	17	16	11	16
40,000	46	41	8	34	32	12	2	-54	-47	-9	-37	-36	-57	-68	28	27	20	23
30,000	38	33	6	26	24	7	-1	-44	-38	-6	-28	-27	-47	-58	27	25	15	24
20,000	25	21	-3	13	13	0	-6	-28	-23	2	-14	-14	-29	-37	19	17	10	17
AKRON TO CHICAGO																	297 N.MI.	
53,000	-44	-29	-13	-28	-27	-41	-49	43	29	13	27	27	14	8	18	16	12	15
40,000	-72	-48	-39	-49	-51	-72	-83	70	46	38	46	49	30	20	29	27	24	29
30,000	-68	-45	-32	-44	-45	-67	-79	65	42	31	41	44	24	15	30	29	20	30
20,000	-46	-30	-22	-30	-30	-46	-55	45	29	21	28	29	16	9	23	23	14	22
AKRON TO NEW YORK																	349 N.MI.	
53,000	47	30	12	29	28	15	9	-48	-31	-12	-29	-29	-44	-52	18	17	12	16
40,000	75	49	37	50	52	32	21	-77	-52	-38	-52	-54	-75	-87	29	28	24	28
30,000	71	46	32	44	46	27	17	-74	-48	-33	-47	-48	-70	-83	29	30	20	29
20,000	49	32	22	30	31	17	11	-50	-33	-22	-31	-32	-49	-59	23	23	13	22
AKRON TO WASHINGTON, D. C.																	238 N.MI.	
53,000	37	27	11	22	23	11	5	-40	-28	-12	-23	-25	-38	-46	19	17	13	16
40,000	64	42	33	37	43	23	13	-70	-46	-34	-41	-47	-68	-80	29	29	24	29
30,000	60	39	25	33	38	18	9	-66	-43	-26	-37	-41	-63	-75	28	30	20	30
20,000	41	30	17	22	26	12	5	-44	-31	-18	-24	-28	-44	-54	23	23	13	23
ALBANY, GA. TO TAMPA																	231 N.MI.	
53,000	13	16	1	7	9	-2	-7	-19	-19	-2	-9	-11	-23	-30	16	17	11	18
40,000	16	18	7	12	13	-3	-12	-27	-27	-8	-17	-19	-36	-46	26	26	19	24
30,000	14	19	4	10	11	-3	-10	-21	-24	-5	-13	-15	-30	-39	22	23	15	22
20,000	9	10	1	3	5	-4	-10	-13	-12	-2	-5	-7	-18	-24	18	18	10	16
ALBANY, N.Y. TO BUFFALO																	217 N.MI.	
53,000	-45	-28	-14	-29	-28	-41	-49	44	28	13	29	27	15	9	18	16	13	16
40,000	-72	-48	-41	-52	-53	-73	-85	70	46	39	50	50	31	20	30	29	25	29
30,000	-70	-46	-37	-47	-48	-70	-82	67	43	35	44	46	26	15	33	32	22	30
20,000	-47	-31	-25	-32	-32	-48	-57	45	30	24	30	31	17	9	24	24	15	23
ALBUQUERQUE TO AMARILLO																	241 N.MI.	
53,000	41	34	5	22	25	10	4	-42	-34	-6	-23	-26	-41	-49	19	16	12	16
40,000	65	51	24	42	44	24	14	-67	-53	-25	-43	-46	-68	-80	31	28	22	27
30,000	53	44	18	32	34	16	7	-56	-46	-19	-34	-36	-57	-70	32	28	17	26
20,000	34	28	11	17	21	8	2	-35	-29	-11	-18	-21	-36	-45	22	20	12	18
ALBUQUERQUE TO CHICAGO																	969 N.MI.	
53,000	37	28	9	21	23	12	7	-38	-29	-9	-22	-24	-36	-43	15	13	10	13
40,000	62	43	29	38	42	25	17	-66	-45	-31	-41	-44	-62	-72	24	22	19	23
30,000	51	37	22	31	33	18	11	-55	-40	-23	-34	-36	-54	-64	26	23	15	23
20,000	32	24	15	19	21	11	6	-34	-25	-16	-21	-23	-35	-42	19	17	10	17
ALBUQUERQUE TO DALLAS																	503 N.MI.	
53,000	41	32	3	21	24	9	3	-43	-33	-4	-21	-25	-40	-47	17	15	11	15
40,000	61	49	18	41	41	22	12	-65	-52	-19	-43	-44	-65	-77	29	26	20	24
30,000	51	42	14	32	32	15	6	-54	-44	-14	-34	-34	-55	-67	29	25	15	24
20,000	34	28	6	17	19	7	1	-35	-29	-7	-18	-20	-35	-44	20	18	10	17
ALBUQUERQUE TO DENVER																	295 N.MI.	
53,000	7	10	6	4	7	-4	-9	-11	-12	-6	-5	-8	-19	-25	18	16	12	16
40,000	11	11	14	7	11	-7	-17	-22	-17	-17	-13	-17	-35	-45	30	27	22	27
30,000	10	10	10	5	8	-9	-19	-18	-15	-12	-7	-12	-30	-40	32	28	18	26
20,000	5	6	8	2	6	-7	-14	-8	-8	-9	-4	-7	-19	-26	22	20	12	19
ALBUQUERQUE TO LAS VEGAS																	423 N.MI.	
53,000	-36	-30	-5	-21	-23	-36	-43	35	29	5	21	22	9	3	18	15	11	15
40,000	-57	-48	-28	-39	-42	-61	-71	55	46	27	37	40	22	13	29	26	21	26
30,000	-49	-41	-21	-31	-33	-53	-64	46	39	20	30	32	15	6	32	27	18	23
20,000	-30	-25	-12	-16	-19	-33	-40	29	24	11	15	18	7	1	21	19	12	17

*HEADWINDS--COMPUTED FOR A 440-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ALBUQUERQUE TO LOS ANGELES																	587 N.MI.	
53,000	-36	-31	-6	-21	-23	-36	-43	35	31	5	20	22	9	4	17	14	11	14
40,000	-56	-48	-29	-37	-42	-60	-70	54	46	28	36	40	23	14	27	25	20	24
30,000	-48	-41	-20	-30	-33	-51	-62	45	39	20	28	31	15	7	30	26	17	22
20,000	-30	-25	-12	-15	-19	-32	-39	28	24	12	14	18	7	1	20	18	11	16
ALBUQUERQUE TO LUBBOCK																	251 N.MI.	
53,000	38	30	3	20	22	8	1	-40	-31	-3	-21	-23	-38	-46	19	16	12	16
40,000	58	47	19	39	39	20	10	-62	-50	-21	-41	-42	-64	-76	31	28	21	26
30,000	48	40	15	31	31	13	5	-51	-42	-16	-33	-33	-54	-66	32	27	17	25
20,000	32	26	7	16	18	6	0	-33	-27	-8	-17	-19	-34	-43	22	19	11	18
ALBUQUERQUE TO PHOENIX																	286 N.MI.	
53,000	-36	-33	-5	-20	-23	-37	-44	34	32	5	19	22	8	2	19	15	12	16
40,000	-57	-50	-27	-37	-42	-62	-73	54	48	26	35	40	21	12	30	27	21	26
30,000	-49	-42	-20	-30	-33	-53	-64	46	40	19	28	31	14	5	33	27	18	23
20,000	-30	-25	-13	-14	-19	-32	-40	28	24	12	14	18	7	1	22	19	11	18
ALBUQUERQUE TO SAN FRANCISCO																	777 N.MI.	
53,000	-35	-27	-7	-21	-22	-34	-40	34	27	6	20	21	10	4	16	14	10	13
40,000	-53	-43	-28	-37	-40	-57	-66	51	41	26	35	38	21	13	26	23	20	23
30,000	-46	-39	-21	-30	-32	-50	-60	43	37	19	29	30	15	6	28	25	17	22
20,000	-29	-23	-12	-16	-19	-31	-38	28	22	11	15	18	7	1	20	18	11	16
ALBUQUERQUE TO WICHITA																	477 N.MI.	
53,000	39	32	7	22	24	11	5	-40	-33	-7	-22	-25	-39	-46	18	15	12	15
40,000	65	48	26	39	43	24	15	-68	-50	-27	-42	-45	-66	-78	29	26	21	26
30,000	52	41	19	30	33	16	8	-55	-43	-20	-32	-35	-56	-67	30	26	16	25
20,000	32	26	12	18	20	9	3	-34	-27	-12	-19	-21	-35	-43	21	19	11	18
ALLENTOWN TO CLEVELAND																	294 N.MI.	
53,000	-47	-31	-13	-29	-28	-43	-51	45	30	12	28	28	15	9	18	17	13	16
40,000	-76	-51	-39	-51	-53	-74	-86	74	48	37	48	51	31	21	29	28	24	28
30,000	-73	-47	-32	-46	-48	-70	-82	70	45	31	43	46	26	16	29	30	20	30
20,000	-50	-33	-22	-30	-32	-48	-58	48	31	22	29	31	17	10	23	23	14	22
ALLENTOWN TO PITTSBURGH																	218 N.MI.	
53,000	-49	-31	-12	-30	-29	-45	-53	48	31	11	29	29	15	8	19	17	13	16
40,000	-78	-52	-38	-53	-54	-76	-88	76	50	36	51	52	31	21	30	29	25	29
30,000	-74	-49	-32	-47	-49	-71	-84	72	46	31	45	47	26	17	30	31	20	30
20,000	-51	-33	-22	-31	-32	-49	-59	50	32	22	30	31	17	10	24	24	14	23
AMARILLO TO COLORADO SPRINGS																	259 N.MI.	
53,000	-25	-16	-2	-15	-14	-26	-33	22	14	2	14	12	1	-5	19	16	12	16
40,000	-39	-27	-15	-28	-26	-45	-56	29	21	12	23	21	3	-7	31	27	22	27
30,000	-31	-23	-13	-25	-21	-40	-51	24	18	11	22	18	1	-8	32	28	18	27
20,000	-23	-16	-6	-14	-13	-27	-35	20	14	5	13	12	0	-6	22	20	12	19
AMARILLO TO DALLAS																	280 N.MI.	
53,000	38	27	4	19	21	7	1	-40	-29	-4	-20	-22	-37	-45	18	16	12	16
40,000	51	41	15	38	35	16	6	-58	-46	-17	-41	-39	-60	-72	30	28	21	26
30,000	42	35	12	31	28	11	2	-48	-39	-13	-33	-31	-51	-63	30	26	16	26
20,000	31	25	4	17	17	5	-1	-33	-27	-5	-18	-19	-34	-43	21	19	11	18
AMARILLO TO DENVER																	311 N.MI.	
53,000	-22	-14	-2	-14	-12	-24	-31	19	11	1	13	10	-1	-6	18	16	12	15
40,000	-35	-23	-14	-25	-23	-43	-53	25	17	10	20	18	0	-9	30	27	22	27
30,000	-28	-20	-11	-23	-19	-37	-48	20	15	9	19	15	-2	-11	32	28	17	27
20,000	-21	-14	-5	-14	-12	-25	-33	18	12	4	12	10	-1	-8	22	20	12	19
AMARILLO TO OKLAHOMA CITY																	200 N.MI.	
53,000	45	35	5	24	27	11	4	-46	-36	-6	-24	-27	-44	-51	19	17	13	16
40,000	70	53	21	45	45	24	14	-73	-55	-22	-47	-48	-71	-84	31	28	22	27
30,000	57	45	15	34	35	16	7	-60	-47	-16	-36	-37	-60	-73	31	27	17	28
20,000	37	30	9	19	22	8	2	-39	-31	-9	-20	-23	-39	-48	22	20	12	19
AMARILLO TO WICHITA																	258 N.MI.	
53,000	35	30	6	19	22	8	2	-38	-31	-6	-20	-23	-37	-45	19	17	12	16
40,000	62	44	20	35	39	19	9	-66	-47	-22	-38	-42	-64	-76	31	28	22	27
30,000	50	38	14	25	29	11	2	-53	-41	-15	-28	-32	-53	-66	31	27	17	28
20,000	29	24	9	15	17	5	-1	-32	-25	-10	-16	-19	-33	-42	22	20	12	19

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ANCHORAGE TO CHICAGO																	2465 N.MI.	
53,000	28	12	9	20	16	10	7	-29	-13	-9	-21	-17	-25	-30	10	8	6	8
40,000	32	17	20	25	23	14	9	-34	-19	-22	-28	-25	-35	-40	13	12	12	14
30,000	32	19	18	25	23	13	7	-34	-21	-20	-27	-25	-36	-42	15	15	13	16
20,000	23	14	13	19	17	9	6	-24	-15	-14	-20	-18	-25	-30	12	10	8	11
ANCHORAGE TO EDMONTON, CANADA																	1253 N.MI.	
53,000	26	11	6	19	14	6	2	-27	-11	-6	-19	-15	-24	-30	13	11	8	10
40,000	29	13	12	21	19	7	1	-31	-15	-13	-23	-20	-32	-39	17	15	16	17
30,000	28	14	11	20	18	5	-3	-30	-16	-13	-23	-20	-34	-42	20	20	18	21
20,000	18	9	8	14	12	2	-2	-20	-10	-8	-15	-13	-23	-28	16	14	12	14
ANCHORAGE TO FAIRBANKS																	226 N.MI.	
53,000	7	5	1	9	5	-4	-9	-9	-5	-1	-9	-6	-15	-21	18	14	9	13
40,000	5	9	7	13	9	-5	-13	-7	-10	-8	-15	-10	-24	-32	22	19	20	21
30,000	3	11	6	14	8	-9	-18	-6	-12	-8	-16	-10	-28	-37	27	25	25	27
20,000	2	9	5	9	7	-6	-13	-4	-9	-6	-10	-8	-20	-27	22	18	16	18
ANCHORAGE TO JUNEAU																	494 N.MI.	
53,000	23	8	4	16	11	2	-2	-24	-8	-4	-17	-12	-22	-29	17	13	9	13
40,000	28	13	13	16	17	3	-4	-29	-14	-15	-19	-19	-33	-41	22	19	20	22
30,000	24	10	10	14	14	-3	-13	-26	-13	-12	-17	-16	-34	-44	26	25	24	27
20,000	14	4	6	8	8	-4	-11	-16	-5	-7	-9	-9	-21	-28	21	18	16	17
ANCHORAGE TO KING SALMON																	250 N.MI.	
53,000	-22	-9	-4	-17	-12	-23	-30	20	9	4	17	11	1	-4	19	15	9	14
40,000	-24	-16	-16	-23	-20	-35	-43	22	15	15	22	18	3	-4	24	20	22	23
30,000	-21	-16	-16	-21	-19	-37	-46	19	15	14	19	17	-1	-11	28	26	26	27
20,000	-13	-10	-10	-14	-12	-25	-33	11	9	9	13	11	-3	-11	25	20	18	20
ANCHORAGE TO LOS ANGELES																	2036 N.MI.	
53,000	19	9	3	10	9	2	-1	-20	-10	-3	-11	-10	-18	-23	11	9	7	9
40,000	26	17	12	15	17	6	0	-30	-20	-14	-18	-20	-32	-38	17	15	15	17
30,000	23	14	9	11	14	2	-5	-28	-18	-12	-15	-18	-31	-38	19	18	16	19
20,000	15	6	7	6	8	-1	-5	-17	-8	-8	-8	-10	-19	-24	16	14	10	13
ANCHORAGE TO MINNEAPOLIS																	2181 N.MI.	
53,000	28	12	8	20	16	9	6	-28	-13	-9	-21	-17	-25	-29	10	8	6	8
40,000	31	16	18	24	22	12	7	-33	-18	-20	-26	-24	-34	-40	14	12	13	15
30,000	31	17	17	24	22	11	5	-33	-19	-18	-26	-24	-35	-42	16	16	14	17
20,000	22	13	12	18	16	8	4	-23	-14	-13	-19	-17	-25	-29	12	11	9	11
ANCHORAGE TO NEW YORK																	2932 N.MI.	
53,000	27	13	10	19	16	10	7	-29	-13	-10	-20	-17	-25	-29	9	7	6	7
40,000	31	19	21	26	24	16	11	-34	-21	-23	-29	-26	-35	-40	12	11	11	13
30,000	31	21	20	25	24	15	10	-34	-23	-22	-28	-26	-36	-41	14	13	12	14
20,000	22	15	15	18	17	11	7	-23	-16	-16	-19	-18	-25	-29	11	10	8	10
ANCHORAGE TO SEATTLE																	1255 N.MI.	
53,000	21	9	5	14	11	3	0	-22	-9	-5	-15	-12	-21	-26	13	11	8	10
40,000	29	15	15	18	19	6	0	-31	-17	-17	-21	-21	-34	-41	19	17	17	19
30,000	26	12	13	13	16	1	-7	-29	-15	-15	-17	-19	-34	-42	22	22	20	23
20,000	15	5	8	9	9	-1	-7	-17	-6	-9	-11	-11	-21	-27	18	16	13	16
ANNETTE ISL., ALASKA TO JUNEAU																	222 N.MI.	
53,000	-16	-5	-3	-9	-7	-18	-23	14	4	3	8	7	-3	-8	17	15	11	13
40,000	-22	-5	-9	-7	-11	-27	-36	19	3	8	4	8	-8	-16	23	22	23	24
30,000	-20	-3	-8	-4	-9	-28	-38	16	0	6	0	5	-14	-24	28	28	26	29
20,000	-10	1	-5	-2	-4	-17	-25	8	-2	4	0	2	-11	-18	23	20	17	19
ANNETTE ISL., ALASKA TO SEATTLE																	571 N.MI.	
53,000	22	9	5	13	11	2	-2	-23	-10	-6	-14	-12	-22	-28	16	13	11	12
40,000	28	16	15	21	19	4	-4	-31	-18	-17	-24	-22	-38	-47	23	22	22	25
30,000	26	13	14	15	17	-1	-11	-30	-17	-16	-19	-20	-39	-48	27	27	24	27
20,000	16	6	10	11	10	-3	-10	-18	-8	-11	-13	-12	-25	-33	22	20	16	20
ATLANTA TO BALTIMORE																	500 N.MI.	
53,000	39	25	0	20	21	6	-1	-42	-27	-1	-21	-22	-38	-46	16	17	11	15
40,000	56	39	12	41	36	16	6	-63	-45	-14	-44	-41	-63	-75	26	27	21	26
30,000	51	34	12	34	31	13	5	-57	-39	-13	-37	-35	-57	-68	24	27	17	27
20,000	37	23	10	21	21	8	2	-40	-25	-11	-23	-23	-38	-47	20	20	11	19

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
ATLANTA TO CHARLESTON, S.C.																	225 N.MI.	
53,000	51	37	1	23	27	8	1	-52	-37	-2	-24	-29	-47	-55	17	18	11	17
40,000	71	56	14	44	46	22	11	-74	-59	-15	-47	-48	-72	-85	27	29	21	27
30,000	62	47	10	36	38	16	7	-64	-49	-11	-38	-39	-63	-74	24	27	16	26
20,000	39	31	8	20	22	9	3	-41	-32	-8	-21	-23	-40	-49	20	20	11	19
ATLANTA TO CHARLESTON, W.VA.																	315 N.MI.	
53,000	21	14	-3	11	10	-2	-8	-27	-17	2	-13	-13	-27	-34	17	17	11	16
40,000	31	21	2	24	19	0	-10	-44	-29	-4	-30	-26	-47	-58	27	29	22	27
30,000	28	18	4	20	16	-1	-9	-38	-24	-5	-25	-22	-41	-53	25	28	17	28
20,000	23	12	5	12	12	0	-6	-28	-15	-5	-14	-14	-28	-37	21	21	12	20
ATLANTA TO CHICAGO																	526 N.MI.	
53,000	-17	-12	-7	-9	-11	-21	-27	11	9	7	7	8	-1	-7	17	16	11	15
40,000	-28	-20	-16	-16	-20	-37	-46	13	13	14	9	12	-5	-14	27	26	21	26
30,000	-24	-18	-11	-14	-16	-33	-42	13	12	9	8	10	-6	-15	26	27	17	27
20,000	-14	-12	-6	-10	-10	-22	-29	8	9	5	7	7	-4	-11	21	20	12	20
ATLANTA TO CINCINNATI																	324 N.MI.	
53,000	-4	-3	-5	-1	-4	-14	-19	-3	-1	5	-1	1	-10	-16	18	17	11	16
40,000	-6	-6	-9	-1	-6	-23	-33	-10	-3	6	-7	-3	-21	-31	28	28	22	27
30,000	-5	-5	-5	0	-4	-20	-29	-8	-2	3	-5	-2	-19	-29	26	28	17	28
20,000	1	-4	-2	0	-1	-13	-20	-7	0	1	-2	-2	-14	-21	21	21	12	20
ATLANTA TO CLEVELAND																	482 N.MI.	
53,000	13	7	-3	8	5	-5	-10	-19	-10	2	-10	-8	-20	-27	17	16	11	15
40,000	15	10	-1	15	9	-8	-17	-30	-18	-2	-22	-17	-36	-46	27	27	21	26
30,000	14	9	2	13	9	-7	-16	-26	-16	-4	-19	-15	-33	-43	25	27	17	27
20,000	13	5	3	8	7	-5	-12	-19	-8	-4	-11	-9	-23	-30	21	21	12	20
ATLANTA TO DALLAS																	625 N.MI.	
53,000	-51	-38	-1	-24	-29	-46	-54	50	37	1	23	28	9	1	16	15	10	15
40,000	-77	-59	-13	-48	-50	-73	-85	75	57	12	47	48	24	12	26	26	19	23
30,000	-66	-49	-9	-37	-39	-63	-74	64	47	8	36	37	15	6	24	24	15	25
20,000	-42	-32	-5	-21	-23	-40	-48	41	31	5	20	23	8	3	19	18	10	17
ATLANTA TO DETROIT																	518 N.MI.	
53,000	4	2	-4	3	1	-9	-14	-10	-5	4	-5	-4	-15	-20	17	16	11	15
40,000	3	1	-6	6	1	-16	-25	-18	-9	2	-13	-9	-27	-37	27	27	21	26
30,000	3	1	-2	5	1	-14	-23	-16	-8	0	-11	-8	-25	-34	26	27	17	27
20,000	5	-1	0	3	2	-10	-16	-11	-3	-1	-6	-5	-17	-24	21	20	12	20
ATLANTA TO GREENSBORO																	265 N.MI.	
53,000	43	30	-1	20	22	6	-1	-46	-31	0	-22	-24	-42	-50	17	18	11	17
40,000	63	46	10	43	40	17	6	-69	-50	-12	-46	-44	-68	-80	27	29	21	27
30,000	57	39	9	35	33	13	4	-61	-43	-10	-38	-37	-60	-71	24	28	17	28
20,000	40	27	8	21	22	8	2	-42	-29	-9	-22	-23	-40	-49	21	21	11	20
ATLANTA TO HOUSTON																	603 N.MI.	
53,000	-49	-35	5	-20	-26	-43	-51	47	34	-5	19	25	4	-4	16	15	10	15
40,000	-73	-57	-5	-44	-46	-69	-81	71	54	4	42	43	19	6	25	25	19	22
30,000	-62	-46	-5	-33	-36	-58	-69	60	43	4	31	33	12	3	23	23	14	23
20,000	-39	-29	0	-18	-20	-37	-45	38	28	0	17	19	4	-2	18	17	9	16
ATLANTA TO INDIANAPOLIS																	376 N.MI.	
53,000	-14	-10	-6	-7	-9	-19	-25	8	7	6	5	6	-4	-9	17	17	11	16
40,000	-21	-17	-13	-12	-16	-33	-43	6	9	11	4	8	-10	-19	27	28	22	27
30,000	-19	-15	-8	-9	-12	-29	-39	6	8	7	4	6	-10	-19	26	28	17	28
20,000	-9	-10	-4	-6	-7	-19	-26	3	7	4	4	4	-8	-15	21	21	12	20
ATLANTA TO JACKSONVILLE																	241 N.MI.	
53,000	27	23	3	13	15	3	-3	-31	-26	-3	-14	-17	-32	-39	17	17	11	17
40,000	35	32	11	23	24	6	-3	-44	-39	-12	-27	-30	-49	-60	26	28	20	26
30,000	30	29	7	18	20	4	-4	-37	-33	-7	-22	-24	-42	-52	23	25	16	25
20,000	18	17	4	9	11	0	-5	-22	-20	-5	-10	-13	-26	-33	19	19	10	18
ATLANTA TO LOS ANGELES																	1686 N.MI.	
53,000	-44	-35	-5	-23	-27	-40	-46	43	34	4	22	27	12	5	13	11	8	11
40,000	-67	-54	-23	-44	-46	-64	-73	65	51	22	42	44	28	20	20	19	15	18
30,000	-57	-46	-16	-34	-37	-54	-63	54	44	15	33	35	19	13	21	19	12	18
20,000	-36	-29	-10	-19	-22	-35	-41	35	28	10	18	21	11	7	15	13	8	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ATLANTA TO LOUISVILLE																	279 N.MI.	
53,000	-14	-10	-6	-6	-9	-20	-26	8	7	6	4	6	-4	-10	18	17	11	16
40,000	-20	-17	-13	-11	-15	-33	-43	5	8	11	4	7	-11	-21	28	29	22	27
30,000	-17	-15	-8	-9	-12	-29	-38	5	8	6	3	5	-11	-20	26	28	17	29
20,000	-7	-10	-4	-5	-6	-18	-26	1	6	3	3	3	-9	-15	21	21	12	20
ATLANTA TO MELBOURNE																	386 N.MI.	
53,000	22	21	2	10	13	1	-4	-27	-24	-2	-12	-15	-28	-35	16	17	10	17
40,000	27	26	9	18	19	3	-5	-37	-34	-10	-23	-25	-43	-53	25	26	19	24
30,000	24	25	5	15	16	2	-5	-31	-30	-6	-18	-20	-36	-46	21	23	15	23
20,000	15	14	2	6	8	-2	-7	-18	-16	-3	-8	-10	-22	-29	18	18	10	16
ATLANTA TO MEMPHIS																	288 N.MI.	
53,000	-50	-37	-4	-24	-28	-46	-54	49	36	4	24	27	10	3	18	17	11	16
40,000	-73	-57	-18	-48	-48	-72	-84	69	54	17	45	46	23	13	28	29	21	26
30,000	-64	-47	-12	-38	-39	-63	-75	60	45	11	35	36	15	6	26	27	17	28
20,000	-40	-32	-9	-22	-24	-41	-49	38	31	9	21	23	9	3	21	20	11	19
ATLANTA TO MIAMI																	518 N.MI.	
53,000	16	17	2	8	10	0	-5	-21	-20	-2	-9	-12	-24	-31	15	16	10	16
40,000	20	20	8	13	15	0	-8	-30	-29	-9	-18	-20	-37	-46	24	24	18	23
30,000	17	21	5	11	12	0	-7	-24	-26	-5	-14	-16	-31	-39	20	21	14	21
20,000	11	11	1	4	6	-3	-8	-14	-13	-1	-5	-7	-18	-25	17	16	9	14
ATLANTA TO MOBILE																	263 N.MI.	
53,000	-41	-28	5	-17	-20	-37	-46	38	26	-5	16	18	2	-6	17	17	11	17
40,000	-63	-47	-2	-37	-37	-61	-73	57	41	1	33	33	10	-1	27	28	20	25
30,000	-53	-36	-4	-29	-29	-51	-62	49	32	3	26	26	6	-2	24	26	16	25
20,000	-34	-24	-1	-16	-17	-33	-41	32	22	1	15	16	2	-3	19	19	10	18
ATLANTA TO NEW ORLEANS																	369 N.MI.	
53,000	-45	-31	6	-18	-23	-40	-48	42	29	-6	17	21	2	-5	17	17	11	16
40,000	-67	-51	-3	-39	-41	-64	-76	63	46	2	36	37	13	1	26	27	20	23
30,000	-57	-40	-4	-30	-32	-54	-65	53	36	3	28	29	8	0	24	25	16	25
20,000	-36	-26	-1	-17	-18	-35	-43	34	24	0	16	17	3	-3	19	18	10	17
ATLANTA TO NEW YORK																	659 N.MI.	
53,000	40	25	2	22	21	7	1	-43	-27	-2	-23	-23	-38	-46	16	16	11	15
40,000	57	40	15	42	38	18	9	-64	-45	-18	-46	-43	-63	-75	25	26	20	25
30,000	52	36	15	36	33	15	7	-59	-40	-16	-39	-37	-58	-69	24	26	16	26
20,000	39	24	12	23	22	10	4	-42	-26	-12	-24	-24	-40	-48	20	20	11	19
ATLANTA TO NORFOLK																	448 N.MI.	
53,000	47	32	1	23	25	8	1	-49	-33	-1	-24	-26	-44	-52	16	17	11	16
40,000	68	50	14	47	44	21	10	-72	-53	-15	-49	-47	-70	-83	26	28	21	26
30,000	61	43	12	38	37	17	7	-64	-46	-13	-41	-40	-63	-74	24	27	16	26
20,000	43	29	10	23	24	11	5	-44	-31	-11	-24	-25	-42	-51	20	20	11	19
ATLANTA TO ORLANDO																	345 N.MI.	
53,000	19	19	2	9	11	1	-5	-24	-22	-3	-11	-14	-27	-34	16	17	11	17
40,000	24	24	9	16	17	1	-7	-34	-32	-10	-21	-23	-41	-51	25	27	19	25
30,000	21	23	5	13	15	0	-7	-28	-28	-6	-17	-19	-35	-44	22	24	15	23
20,000	13	13	3	6	8	-2	-8	-17	-15	-3	-7	-9	-21	-28	18	18	10	16
ATLANTA TO PHILADELPHIA																	579 N.MI.	
53,000	40	25	1	21	21	7	0	-43	-27	-1	-22	-23	-39	-46	16	16	11	15
40,000	57	40	14	42	37	17	8	-64	-45	-16	-45	-42	-63	-75	26	27	21	26
30,000	52	35	13	35	32	14	6	-58	-40	-15	-38	-36	-57	-68	24	26	16	26
20,000	38	23	11	22	22	9	3	-41	-26	-12	-23	-23	-39	-48	20	20	11	19
ATLANTA TO PITTSBURGH																	457 N.MI.	
53,000	23	14	-2	13	11	-1	-6	-28	-17	1	-14	-14	-27	-34	17	17	11	15
40,000	30	21	4	25	19	1	-9	-43	-28	-7	-31	-27	-47	-57	27	27	21	27
30,000	28	18	6	22	17	1	-8	-39	-24	-8	-26	-23	-42	-53	25	27	17	27
20,000	23	11	6	14	12	0	-6	-28	-14	-7	-16	-14	-29	-37	21	21	12	20
ATLANTA TO RALEIGH																	309 N.MI.	
53,000	47	33	0	22	25	7	0	-49	-34	0	-23	-26	-44	-52	17	18	11	16
40,000	69	50	12	47	44	20	9	-73	-54	-13	-49	-47	-72	-84	27	29	21	27
30,000	61	43	10	38	37	15	6	-65	-46	-11	-40	-39	-63	-74	24	27	17	27
20,000	43	29	9	22	23	10	4	-44	-31	-9	-23	-25	-42	-51	20	20	11	19

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
ATLANTA TO ST. LOUIS																	420 N.MI.	
53,000	-36	-26	-7	-18	-21	-35	-42	32	24	7	17	19	7	2	17	17	11	15
40,000	-53	-41	-21	-35	-36	-56	-67	43	35	19	30	31	13	4	27	27	21	26
30,000	-47	-35	-14	-28	-29	-49	-60	38	30	13	24	25	8	0	27	27	17	28
20,000	-29	-23	-10	-18	-18	-32	-41	24	21	9	16	16	5	-1	21	20	11	20
ATLANTA TO ST. PETERSBURG																	355 N.MI.	
53,000	7	11	3	5	6	-4	-9	-13	-14	-3	-6	-9	-20	-25	16	17	10	17
40,000	7	10	8	7	8	-8	-16	-19	-20	-9	-12	-14	-31	-40	25	26	19	24
30,000	7	13	4	6	7	-7	-14	-15	-19	-5	-9	-11	-26	-34	22	23	15	23
20,000	4	6	2	2	3	-7	-12	-8	-9	-2	-3	-5	-15	-22	18	18	10	16
ATLANTA TO SAN ANTONIO																	758 N.MI.	
53,000	-49	-37	5	-20	-27	-44	-51	48	36	-5	19	26	5	-4	15	15	10	14
40,000	-74	-59	-6	-45	-47	-70	-81	72	56	5	43	45	20	7	24	24	18	21
30,000	-63	-47	-4	-34	-37	-59	-70	61	45	4	32	35	13	3	23	22	14	22
20,000	-39	-30	0	-18	-21	-37	-45	38	29	0	17	20	5	-1	17	16	9	15
ATLANTA TO SAN FRANCISCO																	1853 N.MI.	
53,000	-41	-31	-8	-23	-26	-37	-43	40	31	7	23	25	13	8	12	11	8	10
40,000	-63	-48	-28	-43	-45	-60	-69	60	46	26	41	42	28	22	19	18	15	18
30,000	-54	-42	-20	-35	-36	-52	-61	51	40	19	33	34	20	14	20	18	12	18
20,000	-35	-27	-12	-20	-22	-33	-40	33	26	12	19	21	12	8	15	13	8	13
ATLANTA TO SHREVEPORT																	477 N.MI.	
53,000	-51	-38	0	-23	-29	-46	-54	50	37	-1	23	28	8	0	17	16	11	15
40,000	-77	-59	-11	-48	-49	-73	-85	75	57	10	46	48	23	10	26	27	20	23
30,000	-66	-49	-8	-37	-39	-63	-74	64	47	8	36	37	15	5	25	25	15	25
20,000	-42	-32	-4	-21	-23	-40	-49	41	31	4	20	22	7	2	19	18	10	18
ATLANTA TO TAMPA																	355 N.MI.	
53,000	9	12	3	5	7	-3	-8	-15	-15	-3	-7	-9	-20	-27	16	17	10	17
40,000	9	12	8	8	9	-7	-15	-21	-21	-9	-13	-16	-32	-41	25	26	19	24
30,000	8	14	4	7	8	-6	-13	-17	-20	-5	-10	-12	-27	-35	22	23	15	23
20,000	5	7	2	2	4	-6	-12	-9	-10	-2	-3	-5	-16	-22	18	18	10	16
ATLANTA TO WASHINGTON, D.C.																	475 N.MI.	
53,000	39	26	0	20	21	6	-1	-42	-28	-1	-21	-22	-38	-46	17	17	11	16
40,000	56	40	12	41	37	16	6	-64	-45	-14	-44	-41	-63	-75	26	27	21	26
30,000	51	35	11	34	31	13	4	-57	-39	-13	-37	-35	-57	-68	24	27	17	27
20,000	38	23	10	21	21	8	2	-40	-25	-10	-22	-23	-38	-47	20	20	11	19
BALTIMORE TO BOSTON																	321 N.MI.	
53,000	40	22	7	26	23	9	3	-42	-24	-8	-27	-24	-39	-47	19	17	12	16
40,000	57	39	27	46	41	21	11	-64	-43	-30	-49	-46	-67	-78	30	29	25	29
30,000	55	36	25	39	37	18	8	-61	-40	-27	-43	-41	-63	-75	32	31	21	30
20,000	41	24	18	27	26	12	5	-44	-27	-19	-29	-28	-44	-53	23	23	13	22
BALTIMORE TO BUFFALO																	245 N.MI.	
53,000	-16	-14	-8	-8	-11	-22	-29	10	11	8	6	9	-2	-8	19	17	13	16
40,000	-35	-23	-21	-17	-24	-43	-53	22	16	17	9	16	-3	-13	30	29	25	29
30,000	-33	-22	-15	-15	-21	-40	-51	21	16	12	8	14	-5	-15	30	31	21	30
20,000	-20	-18	-10	-9	-14	-28	-36	14	15	9	6	10	-3	-11	24	23	14	23
BALTIMORE TO CHARLOTTE																	313 N.MI.	
53,000	-38	-23	0	-20	-20	-35	-43	34	21	0	19	17	4	-3	17	18	12	16
40,000	-56	-39	-13	-42	-37	-58	-70	46	33	11	37	31	11	1	28	29	22	28
30,000	-51	-35	-13	-36	-32	-53	-64	42	30	12	32	27	10	1	26	29	18	28
20,000	-37	-22	-11	-22	-21	-36	-46	33	19	10	20	19	6	0	22	22	12	21
BALTIMORE TO CHICAGO																	539 N.MI.	
53,000	-44	-30	-13	-27	-27	-41	-48	43	29	12	26	26	14	9	17	16	12	15
40,000	-73	-49	-38	-47	-51	-71	-82	70	46	36	44	48	30	20	27	26	22	27
30,000	-69	-45	-30	-43	-45	-66	-78	66	43	29	39	43	24	15	27	28	18	28
20,000	-47	-31	-21	-28	-30	-46	-55	45	30	20	27	29	16	9	22	21	13	21
BALTIMORE TO DALLAS																	1048 N.MI.	
53,000	-48	-34	-4	-25	-28	-43	-50	47	33	3	24	27	11	4	15	14	9	13
40,000	-76	-54	-20	-48	-49	-70	-81	73	51	18	46	46	26	16	23	23	18	22
30,000	-67	-46	-15	-40	-41	-62	-73	65	44	14	37	38	19	11	22	23	14	23
20,000	-45	-31	-12	-24	-26	-41	-49	43	29	11	23	25	12	7	18	17	10	16

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HLADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BALTIMORE TO DENVER																	1302 N.MI.	
53,000	-44	-31	-12	-27	-28	-40	-46	43	30	12	26	27	16	11	14	13	9	12
40,000	-74	-48	-38	-47	-50	-68	-77	72	47	36	45	48	33	25	22	20	18	22
30,000	-65	-44	-29	-42	-43	-60	-71	62	42	28	39	41	26	19	23	22	14	22
20,000	-43	-29	-20	-28	-28	-41	-48	42	28	19	27	27	17	12	17	17	10	16
BALTIMORE TO DETROIT																	355 N.MI.	
53,000	-39	-27	-12	-24	-24	-37	-45	36	26	12	22	23	11	6	18	17	12	15
40,000	-68	-45	-36	-42	-47	-67	-79	63	41	34	38	43	24	14	29	28	24	28
30,000	-65	-42	-28	-38	-42	-63	-75	59	39	27	34	38	19	10	28	29	20	29
20,000	-44	-30	-19	-25	-28	-44	-53	41	29	19	23	26	13	6	23	23	13	22
BALTIMORE TO HOUSTON																	1080 N.MI.	
53,000	-46	-32	1	-22	-25	-40	-48	44	30	-1	21	24	7	0	14	14	9	13
40,000	-71	-51	-12	-45	-45	-66	-76	67	47	10	42	41	21	10	22	23	17	21
30,000	-62	-43	-10	-36	-37	-58	-68	59	40	9	33	34	15	7	21	22	13	22
20,000	-41	-28	-6	-21	-22	-38	-45	39	26	6	20	21	8	3	17	16	9	16
BALTIMORE TO KANSAS CITY																	833 N.MI.	
53,000	-48	-33	-11	-28	-29	-43	-50	47	32	10	27	28	15	9	16	15	10	13
40,000	-77	-52	-34	-50	-52	-72	-83	75	50	33	48	50	32	23	25	24	20	25
30,000	-71	-47	-27	-44	-45	-66	-78	68	45	26	42	43	25	17	25	25	16	25
20,000	-48	-32	-19	-29	-30	-45	-54	46	30	19	28	29	17	11	19	19	11	19
BALTIMORE TO LOS ANGELES																	2018 N.MI.	
53,000	-42	-31	-9	-24	-27	-37	-43	40	31	9	24	26	15	9	12	10	8	10
40,000	-68	-48	-33	-44	-47	-62	-71	65	46	32	42	45	32	25	19	17	14	17
30,000	-59	-43	-25	-37	-39	-54	-63	56	41	24	35	37	24	18	20	18	12	17
20,000	-38	-28	-17	-23	-25	-36	-42	37	27	16	22	24	15	11	14	13	8	13
BALTIMORE TO MIAMI																	822 N.MI.	
53,000	-14	-6	3	-6	-5	-15	-22	9	2	-4	4	2	-7	-12	14	15	9	15
40,000	-21	-17	2	-16	-12	-29	-37	9	8	-4	11	6	-9	-17	22	24	17	23
30,000	-17	-10	0	-13	-9	-23	-31	8	3	-1	9	5	-8	-15	20	21	14	21
20,000	-12	-7	-4	-9	-8	-17	-23	8	4	3	8	6	-3	-8	17	16	9	15
BALTIMORE TO MONTREAL																	399 N.MI.	
53,000	16	7	0	12	8	-2	-8	-21	-9	-1	-14	-11	-23	-29	18	16	12	15
40,000	20	12	7	20	14	-4	-14	-32	-19	-12	-27	-22	-41	-52	29	27	24	28
30,000	19	10	8	18	13	-5	-15	-31	-16	-12	-24	-20	-39	-51	31	30	21	29
20,000	16	6	6	13	9	-4	-11	-22	-9	-8	-16	-13	-27	-35	23	23	14	22
BALTIMORE TO PHOENIX																	1732 N.MI.	
53,000	-44	-33	-8	-25	-28	-40	-46	43	33	7	24	27	14	8	12	11	8	11
40,000	-72	-52	-29	-46	-48	-65	-75	69	50	28	44	46	31	23	20	19	15	19
30,000	-62	-46	-22	-38	-40	-58	-67	60	43	21	36	38	23	17	21	19	12	19
20,000	-41	-29	-15	-23	-25	-38	-44	39	28	15	22	24	14	10	15	14	8	13
BALTIMORE TO PROVIDENCE																	284 N.MI.	
53,000	42	24	7	27	24	10	4	-44	-25	-8	-28	-25	-40	-48	19	17	12	16
40,000	60	41	28	47	43	23	13	-66	-45	-31	-50	-47	-69	-80	30	29	25	29
30,000	58	39	26	41	39	20	10	-64	-43	-28	-44	-43	-65	-77	32	31	21	30
20,000	43	26	18	28	27	13	6	-45	-28	-19	-29	-29	-45	-54	24	23	13	22
BALTIMORE TO ROCHESTER, N.Y.																	241 N.MI.	
53,000	-7	-8	-6	-3	-6	-17	-23	1	6	6	0	3	-8	-14	19	17	13	16
40,000	-20	-13	-14	-6	-13	-33	-43	6	6	10	-2	5	-14	-24	30	29	25	29
30,000	-19	-14	-9	-5	-11	-31	-41	6	7	5	-2	4	-14	-25	31	31	21	30
20,000	-10	-12	-6	-3	-7	-21	-29	3	8	4	0	4	-10	-18	24	23	14	23
BALTIMORE TO ST. LOUIS																	639 N.MI.	
53,000	-50	-33	-10	-28	-29	-44	-52	49	33	9	28	29	15	8	17	16	11	14
40,000	-78	-53	-33	-51	-53	-74	-85	76	51	31	49	51	31	22	26	25	21	26
30,000	-72	-48	-26	-45	-46	-68	-80	70	46	25	43	44	25	17	26	27	17	27
20,000	-49	-32	-19	-29	-30	-46	-56	48	31	19	28	29	16	10	21	20	12	20
BALTIMORE TO SAN FRANCISCO																	2129 N.MI.	
53,000	-39	-28	-13	-25	-25	-35	-40	38	28	12	24	25	16	11	11	10	7	9
40,000	-63	-43	-38	-44	-46	-60	-67	61	42	37	41	44	32	26	18	17	14	18
30,000	-56	-40	-29	-37	-39	-53	-61	53	38	28	35	37	25	19	19	18	12	18
20,000	-37	-26	-19	-24	-25	-35	-41	35	25	18	23	24	16	12	14	13	8	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BALTIMORE TO SYRACUSE																	238 N.MI.	
53,000	7	0	-3	6	2	-9	-14	-13	-3	2	-9	-5	-17	-23	19	17	13	16
40,000	2	1	-3	9	2	-17	-27	-16	-9	-2	-17	-11	-30	-41	30	29	25	29
30,000	2	0	1	8	3	-16	-26	-15	-7	-4	-15	-10	-29	-40	31	31	21	30
20,000	5	-2	1	6	2	-11	-19	-11	-2	-3	-9	-6	-20	-28	24	23	14	[illegible]
BALTIMORE TO TAMPA																	733 N.MI.	
53,000	-24	-14	3	-11	-11	-23	-30	19	10	-4	9	8	-3	-8	15	15	10	15
40,000	-35	-27	-1	-26	-22	-40	-50	24	19	-1	20	15	-2	-10	23	25	18	24
30,000	-30	-20	-3	-21	-18	-34	-43	21	13	2	17	13	-1	-8	21	23	15	22
20,000	-22	-13	-5	-13	-12	-24	-31	18	11	5	11	10	0	-5	18	17	10	16
BERMUDA TO WASHINGTON																	717 N.MI.	
53,000	-43	-33	-7	-22	-25	-41	-48	41	31	7	21	24	10	4	17	17	10	15
40,000	-60	-48	-20	-35	-39	-59	-71	55	44	18	31	36	18	9	26	26	19	24
30,000	-54	-43	-16	-29	-33	-54	-64	50	40	15	26	30	14	6	26	25	15	23
20,000	-37	-29	-11	-17	-21	-36	-44	34	27	11	15	20	9	3	19	18	10	17
BILLINGS TO BISMARK																	328 N.MI.	
53,000	29	19	16	22	21	11	7	-30	-19	-16	-23	-21	-31	-37	16	14	11	13
40,000	41	29	42	36	37	20	11	-44	-30	-43	-38	-39	-56	-65	25	23	23	28
30,000	41	27	35	34	34	16	6	-43	-29	-37	-36	-36	-54	-64	29	27	21	29
20,000	28	19	23	24	23	11	5	-29	-20	-23	-26	-24	-37	-43	20	19	14	19
BINGHAMPTON TO PITTSBURGH																	217 N.MI.	
53,000	-45	-27	-9	-28	-26	-41	-49	43	25	9	27	25	12	5	19	17	13	16
40,000	-69	-45	-32	-50	-48	-70	-81	64	42	30	47	45	24	14	30	29	25	29
30,000	-66	-42	-29	-45	-44	-66	-78	61	38	27	42	40	21	11	30	31	21	30
20,000	-45	-27	-20	-30	-29	-45	-55	43	24	19	28	27	13	6	24	24	14	23
BIRMINGHAM TO CHARLOTTE																	304 N.MI.	
53,000	49	35	0	23	27	8	0	-51	-36	-1	-24	-28	-46	-54	17	17	11	16
40,000	74	53	12	47	47	22	10	-76	-56	-14	-49	-49	-73	-86	27	29	21	27
30,000	65	45	10	38	38	16	6	-67	-47	-10	-40	-40	-64	-76	25	27	17	27
20,000	43	31	8	22	24	10	3	-44	-32	-9	-23	-25	-42	-51	21	20	11	19
BIRMINGHAM TO CHICAGO																	508 N.MI.	
53,000	-8	-5	-5	-4	-6	-15	-21	1	2	5	1	3	-7	-13	17	16	11	15
40,000	-11	-10	-11	-7	-10	-27	-36	-4	2	8	0	2	-16	-25	27	26	21	26
30,000	-10	-9	-7	-6	-8	-24	-33	-3	2	5	0	1	-15	-24	27	27	17	28
20,000	-4	-6	-3	-5	-4	-16	-23	-2	3	2	2	1	-10	-17	21	20	12	20
BIRMINGHAM TO GREENSBORO																	368 N.MI.	
53,000	48	33	0	23	25	8	0	-49	-34	-1	-23	-27	-44	-52	17	17	11	16
40,000	71	51	12	46	45	21	10	-75	-54	-14	-49	-48	-72	-84	27	28	21	26
30,000	63	43	10	37	37	15	6	-66	-46	-11	-40	-39	-63	-75	24	27	16	27
20,000	43	30	9	22	23	10	4	-44	-31	-9	-23	-25	-42	-51	20	20	11	19
BIRMINGHAM TO NEW ORLEANS																	279 N.MI.	
53,000	-38	-25	6	-15	-17	-34	-42	34	23	-7	14	15	0	-8	17	17	11	16
40,000	-59	-42	0	-32	-33	-56	-68	52	35	-1	28	28	6	-4	27	27	20	24
30,000	-50	-33	-2	-25	-26	-48	-59	45	28	1	21	22	3	-5	25	26	16	25
20,000	-31	-21	2	-13	-14	-30	-39	29	19	-2	12	13	-1	-6	19	19	10	18
BIRMINGHAM TO NEW YORK																	750 N.MI.	
53,000	43	27	2	23	23	9	2	-45	-29	-3	-24	-25	-40	-47	16	15	10	14
40,000	62	43	17	44	41	21	12	-68	-47	-19	-47	-45	-66	-77	25	25	20	25
30,000	57	38	16	37	36	17	9	-62	-42	-17	-40	-39	-60	-71	24	25	16	25
20,000	41	25	12	23	24	11	5	-43	-28	-13	-25	-25	-41	-49	19	19	11	18
BIRMINGHAM TO PITTSBURGH																	519 N.MI.	
53,000	31	20	0	17	16	3	-3	-35	-22	0	-18	-18	-33	-40	17	16	11	15
40,000	45	30	8	32	28	9	-1	-55	-36	-11	-37	-34	-55	-66	26	27	21	26
30,000	41	26	9	27	24	7	-2	-49	-32	-10	-31	-29	-49	-61	25	27	17	27
20,000	30	17	8	17	16	4	-2	-34	-20	-9	-19	-18	-33	-42	21	20	11	20
BIRMINGHAM TO WASHINGTON, D.C.																	567 N.MI.	
53,000	43	29	1	22	23	8	1	-46	-30	-1	-23	-25	-41	-48	16	16	11	15
40,000	64	44	14	44	41	20	10	-69	-49	-16	-47	-45	-67	-79	26	27	20	25
30,000	57	39	13	36	35	15	7	-62	-42	-14	-39	-38	-60	-71	24	26	16	26
20,000	41	26	10	22	23	10	4	-43	-28	-11	-24	-24	-40	-49	20	20	11	19

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
BISMARK TO MINNEAPOLIS																	335 N.MI.	
53,000	33	20	15	25	22	12	7	-34	-20	-15	-25	-23	-34	-40	17	14	12	14
40,000	49	31	43	41	41	24	15	-51	-33	-45	-43	-43	-60	-70	25	23	23	28
30,000	47	30	37	37	37	19	10	-50	-32	-38	-39	-40	-58	-68	29	28	21	29
20,000	33	22	23	27	26	14	7	-34	-23	-24	-28	-27	-40	-47	21	20	14	20
BOISE TO DENVER																	556 N.MI.	
53,000	32	21	19	22	20	10	5	-33	-21	-10	-23	-21	-32	-38	16	14	11	14
40,000	47	31	29	35	35	18	9	-49	-33	-32	-37	-37	-55	-64	27	24	22	27
30,000	41	29	24	32	31	14	5	-44	-31	-26	-34	-33	-51	-61	30	27	19	27
20,000	28	19	15	21	20	8	2	-30	-20	-16	-22	-21	-34	-41	21	19	12	18
BOISE TO PORTLAND, ORE.																	298 N.MI.	
53,000	-30	-18	-11	-22	-20	-31	-37	30	17	10	21	19	9	4	17	15	11	13
40,000	-43	-31	-25	-37	-34	-53	-63	41	29	23	35	32	13	4	28	26	24	29
30,000	-43	-31	-24	-34	-33	-53	-64	40	29	22	32	30	11	0	32	30	23	31
20,000	-28	-19	-16	-22	-21	-35	-43	27	17	16	20	20	6	-1	23	22	15	21
BOISE TO RENO																	291 N.MI.	
53,000	-13	-13	-13	-12	-13	-22	-27	10	11	13	11	11	2	-4	18	15	11	14
40,000	-21	-16	-27	-21	-22	-40	-49	15	12	25	17	17	-1	-11	28	27	24	29
30,000	-20	-16	-22	-15	-18	-37	-47	14	12	20	10	14	-5	-16	32	29	23	29
20,000	-12	-10	-14	-11	-12	-25	-32	9	8	13	9	10	-3	-11	24	21	14	21
BOISE TO SALT LAKE CITY																	252 N.MI.	
53,000	27	16	5	18	16	5	0	-29	-17	-6	-19	-17	-28	-35	18	15	11	14
40,000	38	25	18	27	27	8	-1	-42	-28	-22	-31	-30	-49	-59	29	26	24	29
30,000	35	24	15	27	24	5	-5	-39	-27	-18	-30	-27	-47	-58	32	30	22	29
20,000	24	15	10	17	16	3	-4	-26	-17	-11	-18	-17	-31	-38	23	21	14	20
BOISE TO SAN FRANCISCO																	453 N.MI.	
53,000	-15	-15	-14	-14	-14	-23	-29	13	13	13	12	13	4	-1	17	14	11	13
40,000	-25	-19	-29	-23	-24	-41	-51	19	15	27	19	20	3	-7	27	26	23	27
30,000	-23	-18	-22	-17	-20	-38	-48	17	14	20	13	16	-2	-12	31	28	22	28
20,000	-14	-11	-14	-12	-13	-25	-32	11	10	13	10	11	-1	-8	23	21	13	19
BOISE TO SEATTLE																	346 N.MI.	
53,000	-28	-14	-7	-18	-16	-27	-33	27	14	7	18	15	5	0	17	14	11	13
40,000	-38	-26	-19	-33	-28	-47	-57	35	24	16	30	26	8	-2	27	25	23	29
30,000	-38	-26	-19	-30	-28	-48	-59	34	23	16	27	24	5	-5	31	30	23	30
20,000	-25	-15	-12	-19	-17	-31	-39	23	14	11	17	16	2	-5	22	21	15	21
BOSTON TO BUFFALO																	343 N.MI.	
53,000	-45	-29	-14	-29	-28	-41	-49	44	28	14	28	27	15	9	18	16	12	15
40,000	-72	-48	-41	-52	-52	-73	-84	69	46	39	50	50	31	21	29	28	25	29
30,000	-69	-46	-37	-46	-48	-70	-82	66	44	35	44	46	26	16	33	31	22	30
20,000	-46	-32	-25	-31	-32	-48	-57	45	30	24	30	31	17	10	23	23	14	22
BOSTON TO CHICAGO																	751 N.MI.	
53,000	-45	-29	-13	-29	-28	-41	-48	44	28	13	28	27	16	10	16	14	11	14
40,000	-72	-48	-40	-51	-52	-71	-81	70	46	38	49	50	32	23	26	24	22	25
30,000	-69	-45	-35	-46	-47	-67	-78	67	43	34	44	45	27	19	28	27	19	26
20,000	-47	-30	-24	-31	-31	-46	-54	45	29	23	30	31	18	12	21	20	12	20
BOSTON TO CLEVELAND																	488 N.MI.	
53,000	-47	-29	-13	-30	-28	-42	-50	46	29	12	29	28	15	9	17	16	12	15
40,000	-74	-49	-39	-53	-53	-73	-84	72	47	37	51	51	32	22	28	27	23	27
30,000	-71	-46	-35	-47	-48	-69	-81	68	44	33	45	46	27	17	30	29	20	28
20,000	-48	-31	-23	-32	-32	-48	-57	47	30	23	31	31	18	11	22	22	13	21
BOSTON TO DALLAS																	1348 N.MI.	
53,000	-46	-31	-6	-26	-27	-40	-47	45	30	5	25	26	12	6	14	13	9	12
40,000	-73	-50	-25	-48	-48	-67	-78	69	47	23	45	45	28	19	22	21	17	21
30,000	-66	-45	-20	-41	-41	-61	-71	63	42	19	38	38	22	14	22	22	14	22
20,000	-44	-29	-15	-26	-27	-41	-48	42	27	14	24	25	14	9	17	16	9	16
BOSTON TO DENVER																	1530 N.MI.	
53,000	-41	-28	-13	-27	-26	-37	-43	40	27	13	26	26	16	11	13	11	9	11
40,000	-69	-45	-40	-47	-49	-65	-73	66	44	39	45	47	33	26	20	19	17	20
30,000	-62	-42	-33	-42	-43	-59	-68	60	39	32	39	41	27	20	22	21	14	21
20,000	-41	-28	-22	-28	-28	-40	-47	40	27	21	27	27	18	13	16	16	10	15

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
BOSTON TO DETROIT																	548 N.MI.	
53,000	-46	-29	-13	-29	-28	-42	-49	45	28	13	29	28	15	10	17	15	12	14
40,000	-73	-49	-40	-52	-53	-72	-83	71	47	38	50	51	32	22	27	26	23	27
30,000	-70	-46	-35	-47	-48	-69	-80	68	43	34	44	46	27	18	29	29	20	28
20,000	-47	-31	-24	-32	-32	-47	-56	46	30	24	30	31	18	11	22	22	13	21
BOSTON TO LOS ANGELES																	2263 N.MI.	
53,000	-39	-29	-11	-24	-25	-35	-40	38	28	11	24	25	15	11	11	10	7	9
40,000	-64	-45	-37	-44	-46	-60	-67	61	42	36	41	44	32	26	18	16	14	17
30,000	-57	-41	-29	-37	-39	-53	-61	54	38	28	35	37	26	20	19	18	12	17
20,000	-37	-26	-19	-24	-25	-35	-41	35	25	19	23	24	16	12	14	13	8	12
BOSTON TO MIAMI																	1094 N.MI.	
53,000	-23	-12	2	-12	-10	-22	-28	18	9	-2	10	8	-2	-7	14	14	9	14
40,000	-34	-27	-4	-25	-22	-38	-47	23	19	2	20	16	1	-7	22	22	17	21
30,000	-29	-20	-6	-21	-18	-32	-41	21	14	4	17	13	0	-6	21	21	14	20
20,000	-21	-14	-7	-14	-13	-23	-29	17	11	6	13	11	2	-3	16	16	9	14
BOSTON TO MONTREAL																	221 N.MI.	
53,000	-21	-16	-11	-13	-15	-26	-32	17	14	10	11	13	2	-3	19	16	13	16
40,000	-37	-27	-26	-26	-29	-49	-59	26	22	22	18	22	3	-8	30	28	26	30
30,000	-35	-28	-24	-23	-27	-48	-59	24	22	20	16	21	0	-11	36	33	23	31
20,000	-21	-19	-15	-15	-17	-32	-40	16	16	14	12	14	0	-8	25	24	15	23
BOSTON TO PHILADELPHIA																	242 N.MI.	
53,000	-41	-23	-8	-27	-23	-38	-46	39	21	7	26	22	9	3	19	17	12	16
40,000	-62	-42	-30	-49	-45	-66	-78	56	38	27	45	41	20	10	30	29	25	30
30,000	-60	-40	-28	-42	-41	-63	-75	54	35	26	39	37	17	7	33	32	21	30
20,000	-43	-26	-19	-29	-28	-44	-53	40	24	18	27	26	12	4	24	24	14	23
BOSTON TO PITTSBURGH																	430 N.MI.	
53,000	-47	-29	-11	-30	-28	-43	-50	46	28	11	29	27	14	8	18	16	12	15
40,000	-73	-49	-37	-53	-52	-73	-84	70	47	35	51	50	30	20	28	27	24	28
30,000	-70	-46	-33	-47	-47	-69	-81	67	43	32	45	45	26	16	30	30	20	29
20,000	-48	-31	-23	-32	-32	-47	-57	47	29	22	30	30	17	10	23	22	13	22
BOSTON TO SAN FRANCISCO																	2343 N.MI.	
53,000	-36	-25	-14	-24	-24	-33	-38	35	25	14	24	24	16	12	11	9	7	9
40,000	-58	-40	-41	-43	-45	-57	-64	56	38	40	41	43	32	26	17	16	14	17
30,000	-54	-38	-34	-38	-40	-52	-59	51	35	32	35	37	26	20	19	17	12	17
20,000	-35	-25	-21	-25	-26	-34	-40	33	23	21	24	25	17	13	14	13	8	12
BOSTON TO SYRACUSE																	230 N.MI.	
53,000	-44	-28	-14	-28	-27	-41	-49	43	27	14	28	27	14	9	19	17	13	16
40,000	-70	-48	-40	-51	-52	-72	-84	67	46	39	48	49	29	19	30	29	26	30
30,000	-68	-46	-37	-45	-47	-69	-82	64	43	36	42	45	25	14	34	32	23	30
20,000	-45	-32	-25	-31	-32	-47	-56	43	30	24	29	31	16	9	24	24	15	23
BOSTON TO TAMPA																	1031 N.MI.	
53,000	-31	-18	1	-16	-15	-28	-34	26	15	-2	14	13	1	-4	14	14	9	14
40,000	-44	-34	-8	-33	-29	-47	-57	35	27	6	28	23	7	-1	22	23	17	22
30,000	-40	-27	-9	-28	-25	-41	-50	32	21	7	24	20	6	-1	21	22	14	21
20,000	-28	-18	-8	-18	-17	-29	-36	25	16	8	16	15	5	0	17	17	9	15
BOSTON TO WASHINGTON, D.C.																	346 N.MI.	
53,000	-42	-24	-7	-27	-24	-39	-47	40	22	6	26	22	9	3	18	17	12	16
40,000	-63	-43	-29	-49	-45	-66	-77	56	38	26	45	41	21	11	29	29	24	29
30,000	-61	-40	-27	-42	-41	-62	-74	54	36	25	39	37	18	8	31	31	20	29
20,000	-43	-26	-18	-28	-27	-43	-52	40	24	17	27	26	12	5	23	23	13	22
BUFFALO TO CHICAGO																	410 N.MI.	
53,000	-44	-28	-13	-28	-27	-40	-48	43	28	12	28	27	14	9	17	16	12	15
40,000	-71	-47	-39	-49	-51	-71	-82	69	45	37	47	49	30	20	28	26	23	28
30,000	-68	-43	-33	-45	-46	-67	-78	65	41	32	43	44	25	15	29	29	20	29
20,000	-46	-29	-23	-30	-30	-46	-54	44	27	22	29	29	16	9	23	22	14	22
BUFFALO TO DETROIT																	208 N.MI.	
53,000	-44	-28	-12	-29	-27	-41	-49	44	27	12	28	27	14	8	18	16	13	16
40,000	-71	-47	-38	-50	-51	-72	-83	69	45	36	48	49	29	19	29	28	25	29
30,000	-69	-43	-33	-46	-46	-68	-80	66	40	32	44	44	24	14	30	31	22	30
20,000	-46	-28	-23	-31	-31	-47	-56	45	27	22	29	29	15	8	24	24	14	23

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
BUFFALO TO NEW YORK																	261 N.MI.	
53,000	36	25	13	22	23	11	5	-39	-26	-13	-23	-24	-37	-45	18	17	13	16
40,000	58	40	34	38	42	22	12	-64	-43	-36	-42	-46	-66	-78	30	29	25	29
30,000	56	38	29	33	38	18	8	-62	-42	-31	-38	-41	-63	-75	32	31	21	30
20,000	37	28	20	23	26	12	5	-41	-30	-21	-25	-28	-43	-52	24	23	14	23
BUFFALO TO PHILADELPHIA																	241 N.MI.	
53,000	25	20	11	15	17	6	0	-29	-21	-11	-17	-19	-31	-37	19	17	13	16
40,000	43	30	27	25	31	12	1	-52	-35	-30	-31	-37	-57	-68	30	29	25	29
30,000	41	29	21	22	28	9	-1	-50	-34	-24	-28	-33	-54	-65	31	31	21	30
20,000	27	23	15	15	19	6	-2	-32	-25	-16	-18	-22	-37	-45	24	23	14	23
BUFFALO TO TAMPA																	917 N.MI.	
53,000	-16	-7	3	-8	-6	-17	-23	10	4	-4	5	3	-6	-11	14	14	10	14
40,000	-23	-16	1	-18	-13	-30	-38	9	7	-4	12	6	-9	-17	23	23	18	23
30,000	-20	-11	-2	-15	-11	-26	-34	9	4	0	10	5	-8	-15	20	23	15	22
20,000	-15	-6	-3	-9	-7	-18	-24	9	3	2	7	5	-5	-10	17	17	10	16
BUFFALO TO WASHINGTON, D.C.																	257 N.MI.	
53,000	6	9	7	3	6	-4	-10	-12	-11	-8	-6	-9	-20	-26	19	17	13	16
40,000	15	12	14	4	11	-7	-18	-29	-19	-18	-12	-20	-38	-49	29	29	24	29
30,000	15	12	9	4	10	-8	-19	-28	-19	-12	-11	-17	-36	-47	30	31	20	30
20,000	10	12	7	3	8	-6	-13	-16	-15	-8	-6	-11	-25	-33	24	23	14	23
BURBANK TO SAN FRANCISCO																	284 N.MI.	
53,000	-27	-19	-2	-14	-14	-27	-34	25	17	1	13	13	2	-4	19	16	12	14
40,000	-40	-33	-12	-24	-27	-46	-56	36	30	8	21	23	5	-5	29	27	22	26
30,000	-34	-31	-10	-20	-23	-42	-53	31	28	8	18	20	2	-7	31	28	21	26
20,000	-23	-16	-6	-10	-12	-26	-34	21	15	5	9	11	-1	-8	23	21	13	18
CALGARY TO GREAT FALLS																	240 N.MI.	
53,000	20	7	3	13	10	0	-4	-21	-8	-4	-14	-11	-21	-27	17	13	11	13
40,000	26	11	8	14	14	-3	-11	-29	-13	-11	-17	-17	-34	-43	24	23	23	27
30,000	22	12	7	18	14	-4	-14	-26	-15	-10	-22	-18	-37	-47	28	27	23	30
20,000	19	9	6	15	12	-1	-7	-21	-10	-8	-17	-14	-27	-34	20	19	15	20
CALGARY TO REGINA																	357 N.MI.	
53,000	28	16	15	24	20	11	7	-29	-17	-15	-25	-21	-30	-36	16	12	10	12
40,000	37	23	29	30	30	14	6	-38	-24	-31	-32	-31	-47	-55	22	21	22	25
30,000	40	23	27	34	31	14	4	-42	-25	-28	-37	-32	-50	-60	26	25	21	29
20,000	28	18	18	25	22	10	4	-29	-18	-19	-26	-23	-35	-41	19	17	14	19
CALGARY TO SASKATOON																	280 N.MI.	
53,000	24	16	14	22	19	10	5	-25	-16	-15	-23	-19	-29	-34	16	13	11	13
40,000	30	21	27	28	27	11	3	-32	-22	-29	-30	-28	-44	-52	22	21	22	25
30,000	35	20	26	31	28	11	1	-37	-22	-27	-34	-30	-48	-57	26	26	22	29
20,000	23	16	17	21	19	7	1	-24	-17	-17	-22	-20	-32	-39	19	18	15	19
CALGARY TO TORONTO																	1451 N.MI.	
53,000	32	18	15	24	21	14	10	-33	-19	-15	-25	-22	-30	-35	12	10	8	10
40,000	45	28	37	36	37	24	18	-47	-30	-39	-38	-39	-51	-58	17	16	16	20
30,000	45	29	33	36	35	22	15	-48	-31	-34	-38	-37	-51	-59	20	20	16	21
20,000	32	21	22	26	25	16	11	-33	-22	-23	-27	-26	-36	-41	15	14	10	15
CALGARY TO VANCOUVER																	370 N.MI.	
53,000	-23	-16	-13	-24	-19	-28	-34	22	16	13	23	18	9	4	16	14	11	12
40,000	-32	-23	-20	-34	-27	-43	-52	29	21	18	32	25	9	0	24	22	23	25
30,000	-36	-25	-25	-36	-30	-49	-59	33	23	23	34	28	10	0	28	28	24	29
20,000	-25	-17	-16	-25	-21	-34	-41	24	16	16	24	20	7	0	21	20	15	20
CASPER TO DENVER																	202 N.MI.	
53,000	15	8	0	11	8	-3	-8	-18	-10	-1	-13	-9	-21	-27	18	16	12	15
40,000	22	11	5	15	13	-6	-15	-30	-15	-10	-20	-18	-37	-48	29	26	24	29
30,000	18	10	5	16	11	-7	-17	-25	-14	-8	-20	-16	-35	-46	32	30	20	29
20,000	15	8	3	11	9	-4	-11	-18	-10	-4	-13	-10	-24	-32	23	21	13	20
CASPER TO SALT LAKE CITY																	277 N.MI.	
53,000	-28	-21	-15	-19	-20	-30	-36	26	20	14	18	19	9	4	18	15	11	15
40,000	-42	-31	-41	-36	-37	-56	-65	38	29	39	33	35	17	7	29	26	23	28
30,000	-38	-30	-33	-29	-32	-51	-61	33	27	32	26	30	11	1	32	29	20	28
20,000	-24	-19	-20	-19	-20	-32	-39	22	17	19	17	19	7	0	22	20	13	19

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CHARLESTON, S.C. TO NORFOLK																	305 N.MI.	
53,000	31	20	-3	15	15	1	-5	-35	-23	2	-17	-17	-33	-41	17	18	11	17
40,000	41	32	5	33	27	7	-3	-51	-39	-7	-38	-33	-55	-66	27	29	21	27
30,000	37	27	7	28	23	6	-3	-45	-32	-8	-31	-28	-48	-59	24	27	17	27
20,000	30	19	8	17	17	5	-1	-33	-22	-8	-19	-19	-33	-42	20	20	11	19
CHARLESTON, W.VA. TO HUNTSVILLE																	326 N.MI.	
53,000	-41	-27	-1	-21	-22	-38	-46	38	25	0	19	20	5	-1	18	17	11	16
40,000	-64	-44	-14	-42	-40	-63	-75	57	38	11	39	35	14	4	28	28	22	27
30,000	-57	-38	-11	-35	-34	-56	-68	51	33	10	32	30	11	2	26	28	17	28
20,000	-39	-25	-10	-21	-22	-38	-47	37	22	9	19	20	7	0	21	21	12	20
CHARLESTON, W.VA. TO NEW YORK																	386 N.MI.	
53,000	48	29	8	28	27	13	6	-49	-30	-8	-29	-28	-44	-52	18	17	12	16
40,000	71	48	29	50	49	28	18	-75	-51	-32	-53	-51	-73	-85	28	28	23	28
30,000	67	44	26	44	44	24	15	-71	-47	-28	-46	-46	-68	-81	28	29	19	29
20,000	47	29	19	29	29	15	9	-49	-31	-19	-30	-30	-47	-57	22	22	13	22
CHARLESTON, W.VA. TO WASHINGTON, D.C.																	216 N.MI.	
53,000	51	33	8	28	29	13	6	-51	-33	-8	-29	-29	-46	-54	18	18	12	16
40,000	77	52	29	51	51	29	19	-79	-54	-31	-53	-53	-76	-89	29	29	24	29
30,000	71	47	25	44	45	24	15	-73	-49	-26	-46	-47	-70	-83	27	30	19	30
20,000	49	32	18	28	30	15	9	-50	-33	-18	-30	-31	-48	-58	23	23	13	22
CHARLOTTE TO CHATTANOOGA																	210 N.MI.	
53,000	-54	-38	-3	-26	-30	-48	-56	53	37	3	25	29	10	3	18	18	11	17
40,000	-80	-59	-19	-52	-52	-77	-90	78	56	17	50	50	25	14	28	30	22	28
30,000	-71	-50	-14	-42	-43	-68	-80	69	48	13	40	41	18	8	25	28	17	29
20,000	-46	-34	-11	-24	-27	-45	-54	45	33	10	23	26	11	5	21	21	12	20
CHARLOTTE TO CHICAGO																	521 N.MI.	
53,000	-31	-22	-9	-17	-19	-31	-37	27	20	9	15	17	6	1	17	16	11	15
40,000	-52	-36	-25	-31	-35	-54	-64	42	30	23	25	29	12	3	27	26	22	27
30,000	-47	-32	-18	-26	-30	-49	-59	39	27	17	21	25	9	0	26	27	17	27
20,000	-30	-22	-12	-18	-19	-33	-41	25	20	11	16	17	5	-1	21	21	12	20
CHARLOTTE TO CLEVELAND																	374 N.MI.	
53,000	-4	-6	-6	-2	-4	-15	-20	-2	2	6	-1	2	-9	-15	18	17	12	16
40,000	-16	-10	-12	-2	-10	-28	-38	1	2	9	-6	2	-16	-26	28	28	22	28
30,000	-15	-9	-6	-2	-8	-24	-34	1	2	3	-5	1	-16	-25	26	28	18	28
20,000	-6	-9	-3	-1	-4	-17	-24	0	5	2	-2	1	-11	-19	22	22	12	21
CHARLOTTE TO COLUMBUS, OHIO																	302 N.MI.	
53,000	-15	-12	-8	-8	-10	-21	-27	9	9	7	5	8	-3	-9	18	17	12	16
40,000	-30	-21	-16	-12	-20	-38	-48	16	13	14	5	12	-6	-16	28	28	23	28
30,000	-27	-18	-10	-11	-16	-34	-44	15	11	8	4	10	-7	-16	26	29	18	29
20,000	-14	-14	-6	-7	-9	-23	-30	8	11	5	4	6	-6	-13	22	22	12	21
CHARLOTTE TO JACKSONVILLE																	290 N.MI.	
53,000	-10	-4	5	-4	-3	-14	-20	4	0	-5	2	0	-11	-16	16	17	11	17
40,000	-17	-12	5	-13	-8	-27	-36	4	2	-7	7	1	-16	-25	26	28	20	26
30,000	-14	-6	2	-10	-6	-22	-31	4	-1	-2	6	1	-13	-21	23	26	16	25
20,000	-12	-5	-2	-7	-6	-17	-24	7	2	1	5	3	-7	-13	19	19	10	18
CHARLOTTE TO MIAMI																	567 N.MI.	
53,000	0	5	3	1	2	-7	-13	-6	-8	-3	-3	-5	-14	-20	15	16	10	16
40,000	-3	-1	7	-2	1	-15	-23	-9	-8	-8	-3	-7	-22	-30	23	25	18	24
30,000	-1	5	4	-2	2	-11	-18	-7	-11	-4	-2	-6	-19	-26	19	22	14	21
20,000	-1	1	-2	-3	-1	-10	-16	-2	-4	2	1	0	-10	-15	17	16	9	15
CHARLOTTE TO NEW YORK																	469 N.MI.	
53,000	38	22	2	21	20	6	0	-41	-25	-2	-23	-22	-37	-45	17	17	11	15
40,000	51	37	16	41	35	16	6	-60	-42	-18	-45	-41	-61	-73	27	28	22	27
30,000	48	33	16	35	31	14	5	-55	-38	-17	-38	-36	-56	-68	26	28	18	27
20,000	37	22	12	23	22	9	3	-40	-24	-13	-24	-24	-39	-48	21	21	12	20
CHARLOTTE TO PHILADELPHIA																	389 N.MI.	
53,000	37	22	1	20	19	5	-1	-40	-24	-1	-22	-21	-37	-44	17	17	12	16
40,000	49	35	13	40	34	14	4	-58	-41	-16	-44	-39	-60	-72	27	28	22	28
30,000	46	32	14	34	30	12	3	-54	-37	-15	-37	-34	-55	-66	26	28	18	28
20,000	35	21	11	22	21	8	1	-39	-23	-12	-23	-22	-38	-47	21	21	12	20

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
CHARLOTTE TO RICHMOND																	222 N.MI.	
53,000	41	27	0	21	22	6	-1	-44	-29	-1	-22	-23	-40	-48	17	18	12	17
40,000	58	42	13	43	38	16	6	-65	-47	-15	-47	-43	-66	-78	28	29	22	28
30,000	53	37	13	36	33	14	4	-59	-41	-14	-39	-37	-59	-71	25	29	18	28
20,000	39	25	11	22	22	9	2	-42	-27	-11	-24	-24	-40	-50	22	22	12	21
CHARLOTTE TO WASHINGTON, D.C.																	287 N.MI.	
53,000	34	21	0	18	17	3	-3	-38	-23	0	-20	-20	-35	-43	17	18	12	16
40,000	46	33	10	37	31	11	0	-56	-39	-13	-42	-37	-58	-70	28	29	22	28
30,000	42	29	11	32	27	9	0	-51	-35	-13	-36	-32	-53	-64	25	29	18	28
20,000	33	19	10	20	19	6	-1	-37	-22	-10	-22	-21	-36	-46	22	22	12	21
CHATTANOOGA TO CINCINNATI																	242 N.MI.	
53,000	4	2	-5	3	0	-10	-16	-10	-5	4	-5	-3	-15	-22	18	17	12	16
40,000	5	1	-6	6	1	-17	-26	-20	-10	3	-13	-10	-29	-39	28	29	23	28
30,000	5	1	-2	5	2	-15	-24	-17	-9	1	-11	-8	-26	-36	27	29	18	29
20,000	7	0	0	3	2	-10	-17	-13	-4	-1	-5	-5	-18	-26	22	22	12	21
CHATTANOOGA TO MEMPHIS																	235 N.MI.	
53,000	-53	-38	-3	-26	-30	-48	-56	52	37	3	25	29	11	3	18	18	11	16
40,000	-80	-58	-19	-51	-51	-76	-89	78	56	17	49	49	25	14	28	29	22	27
30,000	-70	-49	-13	-41	-41	-67	-79	68	47	12	39	40	17	7	28	28	17	30
20,000	-45	-34	-10	-24	-26	-44	-53	44	33	9	23	25	10	4	22	21	11	20
CHATTANOOGA TO WASHINGTON, D.C.																	453 N.MI.	
53,000	45	29	2	24	24	9	2	-47	-31	-3	-25	-26	-42	-50	17	17	11	15
40,000	66	46	17	46	43	22	12	-71	-50	-19	-49	-47	-69	-81	27	28	21	27
30,000	60	40	15	39	37	17	9	-65	-44	-17	-41	-40	-63	-74	25	27	17	27
20,000	43	27	12	24	24	11	5	-45	-29	-13	-25	-26	-42	-51	21	21	12	20
CHICAGO TO CINCINNATI																	230 N.MI.	
53,000	26	19	10	16	17	6	1	-30	-21	-11	-18	-19	-31	-38	19	17	12	16
40,000	43	29	27	27	31	12	2	-52	-34	-30	-33	-37	-56	-67	29	27	24	30
30,000	40	27	20	24	27	9	-1	-48	-32	-22	-29	-32	-52	-63	30	30	20	30
20,000	28	20	13	19	19	6	-1	-32	-22	-14	-21	-21	-36	-45	23	23	14	22
CHICAGO TO CLEVELAND																	273 N.MI.	
53,000	44	29	13	27	27	15	9	-45	-30	-13	-28	-28	-41	-49	18	16	12	15
40,000	70	46	38	47	50	30	20	-72	-48	-40	-49	-52	-72	-83	29	27	24	29
30,000	66	43	32	42	44	25	15	-68	-45	-33	-45	-46	-67	-79	30	30	20	30
20,000	45	29	22	29	30	16	9	-46	-30	-22	-30	-31	-47	-56	23	23	14	22
CHICAGO TO COLUMBUS, OHIO																	256 N.MI.	
53,000	39	26	12	24	24	12	6	-41	-28	-13	-25	-25	-38	-46	18	17	12	16
40,000	63	42	35	41	44	25	15	-67	-45	-37	-44	-48	-68	-79	29	27	24	29
30,000	59	39	28	36	39	20	10	-63	-42	-29	-40	-42	-63	-75	30	30	20	30
20,000	41	27	19	26	27	13	6	-43	-29	-20	-27	-28	-44	-53	23	23	14	22
CHICAGO TO DALLAS																	693 N.MI.	
53,000	-31	-23	-2	-16	-17	-30	-37	27	21	2	15	15	4	-2	16	15	11	14
40,000	-55	-37	-14	-31	-33	-53	-63	46	31	11	26	27	10	1	26	24	20	25
30,000	-47	-31	-10	-25	-26	-46	-58	40	27	8	20	22	5	-3	27	25	16	26
20,000	-29	-19	-9	-14	-16	-29	-37	25	17	9	12	14	3	-2	20	19	11	18
CHICAGO TO DAYTON																	209 N.MI.	
53,000	34	24	12	21	22	10	4	-37	-25	-12	-22	-23	-36	-43	19	17	12	16
40,000	55	37	33	36	40	21	11	-62	-41	-35	-40	-44	-64	-75	29	27	24	30
30,000	52	35	25	32	35	16	6	-58	-38	-27	-36	-38	-59	-71	30	30	20	30
20,000	36	24	17	24	24	10	3	-39	-26	-18	-25	-26	-41	-50	23	23	14	23
CHICAGO TO DENVER																	781 N.MI.	
53,000	-39	-28	-13	-25	-25	-37	-43	38	27	12	24	24	14	9	16	14	10	13
40,000	-67	-44	-40	-44	-48	-65	-75	65	42	38	41	46	29	21	25	23	20	25
30,000	-57	-39	-31	-38	-40	-58	-67	54	37	30	36	38	22	14	27	25	17	25
20,000	-37	-26	-20	-26	-26	-39	-46	35	25	20	24	25	14	8	20	19	11	18
CHICAGO TO DES MOINES																	259 N.MI.	
53,000	-42	-29	-13	-26	-26	-40	-47	41	28	12	26	26	14	8	18	16	12	15
40,000	-69	-46	-39	-47	-50	-69	-81	67	45	38	45	48	28	19	28	26	24	30
30,000	-63	-42	-31	-42	-43	-64	-76	61	40	30	40	41	22	12	31	29	20	30
20,000	-42	-28	-22	-28	-29	-43	-52	40	26	21	27	27	14	7	23	22	14	22

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
CHICAGO TO DETROIT																	203 N.MI.	
53,000	43	28	12	27	27	14	8	-44	-29	-13	-28	-27	-41	-49	18	16	13	16
40,000	69	46	38	47	49	29	19	-71	-48	-39	-49	-51	-71	-83	29	27	24	30
30,000	65	41	32	42	43	24	14	-67	-44	-33	-45	-45	-67	-79	31	30	21	30
20,000	44	27	22	29	29	15	8	-45	-29	-23	-30	-30	-46	-55	24	23	14	23
CHICAGO TO EVANSVILLE																	237 N.MI.	
53,000	0	1	5	0	2	-9	-15	-5	-4	-5	-3	-4	-15	-20	19	17	12	16
40,000	-3	0	7	-1	1	-18	-28	-11	-7	-11	-6	-9	-27	-37	29	27	24	29
30,000	-2	1	5	-1	1	-17	-28	-10	-7	-7	-5	-8	-26	-36	30	29	20	30
20,000	0	2	1	3	2	-11	-19	-6	-5	-3	-6	-5	-18	-26	23	23	13	22
CHICAGO TO FORT LAUDERDALE																	1028 N.MI.	
53,000	14	13	5	8	9	1	-3	-20	-16	-5	-9	-12	-22	-27	14	14	9	13
40,000	18	17	12	12	14	1	-6	-30	-25	-14	-18	-21	-36	-44	22	22	17	21
30,000	16	17	8	10	12	0	-7	-26	-23	-9	-14	-17	-31	-38	20	21	14	21
20,000	11	11	3	6	7	-2	-7	-15	-13	-4	-8	-9	-19	-25	16	16	9	15
CHICAGO TO GREENSBORO																	511 N.MI.	
53,000	31	23	10	18	19	9	3	-35	-25	-10	-20	-21	-33	-41	17	16	11	15
40,000	50	35	27	30	35	17	8	-59	-40	-29	-35	-40	-59	-70	27	26	22	27
30,000	47	32	20	26	30	13	4	-54	-36	-21	-31	-34	-54	-65	26	27	18	28
20,000	31	23	13	19	20	8	2	-35	-25	-14	-21	-22	-37	-45	21	21	12	20
CHICAGO TO HARRISBURG																	510 N.MI.	
53,000	44	29	13	27	27	15	9	-45	-30	-13	-28	-28	-41	-49	17	16	12	15
40,000	71	47	38	46	50	31	21	-74	-49	-39	-49	-52	-72	-83	27	26	23	27
30,000	67	43	31	42	44	26	16	-70	-46	-32	-44	-46	-67	-79	28	28	19	28
20,000	46	30	21	28	30	17	10	-48	-31	-22	-30	-31	-46	-56	22	22	13	21
CHICAGO TO HARTFORD																	681 N.MI.	
53,000	45	29	13	28	27	16	10	-45	-29	-13	-29	-28	-41	-48	16	15	11	14
40,000	71	47	38	49	50	32	23	-73	-49	-40	-51	-52	-71	-82	26	25	22	26
30,000	67	43	33	44	45	27	18	-70	-46	-34	-46	-47	-67	-79	28	27	19	27
20,000	46	29	23	29	31	18	11	-47	-31	-23	-31	-32	-46	-55	21	21	13	20
CHICAGO TO HONOLULU																	3685 N.MI.	
53,000	-25	-22	-12	-18	-19	-25	-29	23	21	11	17	18	12	9	9	8	6	8
40,000	-43	-34	-30	-32	-34	-44	-49	40	32	29	30	32	24	19	14	13	11	12
30,000	-36	-29	-22	-26	-27	-36	-42	33	26	21	24	25	17	13	14	13	9	12
20,000	-22	-16	-11	-15	-15	-22	-26	21	15	10	14	14	9	6	10	9	6	8
CHICAGO TO HOUSTON																	821 N.MI.	
53,000	-25	-18	2	-11	-12	-24	-31	20	15	-2	10	10	-1	-6	16	14	10	13
40,000	-45	-29	-5	-23	-25	-43	-54	34	22	3	18	18	1	-7	25	24	19	23
30,000	-39	-24	-3	-18	-19	-38	-49	30	19	2	14	14	-1	-9	25	24	15	24
20,000	-24	-15	-3	-9	-11	-24	-31	19	12	2	7	9	-2	-7	18	18	10	17
CHICAGO TO KANSAS CITY																	350 N.MI.	
53,000	-39	-27	-9	-23	-23	-37	-44	37	26	9	22	22	10	4	18	16	12	15
40,000	-65	-43	-31	-42	-44	-64	-75	60	40	28	38	41	22	12	28	26	23	29
30,000	-58	-39	-24	-37	-37	-58	-70	53	35	22	33	34	16	6	31	29	19	29
20,000	-37	-25	-18	-23	-24	-39	-47	35	23	17	21	23	10	3	22	22	13	21
CHICAGO TO LAS VEGAS																	1313 N.MI.	
53,000	-36	-28	-12	-23	-24	-34	-40	35	27	11	22	23	13	9	14	12	9	11
40,000	-61	-42	-38	-41	-45	-60	-68	58	40	36	39	43	28	21	22	20	17	21
30,000	-51	-38	-29	-35	-37	-52	-61	48	36	28	32	35	21	14	24	22	14	21
20,000	-33	-24	-18	-22	-23	-34	-40	31	23	18	20	22	13	8	17	16	10	15
CHICAGO TO LOS ANGELES																	1512 N.MI.	
53,000	-36	-28	-11	-22	-23	-34	-39	34	27	10	21	23	13	9	13	11	8	11
40,000	-59	-42	-36	-40	-44	-58	-66	56	40	35	37	41	28	21	21	19	16	20
30,000	-50	-38	-27	-33	-36	-50	-58	47	35	26	31	33	21	14	23	20	13	19
20,000	-32	-24	-17	-20	-22	-32	-38	30	23	17	19	21	12	8	16	15	9	14
CHICAGO TO LOUISVILLE																	249 N.MI.	
53,000	15	11	8	9	10	0	-5	-20	-14	-9	-11	-13	-24	-30	19	17	12	16
40,000	23	17	18	14	18	0	-10	-35	-23	-22	-21	-25	-44	-54	29	27	24	29
30,000	21	16	13	13	15	-2	-12	-32	-22	-16	-19	-21	-40	-51	30	29	19	30
20,000	16	12	8	12	11	-2	-9	-21	-15	-9	-14	-14	-28	-36	23	23	13	22

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HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
CHICAGO TO MEMPHIS																	426 N.MI.	
53,000	-14	-9	2	-7	-6	-18	-24	8	6	-3	5	4	-6	-12	18	16	11	15
40,000	-28	-16	-2	-15	-15	-34	-44	15	8	-2	8	7	-11	-20	28	26	22	27
30,000	-25	-13	-2	-13	-12	-31	-41	14	7	0	7	6	-11	-20	29	28	18	29
20,000	-15	-8	-3	-5	-7	-20	-28	10	5	2	3	4	-8	-14	22	21	12	20
CHICAGO TO MIAMI																	1041 N.MI.	
53,000	14	13	5	7	9	1	-4	-19	-16	-5	-9	-12	-21	-27	14	14	9	13
40,000	17	16	12	11	14	0	-7	-29	-24	-13	-17	-20	-35	-43	22	22	17	21
30,000	16	16	8	9	12	0	-7	-25	-22	-9	-14	-17	-30	-38	20	21	13	21
20,000	10	10	3	6	7	-2	-7	-14	-13	-4	-7	-9	-19	-25	16	16	9	15
CHICAGO TO MINNEAPOLIS																	290 N.MI.	
53,000	-35	-22	-13	-23	-22	-34	-40	33	20	13	22	21	11	5	18	16	12	15
40,000	-54	-36	-40	-41	-42	-61	-71	49	33	37	38	39	21	11	27	25	24	29
30,000	-51	-35	-33	-37	-38	-58	-68	45	32	31	34	35	17	7	31	29	21	30
20,000	-36	-23	-21	-26	-26	-40	-48	33	22	20	24	24	11	4	23	22	14	22
CHICAGO TO MONTREAL																	647 N.MI.	
53,000	39	25	12	26	25	14	8	-40	-25	-13	-27	-25	-37	-44	16	14	12	14
40,000	63	41	36	45	46	28	19	-66	-43	-38	-48	-48	-66	-77	26	24	22	26
30,000	60	36	32	41	41	23	14	-64	-39	-34	-44	-44	-63	-74	29	28	20	27
20,000	40	24	22	28	28	15	8	-42	-26	-23	-29	-29	-43	-51	21	21	13	21
CHICAGO TO NASHVILLE																	356 N.MI.	
53,000	3	4	6	3	4	-6	-12	-9	-7	-6	-5	-7	-17	-23	18	16	12	15
40,000	3	4	10	2	5	-13	-23	-17	-12	-13	-10	-13	-31	-40	28	27	23	28
30,000	3	4	7	2	4	-13	-23	-15	-11	-9	-8	-11	-28	-38	29	28	18	29
20,000	3	4	3	5	4	-9	-16	-9	-8	-4	-7	-6	-19	-27	22	22	13	21
CHICAGO TO NEW ORLEANS																	728 N.MI.	
53,000	-13	-7	4	-5	-4	-15	-21	7	4	-5	3	2	-8	-12	16	15	10	14
40,000	-27	-13	2	-11	-11	-29	-38	13	4	-5	5	4	-12	-20	25	25	20	23
30,000	-23	-10	1	-9	-9	-26	-36	12	4	-2	4	3	-11	-19	25	25	16	25
20,000	-14	-6	0	-4	-5	-17	-24	9	3	-1	1	2	-8	-14	19	18	10	18
CHICAGO TO NEW YORK																	641 N.MI.	
53,000	45	29	13	28	27	15	10	-46	-30	-13	-28	-28	-42	-49	17	15	11	14
40,000	72	47	38	48	50	32	23	-74	-49	-39	-50	-52	-72	-82	26	25	22	26
30,000	68	44	32	43	45	27	18	-70	-46	-33	-45	-47	-67	-79	27	27	19	27
20,000	46	30	22	29	30	17	11	-48	-32	-23	-30	-31	-46	-55	21	21	12	20
CHICAGO TO OMAHA																	405 N.MI.	
53,000	-41	-29	-13	-26	-26	-39	-46	40	28	12	25	25	14	8	18	16	12	15
40,000	-69	-46	-39	-46	-49	-68	-79	66	44	37	43	47	28	19	28	25	23	28
30,000	-61	-41	-31	-41	-42	-62	-73	59	39	29	38	40	22	12	30	28	19	29
20,000	-40	-27	-21	-27	-28	-42	-50	39	26	20	26	26	14	7	22	21	13	21
CHICAGO TO PHILADELPHIA																	587 N.MI.	
53,000	44	29	12	27	27	15	9	-45	-30	-13	-28	-28	-41	-49	17	15	11	14
40,000	71	47	37	46	50	31	22	-74	-49	-39	-49	-52	-72	-82	27	26	22	27
30,000	68	44	31	41	44	26	17	-70	-46	-32	-44	-46	-67	-79	27	28	19	27
20,000	46	30	21	28	30	17	10	-48	-32	-22	-30	-31	-46	-55	21	21	12	21
CHICAGO TO PHOENIX																	1249 N.MI.	
53,000	-37	-30	-9	-22	-24	-35	-41	36	29	9	21	23	12	7	14	12	9	12
40,000	-63	-45	-32	-40	-44	-60	-69	59	43	30	37	41	26	19	23	20	17	21
30,000	-53	-40	-24	-33	-35	-52	-62	49	37	23	30	33	19	12	24	22	14	21
20,000	-33	-25	-16	-20	-22	-33	-40	31	23	16	18	21	11	7	17	16	9	15
CHICAGO TO PITTSBURGH																	358 N.MI.	
53,000	43	29	13	27	27	14	8	-44	-30	-13	-27	-27	-41	-48	18	16	12	15
40,000	70	46	38	46	49	30	20	-73	-48	-39	-48	-51	-71	-83	28	27	23	28
30,000	66	43	30	41	43	24	15	-68	-45	-32	-44	-45	-67	-79	29	29	20	29
20,000	45	29	21	28	29	16	9	-47	-31	-22	-29	-30	-46	-55	23	22	13	22
CHICAGO TO PORTLAND, ORE.																	1507 N.MI.	
53,000	-34	-21	-15	-25	-23	-31	-37	33	21	14	24	22	14	11	12	10	8	10
40,000	-51	-34	-40	-41	-41	-55	-62	49	33	38	39	40	27	20	19	17	17	20
30,000	-49	-33	-34	-39	-38	-52	-60	46	31	33	36	36	23	16	22	20	15	21
20,000	-33	-22	-22	-27	-26	-36	-41	32	21	22	26	25	16	11	15	15	10	15

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CHICAGO TO PROVIDENCE																	735 N.MI.	
53,000	45	29	13	28	27	16	10	-46	-29	-13	-29	-28	-41	-48	16	14	11	14
40,000	71	47	38	49	50	32	23	-73	-49	-40	-51	-52	-71	-81	26	25	22	25
30,000	67	43	33	44	45	27	19	-70	-46	-34	-46	-47	-67	-78	27	27	19	26
20,000	46	30	23	29	31	18	12	-47	-31	-23	-31	-32	-46	-54	21	20	12	20
CHICAGO TO ROCHESTER, MINN.																	233 N.MI.	
53,000	-38	-24	-14	-24	-24	-36	-43	36	23	13	24	23	12	6	18	16	12	15
40,000	-59	-39	-41	-44	-45	-64	-74	55	37	39	41	42	24	14	28	26	24	30
30,000	-55	-38	-33	-39	-40	-60	-72	51	35	32	36	38	19	9	31	29	21	30
20,000	-38	-25	-21	-27	-27	-42	-49	36	24	21	26	26	12	5	23	22	14	22
CHICAGO TO ROCHESTER, N.Y.																	457 N.MI.	
53,000	43	27	12	28	27	15	9	-44	-28	-13	-28	-27	-40	-48	17	15	12	15
40,000	68	45	37	47	49	30	21	-71	-47	-39	-50	-51	-70	-81	27	26	23	27
30,000	65	40	32	43	44	25	16	-68	-43	-34	-45	-46	-66	-78	29	29	20	28
20,000	44	27	22	29	29	16	9	-45	-28	-23	-30	-30	-45	-54	22	22	13	22
CHICAGO TO ST. LOUIS																	224 N.MI.	
53,000	-25	-17	-2	-14	-14	-26	-33	20	15	2	13	11	0	-5	19	17	12	15
40,000	-42	-28	-14	-27	-27	-47	-58	31	22	10	21	20	2	-8	29	27	24	30
30,000	-39	-24	-11	-24	-23	-43	-55	29	19	9	18	18	-1	-10	31	30	20	30
20,000	-24	-15	-10	-12	-15	-29	-37	20	12	9	9	12	-1	-8	23	23	13	22
CHICAGO TO SALT LAKE CITY																	1082 N.MI.	
53,000	-37	-26	-14	-25	-24	-35	-41	36	26	13	24	24	14	10	14	12	9	12
40,000	-60	-40	-42	-43	-46	-62	-70	58	39	41	41	44	29	22	23	20	19	23
30,000	-53	-37	-34	-38	-39	-55	-64	50	35	32	36	37	23	15	25	23	16	23
20,000	-35	-24	-21	-25	-26	-37	-43	33	23	20	24	25	14	9	18	17	11	16
CHICAGO TO SAN FRANCISCO																	1600 N.MI.	
53,000	-35	-26	-14	-23	-23	-33	-38	34	25	13	22	23	14	10	13	11	8	10
40,000	-56	-39	-40	-41	-43	-57	-64	53	37	39	39	41	29	22	20	18	16	20
30,000	-49	-36	-31	-35	-37	-50	-58	46	34	30	32	35	22	15	22	20	14	20
20,000	-32	-23	-19	-22	-23	-33	-39	30	22	19	21	22	13	9	16	15	9	14
CHICAGO TO SEATTLE																	1491 N.MI.	
53,000	-33	-21	-14	-25	-22	-31	-36	32	20	14	24	22	14	10	12	10	8	10
40,000	-49	-33	-38	-41	-40	-53	-60	47	31	37	38	38	25	19	19	17	17	20
30,000	-48	-32	-34	-39	-38	-52	-60	45	30	32	37	36	22	15	22	20	16	21
20,000	-33	-22	-22	-27	-26	-35	-41	32	21	21	26	25	15	10	15	15	10	15
CHICAGO TO SPOKANE																	1301 N.MI.	
53,000	-34	-21	-14	-25	-23	-32	-37	33	20	14	24	22	14	10	13	11	9	10
40,000	-50	-33	-40	-41	-41	-55	-62	48	31	38	39	39	25	19	20	18	18	21
30,000	-49	-32	-34	-39	-38	-53	-61	46	30	33	37	36	22	15	23	21	16	22
20,000	-34	-22	-22	-28	-26	-36	-42	33	21	21	27	25	15	10	16	15	11	15
CHICAGO TO TAMPA																	881 N.MI.	
53,000	10	10	5	6	8	-1	-6	-16	-13	-5	-8	-10	-20	-25	15	14	10	14
40,000	12	12	11	9	11	-4	-12	-25	-21	-13	-15	-18	-33	-41	23	23	18	23
30,000	11	13	7	7	9	-4	-11	-21	-19	-9	-12	-14	-29	-37	22	23	14	23
20,000	7	8	4	5	6	-4	-9	-12	-11	-4	-7	-8	-18	-24	17	17	10	16
CHICAGO TO TORONTO																	378 N.MI.	
53,000	41	26	12	27	25	13	8	-42	-27	-12	-27	-26	-39	-46	17	16	12	15
40,000	65	43	36	45	47	28	18	-68	-45	-38	-48	-49	-68	-79	28	26	23	28
30,000	62	38	31	41	42	23	13	-65	-41	-32	-44	-44	-65	-76	30	29	21	29
20,000	42	25	22	28	28	14	7	-43	-27	-22	-29	-29	-44	-53	23	22	14	22
CHICAGO TO TUCSON																	1247 N.MI.	
53,000	-37	-30	-8	-21	-23	-35	-41	35	29	8	20	22	11	6	14	12	9	12
40,000	-63	-46	-28	-39	-43	-59	-69	59	43	27	36	40	25	17	23	20	17	21
30,000	-53	-40	-21	-32	-34	-51	-61	49	37	20	29	32	18	11	24	21	14	20
20,000	-33	-25	-14	-19	-21	-33	-39	31	23	14	17	20	10	6	17	16	9	15
CHICAGO TO TULSA																	508 N.MI.	
53,000	-34	-25	-6	-19	-20	-33	-40	31	23	5	18	18	7	1	17	16	11	14
40,000	-59	-39	-21	-36	-38	-58	-69	52	35	19	31	33	15	5	27	25	22	27
30,000	-52	-35	-16	-30	-31	-52	-63	46	30	14	26	27	10	1	29	27	18	28
20,000	-33	-22	-13	-18	-20	-34	-42	29	20	12	16	18	6	0	21	20	12	20

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CHICAGO TO WASHINGTON, D.C.																	530 N.MI.	
53,000	42	29	12	25	26	14	8	-44	-30	-12	-26	-27	-40	-48	17	16	12	15
40,000	69	46	36	43	47	29	19	-73	-48	-37	-46	-50	-70	-81	27	26	22	27
30,000	65	42	28	38	42	23	14	-68	-45	-29	-42	-44	-65	-77	27	28	18	28
20,000	44	30	20	26	28	15	9	-46	-31	-20	-28	-30	-45	-54	22	21	12	21
CHICAGO TO WATERLOO																	203 N.MI.	
53,000	-42	-28	-14	-27	-26	-39	-47	41	27	14	26	26	14	8	19	16	12	15
40,000	-67	-45	-41	-47	-50	-70	-80	65	44	40	45	48	29	19	29	26	24	30
30,000	-63	-42	-34	-42	-44	-65	-76	60	40	33	40	42	23	13	32	30	21	30
20,000	-42	-28	-22	-29	-29	-44	-53	41	26	22	28	28	15	7	23	23	14	22
CHICAGO TO WEST PALM BEACH																	995 N.MI.	
53,000	15	14	5	8	10	1	-3	-21	-17	-5	-10	-12	-22	-28	14	14	9	14
40,000	20	18	13	12	15	1	-6	-32	-25	-14	-18	-22	-37	-45	22	22	17	22
30,000	18	17	8	10	13	0	-6	-27	-23	-9	-15	-18	-32	-40	20	21	14	21
20,000	11	11	4	6	7	-2	-7	-16	-14	-4	-8	-10	-20	-26	16	16	9	15
CINCINNATI TO DALLAS																	698 N.MI.	
53,000	-44	-32	-3	-22	-25	-40	-47	41	30	2	21	23	9	2	16	15	10	14
40,000	-71	-50	-16	-43	-44	-66	-78	67	46	15	40	41	20	10	26	25	20	24
30,000	-62	-42	-12	-34	-36	-59	-70	58	39	10	31	33	13	5	26	25	16	26
20,000	-40	-28	-10	-20	-22	-38	-46	38	26	10	19	21	9	3	19	18	10	18
CINCINNATI TO DETROIT																	200 N.MI.	
53,000	15	8	-1	10	7	-4	-10	-20	-11	0	-12	-10	-22	-29	19	17	13	16
40,000	16	11	2	15	11	-8	-18	-29	-18	-7	-22	-19	-39	-49	30	28	24	29
30,000	15	9	5	14	10	-8	-18	-27	-16	-8	-20	-17	-36	-47	30	30	20	30
20,000	11	4	5	8	7	-7	-14	-17	-8	-6	-11	-10	-24	-32	23	23	14	23
CINCINNATI TO FORT LAUDERDALE																	811 N.MI.	
53,000	10	11	4	5	7	-2	-6	-16	-14	-4	-7	-10	-20	-25	15	15	9	15
40,000	11	12	9	7	10	-5	-12	-24	-20	-11	-12	-16	-32	-40	23	24	17	22
30,000	10	13	6	6	8	-4	-11	-20	-19	-7	-10	-13	-27	-34	20	22	14	21
20,000	6	8	1	2	4	-5	-10	-10	-11	-2	-4	-6	-16	-22	17	16	9	15
CINCINNATI TO LOS ANGELES																	1646 N.MI.	
53,000	-40	-31	-9	-23	-25	-37	-43	39	31	8	23	25	14	9	13	11	8	11
40,000	-65	-48	-32	-43	-46	-61	-70	63	46	31	40	44	30	23	20	19	15	19
30,000	-55	-42	-24	-35	-37	-53	-62	53	40	23	33	35	22	16	22	20	13	19
20,000	-35	-27	-15	-21	-23	-34	-41	34	26	15	20	22	13	9	15	14	8	13
CINCINNATI TO MIAMI																	825 N.MI.	
53,000	9	11	4	5	7	-2	-7	-15	-14	-4	-7	-9	-19	-25	14	15	9	15
40,000	10	11	9	6	9	-5	-13	-23	-20	-11	-12	-16	-31	-39	22	23	17	22
30,000	10	13	6	5	8	-4	-11	-19	-19	-6	-9	-13	-26	-34	20	21	14	21
20,000	5	7	1	2	4	-5	-10	-10	-10	-2	-4	-5	-16	-21	17	16	9	15
CINCINNATI TO NEW YORK																	510 N.MI.	
53,000	49	31	10	29	29	15	8	-50	-32	-10	-30	-29	-44	-52	17	16	12	15
40,000	75	50	33	51	51	31	21	-78	-52	-35	-53	-53	-74	-86	28	27	23	27
30,000	71	46	29	45	45	26	17	-73	-48	-30	-47	-47	-69	-82	27	28	18	28
20,000	49	31	20	30	30	17	11	-51	-32	-21	-31	-32	-48	-58	22	22	12	21
CINCINNATI TO PITTSBURGH																	222 N.MI.	
53,000	47	29	8	28	27	12	6	-48	-30	-9	-28	-28	-43	-52	19	17	13	16
40,000	70	46	29	48	47	26	16	-74	-49	-31	-50	-50	-72	-84	29	28	24	29
30,000	65	42	25	43	42	22	12	-69	-45	-26	-45	-44	-67	-80	28	30	19	30
20,000	45	27	18	28	28	14	7	-47	-29	-19	-29	-29	-46	-56	23	23	13	23
CINCINNATI TO ST. LOUIS																	267 N.MI.	
53,000	-49	-34	-9	-28	-29	-44	-52	48	33	9	27	28	14	7	19	17	12	16
40,000	-77	-53	-31	-50	-52	-74	-86	75	51	30	48	50	29	19	29	28	23	29
30,000	-70	-47	-24	-44	-44	-67	-80	68	45	23	41	42	22	13	30	29	19	30
20,000	-47	-31	-18	-28	-29	-46	-55	46	30	18	27	28	14	8	23	22	13	22
CINCINNATI TO ST. PETERSBURG																	675 N.MI.	
53,000	2	5	4	2	4	-6	-11	-9	-9	-5	-4	-6	-16	-21	15	15	10	15
40,000	0	4	8	0	3	-12	-21	-14	-13	-10	-7	-11	-26	-34	24	25	19	23
30,000	1	6	4	0	3	-11	-19	-11	-12	-5	-5	-8	-22	-30	22	23	15	23
20,000	-1	4	2	0	1	-9	-15	-4	-7	-2	-2	-3	-14	-19	18	18	10	16

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
CINCINNATI TO TAMPA																	673 N.MI.	
53,000	3	6	4	3	4	-5	-10	-10	-9	-5	-4	-7	-16	-22	15	16	10	15
40,000	1	5	8	1	4	-11	-20	-15	-14	-10	-7	-11	-27	-35	24	25	19	23
30,000	2	6	5	1	3	-10	-18	-12	-13	-6	-6	-9	-23	-31	22	23	15	23
20,000	0	4	2	0	1	-9	-14	-5	-7	-2	-2	-4	-14	-20	18	18	10	17
CINCINNATI TO WASHINGTON, D.C.																	356 N.MI.	
53,000	49	33	9	28	29	14	8	-50	-33	-10	-29	-29	-45	-53	18	17	12	16
40,000	77	52	32	49	51	31	21	-79	-54	-33	-52	-53	-75	-87	28	28	23	28
30,000	72	47	26	43	45	25	16	-74	-49	-27	-46	-47	-69	-82	27	29	18	29
20,000	49	32	19	28	30	16	9	-50	-33	-19	-29	-31	-48	-58	22	22	13	21
CLEVELAND TO HARTFORD																	413 N.MI.	
53,000	46	29	12	29	28	15	9	-47	-30	-13	-30	-29	-43	-51	18	16	12	15
40,000	73	48	37	50	51	32	22	-75	-50	-39	-53	-53	-74	-85	28	27	24	28
30,000	70	45	33	45	46	27	17	-72	-47	-34	-47	-48	-70	-82	30	30	20	29
20,000	48	31	23	30	31	17	11	-49	-32	-23	-32	-32	-48	-58	23	22	13	22
CLEVELAND TO INDIANAPOLIS																	226 N.MI.	
53,000	-45	-28	-9	-27	-26	-41	-49	43	27	8	26	25	12	5	19	17	13	16
40,000	-70	-46	-31	-48	-48	-69	-81	65	43	29	45	45	24	14	29	28	24	29
30,000	-65	-42	-26	-43	-42	-65	-77	61	39	25	40	39	20	10	30	30	20	30
20,000	-44	-27	-19	-28	-28	-44	-53	42	25	18	26	26	12	5	23	23	14	23
CLEVELAND TO KNOXVILLE																	351 N.MI.	
53,000	-21	-11	2	-12	-10	-22	-29	16	8	-2	9	7	-4	-10	18	17	12	16
40,000	-31	-19	-4	-24	-19	-38	-49	16	11	1	17	11	-7	-17	28	28	23	28
30,000	-28	-17	-6	-21	-17	-36	-46	15	10	4	15	10	-6	-15	27	29	18	29
20,000	-19	-8	-5	-12	-10	-24	-32	13	5	4	9	7	-5	-12	22	22	12	21
CLEVELAND TO LOS ANGELES																	1779 N.MI.	
53,000	-38	-29	-11	-23	-25	-35	-41	37	29	10	23	24	14	10	12	11	8	10
40,000	-63	-45	-36	-42	-45	-60	-67	60	43	34	39	43	30	24	20	18	15	19
30,000	-54	-40	-27	-35	-37	-52	-61	51	38	26	33	35	23	17	21	19	13	18
20,000	-35	-26	-18	-22	-24	-34	-40	33	24	17	21	23	14	10	15	14	8	13
CLEVELAND TO MIAMI																	940 N.MI.	
53,000	-1	4	4	0	2	-7	-12	-5	-7	-4	-2	-5	-13	-18	14	14	9	14
40,000	-1	0	7	-4	1	-14	-22	-12	-9	-9	-3	-8	-22	-30	22	23	17	22
30,000	-1	4	3	-3	1	-11	-19	-10	-10	-5	-2	-6	-19	-26	19	21	14	21
20,000	-1	3	-1	-3	0	-10	-15	-4	-6	0	1	-2	-11	-17	16	16	9	15
CLEVELAND TO MILWAUKEE																	284 N.MI.	
53,000	-42	-28	-14	-27	-26	-39	-47	41	27	13	26	25	14	8	18	16	12	15
40,000	-68	-45	-40	-47	-50	-69	-80	65	43	39	44	47	28	18	28	27	24	29
30,000	-65	-43	-33	-43	-44	-65	-77	61	40	32	40	42	23	13	30	30	21	30
20,000	-44	-29	-22	-29	-30	-45	-54	42	28	22	28	29	15	8	23	23	14	22
CLEVELAND TO NEW YORK																	368 N.MI.	
53,000	46	30	12	28	28	15	9	-47	-31	-13	-29	-29	-43	-51	18	16	12	15
40,000	74	49	37	49	51	31	21	-76	-51	-39	-51	-53	-74	-86	29	28	24	28
30,000	70	45	32	43	46	26	17	-73	-48	-33	-46	-48	-70	-82	29	30	20	29
20,000	48	32	22	29	31	17	10	-50	-33	-23	-31	-32	-48	-58	23	23	13	22
CLEVELAND TO PHILADELPHIA																	315 N.MI.	
53,000	43	29	12	26	27	14	8	-45	-30	-13	-27	-28	-42	-50	18	17	12	16
40,000	72	47	36	45	49	29	19	-75	-50	-38	-48	-52	-73	-84	29	28	24	28
30,000	68	44	30	40	44	24	15	-71	-47	-31	-43	-46	-68	-81	29	30	20	30
20,000	47	31	21	27	30	16	9	-49	-33	-21	-29	-31	-47	-57	23	23	13	22
CLEVELAND TO ROCHESTER, N.Y.																	212 N.MI.	
53,000	41	25	9	26	24	11	5	-42	-26	-10	-27	-25	-39	-47	18	17	13	16
40,000	62	40	30	45	43	23	13	-66	-44	-33	-48	-47	-68	-79	29	28	25	29
30,000	59	35	27	41	39	20	10	-64	-39	-29	-44	-42	-64	-76	30	31	21	30
20,000	41	23	19	27	26	12	5	-43	-25	-20	-29	-28	-44	-53	24	24	14	23
CLEVELAND TO ST. LOUIS																	422 N.MI.	
53,000	-45	-30	-9	-27	-27	-41	-49	44	29	8	26	26	12	6	18	16	12	15
40,000	-71	-48	-31	-48	-49	-69	-80	68	45	29	45	46	26	16	28	26	23	28
30,000	-66	-43	-25	-43	-42	-64	-76	63	41	24	40	40	21	12	29	28	19	29
20,000	-45	-28	-19	-27	-28	-44	-53	43	26	18	26	27	13	7	22	22	13	21

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
CLEVELAND TO ST. PETERSBURG																	811 N.MI.	
53,000	-9	-2	4	-3	-2	-12	-17	2	-2	-4	1	-1	-10	-15	15	15	10	14
40,000	-13	-7	5	-10	-6	-22	-31	-1	-2	-7	4	-2	-17	-25	23	24	18	23
30,000	-11	-4	1	-9	-5	-19	-27	0	-3	-3	3	-1	-14	-22	21	23	15	23
20,000	-8	-2	-1	-5	-4	-14	-20	3	-1	0	3	1	-9	-14	18	17	10	16
CLEVELAND TO TAMPA																	808 N.MI.	
53,000	-8	-2	4	-3	-2	-11	-17	2	-2	-5	1	-1	-10	-15	15	15	10	14
40,000	-12	-7	5	-10	-6	-21	-30	-2	-2	-7	3	-2	-17	-25	23	24	18	23
30,000	-10	-3	1	-8	-4	-19	-27	-1	-4	-3	3	-1	-15	-22	21	23	15	23
20,000	-8	-1	-1	-5	-3	-14	-20	2	-2	0	3	1	-9	-15	18	18	10	16
CLEVELAND TO WASHINGTON, D.C.																	269 N.MI.	
53,000	35	26	11	21	22	10	4	-38	-27	-12	-22	-24	-37	-44	18	17	13	16
40,000	60	40	32	35	41	22	12	-67	-44	-34	-40	-45	-66	-78	29	29	24	29
30,000	57	37	24	31	36	17	7	-63	-41	-26	-36	-40	-61	-73	28	30	20	30
20,000	39	28	17	21	25	11	4	-42	-30	-18	-23	-27	-43	-52	23	23	13	22
COLORADO SPRINGS TO OKLAHOMA CITY																	397 N.MI.	
53,000	35	25	6	21	21	8	2	-37	-27	-6	-22	-22	-36	-43	18	16	12	15
40,000	53	38	23	38	37	19	9	-59	-41	-25	-40	-40	-60	-71	30	26	21	26
30,000	43	33	19	32	30	13	4	-47	-36	-20	-34	-32	-52	-63	30	27	17	27
20,000	31	23	10	19	19	7	1	-33	-25	-11	-21	-20	-35	-43	22	19	12	19
COLUMBIA TO JACKSONVILLE																	214 N.MI.	
53,000	-10	-3	4	-4	-2	-14	-21	4	0	-5	2	0	-11	-16	17	18	11	18
40,000	-17	-12	6	-12	-8	-27	-36	4	2	-7	6	1	-16	-25	26	28	20	26
30,000	-14	-5	2	-9	-6	-22	-30	4	-1	-3	5	1	-14	-22	23	25	16	25
20,000	-11	-5	-2	-6	-5	-17	-23	6	2	1	5	3	-7	-13	19	19	10	18
COLUMBIA TO MERIDIAN																	395 N.MI.	
53,000	-51	-37	1	-23	-28	-46	-54	50	36	-1	23	27	7	-1	17	17	11	16
40,000	-76	-58	-11	-48	-48	-73	-85	73	56	9	46	47	21	9	26	27	20	25
30,000	-65	-48	-9	-38	-39	-63	-74	64	45	8	36	37	15	5	24	26	16	26
20,000	-42	-32	-7	-21	-24	-41	-49	41	31	6	20	23	8	3	19	19	10	18
COLUMBIA TO MONTGOMERY																	283 N.MI.	
53,000	-50	-35	2	-23	-27	-45	-53	49	34	-2	22	26	6	-2	17	17	11	17
40,000	-73	-57	-9	-47	-47	-71	-84	70	54	8	44	44	19	7	27	28	21	26
30,000	-63	-46	-8	-37	-38	-61	-72	61	43	7	35	36	14	4	24	26	16	26
20,000	-42	-31	-7	-21	-23	-40	-49	40	29	6	20	22	8	2	20	20	11	18
COLUMBIA TO PENSACOLA																	373 N.MI.	
53,000	-45	-31	4	-19	-23	-41	-48	43	29	-4	18	21	3	-4	16	17	11	16
40,000	-66	-51	-4	-41	-41	-65	-76	61	47	3	38	38	14	2	26	27	20	25
30,000	-56	-40	-5	-32	-33	-55	-65	53	37	4	30	30	10	1	23	25	16	24
20,000	-37	-27	-4	-18	-20	-35	-44	35	25	4	17	18	5	0	19	19	10	17
COLUMBIA TO WASHINGTON, D.C.																	354 N.MI.	
53,000	29	18	-2	15	14	1	-5	-33	-21	1	-17	-16	-31	-39	17	17	11	16
40,000	38	28	6	33	25	6	-4	-49	-35	-9	-38	-32	-53	-64	27	29	22	27
30,000	35	25	8	28	22	5	-3	-44	-30	-9	-32	-27	-47	-58	25	28	17	27
20,000	29	16	8	17	16	4	-3	-33	-19	-8	-19	-18	-33	-42	21	21	12	20
COLUMBUS, OHIO TO NEW YORK																	418 N.MI.	
53,000	49	31	11	29	29	15	9	-50	-32	-11	-30	-29	-45	-52	18	16	12	15
40,000	76	50	35	51	52	32	22	-78	-52	-37	-53	-54	-75	-87	28	28	23	28
30,000	72	46	30	45	46	27	18	-74	-49	-31	-47	-48	-70	-83	28	29	19	29
20,000	50	31	21	30	31	17	11	-51	-33	-22	-31	-32	-49	-59	23	22	13	22
COLUMBUS, OHIO TO PHILADELPHIA																	352 N.MI.	
53,000	49	32	11	29	29	15	9	-50	-32	-12	-30	-30	-45	-53	18	17	12	16
40,000	77	51	36	50	52	32	22	-80	-53	-37	-52	-54	-76	-88	29	28	24	28
30,000	73	47	30	44	46	27	17	-75	-49	-31	-47	-48	-71	-84	28	29	19	29
20,000	50	32	21	30	31	17	11	-52	-34	-21	-31	-32	-49	-59	23	23	13	22
COLUMBUS, OHIO TO TAMPA																	722 N.MI.	
53,000	-4	1	4	-1	1	-9	-15	-2	-5	-5	-1	-3	-12	-17	15	15	10	15
40,000	-8	-3	6	-6	-2	-18	-27	-6	-6	-8	0	-5	-20	-29	24	25	19	23
30,000	-6	0	3	-5	-2	-16	-24	-5	-7	-4	0	-4	-17	-25	21	23	15	23
20,000	-5	0	0	-3	-2	-12	-18	0	-3	-1	1	-1	-11	-16	18	18	10	17

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
COLUMBUS, OHIO TO WASHINGTON, D.C.																	280 N.MI.	
53,000	46	31	11	27	27	14	8	-47	-32	-11	-27	-28	-43	-51	18	17	12	16
40,000	75	50	34	46	50	29	19	-78	-52	-35	-49	-52	-74	-86	29	29	24	29
30,000	70	45	27	41	44	24	15	-73	-48	-28	-44	-46	-69	-82	28	30	19	30
20,000	48	32	19	27	29	15	9	-50	-33	-20	-28	-31	-48	-58	23	23	13	22
DALLAS TO DENVER																	568 N.MI.	
53,000	-31	-21	-5	-18	-18	-30	-37	28	19	4	16	16	5	-1	17	15	11	15
40,000	-47	-33	-19	-34	-32	-51	-60	38	28	17	30	27	10	1	28	25	20	25
30,000	-37	-29	-15	-29	-26	-44	-54	30	24	14	26	22	7	-1	29	25	16	25
20,000	-27	-20	-7	-17	-16	-29	-37	24	18	6	16	14	3	-2	20	18	11	17
DALLAS TO EL PASO																	487 N.MI.	
53,000	-45	-36	0	-20	-25	-42	-49	44	36	0	19	25	8	0	17	15	11	15
40,000	-70	-59	-14	-44	-46	-69	-81	68	57	13	42	44	22	12	28	26	19	23
30,000	-58	-49	-9	-33	-35	-58	-69	56	47	8	31	33	13	5	28	24	15	23
20,000	-36	-30	-5	-17	-20	-36	-44	35	29	4	16	19	6	0	19	17	10	16
DALLAS TO HOUSTON																	208 N.MI.	
53,000	10	9	3	7	7	-4	-9	-15	-13	-3	-8	-9	-20	-26	18	17	11	16
40,000	10	13	7	15	11	-6	-15	-23	-22	-8	-20	-18	-35	-45	29	27	21	23
30,000	9	11	6	12	9	-6	-14	-18	-17	-7	-16	-13	-30	-39	27	26	16	25
20,000	7	8	-4	6	3	-8	-13	-11	-11	4	-8	-5	-18	-25	20	18	10	17
DALLAS TO JACKSON																	336 N.MI.	
53,000	48	37	0	22	27	8	1	-49	-37	-1	-22	-27	-45	-53	17	16	11	16
40,000	71	57	11	46	46	22	10	-74	-59	-12	-47	-48	-72	-84	28	27	20	24
30,000	59	47	8	34	35	14	5	-62	-48	-8	-36	-37	-61	-72	27	26	16	26
20,000	38	30	2	19	21	5	-1	-39	-31	-2	-20	-21	-39	-47	20	19	10	18
DALLAS TO KANSAS CITY																	392 N.MI.	
53,000	11	11	-1	5	6	-4	-10	-16	-14	0	-7	-8	-20	-27	18	16	12	15
40,000	24	15	2	9	11	-6	-15	-36	-23	-4	-15	-18	-38	-48	29	27	21	26
30,000	20	13	0	4	8	-8	-17	-30	-19	-1	-9	-13	-32	-44	29	27	16	27
20,000	10	7	3	3	5	-6	-12	-15	-10	-4	-5	-8	-20	-27	21	20	11	19
DALLAS TO LAS VEGAS																	925 N.MI.	
53,000	-40	-32	-5	-21	-24	-37	-44	39	31	4	21	23	10	4	15	13	10	13
40,000	-62	-51	-23	-41	-43	-61	-72	59	48	22	39	41	24	15	25	23	18	22
30,000	-52	-43	-17	-33	-34	-53	-63	49	41	16	31	32	16	9	27	23	14	21
20,000	-33	-27	-9	-17	-20	-33	-40	32	26	8	16	19	8	3	18	16	10	15
DALLAS TO LITTLE ROCK																	256 N.MI.	
53,000	44	34	0	20	24	7	0	-46	-35	-1	-21	-25	-43	-50	18	17	12	16
40,000	71	52	10	41	43	19	8	-74	-55	-12	-44	-45	-70	-83	29	28	21	25
30,000	60	43	6	30	32	11	2	-62	-46	-7	-33	-35	-60	-72	29	27	16	28
20,000	38	28	5	17	20	6	0	-39	-29	-6	-18	-21	-38	-47	21	19	11	19
DALLAS TO LOS ANGELES																	1080 N.MI.	
53,000	-40	-33	-4	-21	-24	-38	-44	39	32	3	20	24	10	3	15	13	10	12
40,000	-62	-52	-22	-40	-43	-61	-71	59	50	21	39	41	24	16	24	22	17	20
30,000	-52	-44	-15	-32	-34	-52	-62	49	42	15	30	32	17	9	25	21	14	19
20,000	-33	-27	-8	-16	-19	-32	-39	31	26	7	15	18	8	3	17	15	9	14
DALLAS TO LOUISVILLE																	630 N.MI.	
53,000	42	31	2	21	24	8	2	-44	-33	-2	-22	-25	-41	-48	17	15	11	14
40,000	69	47	14	41	42	20	10	-73	-51	-16	-44	-45	-68	-80	26	26	20	24
30,000	59	40	10	31	33	13	4	-63	-43	-11	-34	-36	-59	-71	26	25	16	26
20,000	39	27	9	19	21	8	3	-41	-28	-9	-20	-22	-38	-47	20	19	11	18
DALLAS TO LUBBOCK																	254 N.MI.	
53,000	-45	-35	-3	-21	-25	-42	-50	44	34	2	20	24	8	2	18	16	12	16
40,000	-69	-55	-16	-45	-45	-69	-81	65	53	15	43	43	21	10	30	28	21	25
30,000	-57	-46	-11	-35	-35	-58	-70	54	44	10	33	33	13	4	29	26	16	26
20,000	-37	-30	-5	-19	-21	-37	-46	36	29	4	18	20	6	0	21	19	11	18
DALLAS TO MEMPHIS																	367 N.MI.	
53,000	46	35	1	22	25	9	1	-48	-36	-1	-23	-26	-44	-52	18	16	11	16
40,000	74	53	12	43	45	21	10	-76	-56	-13	-46	-47	-72	-84	28	28	21	25
30,000	62	44	7	32	34	12	3	-65	-47	-8	-35	-37	-61	-74	28	26	16	27
20,000	40	29	6	19	21	7	1	-41	-30	-6	-20	-22	-39	-48	21	19	11	18

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DALLAS TO MIAMI																	963 N.MI.	
53,000	39	32	-3	16	22	5	-2	-41	-33	2	-17	-23	-38	-45	14	14	9	14
40,000	54	51	5	35	37	16	7	-59	-54	-6	-37	-40	-60	-69	21	21	16	19
30,000	44	40	4	27	29	11	4	-48	-43	-5	-28	-31	-49	-57	19	19	12	18
20,000	27	25	0	13	15	3	-2	-29	-26	0	-14	-16	-29	-36	15	14	8	13
DALLAS TO MIDLAND																	276 N.MI.	
53,000	-46	-37	0	-20	-25	-43	-51	45	36	0	19	24	7	-1	18	16	12	16
40,000	-72	-59	-12	-44	-46	-71	-83	70	58	11	43	45	21	10	29	27	21	24
30,000	-60	-49	-6	-33	-35	-59	-71	58	47	5	31	33	11	3	28	26	15	25
20,000	-37	-30	-4	-17	-20	-37	-45	36	29	4	16	20	6	0	20	18	11	18
DALLAS TO MONROE																	244 N.MI.	
53,000	48	36	1	21	26	8	1	-49	-37	-1	-22	-27	-45	-53	18	17	12	16
40,000	70	57	11	45	46	22	10	-73	-59	-12	-47	-48	-72	-84	29	28	21	24
30,000	59	47	8	34	35	13	4	-61	-48	-8	-36	-37	-61	-73	28	26	16	26
20,000	38	30	2	19	20	5	-1	-39	-31	-2	-19	-21	-38	-47	20	19	11	18
DALLAS TO NEW ORLEANS																	379 N.MI.	
53,000	39	32	-1	18	21	6	-1	-42	-33	0	-19	-23	-39	-47	17	16	11	15
40,000	56	50	9	39	38	17	6	-62	-54	-10	-42	-42	-64	-75	27	26	20	23
30,000	47	40	6	30	29	10	2	-51	-43	-7	-32	-32	-53	-64	25	25	15	24
20,000	30	26	-2	16	16	2	-4	-32	-27	1	-17	-17	-33	-41	19	18	10	17
DALLAS TO NEW YORK																	1199 N.MI.	
53,000	46	32	4	25	27	12	5	-48	-33	-5	-26	-28	-42	-49	14	13	9	12
40,000	72	49	21	46	46	27	18	-75	-52	-22	-48	-49	-69	-80	22	22	18	21
30,000	64	43	17	38	39	21	13	-67	-46	-18	-40	-41	-62	-72	22	22	14	22
20,000	43	29	13	24	25	14	9	-45	-30	-14	-25	-26	-41	-49	17	17	9	16
DALLAS TO ORLANDO																	840 N.MI.	
53,000	44	35	-2	19	25	6	-2	-46	-36	2	-20	-26	-42	-49	14	14	9	14
40,000	62	55	7	41	42	20	9	-66	-58	-8	-43	-45	-66	-76	23	23	17	20
30,000	52	44	6	31	33	13	5	-55	-46	-6	-33	-35	-55	-64	21	21	13	20
20,000	33	28	2	16	18	5	0	-34	-29	-2	-17	-19	-34	-41	16	15	9	14
DALLAS TO ST. LOUIS																	474 N.MI.	
53,000	31	24	1	16	17	4	-2	-34	-26	-1	-17	-19	-33	-41	18	16	11	15
40,000	53	36	10	29	31	11	1	-61	-41	-12	-34	-36	-58	-69	28	27	21	25
30,000	46	31	6	22	24	6	-3	-52	-35	-7	-26	-28	-50	-62	28	26	16	27
20,000	29	20	7	13	15	4	-2	-32	-22	-8	-14	-17	-31	-40	21	19	11	19
DALLAS TO SAN ANTONIO																	216 N.MI.	
53,000	-26	-20	5	-8	-11	-26	-33	21	17	-6	6	9	-4	-10	18	16	12	16
40,000	-44	-34	1	-20	-23	-44	-56	34	27	-2	15	17	-2	-11	29	27	21	23
30,000	-36	-28	4	-14	-16	-37	-49	28	22	-4	10	12	-5	-13	27	25	15	25
20,000	-21	-15	-4	-7	-10	-23	-30	17	13	4	5	9	-2	-8	20	18	10	17
DALLAS TO SAN FRANCISCO																	1279 N.MI.	
53,000	-38	-29	-6	-21	-23	-35	-41	37	28	6	20	22	11	5	14	12	9	12
40,000	-58	-46	-25	-39	-41	-57	-67	55	44	24	37	39	24	16	23	21	17	20
30,000	-49	-40	-19	-32	-33	-50	-59	46	38	17	30	31	17	10	24	21	14	19
20,000	-31	-25	-10	-17	-19	-31	-38	30	24	10	16	18	9	4	17	15	9	14
DALLAS TO SEATTLE																	1449 N.MI.	
53,000	-31	-20	-7	-20	-19	-29	-34	29	19	7	19	18	9	5	13	11	8	11
40,000	-46	-32	-23	-35	-33	-48	-56	41	28	20	32	30	16	9	21	19	16	20
30,000	-41	-29	-20	-32	-29	-44	-52	36	26	18	29	26	13	6	23	21	14	20
20,000	-28	-19	-11	-20	-18	-29	-35	26	18	10	18	17	8	3	16	15	9	14
DALLAS TO TUCSON																	714 N.MI.	
53,000	-43	-36	-1	-20	-25	-40	-47	42	35	1	20	24	8	1	16	14	11	14
40,000	-67	-57	-17	-42	-45	-66	-77	64	55	16	41	43	23	13	26	24	18	22
30,000	-56	-47	-11	-32	-35	-56	-67	54	46	10	31	33	15	7	27	23	14	21
20,000	-35	-29	-5	-16	-19	-34	-42	34	28	5	15	19	6	1	18	16	9	15
DALLAS TO TULSA																	207 N.MI.	
53,000	9	11	-2	4	5	-6	-12	-15	-14	2	-6	-8	-20	-27	19	17	12	16
40,000	23	15	0	8	10	-8	-18	-35	-23	-1	-14	-17	-37	-49	30	29	22	26
30,000	20	13	-2	3	7	-10	-19	-29	-19	1	-7	-11	-31	-43	30	27	17	28
20,000	10	6	3	2	5	-7	-13	-14	-9	-4	-4	-7	-19	-26	22	20	11	19

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DALLAS TO WASHINGTON, D.C.																	1026 N.MI.	
53,000	47	33	3	24	27	11	4	-49	-34	-4	-25	-28	-43	-50	15	14	9	13
40,000	73	51	18	46	47	26	16	-76	-54	-20	-48	-49	-70	-81	23	23	18	22
30,000	65	44	14	37	38	19	11	-68	-47	-15	-40	-41	-63	-73	22	23	14	23
20,000	43	29	11	23	25	12	7	-45	-31	-11	-24	-26	-41	-49	18	17	10	16
DAYTON TO HARTFORD																	536 N.MI.	
53,000	47	29	11	29	28	15	9	-48	-30	-11	-30	-29	-43	-51	17	16	12	15
40,000	73	48	35	50	50	31	21	-76	-50	-36	-53	-53	-73	-84	27	26	23	27
30,000	69	44	30	45	45	26	17	-72	-47	-32	-47	-47	-69	-81	28	28	19	28
20,000	48	30	21	30	30	17	11	-49	-31	-22	-31	-32	-47	-57	22	22	13	21
DAYTON TO LOS ANGELES																	1668 N.MI.	
53,000	-39	-31	-10	-23	-25	-36	-42	38	30	9	23	25	14	9	13	11	8	10
40,000	-64	-47	-34	-42	-46	-61	-69	62	45	32	40	44	30	23	20	18	16	19
30,000	-55	-41	-25	-35	-37	-52	-62	52	39	24	33	35	22	16	22	20	13	19
20,000	-35	-26	-16	-21	-23	-34	-40	34	25	16	20	22	13	9	15	14	9	13
DAYTON TO NEW YORK																	479 N.MI.	
53,000	49	31	11	29	29	15	9	-49	-32	-11	-30	-29	-44	-52	18	16	12	15
40,000	76	50	35	51	52	32	22	-78	-52	-37	-53	-54	-75	-86	28	27	23	27
30,000	72	46	30	45	46	27	18	-74	-48	-31	-47	-48	-70	-83	28	29	19	28
20,000	49	31	21	30	31	17	11	-51	-33	-22	-31	-32	-48	-58	22	22	13	21
DAYTON TO ST. LOUIS																	294 N.MI.	
53,000	-47	-32	-9	-27	-28	-43	-51	46	31	9	27	27	13	7	18	17	12	15
40,000	-75	-51	-31	-49	-51	-72	-84	72	49	29	47	48	28	17	29	27	23	29
30,000	-69	-46	-24	-43	-43	-66	-79	66	44	23	41	41	21	12	30	29	19	30
20,000	-46	-30	-19	-28	-29	-45	-55	45	29	18	27	28	14	7	22	22	13	22
DAYTON TO WASHINGTON, D.C.																	339 N.MI.	
53,000	47	32	11	27	28	14	8	-48	-32	-11	-28	-29	-44	-52	18	17	12	16
40,000	76	50	34	47	51	30	20	-78	-53	-35	-50	-53	-75	-86	29	28	23	28
30,000	71	46	27	42	44	25	15	-73	-48	-28	-44	-46	-69	-82	27	29	19	29
20,000	48	32	19	28	30	16	9	-50	-33	-20	-29	-31	-48	-58	23	22	13	22
DAYTONA BEACH TO MIAMI																	207 N.MI.	
53,000	6	11	1	4	5	-5	-11	-10	-13	-2	-5	-7	-18	-24	17	17	10	18
40,000	7	7	6	4	6	-9	-18	-16	-16	-7	-8	-11	-27	-36	24	25	18	24
30,000	6	13	4	4	6	-6	-13	-11	-17	-5	-6	-9	-22	-30	19	21	14	20
20,000	6	6	-4	-1	1	-8	-13	-8	-8	3	0	-2	-12	-18	17	16	9	14
DENVER TO EL PASO																	484 N.MI.	
53,000	-8	-10	-5	-3	-6	-16	-22	4	7	5	1	4	-5	-11	17	15	11	15
40,000	-17	-14	-11	-8	-12	-29	-38	6	7	8	2	6	-11	-20	29	26	21	25
30,000	-14	-12	-7	-4	-9	-25	-34	6	6	5	0	4	-11	-20	30	26	16	24
20,000	-5	-6	-7	-2	-5	-16	-22	2	3	7	0	4	-8	-14	21	18	11	17
DENVER TO KANSAS CITY																	478 N.MI.	
53,000	39	29	11	25	25	13	7	-40	-30	-11	-25	-25	-39	-46	18	16	11	15
40,000	68	43	37	43	46	28	19	-71	-45	-38	-45	-48	-68	-79	28	25	22	27
30,000	53	38	28	36	37	20	11	-55	-40	-29	-38	-39	-58	-69	30	27	18	27
20,000	35	25	17	24	24	12	6	-36	-26	-17	-25	-25	-39	-47	22	20	12	19
DENVER TO LAS VEGAS																	534 N.MI.	
53,000	-31	-26	-11	-20	-21	-32	-39	29	25	11	19	20	10	5	17	14	11	14
40,000	-49	-39	-37	-37	-40	-57	-67	45	36	36	34	37	21	12	28	25	21	26
30,000	-42	-35	-28	-29	-32	-50	-60	38	32	27	26	30	14	5	31	27	18	25
20,000	-26	-21	-17	-16	-19	-31	-38	24	20	16	15	18	7	1	21	19	12	18
DENVER TO LINCOLN																	377 N.MI.	
53,000	36	27	12	23	24	12	7	-37	-28	-13	-24	-24	-37	-44	18	16	12	15
40,000	65	40	39	40	45	27	17	-67	-42	-41	-42	-47	-66	-77	29	26	23	27
30,000	50	36	30	34	36	19	10	-52	-38	-31	-36	-38	-57	-68	31	28	18	28
20,000	32	23	18	23	23	11	5	-33	-25	-19	-24	-24	-38	-45	22	21	12	19
DENVER TO LOS ANGELES																	736 N.MI.	
53,000	-30	-26	-10	-19	-20	-31	-37	28	25	10	18	19	9	4	16	14	10	13
40,000	-47	-38	-35	-34	-38	-54	-63	43	35	34	32	36	20	12	26	24	20	24
30,000	-40	-34	-25	-27	-31	-47	-56	36	31	24	25	28	13	5	29	25	17	23
20,000	-25	-21	-16	-15	-18	-30	-36	23	20	15	14	17	7	1	20	18	11	16

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
DENVER TO LUBBOCK																	395 N.MI.	
53,000	14	7	0	9	7	-3	-9	-18	-10	-1	-11	-9	-20	-27	18	16	12	15
40,000	15	11	6	15	11	-6	-15	-27	-18	-9	-20	-18	-36	-46	30	26	21	26
30,000	13	10	6	15	10	-6	-15	-21	-15	-8	-19	-15	-32	-42	31	27	17	26
20,000	13	9	2	9	7	-4	-10	-16	-11	-3	-11	-9	-22	-29	22	19	11	18
DENVER TO MILWAUKEE																	787 N.MI.	
53,000	36	26	13	23	24	13	8	-37	-27	-13	-24	-24	-36	-42	16	14	10	13
40,000	62	40	39	40	44	28	19	-64	-42	-40	-43	-47	-64	-74	25	22	20	25
30,000	52	36	31	35	37	21	13	-55	-38	-32	-37	-39	-57	-66	27	25	17	25
20,000	34	24	20	24	24	13	7	-35	-25	-20	-25	-25	-38	-45	20	19	11	18
DENVER TO MINNEAPOLIS																	601 N.MI.	
53,000	28	21	13	18	19	10	5	-30	-22	-13	-20	-20	-31	-37	16	14	11	13
40,000	47	32	36	32	37	20	11	-52	-35	-39	-35	-40	-57	-66	26	23	21	26
30,000	40	29	29	27	31	14	5	-44	-32	-31	-31	-34	-51	-61	29	26	18	27
20,000	25	19	18	19	20	8	2	-27	-20	-19	-21	-21	-34	-40	21	19	12	19
DENVER TO NEW YORK																	1419 N.MI.	
53,000	42	29	12	26	26	16	11	-43	-30	-13	-27	-27	-39	-45	13	12	9	11
40,000	70	45	38	45	48	33	26	-72	-47	-39	-47	-50	-67	-75	21	20	17	21
30,000	61	41	30	40	41	27	20	-64	-43	-31	-42	-43	-60	-70	22	21	14	21
20,000	41	28	20	27	27	17	13	-43	-29	-21	-28	-29	-40	-48	17	16	10	16
DENVER TO OMAHA																	377 N.MI.	
53,000	36	27	12	23	24	12	7	-37	-28	-13	-24	-24	-37	-44	18	16	12	15
40,000	65	40	39	40	45	27	17	-67	-42	-41	-42	-47	-66	-77	29	26	23	27
30,000	50	36	30	34	36	19	10	-52	-38	-31	-36	-38	-57	-68	31	28	18	28
20,000	32	23	18	23	23	11	5	-33	-25	-19	-24	-24	-38	-45	22	21	12	19
DENVER TO PHOENIX																	512 N.MI.	
53,000	-24	-23	-8	-14	-17	-28	-34	22	22	8	13	15	5	0	17	15	11	15
40,000	-41	-33	-29	-28	-32	-50	-59	34	29	27	24	28	12	3	28	25	21	25
30,000	-34	-29	-21	-21	-25	-43	-52	28	25	20	18	22	7	-2	31	27	17	24
20,000	-20	-17	-15	-11	-16	-27	-33	18	16	14	10	14	3	-3	21	19	11	17
DENVER TO PORTLAND, ORE.																	854 N.MI.	
53,000	-32	-20	-10	-23	-20	-31	-36	31	19	10	22	20	10	6	15	13	10	12
40,000	-47	-32	-30	-37	-36	-52	-61	45	30	27	35	34	18	10	24	22	20	25
30,000	-44	-31	-25	-34	-33	-50	-60	41	28	23	32	30	14	6	27	25	18	25
20,000	-29	-20	-16	-22	-21	-33	-39	28	18	15	21	20	9	3	19	18	12	17
DENVER TO RAPID CITY																	270 N.MI.	
53,000	5	7	8	2	6	-4	-10	-9	-8	-8	-4	-7	-17	-23	18	15	12	15
40,000	7	9	15	6	9	-9	-18	-16	-13	-20	-11	-15	-33	-42	28	26	23	28
30,000	6	8	12	2	8	-11	-21	-13	-13	-15	-7	-12	-30	-40	32	29	20	29
20,000	2	4	8	2	4	-8	-16	-5	-7	-9	-4	-7	-19	-26	22	21	13	20
DENVER TO RENO																	687 N.MI.	
53,000	-34	-25	-13	-23	-22	-33	-40	33	25	12	22	22	12	7	16	14	10	13
40,000	-51	-38	-38	-40	-41	-58	-67	49	36	36	38	39	23	14	26	24	21	25
30,000	-45	-35	-29	-33	-34	-52	-62	42	33	27	31	32	16	7	29	27	18	25
20,000	-28	-22	-17	-20	-21	-33	-40	27	20	16	19	20	9	3	21	18	12	18
DENVER TO SALT LAKE CITY																	330 N.MI.	
53,000	-35	-25	-11	-24	-23	-35	-42	34	25	11	23	22	11	6	18	15	11	15
40,000	-54	-37	-38	-41	-42	-60	-71	52	35	35	39	40	22	12	29	26	23	28
30,000	-47	-35	-29	-35	-35	-54	-65	44	33	28	33	33	16	6	32	30	19	28
20,000	-30	-22	-17	-22	-22	-35	-42	29	21	16	21	21	9	2	22	20	13	19
DENVER TO SAN FRANCISCO																	828 N.MI.	
53,000	-33	-26	-12	-21	-22	-32	-39	31	25	12	21	21	12	7	16	13	10	13
40,000	-50	-38	-37	-38	-40	-56	-65	47	36	36	36	38	23	15	25	23	20	24
30,000	-44	-35	-28	-31	-33	-50	-59	40	33	26	29	31	16	8	28	25	17	24
20,000	-28	-21	-17	-18	-20	-32	-38	26	20	16	17	19	9	3	20	18	11	17
DENVER TO SEATTLE																	884 N.MI.	
53,000	-30	-18	-9	-22	-19	-29	-35	29	17	9	21	18	9	4	15	12	10	12
40,000	-45	-29	-27	-35	-33	-49	-58	42	27	24	33	31	15	7	23	21	20	24
30,000	-42	-28	-24	-34	-31	-48	-58	39	26	21	31	28	12	4	27	25	18	25
20,000	-29	-18	-15	-22	-20	-32	-38	27	17	14	21	19	8	2	19	17	12	17

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DENVER TO SIOUX FALLS																	430 N.MI.	
53,000	28	21	13	18	19	9	4	-30	-22	-13	-19	-20	-31	-37	17	15	11	14
40,000	47	32	36	31	36	19	9	-52	-35	-38	-34	-39	-57	-67	27	25	22	27
30,000	38	29	28	26	30	13	3	-43	-32	-30	-30	-33	-51	-61	30	27	19	28
20,000	24	19	17	18	19	7	1	-26	-20	-18	-20	-21	-33	-40	22	20	13	19
DENVER TO TULSA																	476 N.MI.	
53,000	36	27	7	22	22	10	4	-38	-28	-8	-23	-23	-37	-44	18	16	11	15
40,000	58	39	28	40	40	22	13	-63	-42	-29	-42	-43	-63	-73	29	26	21	26
30,000	46	34	21	33	32	15	7	-50	-37	-22	-35	-34	-54	-64	30	27	17	27
20,000	32	23	12	21	21	9	3	-34	-25	-13	-22	-22	-36	-44	21	19	11	18
DENVER TO WASHINGTON, D.C.																	1289 N.MI.	
53,000	43	30	11	26	27	16	10	-44	-31	-12	-27	-28	-40	-46	14	13	9	12
40,000	72	47	36	45	48	33	25	-74	-49	-37	-47	-50	-68	-78	22	20	18	22
30,000	62	42	28	39	41	26	19	-65	-44	-29	-41	-43	-60	-71	23	22	14	22
20,000	42	28	19	26	27	17	12	-43	-29	-19	-28	-28	-41	-48	17	17	10	16
DENVER TO WICHITA																	379 N.MI.	
53,000	37	28	9	24	23	11	5	-38	-29	-9	-24	-24	-37	-44	18	16	12	15
40,000	63	41	32	41	43	24	15	-66	-43	-33	-43	-45	-65	-76	29	26	22	27
30,000	48	36	24	34	34	17	8	-52	-38	-25	-37	-36	-56	-67	31	28	18	27
20,000	33	24	14	22	22	10	4	-35	-25	-15	-23	-23	-37	-45	22	20	12	19
DES MOINES TO LOS ANGELES																	1254 N.MI.	
53,000	-34	-28	-11	-21	-22	-33	-39	32	27	10	20	22	12	8	14	12	9	12
40,000	-57	-41	-36	-38	-42	-57	-65	53	39	35	35	40	26	19	22	20	17	21
30,000	-47	-37	-27	-31	-34	-49	-57	43	34	26	29	32	18	11	25	22	14	20
20,000	-29	-23	-17	-18	-21	-31	-37	27	22	16	17	20	11	6	17	16	10	15
DES MOINES TO MINNEAPOLIS																	202 N.MI.	
53,000	-3	1	0	-2	-1	-11	-17	-1	-3	0	0	-1	-11	-17	18	16	12	15
40,000	-2	1	-4	-5	-2	-20	-30	-9	-7	-2	-2	-5	-23	-32	28	26	24	30
30,000	-2	-2	-3	-5	-3	-21	-31	-8	-3	-1	-1	-3	-22	-32	32	29	21	30
20,000	-4	-2	0	-4	-2	-16	-23	-1	-1	-1	1	-1	-14	-21	23	22	14	22
DES MOINES TO ST. LOUIS																	225 N.MI.	
53,000	28	20	10	18	18	7	1	-32	-22	-10	-19	-20	-32	-39	19	17	12	15
40,000	43	30	26	31	32	14	4	-52	-35	-29	-35	-37	-57	-68	29	27	24	30
30,000	39	27	21	27	27	9	-1	-46	-31	-22	-31	-31	-51	-62	32	29	19	30
20,000	28	18	13	21	19	6	-1	-31	-20	-14	-23	-21	-36	-44	23	22	13	22
DETROIT TO INDIANAPOLIS																	200 N.MI.	
53,000	-34	-21	-5	-21	-19	-33	-40	31	19	5	19	18	5	-1	19	17	13	16
40,000	-53	-35	-22	-37	-36	-57	-68	44	30	18	32	31	11	1	29	28	24	30
30,000	-50	-31	-19	-33	-32	-53	-64	42	26	17	29	27	8	-1	30	30	20	30
20,000	-33	-19	-14	-21	-20	-36	-44	29	16	13	18	18	5	-3	23	23	14	23
DETROIT TO LAND O LAKES																	344 N.MI.	
53,000	-32	-19	-13	-22	-21	-32	-38	30	18	13	20	19	9	4	17	15	12	15
40,000	-50	-33	-38	-38	-40	-58	-67	44	29	35	34	36	18	8	27	25	24	28
30,000	-48	-34	-32	-35	-37	-56	-67	42	31	30	31	33	15	5	30	29	21	29
20,000	-34	-23	-21	-24	-25	-39	-47	31	21	20	22	23	10	2	23	22	14	22
DETROIT TO LAS VEGAS																	1516 N.MI.	
53,000	-37	-28	-12	-23	-24	-35	-41	36	27	11	23	24	14	10	13	11	8	11
40,000	-62	-43	-38	-42	-46	-60	-68	60	41	37	40	43	30	23	21	19	16	20
30,000	-54	-39	-29	-36	-38	-53	-61	51	37	28	34	36	23	16	22	21	14	20
20,000	-34	-25	-19	-23	-24	-35	-41	33	24	18	22	23	14	9	16	15	9	14
DETROIT TO LOS ANGELES																	1715 N.MI.	
53,000	-37	-28	-11	-23	-24	-34	-40	35	28	11	22	23	14	10	12	11	8	10
40,000	-61	-43	-37	-41	-44	-59	-66	58	41	35	38	42	29	23	20	18	16	19
30,000	-52	-39	-28	-34	-37	-51	-59	49	36	27	32	35	22	16	22	20	13	19
20,000	-33	-25	-18	-21	-23	-33	-39	32	23	17	20	22	14	9	15	14	9	13
DETROIT TO LOUISVILLE																	266 N.MI.	
53,000	-25	-14	-1	-14	-13	-25	-32	20	12	0	12	10	-1	-7	18	17	12	16
40,000	-38	-24	-10	-27	-24	-44	-55	25	17	6	20	17	-2	-12	29	28	24	29
30,000	-35	-21	-10	-24	-21	-41	-52	24	15	8	18	15	-3	-12	29	30	20	30
20,000	-22	-11	-8	-14	-13	-27	-35	17	8	7	11	10	-3	-10	23	23	13	22

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
DETROIT TO MIAMI																	998 N.MI.	
53,000	3	6	4	2	4	-5	-9	-9	-9	-5	-4	-6	-15	-20	14	14	9	14
40,000	3	4	9	0	4	-10	-18	-16	-13	-11	-6	-11	-25	-33	22	22	17	22
30,000	3	7	5	0	4	-9	-15	-14	-13	-6	-5	-9	-22	-29	19	21	14	21
20,000	2	5	0	0	1	-8	-13	-7	-8	-1	-2	-4	-13	-19	16	16	9	15
DETROIT TO MILWAUKEE																	206 N.MI.	
53,000	-42	-28	-14	-27	-27	-40	-48	41	27	14	27	26	14	8	18	16	13	15
40,000	-69	-46	-41	-48	-51	-70	-81	66	44	40	46	48	29	19	29	27	24	29
30,000	-65	-43	-34	-44	-45	-66	-78	62	41	33	41	43	24	14	31	30	21	30
20,000	-44	-29	-23	-30	-30	-46	-54	43	27	23	28	29	15	8	24	23	14	23
DETROIT TO MINNEAPOLIS																	457 N.MI.	
53,000	-39	-25	-15	-26	-25	-37	-44	38	24	14	25	24	14	8	17	15	12	14
40,000	-62	-41	-43	-46	-48	-66	-76	59	39	42	43	45	28	19	26	24	23	28
30,000	-59	-40	-36	-42	-43	-62	-73	56	37	35	39	41	23	14	29	28	20	28
20,000	-40	-27	-23	-29	-29	-43	-51	39	25	23	27	28	15	8	22	21	13	21
DETROIT TO NEW YORK																	441 N.MI.	
53,000	44	29	13	27	27	15	9	-45	-30	-13	-28	-28	-42	-49	18	16	12	15
40,000	71	47	38	47	50	30	21	-74	-49	-39	-50	-52	-72	-83	28	27	23	27
30,000	68	44	32	42	45	26	16	-70	-46	-33	-45	-47	-68	-80	29	29	20	29
20,000	46	31	22	28	30	17	10	-48	-32	-23	-30	-31	-47	-56	23	22	13	22
DETROIT TO OMAHA																	608 N.MI.	
53,000	-42	-29	-13	-27	-26	-39	-46	41	28	12	26	26	14	9	17	15	11	14
40,000	-69	-46	-39	-47	-50	-68	-79	67	44	37	45	48	30	21	26	24	22	27
30,000	-63	-42	-31	-42	-43	-63	-74	61	40	30	40	41	24	15	28	27	18	27
20,000	-42	-28	-21	-28	-28	-42	-51	40	26	21	27	27	15	9	21	20	12	20
DETROIT TO PHILADELPHIA																	393 N.MI.	
53,000	41	28	12	25	26	14	8	-43	-29	-13	-26	-27	-40	-48	18	16	12	15
40,000	68	45	36	43	47	28	18	-72	-48	-38	-47	-50	-70	-82	28	27	23	28
30,000	65	42	30	39	42	23	14	-69	-45	-31	-42	-45	-66	-78	28	29	20	29
20,000	44	30	21	26	29	15	9	-47	-32	-21	-28	-30	-46	-55	23	22	13	22
DETROIT TO ROCHESTER, N.Y.																	256 N.MI.	
53,000	43	27	12	28	27	14	8	-44	-28	-12	-29	-27	-41	-49	18	16	13	16
40,000	69	45	37	48	49	29	19	-71	-47	-38	-50	-51	-71	-83	29	28	24	29
30,000	66	40	32	44	44	24	14	-69	-43	-34	-46	-46	-68	-80	30	30	21	30
20,000	45	27	22	29	29	15	8	-46	-28	-23	-31	-31	-47	-56	24	23	14	23
DETROIT TO ST. LOUIS																	382 N.MI.	
53,000	-40	-27	-8	-24	-24	-38	-45	38	25	7	23	22	10	4	18	16	12	15
40,000	-64	-43	-28	-43	-44	-64	-75	59	40	25	40	40	21	11	28	26	23	28
30,000	-60	-39	-23	-39	-38	-59	-71	55	35	21	35	35	16	7	29	29	19	29
20,000	-40	-25	-17	-24	-25	-40	-49	37	23	17	22	23	10	3	22	22	13	21
DETROIT TO ST. PETERSBURG																	860 N.MI.	
53,000	-4	1	4	-1	1	-9	-14	-3	-5	-5	-1	-3	-12	-17	15	15	10	14
40,000	-7	-2	6	-6	-2	-17	-25	-7	-7	-9	-1	-6	-21	-29	23	24	18	23
30,000	-5	0	3	-4	-1	-15	-23	-6	-7	-4	-1	-5	-18	-25	21	23	15	23
20,000	-4	1	0	-3	-1	-11	-17	-1	-4	-1	0	-1	-11	-17	18	17	10	16
DETROIT TO SAN FRANCISCO																	1801 N.MI.	
53,000	-35	-26	-14	-23	-24	-33	-38	34	25	13	23	23	15	11	12	10	8	10
40,000	-57	-39	-40	-42	-44	-57	-64	54	38	39	39	42	30	23	19	17	16	19
30,000	-50	-36	-32	-36	-38	-51	-59	47	34	31	33	35	23	17	21	19	14	19
20,000	-33	-23	-20	-23	-24	-33	-39	31	22	19	22	23	14	10	15	14	9	13
DETROIT TO WASHINGTON, D.C.																	352 N.MI.	
53,000	34	25	12	21	22	10	5	-37	-26	-12	-22	-23	-36	-44	18	17	12	15
40,000	59	39	33	35	41	22	12	-66	-43	-35	-40	-45	-65	-77	28	28	23	28
30,000	56	37	25	31	36	17	8	-62	-41	-27	-36	-40	-61	-72	28	29	19	29
20,000	39	28	17	21	25	11	4	-42	-30	-18	-24	-27	-43	-51	23	23	13	22
EDMONTON TO GRAND PRAIRIE																	217 N.MI.	
53,000	-29	-15	-10	-22	-18	-29	-34	28	15	10	21	18	8	3	16	14	11	13
40,000	-34	-16	-13	-28	-23	-39	-47	33	15	12	26	21	5	-3	22	21	22	23
30,000	-37	-21	-17	-32	-26	-45	-54	35	19	15	29	24	6	-3	26	26	23	28
20,000	-26	-15	-11	-22	-18	-31	-38	25	14	11	21	17	5	-1	19	18	15	18

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EDMONTON TO MINNEAPOLIS																	942 N.MI.	
53,000	29	15	12	23	19	11	7	-30	-16	-13	-23	-20	-29	-34	14	11	9	11
40,000	39	22	29	31	30	16	9	-41	-23	-32	-33	-32	-46	-54	19	18	19	22
30,000	39	23	26	32	30	15	7	-42	-25	-28	-34	-32	-47	-55	23	22	18	24
20,000	29	18	18	25	22	12	6	-30	-19	-19	-26	-23	-34	-40	16	15	12	16
EDMONTON TO MONTREAL																	1602 N.MI.	
53,000	30	17	15	23	20	13	10	-31	-17	-15	-24	-21	-29	-33	11	9	8	10
40,000	41	25	34	34	34	22	16	-43	-27	-36	-36	-35	-47	-53	16	15	16	18
30,000	41	27	32	34	33	21	14	-44	-29	-33	-37	-35	-48	-55	19	18	15	19
20,000	29	19	22	24	24	15	10	-31	-20	-23	-25	-25	-34	-39	14	13	10	14
EDMONTON TO REGINA																	372 N.MI.	
53,000	29	15	12	23	19	10	5	-29	-15	-13	-24	-19	-29	-35	16	12	10	12
40,000	36	19	23	26	26	11	2	-37	-20	-25	-28	-28	-43	-51	21	20	22	24
30,000	38	21	22	32	28	11	2	-40	-23	-24	-34	-30	-47	-57	25	25	21	28
20,000	28	17	16	24	21	9	3	-29	-17	-17	-25	-22	-34	-40	18	17	14	18
EDMONTON TO SASKATOON																	260 N.MI.	
53,000	29	16	13	24	20	10	6	-29	-16	-14	-24	-20	-30	-36	16	13	11	13
40,000	35	20	23	28	26	11	3	-36	-21	-25	-29	-28	-43	-52	22	21	22	24
30,000	39	21	23	33	28	11	2	-40	-23	-24	-35	-30	-48	-58	26	25	22	29
20,000	27	17	16	24	21	9	3	-28	-18	-17	-25	-21	-34	-41	19	17	15	19
EDMONTON TO TORONTO																	1451 N.MI.	
53,000	31	17	14	23	21	13	10	-32	-18	-15	-24	-21	-30	-34	12	10	8	10
40,000	43	26	34	34	34	22	15	-45	-28	-36	-37	-36	-49	-55	17	16	16	19
30,000	43	27	31	34	34	20	14	-46	-29	-32	-36	-36	-49	-57	20	19	16	20
20,000	31	20	21	25	24	15	10	-32	-21	-22	-26	-25	-34	-40	15	14	11	14
EDMONTON TO VANCOUVER																	437 N.MI.	
53,000	-17	-14	-12	-20	-16	-25	-30	15	13	11	19	15	6	1	16	13	11	12
40,000	-23	-18	-16	-28	-21	-37	-45	20	16	14	25	19	3	-5	23	21	22	24
30,000	-28	-21	-20	-31	-25	-43	-52	24	19	18	28	22	5	-5	27	27	23	28
20,000	-20	-15	-13	-21	-17	-30	-36	18	13	13	20	16	4	-3	20	19	15	19
EDMONTON TO WINNIPEG																	641 N.MI.	
53,000	29	15	14	24	20	11	7	-30	-16	-14	-24	-20	-30	-35	15	11	10	12
40,000	37	21	29	30	29	15	7	-38	-22	-30	-32	-31	-45	-53	20	19	20	23
30,000	40	23	27	32	30	14	6	-41	-24	-28	-34	-32	-48	-56	23	23	20	25
20,000	29	18	18	25	22	11	6	-30	-19	-19	-26	-23	-34	-40	17	16	13	17
EL PASO TO FT. WORTH																	477 N.MI.	
53,000	44	36	0	19	25	8	0	-45	-36	0	-20	-25	-42	-49	17	15	11	15
40,000	68	57	13	42	44	22	11	-70	-59	-14	-43	-46	-69	-81	28	26	20	23
30,000	56	47	8	31	33	13	5	-58	-49	-9	-33	-35	-58	-69	28	24	15	23
20,000	35	29	4	16	19	6	0	-36	-30	-5	-17	-20	-35	-44	19	17	10	16
EL PASO TO HOUSTON																	587 N.MI.	
53,000	41	33	-6	17	22	4	-5	-42	-35	5	-17	-23	-40	-47	16	15	11	15
40,000	63	55	8	41	42	19	9	-66	-57	-9	-42	-44	-66	-77	26	24	19	21
30,000	51	44	5	30	31	12	4	-54	-47	-6	-32	-33	-55	-65	25	23	14	21
20,000	33	27	-1	15	17	3	-2	-34	-28	0	-15	-18	-33	-41	18	16	9	15
EL PASO TO LOS ANGELES																	619 N.MI.	
53,000	-35	-31	-1	-19	-22	-35	-42	34	30	1	19	21	7	1	17	14	11	14
40,000	-56	-50	-20	-36	-39	-58	-69	54	47	18	35	37	20	11	26	24	19	23
30,000	-47	-42	-13	-28	-30	-49	-60	45	40	12	26	29	12	4	29	24	16	20
20,000	-30	-25	-5	-13	-16	-30	-38	28	24	4	12	15	4	-1	19	17	10	15
EL PASO TO MIDLAND																	213 N.MI.	
53,000	41	35	-2	19	23	6	-2	-42	-36	1	-19	-24	-41	-49	18	16	12	16
40,000	64	56	14	40	43	21	10	-67	-58	-15	-42	-44	-68	-80	30	27	21	25
30,000	54	46	10	30	33	13	4	-56	-48	-10	-32	-34	-57	-68	30	26	16	23
20,000	34	28	3	15	18	5	-1	-35	-29	-4	-15	-19	-35	-43	21	18	11	17
EL PASO TO PHOENIX																	301 N.MI.	
53,000	-35	-30	1	-19	-21	-36	-43	34	29	-1	18	20	5	-2	18	16	12	15
40,000	-57	-51	-16	-37	-39	-60	-72	54	48	14	35	37	17	7	29	26	21	25
30,000	-48	-42	-11	-28	-30	-50	-62	45	39	9	26	28	10	2	32	26	17	21
20,000	-30	-25	-2	-13	-15	-31	-39	29	24	2	12	15	2	-4	21	18	11	17

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
EL PASO TO SAN ANTONIO																	430 N.MI.	
53,000	38	31	-6	16	20	3	-5	-40	-33	5	-16	-22	-38	-45	17	15	11	15
40,000	59	51	9	39	39	18	7	-63	-55	-10	-40	-42	-64	-75	27	25	19	22
30,000	48	42	6	29	29	10	2	-52	-44	-6	-30	-31	-53	-63	27	24	15	22
20,000	31	25	-1	13	16	2	-3	-32	-26	0	-14	-17	-32	-40	19	16	10	16
EL PASO TO SAN DIEGO																	551 N.MI.	
53,000	-36	-32	-1	-19	-22	-36	-43	35	32	0	19	21	7	0	17	15	12	14
40,000	-57	-52	-19	-37	-40	-60	-71	55	50	18	35	39	20	11	27	24	19	23
30,000	-49	-43	-12	-28	-31	-50	-61	46	42	11	27	30	13	5	29	24	16	20
20,000	-30	-26	-4	-13	-16	-31	-39	29	25	4	12	16	4	-2	19	17	10	15
EL PASO TO SAN FRANCISCO																	862 N.MI.	
53,000	-33	-26	-3	-19	-20	-32	-38	32	25	2	18	19	7	1	16	13	10	13
40,000	-52	-44	-21	-34	-37	-54	-63	49	41	18	32	34	18	9	25	23	19	22
30,000	-44	-38	-15	-27	-29	-47	-57	41	36	13	25	27	11	4	27	23	16	20
20,000	-28	-22	-7	-13	-16	-28	-36	26	21	6	12	15	4	-1	19	17	10	15
EL PASO TO TUCSON																	233 N.MI.	
53,000	-38	-34	1	-20	-23	-38	-46	37	33	-1	19	22	6	-1	19	16	13	16
40,000	-61	-55	-16	-39	-42	-64	-76	58	53	15	37	40	19	9	30	27	21	25
30,000	-52	-46	-11	-29	-32	-53	-65	49	44	10	28	30	12	4	32	26	17	21
20,000	-32	-27	-3	-13	-17	-32	-41	31	26	2	13	16	3	-3	21	18	10	17
FAIRBANKS TO JUNEAU																	540 N.MI.	
53,000	19	5	2	10	8	-1	-5	-20	-5	-3	-11	-9	-18	-24	16	13	9	12
40,000	21	5	7	5	9	-4	-11	-23	-6	-8	-8	-11	-25	-32	20	18	19	20
30,000	18	2	5	4	7	-10	-19	-20	-4	-6	-7	-9	-26	-35	25	23	23	25
20,000	11	-1	3	2	3	-8	-14	-12	0	-4	-3	-4	-16	-22	20	17	14	16
FAIRBANKS TO SAN FRANCISCO																	1862 N.MI.	
53,000	16	6	2	8	7	0	-3	-18	-7	-2	-9	-8	-16	-20	12	10	7	9
40,000	21	10	9	9	12	1	-5	-24	-13	-12	-13	-15	-27	-33	17	15	15	17
30,000	19	8	7	6	10	-3	-10	-23	-11	-9	-10	-13	-26	-33	20	19	16	19
20,000	11	2	6	3	5	-4	-9	-14	-4	-7	-5	-7	-16	-21	16	14	11	13
FAIRBANKS TO SEATTLE																	1328 N.MI.	
53,000	19	6	3	11	9	2	-2	-21	-7	-4	-12	-10	-18	-23	13	11	8	10
40,000	24	9	10	11	13	1	-5	-26	-11	-12	-15	-15	-28	-34	17	16	16	18
30,000	21	6	8	8	11	-3	-11	-24	-9	-10	-12	-14	-28	-36	21	20	19	21
20,000	12	2	6	5	6	-4	-9	-14	-3	-7	-7	-7	-17	-23	17	15	12	14
FAIRBANKS TO WHITEHORSE																	427 N.MI.	
53,000	23	6	3	13	10	1	-3	-24	-7	-3	-14	-10	-21	-27	17	13	9	12
40,000	23	7	9	9	12	-2	-9	-24	-8	-10	-11	-13	-27	-34	20	17	19	20
30,000	20	5	6	8	10	-7	-16	-22	-7	-8	-11	-12	-28	-38	25	23	23	25
20,000	12	2	5	5	5	-6	-12	-14	-3	-5	-6	-6	-18	-24	20	17	14	16
FAYETTEVILLE TO NEW BERN																	837 N.MI.	
53,000	51	36	5	25	29	12	5	-52	-37	-5	-26	-30	-46	-54	15	15	10	14
40,000	76	55	20	48	49	28	18	-78	-57	-22	-50	-51	-73	-85	24	25	19	23
30,000	67	47	15	39	40	20	11	-69	-49	-15	-41	-42	-65	-76	23	24	15	24
20,000	44	32	11	23	26	13	7	-45	-33	-12	-24	-27	-43	-51	18	18	10	17
FAYETTEVILLE TO WILMINGTON, N.C.																	804 N.MI.	
53,000	51	36	4	25	29	12	5	-52	-37	-4	-26	-30	-46	-54	15	15	10	14
40,000	75	55	19	47	49	27	17	-77	-57	-20	-50	-51	-73	-84	24	25	19	23
30,000	66	47	14	38	40	19	10	-68	-49	-14	-40	-42	-64	-75	23	24	15	25
20,000	42	32	10	22	25	12	6	-44	-33	-11	-24	-26	-42	-50	18	18	10	17
FLINT TO NEW YORK																	467 N.MI.	
53,000	42	28	13	26	26	14	9	-43	-29	-13	-27	-27	-40	-47	17	16	12	15
40,000	68	45	38	45	48	29	20	-71	-48	-39	-48	-51	-70	-81	28	27	23	27
30,000	65	42	32	40	44	25	15	-68	-45	-33	-43	-46	-67	-78	29	29	20	28
20,000	44	30	22	27	29	16	9	-46	-31	-23	-29	-31	-46	-55	22	22	13	22
FT. LAUDERDALE TO NEW YORK																	930 N.MI.	
53,000	15	6	-3	8	5	-4	-9	-20	-10	3	-9	-8	-20	-26	14	15	9	14
40,000	17	15	-1	17	11	-3	-11	-29	-23	-1	-22	-18	-35	-44	22	23	17	22
30,000	16	10	2	14	9	-3	-10	-25	-16	-3	-18	-14	-29	-37	20	21	14	21
20,000	13	8	5	11	9	0	-5	-17	-11	-6	-12	-11	-21	-27	16	16	9	15

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
FT. LAUDERDALE TO WASHINGTON, D.C.																	783 N.MI.	
53,000	8	2	-4	4	2	-8	-12	-13	-5	4	-6	-4	-15	-21	15	15	10	15
40,000	8	7	-5	10	4	-10	-18	-20	-16	3	-15	-11	-28	-37	23	24	17	23
30,000	7	2	-1	9	4	-9	-16	-16	-9	0	-13	-8	-23	-30	20	22	14	21
20,000	8	4	3	7	5	-4	-9	-12	-7	-4	-9	-7	-17	-23	17	16	9	15
FT. NELSON TO WATSON LAKE																	205 N.MI.	
53,000	-30	-11	-6	-21	-16	-27	-34	29	11	6	20	15	5	0	17	14	10	13
40,000	-28	-13	-11	-22	-19	-33	-41	27	12	10	21	17	3	-5	21	20	20	21
30,000	-28	-16	-10	-20	-19	-35	-44	27	14	9	19	17	1	-8	23	24	22	24
20,000	-19	-11	-8	-16	-13	-25	-31	18	10	8	15	12	1	-5	19	17	14	16
FT. NELSON TO WHITEHORSE																	393 N.MI.	
53,000	-29	-11	-6	-20	-15	-27	-33	29	10	5	20	15	5	0	16	14	9	12
40,000	-29	-15	-12	-23	-19	-34	-41	28	14	11	22	18	4	-3	20	19	19	21
30,000	-28	-16	-11	-21	-19	-35	-44	26	15	10	19	17	1	-7	23	23	22	24
20,000	-18	-11	-9	-15	-13	-24	-31	17	10	8	14	12	1	-5	19	16	14	16
FT. WAYNE TO NEW YORK																	519 N.MI.	
53,000	47	30	12	29	28	15	9	-48	-31	-12	-29	-29	-43	-51	17	16	12	15
40,000	74	49	37	49	51	32	22	-77	-51	-38	-52	-53	-74	-85	27	26	23	27
30,000	71	45	31	44	46	27	18	-73	-48	-32	-46	-48	-69	-82	28	28	19	28
20,000	48	31	22	30	31	18	11	-50	-32	-22	-31	-32	-48	-57	22	22	13	21
FT. WILLIAM TO SAULT STE. MARIE																	227 N.MI.	
53,000	32	19	15	23	21	11	6	-33	-19	-15	-24	-22	-33	-39	17	14	12	15
40,000	47	30	39	38	39	21	12	-50	-32	-41	-41	-41	-58	-68	26	24	23	28
30,000	45	31	35	37	37	18	8	-49	-33	-37	-39	-39	-58	-69	30	29	22	29
20,000	32	21	24	25	26	12	5	-34	-23	-25	-26	-27	-40	-48	22	21	15	21
FT. WILLIAM TO TORONTO																	492 N.MI.	
53,000	31	19	14	22	21	11	6	-33	-20	-14	-23	-22	-33	-39	16	14	12	14
40,000	47	31	38	37	38	21	12	-52	-34	-40	-40	-41	-58	-68	25	24	22	27
30,000	46	32	33	35	36	19	9	-51	-35	-35	-38	-39	-58	-68	29	28	21	28
20,000	33	22	23	24	25	12	5	-35	-23	-24	-25	-26	-40	-47	22	21	14	21
FT. WILLIAM TO WINNIPEG																	322 N.MI.	
53,000	-33	-18	-16	-24	-22	-32	-38	32	17	16	24	21	12	7	16	13	11	14
40,000	-46	-28	-41	-39	-39	-55	-64	45	27	40	37	37	21	12	23	22	22	28
30,000	-46	-30	-36	-37	-38	-55	-65	44	29	35	35	36	18	9	27	27	22	28
20,000	-33	-21	-25	-27	-26	-39	-46	32	20	25	26	25	13	6	20	19	14	20
FT. WORTH TO HOUSTON																	212 N.MI.	
53,000	12	11	2	8	8	-3	-8	-17	-14	-3	-9	-10	-21	-28	18	17	11	16
40,000	13	16	7	17	13	-4	-13	-26	-25	-8	-22	-19	-37	-47	29	27	21	23
30,000	12	13	6	14	10	-4	-13	-21	-19	-7	-17	-15	-31	-41	27	26	15	25
20,000	9	9	-4	7	4	-7	-12	-13	-12	4	-8	-6	-19	-27	20	18	10	17
FT. WORTH TO LITTLE ROCK																	266 N.MI.	
53,000	44	34	0	21	24	8	0	-46	-35	-1	-21	-25	-43	-51	18	17	12	16
40,000	71	52	11	41	43	19	8	-74	-55	-12	-44	-46	-70	-83	29	28	21	25
30,000	60	44	7	30	33	11	2	-62	-46	-7	-33	-35	-60	-72	28	27	16	27
20,000	38	28	5	17	20	6	0	-39	-29	-6	-18	-21	-38	-47	21	19	11	19
FT. WORTH TO LOS ANGELES																	1070 N.MI.	
53,000	-40	-33	-4	-21	-24	-37	-44	39	32	3	20	23	10	3	15	13	10	12
40,000	-62	-52	-22	-40	-43	-61	-71	59	50	21	39	41	24	16	24	22	17	20
30,000	-52	-44	-15	-31	-34	-52	-62	49	42	15	30	32	16	9	25	21	14	19
20,000	-33	-27	-8	-16	-19	-32	-39	31	26	7	15	18	8	3	17	15	9	14
FT. WORTH TO NEW ORLEANS																	387 N.MI.	
53,000	40	32	-1	18	22	6	-1	-42	-33	1	-19	-23	-40	-47	17	16	11	15
40,000	56	50	9	40	39	17	7	-63	-54	-10	-42	-42	-64	-75	27	26	20	22
30,000	47	41	6	30	29	10	2	-52	-43	-7	-32	-32	-54	-64	25	25	15	24
20,000	30	26	-2	16	16	2	-4	-32	-27	1	-17	-18	-34	-41	19	18	10	17
FREDERICTON TO MONTREAL																	303 N.MI.	
53,000	-41	-24	-16	-30	-27	-39	-46	40	23	15	29	26	14	9	18	16	13	15
40,000	-67	-43	-43	-54	-51	-72	-83	65	41	42	52	49	30	20	30	27	26	29
30,000	-63	-42	-42	-49	-48	-69	-81	60	39	40	46	46	25	15	36	32	24	30
20,000	-42	-28	-27	-34	-32	-47	-55	41	26	26	32	31	16	9	24	23	15	23

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
FREDERICTON TO QUEBEC																	209 N.MI.	
53,000	-36	-22	-16	-27	-25	-37	-43	35	22	16	26	24	13	7	19	16	13	16
40,000	-59	-39	-42	-50	-47	-67	-78	56	37	40	47	45	25	15	30	27	26	30
30,000	-55	-39	-41	-45	-45	-66	-77	51	36	39	41	42	21	10	36	33	24	31
20,000	-37	-25	-27	-31	-29	-45	-53	35	24	26	29	28	14	6	25	24	16	23
GANDER TO MONTREAL																	846 N.MI.	
53,000	-37	-21	-16	-30	-25	-36	-43	36	20	15	29	24	14	9	17	13	11	14
40,000	-60	-37	-43	-55	-48	-66	-75	57	35	41	53	46	29	20	25	23	22	25
30,000	-56	-37	-40	-50	-45	-63	-74	53	34	38	48	43	25	16	29	27	21	26
20,000	-39	-23	-26	-33	-30	-43	-50	37	22	25	32	28	16	9	21	20	14	20
GRAND JUNCTION TO LAS VEGAS																	363 N.MI.	
53,000	-29	-25	-11	-18	-20	-31	-38	27	24	11	17	19	9	3	18	15	11	15
40,000	-44	-37	-36	-34	-38	-55	-65	40	34	35	32	35	17	8	29	26	22	27
30,000	-39	-33	-27	-27	-30	-49	-59	34	30	26	24	28	11	2	32	29	19	25
20,000	-24	-20	-17	-15	-18	-31	-38	22	19	16	14	17	6	-1	22	20	12	18
GRAND RAPIDS TO LAND O LAKES																	247 N.MI.	
53,000	-28	-16	-12	-19	-18	-29	-35	26	15	11	18	17	6	1	18	15	12	15
40,000	-42	-28	-35	-34	-35	-53	-63	35	24	31	30	30	12	2	27	26	24	29
30,000	-41	-30	-29	-31	-32	-52	-62	33	26	27	27	28	9	-1	31	30	22	30
20,000	-30	-20	-19	-21	-22	-36	-44	26	18	17	19	20	6	-1	23	22	14	22
GREAT FALLS TO SALI LAKE CITY																	403 N.MI.	
53,000	3	-2	-7	1	-2	-11	-16	-6	1	6	-3	0	-10	-15	17	14	11	14
40,000	3	-3	-13	-4	-5	-22	-31	-9	-1	9	-1	0	-18	-27	26	24	23	27
30,000	1	-3	-11	1	-3	-21	-31	-8	-1	7	-6	-1	-20	-30	30	28	21	28
20,000	5	0	-6	1	-1	-13	-19	-8	-2	5	-3	-1	-14	-22	21	19	14	19
GREAT FALLS TO SPOKANE																	254 N.MI.	
53,000	-29	-18	-15	-25	-21	-31	-37	28	18	14	24	20	11	6	17	14	11	13
40,000	-41	-28	-31	-36	-34	-51	-61	39	26	29	34	32	15	6	25	24	23	28
30,000	-43	-28	-30	-38	-34	-53	-64	40	26	28	35	32	13	3	30	29	23	30
20,000	-29	-19	-19	-26	-23	-36	-44	28	18	19	25	22	9	2	21	20	15	20
GREENSBORO TO LOUISVILLE																	305 N.MI.	
53,000	-47	-32	-8	-24	-27	-43	-51	45	31	8	23	26	12	5	18	17	12	16
40,000	-73	-52	-27	-45	-48	-70	-82	68	48	26	41	45	24	14	28	28	22	28
30,000	-66	-46	-20	-38	-40	-63	-75	62	43	19	35	38	18	9	26	28	18	29
20,000	-42	-31	-14	-24	-26	-42	-51	40	30	13	22	25	11	5	22	21	12	21
GREENSBORO TO NEW YORK																	397 N.MI.	
53,000	38	22	2	22	20	6	0	-41	-24	-3	-24	-22	-37	-45	18	17	12	16
40,000	52	37	17	41	36	16	6	-60	-42	-20	-45	-41	-62	-74	28	28	23	28
30,000	49	33	17	36	32	14	5	-56	-38	-19	-39	-36	-57	-69	27	29	18	28
20,000	37	22	13	23	22	9	3	-40	-24	-14	-25	-24	-40	-49	22	22	12	21
GREENSBORO TO PITTSBURGH																	263 N.MI.	
53,000	0	-3	-6	1	-2	-13	-19	-7	0	5	-3	-1	-12	-18	18	18	12	16
40,000	-12	-7	-10	3	-7	-25	-35	-4	-2	7	-10	-2	-21	-31	28	29	23	28
30,000	-10	-6	-4	2	-4	-21	-31	-3	-1	1	-9	-3	-20	-30	26	29	18	29
20,000	-3	-7	-1	2	-2	-15	-23	-4	4	0	-5	-1	-14	-22	22	22	13	22
GREENSBORO TO WASHINGTON, D.C.																	216 N.MI.	
53,000	34	20	0	19	17	3	-3	-38	-23	0	-20	-19	-35	-43	18	18	12	17
40,000	45	32	11	37	30	10	0	-55	-38	-14	-41	-36	-58	-70	29	29	23	29
30,000	42	29	12	32	27	9	0	-50	-34	-14	-36	-32	-53	-64	27	29	18	29
20,000	33	18	10	20	19	6	-1	-36	-21	-11	-22	-21	-36	-46	22	22	12	21
GREENVILLE TO RICHMOND																	291 N.MI.	
53,000	44	29	1	22	23	7	0	-46	-31	-1	-23	-25	-42	-50	17	18	12	16
40,000	63	45	14	45	41	19	8	-68	-49	-16	-48	-45	-68	-80	27	29	22	28
30,000	57	40	13	38	35	15	6	-62	-43	-14	-40	-38	-61	-73	25	28	17	28
20,000	41	27	11	23	23	10	4	-44	-29	-12	-24	-25	-42	-51	21	21	12	20
GOOSE BAY TO MONTREAL																	700 N.MI.	
53,000	-31	-15	-12	-25	-20	-31	-37	29	14	11	24	19	9	4	16	13	12	14
40,000	-48	-25	-29	-44	-36	-53	-63	44	22	26	41	33	16	7	25	22	22	25
30,000	-45	-26	-28	-40	-34	-53	-63	40	22	24	37	31	13	3	28	28	22	27
20,000	-30	-15	-18	-25	-21	-35	-42	28	14	17	23	20	7	0	21	20	14	20

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
HALIFAX TO MONTREAL																	434 N.MI.	
53,000	-40	-24	-16	-29	-26	-39	-46	39	24	15	29	26	15	9	18	15	12	15
40,000	-66	-44	-44	-54	-52	-71	-82	63	42	42	52	49	30	20	29	26	25	28
30,000	-63	-43	-42	-48	-48	-69	-81	59	40	41	46	46	26	16	35	31	23	29
20,000	-42	-29	-27	-33	-32	-47	-55	40	27	26	32	31	17	9	24	23	15	22
HARTFORD TO LOS ANGELES																	2191 N.MI.	
53,000	-39	-29	-11	-24	-26	-36	-41	38	28	11	24	25	15	11	11	10	7	9
40,000	-65	-45	-37	-44	-46	-60	-68	62	43	35	41	44	32	26	18	16	14	17
30,000	-57	-41	-29	-37	-39	-53	-62	54	39	28	35	37	25	20	19	18	12	17
20,000	-37	-27	-19	-24	-25	-35	-41	36	25	18	22	24	16	12	14	13	8	12
HARTFORD TO PITTSBURGH																	350 N.MI.	
53,000	-48	-30	-11	-30	-29	-43	-51	47	29	11	29	28	14	8	18	17	12	15
40,000	-75	-50	-37	-53	-53	-74	-85	72	48	35	51	51	31	20	29	28	24	28
30,000	-72	-47	-33	-47	-48	-70	-82	69	44	31	45	46	26	16	30	30	20	29
20,000	-49	-32	-22	-32	-32	-48	-58	48	30	22	30	31	17	10	23	23	13	22
HARTFORD TO WASHINGTON, D.C.																	265 N.MI.	
53,000	-41	-23	-6	-26	-23	-38	-46	38	21	6	25	21	8	2	19	17	12	16
40,000	-61	-41	-27	-47	-43	-65	-76	54	37	24	43	39	18	8	30	29	25	29
30,000	-59	-39	-25	-41	-39	-61	-73	51	34	23	37	35	16	6	31	31	20	30
20,000	-42	-25	-17	-27	-26	-42	-51	39	22	16	26	24	10	3	24	23	13	22
HONOLULU TO LOS ANGELES																	2218 N.MI.	
53,000	19	21	7	13	14	7	3	-21	-22	-8	-13	-15	-24	-29	12	11	8	10
40,000	33	31	23	25	28	18	13	-36	-34	-24	-26	-29	-40	-46	17	15	12	14
30,000	25	23	15	17	19	11	6	-27	-24	-15	-18	-20	-30	-35	16	14	10	12
20,000	13	10	4	6	8	2	-1	-14	-11	-5	-7	-8	-15	-19	12	10	7	8
HONOLULU TO NEW YORK																	4323 N.MI.	
53,000	26	22	12	18	19	13	10	-28	-23	-12	-19	-20	-27	-31	9	8	6	7
40,000	45	34	30	33	35	27	22	-48	-36	-32	-35	-37	-46	-51	13	12	10	12
30,000	38	29	23	27	28	20	16	-41	-31	-23	-29	-30	-39	-45	13	12	9	12
20,000	24	18	12	16	17	11	8	-26	-19	-13	-17	-18	-24	-28	10	9	6	8
HONOLULU TO PORTLAND, ORE.																	2264 N.MI.	
53,000	11	15	11	12	12	5	1	-13	-16	-11	-13	-13	-20	-24	12	11	8	10
40,000	27	23	18	23	22	12	7	-32	-26	-19	-26	-25	-36	-42	17	15	13	15
30,000	22	20	13	18	18	8	3	-26	-23	-14	-21	-20	-31	-37	18	15	11	15
20,000	14	13	4	11	10	3	-1	-16	-14	-5	-12	-11	-19	-23	13	11	8	10
HONOLULU TO SAN FRANCISCO																	2083 N.MI.	
53,000	16	19	9	12	14	7	3	-18	-20	-10	-13	-15	-23	-27	13	11	8	10
40,000	31	28	22	24	26	16	10	-34	-31	-23	-26	-28	-39	-45	18	16	13	15
30,000	24	21	14	17	18	9	4	-26	-23	-15	-18	-20	-30	-36	17	15	10	13
20,000	13	10	4	8	8	2	-2	-14	-11	-4	-8	-9	-16	-20	12	10	7	9
HONOLULU TO SEATTLE																	2329 N.MI.	
53,000	10	14	11	12	11	5	1	-12	-15	-11	-13	-13	-20	-23	12	10	8	10
40,000	26	22	17	23	21	11	6	-31	-25	-18	-26	-25	-35	-41	17	15	13	15
30,000	21	20	12	19	18	8	3	-26	-23	-14	-21	-20	-31	-37	18	15	11	15
20,000	14	13	4	12	10	3	-1	-16	-14	-5	-13	-12	-19	-24	13	11	8	10
HONOLULU TO VANCOUVER																	2354 N.MI.	
53,000	8	13	10	11	11	4	0	-11	-14	-11	-12	-12	-19	-23	12	10	8	10
40,000	24	20	15	22	20	10	5	-29	-24	-17	-25	-24	-34	-40	17	15	13	15
30,000	20	19	11	19	17	7	2	-25	-22	-13	-22	-20	-30	-36	18	16	11	15
20,000	14	13	4	12	10	3	-1	-16	-15	-5	-13	-12	-20	-24	13	11	8	11
HOUSTON TO LAS VEGAS																	1072 N.MI.	
53,000	-38	-30	0	-19	-22	-35	-42	36	29	-1	18	21	6	0	14	13	9	13
40,000	-59	-50	-17	-39	-41	-59	-69	55	47	16	37	38	21	12	23	22	17	20
30,000	-49	-42	-12	-31	-32	-50	-60	45	39	11	29	29	14	7	24	21	13	19
20,000	-31	-25	-4	-15	-17	-31	-38	29	24	3	14	16	5	0	17	15	9	14
HOUSTON TO LOS ANGELES																	1205 N.MI.	
53,000	-39	-32	1	-18	-23	-36	-43	37	31	-2	18	22	7	-1	14	12	9	12
40,000	-61	-53	-16	-39	-42	-60	-70	58	50	15	38	40	22	13	22	20	16	19
30,000	-51	-44	-10	-30	-32	-50	-60	48	42	9	28	30	14	7	23	20	13	18
20,000	-32	-26	-3	-14	-17	-31	-37	30	25	3	13	16	5	0	16	14	8	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
HOUSTON TO MIAMI																	828 N.MI.	
53,000	40	33	-6	15	22	2	-6	-41	-34	6	-16	-23	-39	-46	14	14	9	14
40,000	57	55	1	34	39	15	3	-60	-57	-2	-36	-41	-61	-71	21	21	16	19
30,000	46	42	2	26	29	10	2	-48	-43	-2	-27	-31	-48	-57	18	18	12	18
20,000	27	24	-2	11	14	2	-3	-28	-25	2	-12	-15	-28	-34	14	14	8	12
HOUSTON TO NASHVILLE																	581 N.MI.	
53,000	38	28	-4	16	19	3	-4	-41	-30	4	-18	-21	-37	-45	16	16	10	15
40,000	61	42	4	34	35	13	2	-67	-48	-5	-38	-39	-62	-74	26	26	19	22
30,000	52	35	3	26	27	7	-1	-57	-39	-4	-29	-30	-53	-64	25	24	15	25
20,000	34	23	0	14	16	2	-3	-36	-25	0	-16	-17	-34	-42	19	18	10	17
HOUSTON TO NEW ORLEANS																	262 N.MI.	
53,000	48	37	-8	18	25	2	-7	-49	-38	8	-19	-26	-45	-52	17	16	11	16
40,000	71	61	2	43	46	19	5	-73	-63	-3	-45	-47	-72	-83	27	26	20	22
30,000	59	48	2	32	34	11	2	-60	-49	-3	-33	-36	-59	-70	25	24	15	23
20,000	36	29	-3	16	18	2	-4	-37	-30	3	-16	-19	-36	-44	18	17	10	16
HOUSTON TO NEW YORK																	1238 N.MI.	
53,000	44	29	0	22	24	8	1	-46	-31	-1	-23	-26	-40	-47	14	13	9	12
40,000	66	46	13	42	42	22	12	-71	-50	-15	-45	-45	-65	-76	21	22	17	20
30,000	59	40	12	34	35	17	9	-63	-43	-13	-37	-38	-58	-68	21	21	13	21
20,000	40	26	8	21	22	10	5	-42	-28	-8	-22	-23	-38	-46	16	16	9	15
HOUSTON TO ST. LOUIS																	597 N.MI.	
53,000	20	15	-4	9	9	-2	-8	-25	-18	3	-10	-11	-25	-32	17	15	10	15
40,000	35	22	0	16	17	-1	-9	-46	-30	-2	-22	-24	-44	-55	26	25	20	23
30,000	30	18	0	12	13	-3	-11	-39	-24	-1	-16	-18	-38	-49	26	25	15	25
20,000	19	12	0	7	8	-3	-9	-23	-15	0	-8	-10	-23	-31	19	18	10	17
HOUSTON TO SAN FRANCISCO																	1431 N.MI.	
53,000	-37	-29	-2	-19	-22	-34	-40	35	28	1	18	21	8	2	13	11	9	11
40,000	-57	-47	-20	-38	-40	-56	-65	53	44	18	36	37	22	14	21	19	16	18
30,000	-48	-40	-14	-30	-31	-48	-57	44	38	13	28	29	15	8	22	20	13	18
20,000	-30	-24	-6	-15	-17	-30	-36	28	23	6	14	16	6	2	16	14	8	13
HOUSTON TO TULSA																	394 N.MI.	
53,000	-3	-1	-4	-3	-3	-13	-18	-3	-3	4	1	0	-10	-16	17	16	11	15
40,000	0	-4	-7	-7	-5	-21	-30	-14	-6	5	1	-3	-20	-30	28	27	20	24
30,000	1	-3	-6	-7	-4	-19	-27	-11	-4	5	3	-1	-17	-26	27	25	15	25
20,000	-1	-3	2	-3	-1	-12	-18	-4	0	-3	2	-1	-12	-18	20	18	10	18
HOUSTON TO WASHINGTON, D.C.																	1056 N.MI.	
53,000	44	31	-1	21	24	7	0	-46	-32	1	-22	-25	-41	-48	14	14	9	13
40,000	67	48	10	42	42	21	10	-71	-51	-12	-45	-45	-66	-77	22	23	17	21
30,000	59	40	9	33	34	15	7	-62	-43	-10	-36	-37	-58	-68	21	22	14	22
20,000	39	26	6	20	21	8	3	-41	-28	-6	-21	-22	-38	-45	17	16	9	16
HUNTINGTON TO WASHINGTON, D.C.																	260 N.MI.	
53,000	50	33	8	28	29	14	7	-51	-34	-8	-29	-29	-46	-54	18	17	12	16
40,000	77	52	29	50	51	30	19	-79	-54	-31	-52	-53	-76	-89	29	29	23	29
30,000	71	47	25	44	45	24	15	-73	-49	-26	-46	-47	-70	-83	27	30	19	29
20,000	49	32	18	28	30	15	9	-50	-33	-18	-30	-31	-48	-58	23	23	13	22
HUNTSVILLE TO LEXINGTON																	223 N.MI.	
53,000	20	14	-3	11	10	-2	-8	-26	-17	2	-13	-12	-26	-34	18	18	12	16
40,000	33	20	2	22	18	-1	-11	-45	-28	-5	-28	-25	-47	-58	28	29	23	28
30,000	29	18	3	18	16	-2	-11	-40	-24	-5	-23	-21	-41	-54	27	29	18	29
20,000	23	12	4	11	11	-1	-8	-27	-15	-5	-13	-13	-28	-37	22	21	12	21
HUNTSVILLE TO LOUISVILLE																	214 N.MI.	
53,000	8	5	-4	5	3	-8	-14	-14	-9	4	-7	-5	-18	-24	18	18	12	16
40,000	14	6	-4	9	6	-12	-22	-28	-15	1	-16	-14	-34	-45	29	29	23	28
30,000	13	6	-1	8	5	-12	-21	-25	-13	0	-13	-11	-31	-41	28	29	18	30
20,000	12	4	1	5	5	-8	-14	-17	-7	-2	-7	-7	-21	-29	22	22	12	21
HUNTSVILLE TO WASHINGTON, D.C.																	522 N.MI.	
53,000	46	30	2	24	25	9	2	-48	-32	-3	-25	-26	-42	-50	17	16	11	15
40,000	68	47	17	46	44	22	12	-72	-51	-19	-49	-47	-70	-82	26	27	21	26
30,000	61	41	15	39	38	18	9	-65	-44	-16	-41	-40	-63	-75	25	27	17	27
20,000	43	28	12	24	25	11	5	-45	-29	-13	-25	-26	-43	-51	20	20	11	19

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INDIANAPOLIS TO MEMPHIS																	331 N.MI.	
53,000	-30	-20	0	-16	-15	-29	-36	25	17	-1	14	13	1	-5	18	17	12	15
40,000	-51	-32	-9	-31	-30	-51	-62	41	25	7	25	23	4	-6	28	28	22	27
30,000	-46	-28	-7	-25	-24	-46	-58	37	22	6	21	20	2	-7	29	28	18	29
20,000	-30	-18	-7	-14	-16	-30	-39	26	15	7	12	13	1	-6	22	21	12	21
INDIANAPOLIS TO NASHVILLE																	217 N.MI.	
53,000	-9	-5	4	-4	-3	-14	-21	3	1	-5	2	0	-10	-16	19	17	12	16
40,000	-18	-9	3	-11	-8	-28	-38	3	1	-6	4	0	-18	-28	29	28	23	29
30,000	-16	-8	1	-9	-7	-26	-36	3	1	-3	3	0	-17	-26	29	29	19	30
20,000	-10	-3	-1	-4	-4	-17	-25	4	0	0	1	1	-11	-19	23	22	13	22
INDIANAPOLIS TO NEW YORK																	575 N.MI.	
53,000	48	31	11	29	29	15	9	-49	-32	-11	-30	-29	-44	-52	17	16	11	15
40,000	76	50	35	50	51	32	23	-78	-52	-37	-52	-54	-74	-86	27	26	22	27
30,000	71	46	30	45	46	27	18	-74	-48	-31	-47	-48	-69	-82	27	28	18	28
20,000	49	31	21	30	31	18	11	-51	-32	-22	-31	-32	-48	-57	21	21	12	21
INDIANAPOLIS TO PITTSBURGH																	282 N.MI.	
53,000	48	31	10	29	28	14	8	-49	-32	-11	-29	-29	-44	-52	18	17	12	16
40,000	75	49	34	49	51	30	20	-77	-51	-35	-52	-53	-75	-86	29	28	24	29
30,000	70	45	28	44	45	25	15	-72	-47	-29	-46	-47	-69	-82	29	30	19	30
20,000	48	30	20	29	30	16	9	-50	-31	-21	-31	-3[illegible]	-48	-58	23	23	13	22
JACKSONVILLE TO MIAMI																	286 N.MI.	
53,000	8	12	1	4	6	-4	-9	-13	-15	-1	-6	-8	-20	-26	16	17	10	18
40,000	10	10	6	7	8	-7	-15	-19	-19	-7	-11	-13	-29	-38	24	25	18	24
30,000	8	15	4	5	8	-5	-11	-14	-20	-5	-8	-11	-24	-32	20	21	14	20
20,000	7	7	-3	0	2	-7	-12	-9	-9	2	-1	-3	-13	-20	17	16	9	14
JACKSONVILLE TO NEW ORLEANS																	447 N.MI.	
53,000	-50	-38	5	-21	-28	-46	-54	50	37	-6	20	27	4	-5	16	16	10	16
40,000	-71	-62	-4	-44	-47	-71	-82	69	60	3	43	45	19	6	25	25	19	22
30,000	-59	-48	-4	-34	-36	-58	-68	58	46	4	33	35	13	3	22	23	15	22
20,000	-37	-30	-2	-18	-20	-36	-44	36	29	2	17	19	6	0	17	17	9	16
JACKSONVILLE TO NEW YORK																	722 N.MI.	
53,000	26	15	-2	14	12	1	-5	-31	-18	2	-16	-15	-29	-36	15	16	10	15
40,000	34	26	5	29	23	5	-4	-45	-33	-7	-34	-29	-48	-58	24	25	19	24
30,000	31	21	7	24	20	5	-3	-40	-27	-8	-28	-25	-42	-52	23	25	15	24
20,000	25	15	7	16	15	4	-2	-29	-18	-8	-18	-17	-30	-38	19	18	10	17
JACKSONVILLE TO PITTSBURGH																	608 N.MI.	
53,000	5	1	-5	3	1	-9	-14	-12	-5	4	-5	-4	-15	-21	16	16	11	15
40,000	2	2	-6	8	1	-15	-23	-17	-11	4	-15	-9	-27	-36	25	26	20	25
30,000	3	0	-1	7	2	-12	-20	-15	-8	0	-13	-8	-24	-32	22	25	16	25
20,000	6	0	1	5	3	-8	-14	-12	-4	-2	-8	-6	-17	-24	19	19	10	18
JACKSONVILLE TO WASHINGTON, D.C.																	554 N.MI.	
53,000	20	11	-4	10	8	-3	-8	-25	-15	3	-12	-11	-25	-32	16	16	11	16
40,000	25	19	0	23	16	-1	-10	-37	-28	-2	-28	-23	-42	-53	25	26	20	25
30,000	23	15	3	19	14	-1	-9	-32	-21	-4	-23	-19	-37	-46	22	25	16	25
20,000	20	11	5	12	11	0	-5	-24	-14	-5	-14	-13	-26	-34	19	19	10	18
JACKSONVILLE TO WEST PALM BEACH																	238 N.MI.	
53,000	13	16	1	6	8	-3	-8	-17	-19	-1	-8	-10	-22	-30	16	17	10	18
40,000	16	16	7	10	11	-4	-12	-25	-24	-7	-14	-17	-34	-43	25	26	18	25
30,000	13	19	4	8	10	-2	-9	-19	-23	-5	-11	-14	-28	-36	20	22	15	21
20,000	10	9	-2	2	3	-6	-11	-12	-11	2	-2	-5	-16	-22	17	17	9	14
JUNEAU TO SEATTLE																	788 N.MI.	
53,000	20	8	4	11	10	1	-3	-21	-9	-5	-12	-11	-20	-25	15	13	10	11
40,000	25	11	12	16	16	1	-6	-28	-14	-14	-19	-19	-33	-41	21	20	20	22
30,000	23	9	11	10	13	-3	-12	-26	-12	-13	-15	-17	-33	-43	25	25	22	25
20,000	13	4	8	7	8	-4	-10	-16	-5	-9	-10	-10	-22	-28	20	18	15	18
KANSAS CITY TO LOS ANGELES																	1185 N.MI.	
53,000	-36	-30	-9	-22	-24	-35	-41	35	29	9	21	23	12	7	14	12	9	12
40,000	-60	-45	-33	-39	-43	-59	-68	57	43	32	37	41	27	19	23	21	17	21
30,000	-50	-40	-24	-32	-35	-51	-60	47	37	23	30	33	19	12	25	22	14	20
20,000	-31	-25	-15	-18	-21	-32	-39	30	24	15	17	20	11	6	17	16	9	15

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
KANSAS CITY TO MINNEAPOLIS																	351 N.MI.	
53,000	2	4	1	1	2	-8	-14	-6	-6	-1	-3	-4	-14	-20	18	16	12	15
40,000	4	5	0	0	2	-15	-25	-16	-10	-5	-6	-9	-27	-37	28	25	23	28
30,000	4	2	1	0	2	-16	-26	-14	-8	-4	-5	-7	-25	-36	31	28	20	29
20,000	0	1	2	-1	1	-12	-19	-5	-4	-4	-1	-3	-16	-23	22	21	13	21
KANSAS CITY TO NEW YORK																	961 N.MI.	
53,000	47	31	11	28	28	16	10	-47	-32	-11	-28	-29	-42	-49	15	14	10	13
40,000	74	49	34	48	50	33	24	-76	-51	-36	-51	-52	-71	-82	24	23	20	24
30,000	68	45	28	43	44	27	19	-71	-47	-29	-45	-46	-66	-77	25	24	16	25
20,000	46	30	20	28	29	18	12	-48	-31	-21	-30	-31	-45	-53	19	19	11	18
KANSAS CITY TO PHOENIX																	907 N.MI.	
53,000	-38	-32	-8	-21	-24	-37	-43	36	31	7	21	23	11	6	16	13	10	13
40,000	-64	-48	-29	-40	-44	-62	-72	60	45	28	37	41	25	17	25	23	19	23
30,000	-52	-41	-21	-31	-34	-52	-63	49	39	20	29	32	17	10	27	23	15	22
20,000	-32	-26	-14	-18	-21	-33	-40	30	24	13	17	20	10	4	19	17	10	16
KANSAS CITY TO WASHINGTON, D.C.																	818 N.MI.	
53,000	47	32	10	27	28	15	9	-48	-33	-10	-28	-29	-43	-51	16	15	10	13
40,000	75	51	32	48	50	32	23	-77	-52	-34	-50	-52	-72	-83	25	24	20	25
30,000	68	45	25	42	43	25	17	-70	-47	-26	-44	-45	-66	-78	25	25	16	25
20,000	46	30	18	28	29	16	11	-48	-32	-19	-29	-30	-45	-54	19	19	11	19
KNOXVILLE TO MEMPHIS																	297 N.MI.	
53,000	-52	-37	-3	-26	-29	-47	-55	51	36	3	25	28	11	3	18	17	11	16
40,000	-80	-57	-19	-51	-51	-76	-89	78	55	17	49	49	25	14	28	29	22	27
30,000	-70	-49	-13	-41	-42	-67	-79	68	47	12	39	40	17	7	27	28	17	29
20,000	-46	-33	-10	-24	-26	-44	-53	45	32	10	23	25	11	5	21	21	11	20
KNOXVILLE TO NEW YORK																	560 N.MI.	
53,000	45	28	4	25	25	10	3	-47	-29	-5	-26	-26	-42	-49	17	16	11	15
40,000	64	44	22	47	43	23	14	-70	-48	-24	-49	-47	-68	-80	27	27	22	26
30,000	60	40	20	40	38	20	11	-65	-44	-21	-43	-41	-63	-75	26	27	17	27
20,000	43	26	15	26	25	13	6	-45	-28	-16	-27	-27	-43	-52	21	21	12	20
KNOXVILLE TO PITTSBURG																	332 N.MI.	
53,000	29	17	0	16	14	2	-4	-33	-19	0.	-18	-17	-31	-39	18	17	12	16
40,000	37	26	8	30	25	6	-4	-49	-32	-11	-36	-31	-52	-63	28	28	23	28
30,000	35	23	10	26	22	5	-4	-45	-29	-12	-31	-27	-48	-59	26	29	18	29
20,000	26	13	8	17	15	2	-4	-31	-17	-9	-19	-17	-32	-41	22	22	12	21
KNOXVILLE TO WASHINGTON, D.C.																	378 N.MI.	
53,000	46	30	3	24	25	10	2	-48	-31	-4	-25	-26	-43	-51	17	17	12	16
40,000	67	46	19	47	44	22	12	-72	-50	-21	-49	-47	-70	-82	27	28	22	27
30,000	61	41	17	40	38	18	10	-65	-44	-18	-42	-41	-64	-76	25	28	17	28
20,000	43	27	13	25	25	12	5	-45	-29	-14	-26	-26	-43	-52	21	21	12	21
KODIAK TO SEATTLE																	1246 N.MI.	
53,000	23	11	7	16	13	5	1	-24	-12	-7	-17	-14	-23	-28	14	11	9	11
40,000	33	21	20	25	24	12	5	-35	-23	-21	-28	-27	-40	-47	19	18	18	20
30,000	31	19	17	20	21	6	-2	-34	-22	-19	-24	-24	-40	-48	23	23	20	23
20,000	19	9	12	14	13	2	-4	-21	-11	-13	-16	-15	-26	-32	19	16	14	16
LAND O LAKES TO NEW YORK																	748 N.MI.	
53,000	36	24	14	24	24	13	8	-38	-25	-14	-25	-25	-36	-42	16	14	11	13
40,000	58	39	39	41	44	27	18	-62	-41	-41	-44	-47	-64	-74	25	24	21	25
30,000	56	38	33	37	40	23	14	-60	-40	-35	-41	-43	-61	-71	27	27	19	26
20,000	38	26	23	25	27	15	9	-41	-28	-23	-27	-29	-42	-50	21	20	13	20
LAS VEGAS TO LOS ANGELES																	205 N.MI.	
53,000	-25	-24	-9	-16	-18	-29	-36	23	23	9	15	16	6	0	19	16	12	15
40,000	-38	-32	-33	-28	-33	-51	-60	33	28	32	26	30	12	2	29	27	22	26
30,000	-32	-29	-21	-22	-25	-43	-53	28	25	20	20	23	6	-4	32	28	20	25
20,000	-20	-18	-13	-11	-15	-28	-35	18	17	13	10	14	2	-5	23	21	13	18
LAS VEGAS TO PHOENIX																	222 N.MI.	
53,000	25	18	0	14	13	1	-5	-27	-20	0	-15	-14	-27	-35	19	16	12	15
40,000	38	32	9	24	24	6	-4	-43	-36	-12	-27	-28	-48	-59	30	27	22	26
30,000	31	28	7	19	19	2	-7	-36	-31	-9	-21	-22	-42	-54	33	28	19	24
20,000	20	16	2	9	10	-2	-8	-23	-17	-2	-10	-12	-26	-34	22	20	12	18

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
LAS VEGAS TO SACRAMENTO																	336 N.MI.	
53,000	-32	-23	-6	-19	-19	-31	-39	31	23	5	18	18	7	1	18	15	11	14
40,000	-48	-38	-24	-32	-35	-54	-64	45	36	21	30	32	14	5	28	26	22	26
30,000	-42	-35	-17	-28	-29	-49	-59	39	33	15	26	27	9	-1	31	28	21	26
20,000	-27	-21	-10	-14	-17	-31	-39	25	19	10	13	16	3	-3	23	21	13	19
LAS VEGAS TO SALT LAKE CITY																	320 N.MI.	
53,000	10	12	11	8	10	0	-5	-13	-14	-11	-9	-12	-22	-27	18	15	11	15
40,000	14	14	26	15	18	-1	-10	-21	-18	-29	-20	-22	-40	-49	29	26	23	27
30,000	12	12	19	9	14	-4	-15	-18	-17	-21	-13	-18	-35	-45	32	29	20	27
20,000	8	8	13	6	9	-3	-10	-11	-10	-13	-8	-11	-23	-30	23	20	13	19
LAS VEGAS TO SAN FRANCISCO																	359 N.MI.	
53,000	-33	-25	-8	-20	-20	-33	-40	32	25	7	19	20	8	3	18	15	11	14
40,000	-50	-40	-27	-34	-37	-56	-66	47	38	25	32	35	17	8	28	26	22	26
30,000	-43	-37	-20	-28	-31	-50	-60	41	35	18	27	29	11	2	31	28	21	26
20,000	-28	-22	-12	-15	-18	-31	-39	26	21	11	14	17	5	-2	23	20	13	18
LITTLE ROCK TO ST. LOUIS																	257 N.MI.	
53,000	14	11	-2	8	7	-4	-9	-20	-15	1	-10	-10	-22	-29	19	17	12	16
40,000	29	16	1	13	14	-5	-15	-41	-24	-4	-20	-21	-42	-53	29	28	23	27
30,000	25	14	1	10	11	-7	-16	-35	-20	-2	-16	-16	-37	-49	30	28	18	30
20,000	17	9	3	6	8	-5	-11	-21	-12	-4	-8	-10	-24	-32	22	21	12	20
LOS ANGELES TO MIAMI																	2030 N.MI.	
53,000	39	32	-3	17	23	6	-1	-40	-33	2	-18	-24	-37	-42	11	10	7	10
40,000	58	52	10	37	41	22	12	-61	-55	-12	-38	-43	-59	-67	17	16	13	15
30,000	47	42	7	28	31	15	8	-50	-44	-8	-29	-33	-48	-56	17	15	10	14
20,000	29	25	1	13	17	5	1	-30	-26	-2	-14	-18	-29	-35	12	11	6	10
LOS ANGELES TO MONTREAL																	2143 N.MI.	
53,000	33	25	12	22	22	14	11	-35	-26	-13	-23	-23	-32	-37	11	10	7	9
40,000	54	38	38	38	41	30	24	-57	-40	-39	-41	-44	-56	-63	18	16	14	17
30,000	48	34	30	33	35	24	18	-51	-36	-31	-35	-37	-50	-58	20	18	13	17
20,000	31	22	20	21	23	15	11	-33	-23	-20	-23	-24	-33	-38	14	13	8	13
LOS ANGELES TO NEW ORLEANS																	1448 N.MI.	
53,000	40	33	0	19	24	8	1	-41	-33	0	-20	-25	-38	-44	13	12	9	11
40,000	60	52	15	39	42	24	15	-63	-54	-17	-41	-44	-61	-71	21	19	15	17
30,000	50	43	11	30	32	16	9	-53	-45	-11	-31	-34	-51	-60	21	19	12	17
20,000	32	26	3	15	18	6	2	-33	-27	-4	-16	-18	-32	-38	15	13	8	12
LOS ANGELES TO NEW YORK																	2144 N.MI.	
53,000	39	30	10	24	25	15	10	-41	-30	-11	-25	-26	-37	-42	11	10	7	9
40,000	64	45	34	42	45	32	26	-67	-47	-36	-44	-47	-61	-69	18	17	14	17
30,000	55	40	26	35	37	25	19	-58	-42	-27	-38	-39	-54	-63	19	18	12	17
20,000	37	26	18	22	24	16	12	-38	-27	-18	-23	-25	-36	-42	14	13	8	13
LOS ANGELES TO OKLAHOMA CITY																	1027 N.MI.	
53,000	38	32	5	21	24	11	5	-39	-33	-6	-22	-25	-37	-44	15	13	10	13
40,000	59	48	26	39	42	26	18	-62	-50	-27	-41	-44	-61	-71	24	22	17	21
30,000	49	41	19	30	33	18	11	-52	-43	-20	-32	-34	-52	-62	26	22	14	20
20,000	31	26	11	16	19	9	4	-33	-27	-12	-17	-20	-32	-40	18	16	10	15
LOS ANGELES TO PHILADELPHIA																	2081 N.MI.	
53,000	40	30	10	24	26	15	10	-41	-31	-10	-25	-26	-37	-43	12	10	8	10
40,000	65	46	33	42	45	32	26	-67	-48	-35	-44	-47	-62	-70	18	17	14	17
30,000	56	41	25	35	37	25	19	-59	-43	-26	-37	-39	-54	-63	19	18	12	17
20,000	37	26	17	22	24	16	11	-38	-28	-17	-23	-25	-36	-42	14	13	8	13
LOS ANGELES TO PHOENIX																	320 N.MI.	
53,000	34	29	4	19	21	8	1	-35	-30	-4	-20	-21	-35	-43	18	16	12	15
40,000	52	45	24	34	38	20	10	-54	-47	-25	-35	-39	-58	-69	28	26	21	25
30,000	43	39	16	26	29	12	3	-46	-41	-17	-28	-31	-50	-61	31	27	18	23
20,000	27	23	8	12	16	4	-2	-29	-24	-9	-13	-17	-30	-39	22	19	12	17
LOS ANGELES TO PITTSBURGH																	1851 N.MI.	
53,000	39	30	10	23	25	14	10	-40	-30	-10	-24	-25	-36	-42	12	11	8	10
40,000	62	44	33	41	44	31	24	-65	-46	-35	-43	-46	-61	-69	19	18	15	18
30,000	53	39	25	34	36	23	17	-56	-42	-26	-36	-38	-53	-62	21	19	12	18
20,000	35	25	17	21	23	14	10	-36	-26	-17	-22	-24	-35	-41	15	14	8	13

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LOS ANGELES TO PORTLAND, ORE.																	725 N.MI.	
53,000	-16	-7	3	-6	-6	-16	-22	13	5	-3	5	4	-5	-10	16	14	10	12
40,000	-23	-17	0	-13	-13	-30	-39	17	13	-4	9	8	-8	-17	25	24	21	25
30,000	-21	-16	-1	-13	-12	-30	-40	15	12	-1	9	8	-9	-17	28	26	20	25
20,000	-13	-8	-1	-5	-6	-18	-25	10	6	0	4	4	-7	-13	21	19	12	18
LOS ANGELES TO SACRAMENTO																	309 N.MI.	
53,000	-21	-13	2	-10	-9	-21	-28	19	11	-2	8	8	-3	-8	18	16	12	14
40,000	-31	-26	-2	-17	-18	-38	-48	26	22	-2	14	14	-4	-14	28	26	22	26
30,000	-27	-24	-4	-15	-16	-36	-46	22	20	2	12	13	-5	-14	31	28	21	26
20,000	-17	-12	-2	-7	-8	-22	-30	15	10	1	6	7	-5	-12	23	21	13	18
LOS ANGELES TO ST. LOUIS																	1380 N.MI.	
53,000	37	30	8	22	24	13	8	-38	-31	-9	-23	-25	-36	-42	14	12	9	11
40,000	60	45	31	39	43	28	21	-63	-47	-32	-41	-45	-61	-69	22	20	16	20
30,000	50	39	22	31	34	20	14	-53	-41	-23	-33	-36	-52	-61	23	21	13	19
20,000	32	25	14	18	21	12	7	-33	-26	-15	-19	-22	-33	-40	16	15	9	14
LOS ANGELES TO SALT LAKE CITY																	513 N.MI.	
53,000	15	16	11	11	13	3	-2	-17	-17	-11	-12	-14	-24	-29	17	15	11	14
40,000	21	18	30	20	23	6	-4	-27	-23	-32	-24	-27	-43	-52	27	25	21	25
30,000	18	17	20	14	17	1	-9	-24	-21	-22	-17	-21	-37	-47	30	27	19	25
20,000	12	12	13	8	11	0	-7	-15	-13	-14	-10	-13	-24	-31	22	19	12	18
LOS ANGELES TO SAN FRANCISCO																	295 N.MI.	
53,000	-26	-18	-1	-13	-14	-26	-33	25	16	0	12	12	1	-5	19	16	12	14
40,000	-39	-32	-10	-23	-25	-45	-55	35	29	7	20	22	4	-6	28	26	22	26
30,000	-33	-30	-9	-19	-22	-41	-51	30	27	7	17	19	1	-8	31	28	21	26
20,000	-22	-16	-5	-10	-12	-25	-33	20	14	5	8	11	-2	-8	23	21	13	18
LOS ANGELES TO SEATTLE																	830 N.MI.	
53,000	-15	-6	3	-5	-5	-15	-20	12	4	-4	4	3	-6	-10	15	13	10	12
40,000	-20	-15	1	-12	-11	-28	-37	14	11	-5	7	6	-9	-18	24	23	20	24
30,000	-19	-14	0	-12	-11	-28	-37	13	10	-2	8	6	-10	-18	27	25	19	25
20,000	-12	-6	0	-5	-5	-17	-24	9	4	-1	3	3	-8	-14	20	18	12	17
LOS ANGELES TO SYRACUSE																	2036 N.MI.	
53,000	36	27	11	23	24	15	10	-37	-28	-12	-23	-25	-34	-39	11	10	8	10
40,000	59	41	36	40	43	31	25	-62	-43	-38	-42	-45	-59	-66	18	17	15	18
30,000	51	36	28	34	36	24	18	-54	-39	-29	-36	-38	-52	-60	20	18	12	18
20,000	33	24	19	21	23	15	11	-35	-25	-19	-23	-24	-34	-40	14	13	8	13
LOS ANGELES TO TAMPA																	1870 N.MI.	
53,000	40	33	-1	19	25	7	0	-42	-34	1	-19	-25	-38	-44	12	11	8	10
40,000	60	53	13	39	42	23	14	-63	-55	-14	-41	-44	-61	-69	18	17	13	16
30,000	50	43	9	30	32	16	9	-52	-45	-10	-31	-34	-51	-59	18	17	11	15
20,000	31	26	3	15	18	7	2	-33	-27	-3	-15	-19	-31	-37	13	12	7	11
LOS ANGELES TO TUCSON																	390 N.MI.	
53,000	33	28	1	18	20	6	0	-34	-29	-2	-19	-20	-34	-41	18	15	12	14
40,000	51	45	18	32	35	17	8	-53	-47	-20	-34	-38	-57	-67	27	25	20	24
30,000	42	38	11	25	27	10	2	-45	-40	-13	-26	-29	-48	-59	30	25	18	22
20,000	27	22	5	11	15	3	-3	-28	-24	-5	-12	-15	-29	-38	21	18	11	16
LOUISVILLE TO MEMPHIS																	277 N.MI.	
53,000	-40	-28	-1	-20	-21	-37	-45	36	25	1	19	19	5	-1	18	17	12	16
40,000	-66	-43	-14	-40	-40	-63	-75	59	38	11	36	35	14	3	28	28	22	27
30,000	-58	-37	-10	-33	-32	-56	-68	52	33	9	29	28	9	0	28	28	18	29
20,000	-39	-25	-9	-19	-21	-37	-47	36	22	8	18	19	6	-1	22	21	12	21
LOUISVILLE TO NEW YORK																	573 N.MI.	
53,000	49	31	9	29	28	14	7	-50	-32	-9	-29	-29	-44	-52	17	16	11	15
40,000	74	49	31	50	50	30	20	-77	-52	-32	-52	-52	-73	-85	27	26	22	26
30,000	69	45	27	44	44	25	17	-72	-48	-28	-46	-46	-68	-81	26	28	18	27
20,000	48	30	19	29	30	16	10	-50	-32	-20	-30	-31	-47	-56	21	21	12	20
LOUISVILLE TO ST. LOUIS																	220 N.MI.	
53,000	-48	-34	-9	-27	-28	-44	-52	47	33	9	26	28	13	7	19	17	12	16
40,000	-76	-53	-31	-49	-51	-73	-86	73	51	30	47	49	28	18	29	28	24	29
30,000	-69	-47	-23	-42	-43	-66	-79	66	45	23	40	41	21	11	30	29	19	30
20,000	-46	-31	-17	-28	-28	-45	-55	44	30	17	27	27	14	7	23	22	13	22

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
LOUISVILLE TO ST. PETERSBURG																	634 N.MI.	
53,000	7	9	4	5	6	-3	-8	-14	-12	-5	-6	-9	-19	-24	15	16	10	15
40,000	6	9	9	5	8	-8	-16	-20	-18	-11	-12	-15	-30	-39	24	25	19	23
30,000	6	11	5	5	6	-7	-15	-16	-17	-6	-9	-11	-26	-34	22	23	15	23
20,000	3	6	3	2	3	-6	-12	-8	-9	-3	-4	-6	-16	-22	18	18	10	16
LOUISVILLE TO TAMPA																	634 N.MI.	
53,000	8	9	4	5	6	-3	-8	-14	-13	-5	-7	-9	-19	-25	15	16	10	15
40,000	7	10	9	6	8	-7	-15	-21	-19	-11	-12	-15	-31	-40	24	25	19	23
30,000	7	11	5	5	7	-7	-14	-17	-17	-6	-10	-12	-27	-35	22	23	15	23
20,000	4	7	3	2	4	-6	-12	-8	-10	-3	-4	-6	-16	-22	18	18	10	16
LOUISVILLE TO WASHINGTON, D.C.																	410 N.MI.	
53,000	50	33	8	28	29	14	7	-51	-34	-8	-29	-29	-45	-54	18	17	12	15
40,000	77	52	29	50	51	30	20	-79	-54	-31	-52	-53	-75	-87	28	28	22	27
30,000	71	47	24	43	44	24	15	-73	-49	-25	-46	-46	-69	-82	26	28	18	28
20,000	48	32	18	28	29	16	9	-50	-33	-18	-29	-30	-47	-57	22	22	12	21
MEDFORD TO SACRAMENTO																	243 N.MI.	
53,000	14	6	-3	5	5	-6	-11	-17	-8	2	-7	-6	-18	-24	18	15	12	14
40,000	18	14	-1	9	10	-9	-19	-24	-18	-3	-13	-14	-34	-44	29	27	24	29
30,000	17	13	0	11	9	-10	-20	-23	-17	-2	-15	-13	-34	-45	33	29	23	30
20,000	11	7	2	4	5	-8	-15	-14	-9	-3	-6	-7	-21	-29	25	22	14	21
MEDFORD TO SAN FRANCISCO																	286 N.MI.	
53,000	8	1	-6	1	0	-10	-15	-11	-3	5	-2	-2	-13	-19	18	15	12	14
40,000	8	7	-7	1	2	-17	-26	-15	-11	4	-6	-7	-25	-36	29	27	23	28
30,000	8	6	-5	4	3	-16	-26	-14	-11	2	-8	-7	-27	-37	32	29	23	29
20,000	5	3	-1	0	1	-12	-19	-8	-5	0	-2	-3	-17	-25	24	22	14	20
MEMPHIS TO NEW ORLEANS																	304 N.MI.	
53,000	-10	-4	6	-2	-1	-13	-19	3	0	-6	0	-1	-11	-17	17	17	11	16
40,000	-24	-8	6	-5	-7	-25	-35	9	-2	-7	-1	-1	-18	-26	27	28	21	24
30,000	-19	-6	3	-4	-5	-23	-32	9	-1	-3	-1	0	-15	-23	26	26	16	26
20,000	-11	-3	4	-2	-2	-14	-21	7	0	-5	0	-1	-11	-17	20	19	11	18
MEMPHIS TO ST. LOUIS																	222 N.MI.	
53,000	-7	-5	-5	-3	-5	-15	-21	1	1	5	1	2	-8	-14	19	17	12	16
40,000	-6	-9	-10	-8	-8	-26	-36	-10	0	8	1	0	-19	-29	29	29	23	28
30,000	-5	-7	-7	-6	-6	-24	-34	-8	0	5	1	0	-18	-28	30	29	18	30
20,000	-2	-4	-3	-5	-3	-16	-23	-4	1	2	3	1	-12	-19	22	22	12	21
MEMPHIS TO SHREVEPORT																	247 N.MI.	
53,000	-42	-31	2	-19	-22	-39	-47	39	29	-2	18	20	4	-3	18	17	11	16
40,000	-70	-48	-7	-39	-40	-65	-78	65	44	6	35	36	13	2	29	29	21	25
30,000	-59	-40	-5	-30	-31	-56	-68	55	36	4	26	28	7	-2	28	27	17	28
20,000	-37	-26	-1	-17	-18	-36	-45	35	24	1	15	17	2	-4	21	20	11	19
MEMPHIS TO WASHINGTON, D.C.																	660 N.MI.	
53,000	48	32	4	25	27	11	4	-50	-34	-4	-26	-28	-44	-52	16	16	11	14
40,000	73	50	21	48	47	26	16	-77	-53	-22	-50	-50	-72	-84	25	26	20	25
30,000	66	44	17	40	40	20	11	-69	-47	-18	-42	-42	-65	-77	24	26	16	26
20,000	45	30	13	25	26	13	7	-47	-31	-14	-26	-27	-44	-53	20	19	11	19
MIAMI TO MINNEAPOLIS																	1305 N.MI.	
53,000	-25	-19	-6	-13	-15	-24	-30	20	16	5	11	12	4	0	13	13	8	12
40,000	-36	-29	-17	-24	-26	-40	-47	26	22	15	19	20	7	0	20	20	16	20
30,000	-31	-26	-12	-20	-21	-35	-43	23	21	11	16	17	5	-1	20	20	13	20
20,000	-20	-16	-7	-12	-13	-23	-29	16	14	6	10	11	2	-2	15	15	9	14
MIAMI TO MONTREAL																	1221 N.MI.	
53,000	11	4	-3	7	4	-4	-9	-17	-7	2	-9	-7	-17	-22	13	13	9	13
40,000	13	10	-1	14	8	-5	-13	-25	-18	-2	-20	-16	-31	-39	21	21	17	21
30,000	12	6	2	12	7	-5	-12	-22	-12	-4	-17	-13	-26	-34	20	21	14	20
20,000	11	5	4	9	7	-2	-7	-15	-8	-5	-11	-9	-19	-25	16	16	9	15
MIAMI TO NEW ORLEANS																	585 N.MI.	
53,000	-39	-33	4	-16	-22	-38	-45	38	32	-4	15	21	3	-5	15	15	9	16
40,000	-56	-54	-3	-34	-38	-59	-69	52	51	2	32	35	13	3	23	23	17	21
30,000	-45	-42	-3	-25	-29	-47	-55	42	40	3	24	27	9	2	19	20	13	19
20,000	-26	-24	0	-11	-14	-27	-34	25	23	0	11	13	2	-3	15	15	8	13

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
MIAMI TO NEW YORK																	947 N.MI.	
53,000	15	6	-3	8	5	-4	-9	-20	-10	3	-9	-8	-20	-26	14	15	9	14
40,000	17	15	-1	16	11	-3	-11	-29	-23	-1	-22	-18	-35	-44	22	23	17	22
30,000	16	10	2	14	9	-3	-10	-25	-16	-3	-18	-14	-29	-37	20	21	14	20
20,000	13	8	5	11	8	0	-5	-17	-11	-6	-12	-11	-21	-27	16	16	9	15
MIAMI TO PHILADELPHIA																	882 N.MI.	
53,000	12	4	-3	6	4	-5	-10	-18	-8	3	-8	-7	-18	-24	14	15	9	15
40,000	14	12	-3	14	9	-6	-14	-25	-21	1	-19	-15	-32	-41	22	23	17	22
30,000	12	7	0	12	7	-5	-12	-21	-13	-2	-16	-12	-26	-34	20	21	14	21
20,000	11	6	4	9	7	-2	-7	-15	-9	-5	-11	-9	-19	-25	16	16	9	15
MIAMI TO PITTSBURGH																	881 N.MI.	
53,000	-1	-4	-4	0	-3	-11	-16	-5	1	4	-2	0	-9	-14	14	15	9	15
40,000	-6	-4	-8	2	-4	-19	-26	-7	-5	6	-8	-3	-18	-26	22	23	17	22
30,000	-5	-7	-3	2	-3	-16	-23	-5	0	2	-6	-2	-15	-22	19	21	14	21
20,000	0	-3	1	3	0	-9	-14	-5	0	-2	-5	-3	-12	-17	16	16	9	15
MIAMI TO ST. LOUIS																	929 N.MI.	
53,000	-28	-23	-4	-13	-16	-28	-34	24	20	3	12	14	4	-1	14	14	9	14
40,000	-40	-35	-13	-25	-27	-44	-52	29	28	11	21	22	7	0	22	23	17	21
30,000	-33	-30	-9	-20	-22	-37	-46	25	25	8	17	18	5	-2	20	21	13	21
20,000	-20	-18	-4	-10	-12	-23	-29	16	16	4	9	10	1	-4	16	16	9	15
MIAMI TO SAN FRANCISCO																	2242 N.MI.	
53,000	-39	-31	-2	-19	-24	-35	-41	37	30	2	19	23	9	3	11	10	7	10
40,000	-58	-50	-17	-38	-41	-57	-64	55	47	15	36	39	23	16	17	16	13	15
30,000	-48	-41	-12	-30	-32	-47	-55	45	39	12	29	30	16	11	17	16	10	15
20,000	-30	-25	-5	-15	-18	-29	-35	29	24	5	15	17	7	4	12	11	7	10
MIAMI TO SAN JUAN																	908 N.MI.	
53,000	26	25	-6	7	12	-1	-6	-27	-25	6	-7	-12	-27	-34	14	14	8	12
40,000	42	43	4	15	24	7	0	-44	-45	-4	-16	-26	-46	-54	18	19	13	19
30,000	30	30	3	9	16	4	-1	-31	-31	-3	-10	-17	-32	-39	16	15	10	13
20,000	10	13	-5	-1	3	-5	-8	-10	-14	5	1	-3	-13	-18	12	11	7	9
MIAMI TO SEATTLE																	2363 N.MI.	
53,000	-34	-25	-7	-20	-21	-31	-36	32	23	6	19	20	11	6	10	9	7	9
40,000	-51	-38	-22	-36	-37	-49	-56	46	35	20	33	33	21	15	16	15	13	16
30,000	-44	-34	-18	-32	-31	-43	-51	39	31	17	29	28	17	11	17	16	11	16
20,000	-29	-22	-11	-19	-19	-28	-34	27	20	11	18	18	10	7	12	12	7	11
MIAMI TO TALLAHASSEE																	350 N.MI.	
53,000	-28	-26	0	-12	-15	-30	-37	24	24	-1	11	13	1	-5	16	16	10	17
40,000	-40	-39	-6	-23	-26	-45	-55	32	33	5	20	22	5	-3	24	24	18	23
30,000	-31	-33	-5	-18	-21	-36	-45	26	29	4	16	18	4	-3	20	21	14	20
20,000	-19	-18	0	-6	-9	-21	-28	17	16	-1	6	8	-2	-6	16	16	9	14
MIAMI TO WASHINGTON, D.C.																	800 N.MI.	
53,000	8	2	-4	4	2	-7	-12	-14	-5	4	-6	-4	-15	-21	15	15	9	15
40,000	8	7	-5	10	5	-10	-18	-20	-16	3	-15	-11	-28	-37	23	24	17	23
30,000	7	2	-1	9	4	-9	-15	-16	-9	0	-13	-9	-23	-30	20	21	14	21
20,000	8	4	3	7	5	-4	-9	-12	-7	-4	-9	-7	-17	-22	17	16	9	15
MILWAUKEE TO MINNEAPOLIS																	257 N.MI.	
53,000	-37	-23	-15	-25	-24	-36	-42	36	22	14	24	23	12	7	18	16	12	15
40,000	-58	-38	-43	-44	-46	-64	-74	54	36	41	42	43	25	15	27	25	24	29
30,000	-55	-37	-36	-40	-41	-61	-72	51	35	35	38	39	20	10	31	29	21	30
20,000	-38	-25	-23	-28	-28	-42	-50	36	24	22	26	26	13	6	23	22	14	22
MILWAUKEE TO NEW YORK																	646 N.MI.	
53,000	43	28	13	27	27	15	10	-44	-29	-13	-28	-27	-40	-48	17	15	11	14
40,000	69	46	39	46	49	31	22	-72	-48	-40	-49	-51	-70	-81	26	25	22	26
30,000	66	43	32	42	44	26	17	-69	-45	-34	-44	-46	-66	-78	27	27	19	27
20,000	45	30	22	28	30	17	11	-46	-31	-23	-30	-31	-46	-54	21	21	13	20
MILWAUKEE TO PHILADELPHIA																	598 N.MI.	
53,000	42	28	13	26	26	14	9	-43	-29	-13	-27	-27	-40	-47	17	15	11	14
40,000	68	45	38	44	48	30	21	-71	-47	-39	-47	-50	-70	-80	26	25	22	26
30,000	65	42	31	40	43	25	16	-68	-45	-32	-43	-45	-65	-77	27	28	19	27
20,000	44	29	21	27	29	16	10	-46	-31	-22	-29	-30	-45	-54	21	21	13	21

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HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
MILWAUKEE TO WASHINGTON, D.C.																		550 N.MI.
53,000	39	27	12	24	24	13	8	-41	-28	-13	-25	-25	-38	-45	17	16	12	15
40,000	64	43	35	41	45	27	17	-69	-46	-37	-44	-48	-67	-78	27	26	22	27
30,000	61	40	28	36	40	22	13	-65	-43	-29	-40	-43	-63	-74	27	28	19	28
20,000	42	28	19	25	27	14	8	-44	-30	-20	-27	-29	-44	-52	22	21	13	21
MINNEAPOLIS TO NEW YORK																		889 N.MI.
53,000	40	26	14	26	25	15	10	-41	-27	-14	-27	-26	-37	-44	15	13	10	13
40,000	63	42	41	44	47	31	22	-66	-44	-42	-47	-49	-66	-76	24	23	20	24
30,000	60	40	34	40	42	26	18	-64	-42	-36	-43	-45	-63	-73	26	25	18	25
20,000	41	28	23	27	29	17	11	-43	-29	-24	-29	-30	-43	-50	20	19	12	19
MINNEAPOLIS TO OMAHA																		288 N.MI.
53,000	-19	-15	-8	-12	-13	-23	-29	16	13	7	10	11	1	-4	18	16	12	15
40,000	-36	-24	-23	-22	-26	-44	-53	27	20	18	16	20	3	-7	28	25	23	29
30,000	-32	-21	-18	-19	-22	-41	-51	24	16	15	14	17	-1	-11	31	29	20	29
20,000	-18	-13	-12	-12	-13	-26	-34	14	10	10	9	11	-2	-9	22	21	13	21
MINNEAPOLIS TO SALT LAKE CITY																		859 N.MI.
53,000	-32	-22	-15	-22	-22	-32	-37	30	22	15	21	21	13	8	15	13	10	12
40,000	-50	-35	-44	-40	-42	-58	-66	47	33	42	37	40	25	16	23	21	20	24
30,000	-45	-33	-36	-35	-37	-53	-62	42	31	34	32	35	19	10	27	24	17	25
20,000	-30	-21	-22	-24	-24	-35	-41	28	20	21	22	23	12	6	19	17	12	17
MINNEAPOLIS TO SEATTLE																		1212 N.MI.
53,000	-31	-19	-15	-25	-22	-30	-35	30	19	15	24	21	13	9	13	11	9	10
40,000	-45	-30	-37	-39	-38	-51	-59	44	28	36	37	36	23	16	20	18	18	22
30,000	-45	-30	-34	-38	-36	-51	-60	43	28	32	36	35	20	13	23	22	17	23
20,000	-31	-21	-22	-27	-25	-35	-41	30	20	21	26	24	14	9	16	15	11	15
MINNEAPOLIS TO SPOKANE																		1022 N.MI.
53,000	-32	-19	-15	-25	-22	-31	-36	31	19	15	24	21	13	9	14	11	9	11
40,000	-46	-30	-40	-39	-39	-53	-61	45	29	38	37	37	23	16	20	19	19	23
30,000	-46	-30	-35	-38	-37	-52	-61	44	28	33	36	35	20	12	24	22	18	24
20,000	-32	-21	-22	-27	-25	-36	-42	31	20	22	26	24	14	9	17	16	12	16
MINNEAPOLIS TO WASHINGTON, D.C.																		807 N.MI.
53,000	37	25	13	24	24	13	9	-39	-26	-13	-25	-25	-36	-43	16	14	11	13
40,000	60	40	38	41	44	28	19	-65	-43	-39	-44	-47	-64	-74	24	23	21	25
30,000	57	38	30	36	39	23	14	-61	-41	-32	-40	-42	-60	-70	26	26	18	26
20,000	40	27	20	25	27	15	9	-42	-28	-21	-27	-28	-42	-50	20	20	12	19
MINNEAPOLIS TO WINNIPEG																		342 N.MI.
53,000	-23	-11	-9	-17	-14	-24	-30	21	9	8	16	13	3	-2	16	13	11	14
40,000	-31	-18	-26	-27	-25	-42	-51	26	15	22	23	21	5	-4	24	22	22	28
30,000	-31	-20	-22	-26	-25	-42	-52	25	17	19	22	21	3	-6	28	27	21	28
20,000	-23	-16	-15	-19	-18	-31	-38	21	14	14	17	16	4	-3	21	20	14	20
MONCTON TO MONTREAL																		376 N.MI.
53,000	-41	-24	-16	-30	-26	-39	-46	40	23	15	29	26	14	9	18	15	12	15
40,000	-66	-43	-43	-55	-51	-71	-82	64	41	42	52	49	30	20	29	27	25	29
30,000	-62	-42	-42	-49	-48	-68	-81	59	39	40	47	45	26	15	35	31	23	29
20,000	-42	-27	-27	-34	-32	-47	-55	40	26	26	32	31	17	9	24	23	15	22
MONCTON TO TORONTO																		651 N.MI.
53,000	-41	-24	-15	-29	-26	-38	-45	40	24	14	29	26	15	9	17	14	12	14
40,000	-68	-43	-42	-53	-51	-70	-80	65	41	40	51	49	31	21	27	25	23	26
30,000	-65	-41	-39	-48	-47	-67	-78	61	38	38	46	45	26	17	32	29	21	27
20,000	-43	-27	-26	-33	-31	-45	-53	41	26	25	31	30	17	10	22	21	14	21
MONTREAL TO NEW YORK																		290 N.MI.
53,000	-7	0	3	-5	-2	-13	-19	2	-2	-4	3	-1	-11	-17	18	16	13	15
40,000	-12	-4	0	-11	-6	-26	-36	-2	-3	-5	3	-2	-21	-31	30	28	25	29
30,000	-11	-2	-1	-10	-6	-26	-37	-2	-5	-3	3	-2	-21	-32	34	32	22	30
20,000	-8	0	0	-6	-3	-17	-26	2	-4	-2	3	0	-14	-22	24	23	14	23
MONTREAL TO SAGUENAY																		214 N.MI.
53,000	23	11	6	17	14	3	-3	-26	-12	-7	-19	-15	-27	-33	18	15	13	15
40,000	35	17	16	29	24	5	-5	-42	-21	-21	-35	-29	-49	-59	29	27	26	29
30,000	32	16	15	26	22	2	-9	-40	-21	-20	-31	-27	-48	-60	34	32	24	30
20,000	23	11	11	17	15	1	-7	-26	-13	-13	-20	-17	-32	-41	24	23	16	23

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MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
MONTREAL TO ST. JOHN																	331 N.MI.	
53,000	40	24	16	29	26	15	9	-41	-24	-16	-30	-27	-39	-46	18	16	13	15
40,000	64	42	42	52	50	30	20	-67	-44	-44	-54	-52	-72	-83	30	27	26	29
30,000	60	40	41	46	46	26	15	-63	-43	-42	-48	-48	-69	-81	36	32	23	30
20,000	40	27	26	32	31	17	9	-42	-28	-27	-33	-32	-47	-55	24	23	15	23
MONTREAL TO TAMPA																	1130 N.MI.	
53,000	-23	-12	1	-12	-11	-22	-28	18	9	-2	10	8	-1	-6	14	13	9	13
40,000	-34	-24	-5	-26	-22	-38	-47	22	16	2	20	15	0	-8	22	22	17	22
30,000	-31	-18	-7	-22	-18	-34	-42	21	12	5	17	13	0	-7	21	22	14	21
20,000	-22	-12	-6	-14	-12	-24	-30	17	9	5	12	10	0	-5	17	17	9	16
MONTREAL TO TORONTO																	273 N.MI.	
53,000	-40	-24	-13	-28	-25	-38	-45	38	23	12	27	24	12	7	18	16	13	15
40,000	-65	-42	-38	-49	-48	-68	-79	62	39	36	46	45	26	16	29	28	25	29
30,000	-64	-38	-35	-45	-44	-66	-78	60	35	33	42	41	21	11	33	31	23	30
20,000	-42	-25	-23	-30	-29	-45	-54	40	23	22	29	28	13	6	24	23	15	23
MONTREAL TO VANCOUVER																	1986 N.MI.	
53,000	-31	-18	-16	-25	-22	-29	-33	30	18	15	24	21	14	11	11	8	7	9
40,000	-44	-28	-36	-38	-37	-48	-54	42	27	34	36	35	24	18	15	15	15	17
30,000	-46	-30	-34	-38	-36	-49	-56	43	28	32	36	35	23	16	18	18	14	18
20,000	-32	-20	-23	-26	-25	-34	-38	30	19	22	25	24	16	11	13	13	10	13
MONTREAL TO WASHINGTON, D.C.																	423 N.MI.	
53,000	-22	-10	-2	-15	-11	-23	-30	18	8	1	13	9	-2	-7	18	16	12	15
40,000	-34	-20	-12	-28	-23	-42	-53	21	13	8	21	15	-3	-13	29	27	24	28
30,000	-32	-18	-13	-25	-21	-40	-51	21	11	9	19	14	-4	-14	31	30	21	29
20,000	-23	-10	-8	-16	-13	-28	-36	17	6	7	13	10	-3	-10	23	22	14	22
NASHVILLE TO NEW YORK																	663 N.MI.	
53,000	47	30	6	26	26	12	5	-48	-31	-6	-27	-27	-43	-51	16	16	11	14
40,000	70	47	24	48	46	27	17	-74	-50	-27	-51	-49	-70	-82	26	26	21	26
30,000	64	43	22	41	41	22	14	-68	-46	-23	-44	-43	-65	-77	25	27	17	26
20,000	45	28	16	27	27	14	8	-47	-30	-17	-28	-28	-44	-53	20	20	11	19
NASHVILLE TO ST. LOUIS																	235 N.MI.	
53,000	-38	-27	-9	-20	-22	-36	-44	35	25	8	19	20	8	3	19	17	12	16
40,000	-58	-42	-25	-38	-40	-61	-72	49	38	23	34	35	16	6	29	28	23	28
30,000	-51	-37	-18	-32	-33	-54	-65	44	33	17	28	29	11	1	29	29	18	30
20,000	-33	-25	-12	-21	-21	-36	-45	29	23	11	19	19	7	0	22	22	12	21
NASHVILLE TO TULSA																	445 N.MI.	
53,000	-50	-36	-6	-26	-29	-45	-53	49	36	5	26	28	12	5	18	16	11	15
40,000	-78	-56	-23	-50	-50	-73	-86	75	54	22	48	49	27	17	28	27	21	26
30,000	-67	-48	-16	-40	-41	-65	-77	65	46	15	38	39	18	9	28	27	17	28
20,000	-44	-32	-12	-24	-26	-43	-52	43	31	11	23	25	11	5	21	20	11	19
NASHVILLE TO WASHINGTON, D.C.																	487 N.MI.	
53,000	49	32	5	26	27	11	4	-50	-33	-5	-27	-28	-45	-52	17	16	11	15
40,000	73	50	22	49	48	26	16	-76	-53	-24	-51	-50	-72	-85	27	27	21	27
30,000	66	44	19	41	41	21	12	-69	-47	-20	-44	-43	-66	-78	25	27	17	27
20,000	46	30	15	26	27	13	7	-47	-31	-15	-27	-28	-45	-54	21	21	12	20
NEW ORLEANS TO NEW YORK																	1025 N.MI.	
53,000	41	26	-1	20	22	6	0	-44	-28	0	-22	-23	-38	-45	14	14	9	13
40,000	59	42	11	40	38	18	9	-66	-47	-13	-44	-42	-62	-73	22	23	18	22
30,000	53	36	11	33	32	15	7	-59	-40	-12	-36	-35	-56	-66	21	23	14	22
20,000	38	24	8	20	20	9	4	-40	-26	-9	-22	-22	-37	-45	17	17	9	16
NEW ORLEANS TO ST. PETERSBURG																	416 N.MI.	
53,000	43	35	-5	17	24	3	-5	-44	-36	5	-18	-25	-42	-49	16	16	10	16
40,000	60	56	3	37	40	16	5	-63	-58	-4	-39	-42	-64	-75	24	25	18	22
30,000	49	44	3	28	31	11	2	-51	-45	-4	-30	-32	-52	-62	21	22	14	21
20,000	30	26	1	14	16	4	-1	-31	-27	-2	-14	-17	-31	-39	17	16	9	15
NEW ORLEANS TO SHRLVEPORT																	235 N.MI.	
53,000	-36	-30	0	-17	-20	-35	-43	32	28	0	16	18	4	-2	17	17	11	16
40,000	-53	-49	-9	-37	-36	-58	-69	44	43	8	34	32	12	2	28	27	21	23
30,000	-44	-38	-7	-28	-28	-48	-59	38	35	6	26	24	7	-1	26	26	16	25
20,000	-27	-24	-2	-15	-15	-30	-38	24	22	2	14	14	2	-4	19	18	10	17

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
NEW ORLEANS TO TAMPA																	423 N.MI.	
53,000	43	35	-5	18	24	3	-5	-44	-36	5	-18	-25	-42	-49	16	16	10	16
40,000	60	56	3	38	40	16	5	-63	-59	-4	-39	-42	-65	-76	24	25	18	22
30,000	49	44	3	29	31	11	2	-52	-45	-4	-30	-32	-53	-62	21	22	14	21
20,000	30	26	1	14	16	4	-1	-31	-27	-2	-14	-17	-31	-39	17	16	9	15
NEWPORT NEWS TO NEW YORK																	245 N.MI.	
53,000	27	13	0	17	13	1	-5	-31	-16	-1	-19	-16	-30	-38	19	18	12	16
40,000	33	24	11	31	24	5	-5	-45	-31	-15	-37	-31	-52	-63	30	29	24	29
30,000	32	22	13	27	22	4	-5	-42	-29	-15	-32	-28	-48	-60	30	30	20	29
20,000	27	14	10	19	16	3	-4	-32	-17	-11	-21	-19	-34	-43	23	23	13	22
NEW YORK TO NORFOLK																	251 N.MI.	
53,000	-28	-14	0	-17	-14	-27	-35	23	11	-1	15	11	-1	-7	19	18	12	16
40,000	-40	-28	-12	-34	-28	-48	-59	28	20	9	28	21	1	-9	30	29	24	29
30,000	-38	-25	-13	-29	-25	-45	-56	26	19	11	24	19	1	-9	30	30	19	29
20,000	-29	-15	-10	-19	-17	-32	-40	23	12	9	17	14	1	-6	23	23	13	22
NEW YORK TO PHOENIX																	1866 N.MI.	
53,000	-43	-32	-9	-25	-27	-39	-45	42	31	9	25	27	15	9	12	11	8	10
40,000	-71	-50	-32	-46	-48	-65	-74	68	48	30	43	46	32	25	19	18	15	18
30,000	-62	-45	-24	-39	-40	-57	-67	60	42	23	36	38	24	18	20	19	12	18
20,000	-41	-29	-17	-24	-26	-38	-44	39	28	16	23	25	15	11	15	14	8	13
NEW YORK TO PITTSBURGH																	293 N.MI.	
53,000	-49	-31	-12	-30	-29	-44	-53	48	31	11	29	29	15	9	19	17	12	16
40,000	-77	-52	-38	-53	-54	-75	-87	75	50	36	51	52	32	21	29	29	24	29
30,000	-74	-49	-32	-47	-48	-71	-84	72	46	31	45	47	27	17	30	30	20	30
20,000	-51	-33	-22	-31	-33	-49	-59	49	32	22	30	31	17	10	23	23	13	22
NEW YORK TO PORTLAND, ME.																	238 N.MI.	
53,000	31	16	5	22	18	6	-1	-35	-18	-6	-23	-19	-33	-41	19	17	12	16
40,000	46	29	22	38	33	13	3	-54	-34	-26	-43	-39	-60	-71	30	29	26	30
30,000	44	27	22	33	30	10	0	-52	-32	-25	-37	-35	-57	-69	35	32	22	30
20,000	33	19	15	23	21	7	0	-37	-22	-16	-25	-24	-40	-48	24	24	14	23
NEW YORK TO RALEIGH																	370 N.MI.	
53,000	-37	-21	-2	-21	-19	-34	-42	33	19	1	20	17	4	-2	18	17	12	16
40,000	-53	-37	-17	-41	-36	-57	-68	43	31	14	37	31	11	1	28	28	23	28
30,000	-50	-34	-16	-36	-32	-53	-64	41	29	14	32	27	10	1	28	29	18	28
20,000	-36	-21	-12	-23	-22	-37	-46	32	18	11	21	19	7	0	22	22	12	21
NEW YORK TO RICHMOND																	250 N.MI.	
53,000	-38	-21	-3	-23	-20	-35	-43	34	19	2	21	18	5	-1	19	18	12	16
40,000	-55	-38	-20	-43	-38	-60	-71	45	32	17	38	32	13	2	30	29	24	29
30,000	-52	-35	-19	-37	-34	-56	-67	43	30	17	33	29	11	1	30	30	20	30
20,000	-38	-22	-14	-24	-23	-39	-48	34	19	13	22	21	7	0	23	23	13	22
NEW YORK TO ROCHESTER, N.Y.																	229 N.MI.	
53,000	-34	-24	-12	-20	-22	-34	-41	31	22	12	19	20	9	3	19	17	13	16
40,000	-58	-39	-33	-37	-41	-62	-73	50	35	31	32	36	17	7	30	29	25	29
30,000	-56	-38	-28	-33	-37	-59	-70	48	34	26	28	33	14	3	32	31	22	30
20,000	-36	-27	-19	-22	-25	-40	-49	32	25	18	19	23	9	2	24	24	14	23
NEW YORK TO ST. LOUIS																	773 N.MI.	
53,000	-49	-32	-10	-29	-29	-43	-51	48	31	10	28	28	15	9	16	15	11	14
40,000	-77	-52	-35	-52	-53	-73	-84	75	50	33	50	50	32	23	26	25	21	25
30,000	-72	-48	-29	-46	-46	-67	-80	70	45	27	44	44	27	18	25	26	17	26
20,000	-49	-32	-20	-30	-31	-46	-55	48	30	20	29	30	17	11	20	20	12	19
NEW YORK TO SAN FRANCISCO																	2240 N.MI.	
53,000	-38	-27	-13	-25	-25	-34	-39	37	26	13	24	24	16	12	11	10	7	9
40,000	-61	-42	-40	-44	-46	-59	-66	59	40	38	41	44	32	26	17	16	14	17
30,000	-55	-39	-31	-38	-39	-53	-61	52	37	30	35	37	26	20	19	18	12	18
20,000	-36	-25	-20	-25	-26	-35	-41	35	24	20	23	25	16	12	14	13	8	13
NEW YORK TO SEATTLE																	2098 N.MI.	
53,000	-34	-22	-15	-25	-23	-31	-36	33	21	15	25	22	15	12	11	9	7	9
40,000	-52	-35	-39	-41	-41	-53	-60	50	33	37	39	39	28	22	16	15	15	18
30,000	-52	-34	-34	-39	-39	-52	-59	49	32	33	37	37	25	19	19	18	14	18
20,000	-35	-24	-22	-27	-27	-36	-41	34	22	22	26	25	17	13	14	13	9	13

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HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
NEW YORK TO TAMPA																	874 N.MI.	
53,000	-29	-16	2	-14	-13	-27	-33	24	13	-3	12	11	0	-5	15	15	10	14
40,000	-41	-32	-5	-30	-26	-45	-54	31	24	3	25	20	4	-5	23	24	18	23
30,000	-36	-24	-6	-25	-22	-38	-47	28	19	5	21	17	3	-4	21	23	14	22
20,000	-26	-17	-7	-16	-15	-27	-34	22	14	6	14	13	3	-2	17	17	9	16
NEW YORK TO TOLEDO																	456 N.MI.	
53,000	-47	-31	-13	-29	-29	-43	-50	46	30	12	28	28	15	9	18	16	12	15
40,000	-75	-50	-39	-51	-53	-73	-85	73	48	37	48	51	31	22	28	27	23	27
30,000	-72	-47	-33	-46	-48	-69	-81	70	45	32	43	46	26	17	28	29	20	28
20,000	-49	-33	-23	-30	-32	-48	-57	47	31	22	29	31	17	11	22	22	13	21
NEW YORK TO TORONTO																	318 N.MI.	
53,000	-37	-25	-13	-23	-23	-36	-43	34	24	12	21	22	11	5	18	16	13	15
40,000	-61	-41	-36	-41	-44	-64	-75	55	38	33	36	40	21	11	29	28	24	28
30,000	-59	-40	-30	-36	-40	-61	-73	53	36	28	32	36	17	7	31	31	21	30
20,000	-39	-28	-21	-24	-27	-42	-50	35	26	20	22	25	11	4	23	23	14	22
NEW YORK TO TUCSON																	1852 N.MI.	
53,000	-44	-33	-8	-25	-28	-39	-45	43	32	7	24	27	14	8	12	11	8	10
40,000	-71	-52	-28	-46	-48	-65	-75	69	49	27	44	46	31	23	19	18	15	18
30,000	-63	-46	-22	-38	-40	-58	-67	60	43	21	36	38	23	17	20	19	12	18
20,000	-41	-29	-15	-23	-25	-38	-44	40	28	15	22	24	15	10	15	14	8	13
NEW YORK TO WEST PALM BEACH																	894 N.MI.	
53,000	-21	-10	3	-10	-9	-20	-27	15	7	-3	8	6	-4	-9	15	15	9	15
40,000	-30	-24	-1	-23	-19	-36	-45	18	16	0	17	12	-3	-11	23	23	17	23
30,000	-26	-17	-3	-19	-15	-30	-39	17	10	2	15	10	-3	-10	21	22	14	21
20,000	-18	-12	-6	-13	-11	-22	-28	14	9	5	11	9	0	-5	17	17	9	15
NEW YORK TO YOUNGSTOWN																	315 N.MI.	
53,000	-47	-31	-13	-29	-29	-43	-51	46	30	12	28	28	15	9	18	17	12	16
40,000	-76	-51	-39	-51	-53	-74	-86	74	49	37	49	51	31	21	29	28	24	28
30,000	-73	-48	-33	-46	-48	-70	-83	70	46	32	43	46	26	16	30	30	20	30
20,000	-50	-33	-23	-31	-32	-49	-58	48	32	22	29	31	17	10	23	23	14	22
OAKLAND TO PHOENIX																	560 N.MI.	
53,000	31	23	3	17	18	6	1	-32	-24	-4	-18	-19	-31	-38	17	15	11	13
40,000	46	38	18	30	32	15	6	-49	-41	-21	-32	-35	-53	-63	27	25	21	24
30,000	39	34	13	24	26	9	1	-42	-36	-15	-26	-28	-47	-57	30	26	19	23
20,000	25	20	7	12	15	3	-3	-27	-21	-8	-13	-16	-29	-37	21	19	12	17
OAKLAND TO SALT LAKE CITY																	510 N.MI.	
53,000	27	22	14	19	20	10	5	-29	-23	-14	-20	-20	-31	-37	17	14	11	13
40,000	39	31	35	33	35	17	8	-43	-33	-37	-35	-37	-54	-63	27	25	22	26
30,000	35	28	26	25	28	11	2	-39	-31	-27	-28	-31	-49	-58	30	27	20	26
20,000	22	18	16	15	18	6	-1	-24	-19	-17	-16	-19	-31	-38	22	20	13	19
OKLAHOMA CITY TO ST. LOUIS																	401 N.MI.	
53,000	39	30	5	21	23	9	3	-41	-31	-6	-22	-24	-39	-47	18	16	12	15
40,000	66	45	20	39	41	21	11	-70	-48	-22	-42	-44	-66	-79	29	27	22	27
30,000	56	39	14	30	32	13	4	-60	-42	-15	-33	-35	-58	-70	29	27	17	28
20,000	36	25	11	19	21	8	2	-38	-27	-11	-20	-22	-37	-46	22	20	12	19
ONTARIO TO SAN FRANCISCO																	316 N.MI.	
53,000	-28	-20	-2	-15	-15	-28	-35	27	19	2	14	14	3	-3	18	16	12	14
40,000	-42	-35	-14	-26	-28	-48	-58	38	32	10	23	25	7	-3	28	26	22	26
30,000	-36	-32	-11	-21	-24	-43	-53	32	29	9	19	21	5	-6	31	28	21	25
20,000	-24	-17	-6	-11	-13	-27	-35	22	16	6	10	12	0	-6	23	20	13	18
PANAMA CITY TO TAMPA																	213 N.MI.	
53,000	33	30	-2	14	18	3	-4	-36	-31	2	-15	-20	-36	-44	16	17	11	18
40,000	45	44	5	29	30	10	0	-51	-49	-6	-32	-34	-55	-66	26	26	19	24
30,000	37	37	4	23	24	7	-1	-41	-39	-5	-25	-27	-45	-55	22	23	15	22
20,000	23	21	3	10	13	2	-3	-25	-23	-3	-11	-13	-27	-35	18	17	9	15
PHILADELPHIA TO PITTSBURGH																	231 N.MI.	
53,000	-48	-32	-12	-29	-29	-44	-52	47	31	12	28	28	15	8	19	17	13	16
40,000	-78	-52	-38	-51	-53	-75	-87	75	50	36	48	51	31	20	30	29	24	29
30,000	-74	-49	-31	-45	-48	-71	-84	72	46	30	43	46	26	16	29	31	20	30
20,000	-51	-34	-22	-30	-32	-49	-59	49	33	21	29	31	17	10	24	23	13	23

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
PHILADELPHIA TO ROCHESTER, N.Y.																	223 N.MI.	
53,000	-22	-17	-10	-12	-14	-26	-32	17	15	9	10	12	1	-4	19	17	13	16
40,000	-41	-27	-24	-23	-28	-48	-59	29	21	21	15	22	2	-8	30	29	25	29
30,000	-39	-27	-19	-20	-25	-46	-57	28	21	16	14	19	0	-10	31	31	21	30
20,000	-24	-20	-13	-13	-17	-31	-40	18	17	11	10	14	0	-7	24	24	14	23
PHILADELPHIA TO ST. LOUIS																	705 N.MI.	
53,000	-49	-33	-10	-29	-29	-44	-52	48	32	10	28	29	15	9	16	15	11	14
40,000	-78	-53	-34	-52	-53	-73	-85	76	51	32	49	51	32	23	26	25	21	26
30,000	-73	-48	-27	-46	-46	-68	-80	70	46	26	43	44	26	17	26	26	17	26
20,000	-50	-32	-20	-30	-31	-47	-56	48	31	19	29	30	17	11	20	20	12	20
PHILADELPHIA TO SAN JUAN																	1373 N.MI.	
53,000	16	16	3	7	9	1	-3	-20	-18	-3	-8	-11	-21	-27	13	13	8	12
40,000	22	17	6	9	13	1	-5	-30	-24	-8	-13	-18	-31	-39	19	20	13	18
30,000	20	16	5	6	11	0	-5	-25	-21	-5	-9	-14	-26	-34	18	17	11	16
20,000	11	9	-1	-2	3	-4	-8	-13	-11	0	1	-5	-14	-19	13	13	7	11
PHILADELPHIA TO YOUNGSTOWN																	262 N.MI.	
53,000	-45	-30	-13	-27	-27	-42	-50	43	29	12	26	26	14	8	19	17	13	16
40,000	-74	-50	-38	-48	-51	-73	-84	71	47	36	44	49	28	18	29	29	24	29
30,000	-71	-47	-31	-43	-46	-68	-81	68	44	30	40	43	24	14	29	30	20	30
20,000	-48	-33	-21	-28	-31	-47	-57	46	32	21	27	30	15	8	24	23	14	23
PHOENIX TO SAN DIEGO																	263 N.MI.	
53,000	-35	-31	-5	-20	-22	-36	-43	34	31	4	19	21	8	1	19	16	12	15
40,000	-53	-48	-27	-35	-40	-59	-69	51	46	25	34	38	20	11	28	26	21	25
30,000	-46	-41	-17	-28	-31	-50	-61	43	39	16	26	29	12	4	31	26	18	22
20,000	-28	-24	-9	-13	-17	-30	-39	27	24	9	12	16	5	-1	22	19	11	17
PHOENIX TO SAN FRANCISCO																	565 N.MI.	
53,000	-32	-25	-4	-18	-19	-32	-38	31	24	4	17	18	6	1	17	14	11	13
40,000	-49	-41	-21	-32	-35	-53	-63	46	38	19	30	32	15	6	27	25	20	24
30,000	-42	-37	-15	-26	-28	-47	-57	39	34	14	24	26	10	1	29	26	19	23
20,000	-27	-21	-8	-13	-16	-29	-37	25	20	8	12	15	3	-2	21	19	12	17
PITTSBURGH TO RALEIGH																	285 N.MI.	
53,000	4	7	7	2	5	-6	-12	-10	-10	-7	-5	-8	-19	-24	18	17	12	16
40,000	11	9	12	-1	8	-10	-21	-26	-17	-15	-7	-16	-35	-45	28	29	23	28
30,000	11	8	6	0	6	-11	-20	-24	-15	-8	-6	-13	-31	-40	26	29	18	29
20,000	5	10	4	0	4	-8	-15	-12	-13	-5	-3	-8	-21	-29	22	22	13	21
PITTSBURGH TO ST. PETERSBURG																	764 N.MI.	
53,000	-14	-6	4	-6	-5	-15	-21	8	2	-4	4	2	-8	-12	15	15	10	15
40,000	-20	-14	3	-16	-11	-28	-37	7	5	-5	9	3	-12	-20	23	24	18	23
30,000	-17	-9	0	-13	-9	-24	-32	7	2	-1	8	3	-10	-17	21	23	15	23
20,000	-13	-5	-2	-8	-6	-17	-23	8	2	2	6	4	-6	-11	18	18	10	16
PORTLAND, ORE. TO RENO																	386 N.MI.	
53,000	16	6	-2	6	6	-4	-9	-18	-8	1	-8	-7	-18	-24	17	15	11	13
40,000	19	14	1	12	11	-7	-16	-25	-18	-5	-17	-16	-34	-44	28	26	23	28
30,000	18	13	1	13	11	-8	-18	-24	-18	-4	-17	-15	-35	-46	31	29	23	29
20,000	12	7	2	5	6	-7	-14	-15	-9	-3	-7	-8	-22	-30	24	21	14	21
PORTLAND, ORE. TO SALT LAKE CITY																	546 N.MI.	
53,000	29	17	8	20	18	8	3	-30	-18	-9	-21	-18	-29	-36	16	14	11	13
40,000	41	28	22	32	30	13	4	-43	-30	-24	-35	-33	-51	-60	26	24	22	27
30,000	39	27	19	30	28	10	0	-42	-30	-22	-32	-31	-50	-60	30	28	21	28
20,000	26	17	13	18	18	6	-1	-27	-18	-14	-20	-19	-32	-40	21	20	13	19
PORTLAND, ORE. TO SAN FRANCISCO																	477 N.MI.	
53,000	7	0	-6	0	-1	-10	-15	-10	-1	5	-1	-1	-11	-17	17	14	11	14
40,000	6	4	-8	0	0	-17	-26	-12	-9	4	-5	-5	-23	-33	27	25	22	27
30,000	5	4	-5	2	1	-17	-27	-12	-8	3	-7	-5	-24	-35	31	28	22	28
20,000	4	1	-2	-1	0	-13	-19	-7	-3	0	-1	-2	-15	-23	23	21	14	20
PORTLAND, ORE. TO SPOKANE																	239 N.MI.	
53,000	18	15	14	20	17	7	2	-19	-16	-14	-21	-17	-27	-33	17	15	12	13
40,000	28	21	22	27	24	7	-3	-32	-23	-23	-31	-27	-45	-55	27	26	24	29
30,000	30	22	24	26	25	6	-5	-34	-25	-25	-30	-28	-48	-59	31	31	24	31
20,000	20	16	16	20	18	4	-3	-22	-17	-17	-22	-19	-33	-41	23	22	16	22

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EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS* DIRECT JAN	APR	JUL	OCT	**A50	A75	A85	RETURN JAN	APR	JUL	OCT	A50	A75	A85	STANDARD DEVIATION JAN	APR	JUL	OCT
PRINCE GEORGE TO VANCOUVER																	283 N.MI.	
53,000	6	-1	-3	-2	0	-10	-14	-9	0	2	1	-1	-11	-16	17	14	12	13
40,000	6	-1	-1	-2	1	-15	-24	-11	-2	-1	-3	-4	-20	-29	24	23	23	25
30,000	3	-4	-2	-7	-3	-21	-32	-8	1	-1	2	-2	-20	-31	28	29	25	29
20,000	0	-4	-1	-5	-2	-16	-23	-3	2	0	2	0	-13	-20	22	21	16	20
PRINCE RUPERT TO VANCOUVER																	408 N.MI.	
53,000	23	10	6	14	13	3	-2	-24	-11	-6	-15	-13	-24	-29	16	14	11	12
40,000	30	17	16	23	21	5	-4	-32	-19	-17	-26	-24	-40	-49	24	22	23	25
30,000	28	15	15	17	19	0	-10	-31	-18	-17	-21	-22	-41	-51	28	29	25	29
20,000	17	7	10	12	12	-2	-9	-19	-9	-11	-15	-13	-27	-35	23	21	16	20
PROVIDENCE TO WASHINGTON, D.C.																	309 N.MI.	
53,000	-44	-25	-7	-28	-25	-40	-48	42	24	7	27	23	10	4	19	17	12	16
40,000	-65	-45	-30	-50	-47	-68	-79	59	41	27	47	43	23	12	30	29	24	29
30,000	-63	-42	-27	-43	-42	-64	-76	57	38	25	40	38	19	9	31	31	20	30
20,000	-45	-28	-19	-29	-28	-45	-54	42	26	18	27	27	13	6	23	23	13	22
QUEBEC TO SEVEN ISLANDS																	285 N.MI.	
53,000	29	14	10	23	18	7	2	-31	-15	-11	-24	-19	-31	-38	18	15	13	15
40,000	44	22	24	39	32	13	3	-48	-24	-28	-43	-35	-55	-65	28	25	25	28
30,000	40	22	22	36	29	10	-1	-44	-26	-26	-40	-33	-54	-65	32	31	24	30
20,000	28	14	16	21	19	5	-2	-30	-16	-17	-24	-21	-36	-44	23	23	16	22
REGINA TO WINNIPEG																	287 N.MI.	
53,000	29	17	16	23	20	12	7	-30	-17	-16	-24	-21	-31	-36	16	12	11	13
40,000	41	24	38	34	34	18	9	-42	-25	-39	-36	-35	-52	-60	22	21	22	28
30,000	42	25	33	33	33	16	6	-43	-27	-34	-35	-35	-52	-62	26	26	22	28
20,000	29	19	22	25	23	12	6	-30	-20	-23	-26	-24	-36	-43	19	17	15	19
RENO TO SALT LAKE CITY																	366 N.MI.	
53,000	30	23	14	21	21	11	6	-31	-23	-14	-21	-21	-32	-38	17	15	11	14
40,000	43	33	36	35	37	19	9	-46	-35	-37	-37	-39	-57	-66	28	26	23	28
30,000	39	30	27	28	30	12	3	-42	-33	-28	-30	-33	-52	-62	32	29	21	28
20,000	25	19	17	17	19	7	0	-26	-20	-18	-18	-20	-33	-40	23	21	13	20
RENO TO SEATTLE																	490 N.MI.	
53,000	-16	-5	2	-6	-5	-16	-22	14	4	-3	4	4	-5	-10	17	14	11	13
40,000	-21	-14	-2	-14	-12	-30	-40	15	11	-1	9	8	-9	-18	27	25	23	28
30,000	-20	-14	-2	-14	-12	-31	-42	14	10	-1	10	8	-11	-21	30	28	22	29
20,000	-12	-6	-2	-6	-6	-19	-27	9	4	0	3	4	-9	-16	23	21	14	20
ROCHESTER, N.Y. TO WASHINGTON, D.C.																	258 N.MI.	
53,000	-3	3	5	-2	1	-10	-16	-3	-6	-6	0	-4	-14	-20	19	17	13	16
40,000	0	2	7	-6	1	-18	-28	-15	-9	-11	-2	-9	-28	-39	30	29	24	29
30,000	1	3	3	-5	1	-18	-28	-14	-10	-6	-2	-8	-27	-37	30	31	21	30
20,000	0	6	2	-3	1	-12	-20	-7	-9	-4	-1	-5	-19	-27	24	23	14	23
SAGUENAY TO SEVEN ISLANDS																	207 N.MI.	
53,000	33	16	14	27	22	10	4	-34	-17	-14	-28	-22	-35	-41	18	15	13	16
40,000	49	25	31	46	37	18	8	-51	-27	-34	-48	-40	-59	-70	28	25	25	28
30,000	44	26	30	42	35	15	4	-47	-29	-32	-45	-38	-59	-70	32	31	24	30
20,000	31	16	21	25	23	9	1	-33	-17	-22	-27	-24	-39	-47	23	23	16	22
ST. JOHNS TO SYDNEY																	312 N.MI.	
53,000	-37	-21	-17	-29	-25	-38	-45	36	20	16	28	24	12	6	21	16	13	17
40,000	-58	-39	-44	-57	-49	-69	-80	55	37	42	55	47	27	17	30	28	26	30
30,000	-57	-38	-41	-53	-47	-68	-80	54	36	39	50	44	24	13	34	31	25	30
20,000	-40	-25	-26	-34	-31	-46	-55	38	23	25	33	29	14	6	26	24	17	23
ST. LOUIS TO SAN FRANCISCO																	1504 N.MI.	
53,000	-37	-28	-11	-23	-24	-35	-40	36	28	11	23	24	14	10	13	11	8	11
40,000	-60	-42	-36	-42	-44	-59	-67	58	40	35	39	42	29	22	21	19	16	20
30,000	-51	-38	-27	-35	-36	-51	-59	48	36	26	32	34	21	15	23	20	14	20
20,000	-33	-24	-17	-21	-23	-33	-39	31	23	16	20	22	13	8	16	15	9	14
ST. LOUIS TO TAMPA																	756 N.MI.	
53,000	22	19	4	11	13	3	-2	-27	-22	-5	-13	-16	-27	-34	15	15	10	14
40,000	26	26	12	20	21	6	-2	-38	-33	-14	-26	-27	-44	-53	24	24	18	23
30,000	23	23	8	16	17	3	-4	-32	-29	-9	-20	-21	-37	-47	22	23	14	23
20,000	15	15	5	9	10	1	-4	-19	-17	-6	-11	-12	-24	-30	18	17	9	16

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ST. LOUIS TO TULSA																	304 N.MI.	
53,000	-42	-31	-6	-23	-24	-39	-47	39	29	5	22	23	9	3	18	17	12	15
40,000	-70	-48	-22	-42	-44	-66	-79	66	44	20	39	41	20	10	29	27	23	27
30,000	-60	-41	-16	-34	-35	-58	-71	56	38	15	31	32	13	4	30	28	18	29
20,000	-38	-27	-12	-21	-22	-38	-47	36	25	11	19	21	8	2	22	21	12	20
ST. LOUIS TO WASHINGTON, D.C.																	623 N.MI.	
53,000	49	33	9	28	29	15	8	-50	-34	-10	-28	-29	-44	-52	17	16	11	14
40,000	76	52	31	49	51	31	22	-78	-54	-32	-51	-53	-74	-85	26	26	21	26
30,000	70	46	25	42	44	25	16	-72	-48	-26	-45	-46	-68	-80	26	27	17	27
20,000	48	31	18	28	29	16	10	-49	-32	-19	-29	-30	-46	-55	21	20	12	20
ST. PETERSBURG TO WASHINGTON, D.C.																	714 N.MI.	
53,000	19	10	-4	9	8	-3	-8	-24	-14	3	-11	-10	-23	-30	15	16	10	15
40,000	24	19	-1	20	14	-2	-10	-35	-27	-1	-25	-22	-40	-50	23	25	18	24
30,000	21	13	2	17	12	-2	-9	-30	-19	-3	-21	-17	-33	-43	21	23	15	22
20,000	18	10	4	11	10	0	-5	-22	-13	-5	-13	-12	-24	-31	18	17	9	16
SALT LAKE CITY TO SAN FRANCISCO																	519 N.MI.	
53,000	-29	-23	-14	-20	-20	-31	-37	27	22	14	19	20	10	5	17	14	11	13
40,000	-43	-33	-37	-35	-37	-54	-63	39	31	35	32	34	17	8	27	25	22	26
30,000	-39	-31	-27	-28	-31	-48	-58	35	28	26	25	28	11	2	30	27	20	26
20,000	-24	-19	-17	-16	-19	-31	-38	22	18	16	15	18	6	-1	22	20	13	19
SAN DIEGO TO SAN FRANCISCO																	389 N.MI.	
53,000	-26	-18	0	-13	-13	-25	-33	24	16	0	12	12	1	-5	18	15	12	14
40,000	-39	-32	-9	-23	-25	-44	-54	35	29	6	20	21	4	-6	27	26	21	25
30,000	-33	-29	-8	-19	-21	-40	-50	29	26	6	16	18	1	-8	30	27	20	24
20,000	-22	-16	-4	-9	-11	-25	-32	20	14	3	8	10	-2	-8	22	20	12	17
SANDSPIT TO VANCOUVER																	406 N.MI.	
53,000	25	12	8	17	15	5	0	-26	-13	-8	-18	-16	-26	-32	16	14	12	13
40,000	34	22	20	29	26	10	1	-36	-24	-21	-32	-28	-45	-54	24	23	23	26
30,000	32	21	18	23	24	5	-6	-35	-24	-20	-27	-26	-45	-56	28	29	25	29
20,000	21	11	13	17	15	1	-6	-23	-13	-14	-19	-17	-31	-38	23	21	17	21
SAN FRANCISCO TO SEATTLE																	589 N.MI.	
53,000	-10	-1	5	-1	-1	-11	-16	7	-1	-6	-1	-1	-10	-15	17	14	11	13
40,000	-11	-8	4	-5	-5	-22	-31	5	3	-7	0	0	-17	-26	26	25	22	27
30,000	-11	-7	3	-6	-5	-23	-33	4	2	-6	1	0	-17	-27	30	27	22	28
20,000	-6	-2	1	0	-1	-14	-21	3	0	-2	-2	0	-13	-19	22	20	14	20
SAN FRANCISCO TO WASHINGTON, D.C.																	2116 N.MI.	
53,000	38	28	12	24	25	16	11	-39	-28	-12	-25	-25	-35	-41	11	10	7	9
40,000	61	42	36	41	44	32	26	-64	-44	-38	-44	-46	-60	-67	18	17	15	18
30,000	53	38	28	35	37	25	19	-56	-40	-29	-37	-39	-53	-61	19	18	12	18
20,000	35	25	18	23	24	16	12	-37	-26	-19	-24	-25	-35	-41	14	13	8	13
SASKATOON TO WINNIPEG																	381 N.MI.	
53,000	30	15	14	24	20	11	7	-30	-16	-15	-24	-20	-30	-36	16	12	10	13
40,000	39	22	32	32	31	16	7	-40	-23	-34	-34	-33	-48	-57	22	20	21	26
30,000	40	23	29	32	31	14	5	-42	-25	-31	-34	-33	-50	-59	25	25	21	27
20,000	29	19	20	25	23	12	6	-30	-20	-21	-26	-24	-35	-42	18	17	14	18
SAULT STE. MARIE TO TORONTO																	266 N.MI.	
53,000	30	19	13	21	20	9	4	-32	-20	-14	-22	-21	-33	-39	17	15	13	15
40,000	47	31	36	35	37	19	9	-52	-34	-39	-39	-41	-59	-69	28	27	24	28
30,000	46	32	32	33	35	16	6	-52	-35	-34	-37	-39	-59	-70	31	30	23	30
20,000	32	22	22	22	24	10	3	-35	-24	-23	-24	-26	-40	-49	24	23	15	23
SHREVEPORT TO TULSA																	247 N.MI.	
53,000	-22	-14	-5	-11	-12	-24	-30	16	11	5	9	9	-1	-7	18	17	12	16
40,000	-26	-23	-12	-23	-21	-39	-49	12	15	10	17	14	-4	-13	30	28	21	26
30,000	-21	-19	-9	-20	-16	-34	-43	11	13	8	15	11	-5	-14	29	27	17	28
20,000	-15	-14	-6	-11	-11	-23	-30	11	11	5	9	9	-3	-9	22	20	11	19
SYRACUSE TO WASHINGTON, D.C.																	259 N.MI.	
53,000	-15	-5	2	-10	-7	-19	-25	10	2	-2	8	4	-7	-13	19	17	13	16
40,000	-20	-12	-4	-20	-13	-33	-44	6	4	-1	12	5	-14	-24	30	29	25	29
30,000	-19	-10	-6	-17	-12	-32	-43	6	3	3	11	5	-13	-23	31	31	21	30
20,000	-14	-3	-4	-11	-8	-22	-30	8	0	2	8	4	-9	-17	24	23	14	23

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

EQUIVALENT HEADWINDS AND STANDARD DEVIATION IN KNOTS FOR GREAT CIRCLE AIR ROUTES

HEIGHT IN FEET	EQUIVALENT HEADWINDS*														STANDARD DEVIATION			
	DIRECT							RETURN										
	JAN	APR	JUL	OCT	**A50	A75	A85	JAN	APR	JUL	OCT	A50	A75	A85	JAN	APR	JUL	OCT
TAMPA TO TORONTO																	953 N.MI.	
53,000	7	2	-4	4	2	-7	-12	-13	-5	3	-6	-5	-15	-20	14	14	10	14
40,000	5	4	-5	9	3	-12	-20	-19	-12	2	-15	-11	-26	-35	23	23	18	22
30,000	5	1	-1	8	3	-10	-17	-16	-8	-1	-13	-9	-23	-31	21	22	15	22
20,000	7	1	1	6	3	-6	-12	-12	-4	-2	-8	-6	-16	-22	17	17	10	16
TERRACE TO VANCOUVER																	375 N.MI.	
53,000	20	8	4	11	10	1	-4	-22	-9	-5	-13	-11	-22	-27	16	14	12	12
40,000	26	13	12	18	17	1	-8	-29	-16	-14	-22	-20	-36	-45	24	22	23	25
30,000	24	11	12	13	15	-4	-14	-28	-15	-14	-17	-18	-37	-47	28	29	25	29
20,000	14	5	8	9	9	-4	-12	-17	-7	-9	-12	-11	-24	-32	23	21	16	20
TOLEDO TO WASHINGTON, D.C.																	351 N.MI.	
53,000	39	27	12	23	24	12	6	-41	-29	-12	-24	-25	-39	-47	18	17	12	16
40,000	66	44	34	39	45	25	16	-71	-47	-36	-43	-48	-69	-80	29	28	23	28
30,000	62	40	26	35	39	20	11	-67	-44	-28	-39	-42	-64	-76	28	29	19	29
20,000	42	30	18	24	27	13	6	-45	-31	-19	-26	-29	-45	-54	23	23	13	22
TORONTO TO VANCOUVER																	1804 N.MI.	
53,000	-32	-19	-15	-25	-22	-30	-35	31	19	15	25	22	14	11	11	9	8	9
40,000	-47	-30	-37	-39	-38	-50	-57	45	29	36	37	36	25	19	16	15	15	18
30,000	-48	-31	-34	-39	-37	-50	-58	45	29	32	37	35	23	16	19	19	15	19
20,000	-33	-22	-22	-27	-25	-35	-40	32	20	22	26	25	16	11	14	13	10	14
TORONTO TO WASHINGTON, D.C.																	313 N.MI.	
53,000	10	11	8	6	8	-2	-8	-16	-13	-8	-8	-11	-22	-28	18	17	13	16
40,000	21	15	17	9	16	-3	-13	-34	-22	-21	-16	-23	-42	-53	29	28	24	28
30,000	21	16	12	8	14	-4	-14	-33	-22	-15	-15	-21	-39	-50	29	30	20	30
20,000	14	15	9	6	10	-3	-10	-20	-18	-10	-9	-14	-28	-36	23	23	14	22
TORONTO TO WINDSOR																	210 N.MI.	
53,000	-28	-18	-12	-20	-19	-30	-36	26	16	12	18	17	7	1	18	15	13	15
40,000	-47	-31	-35	-35	-37	-56	-66	40	27	32	30	32	14	4	29	27	25	28
30,000	-47	-33	-31	-33	-35	-55	-66	39	29	28	28	31	12	1	32	31	23	30
20,000	-31	-22	-21	-21	-23	-38	-46	27	20	20	19	21	7	0	24	23	15	23
TORONTO TO WINNIPEG																	811 N.MI.	
53,000	-34	-20	-15	-24	-22	-32	-38	33	19	15	24	22	13	8	15	12	10	12
40,000	-51	-33	-41	-41	-41	-57	-65	48	31	39	38	39	24	16	22	21	20	24
30,000	-50	-34	-36	-39	-39	-56	-65	47	32	35	36	37	21	13	26	25	19	25
20,000	-35	-23	-25	-26	-27	-39	-46	33	22	24	25	26	14	8	19	18	13	18
VANCOUVER TO WINNIPEG																	1006 N.MI.	
53,000	27	17	15	24	20	12	8	-27	-17	-15	-24	-20	-29	-33	13	11	9	10
40,000	36	23	29	33	30	17	10	-38	-25	-31	-35	-32	-45	-53	19	18	19	22
30,000	39	24	29	34	31	16	9	-41	-26	-30	-37	-33	-48	-57	22	22	18	24
20,000	27	18	19	25	22	12	6	-29	-18	-20	-26	-23	-33	-39	16	15	12	16
WASHINGTON, D.C. TO WEST PALM BEACH																	746 N.MI.	
53,000	-14	-6	4	-6	-5	-15	-22	8	2	-4	4	2	-7	-12	15	15	10	15
40,000	-20	-16	3	-16	-12	-28	-37	8	7	-4	10	5	-10	-18	23	24	18	23
30,000	-17	-9	0	-13	-9	-23	-31	8	3	-1	9	4	-9	-16	20	22	14	22
20,000	-12	-7	-4	-9	-7	-18	-23	8	4	3	8	5	-4	-9	17	17	9	15
WINDSOR TO WINNIPEG																	611 N.MI.	
53,000	-33	-19	-16	-25	-22	-32	-38	33	18	15	24	22	13	8	15	12	11	13
40,000	-49	-31	-42	-41	-41	-56	-65	47	29	40	38	39	23	15	22	21	21	26
30,000	-48	-32	-37	-39	-39	-56	-65	46	30	36	37	37	20	11	26	25	20	26
20,000	-34	-22	-25	-27	-27	-39	-46	33	21	25	26	26	14	8	20	19	13	19

*HEADWINDS--COMPUTED FOR A 450-KT AIRSPEED.
**A--DENOTES ANNUAL EQUIVALENT HEADWINDS FOR INDICATED PER CENT RELIABILITIES.
MINUS SIGNS DENOTE HEADWINDS.

TABLE 5

LIST OF AIRPORTS WITH GEOGRAPHICAL COORDINATES, ELEVATION AND LENGTH OF LONGEST RUNWAY

TABLE 5. LIST OF AIRPORTS

CITY	AIRPORT	CODE	LAT. ° 'N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Abilene, Texas, USA	Abilene	ABI	32.25	99.41	1778	6,000
Akron, Ohio, USA	Akron-Canton	CAK	40.55	81.27	1228	5,600
Alamogordo, N. Mex., USA	Holloman AFB	ALM	32.51	106.06	4094	12,100
Albany, Ga., USA	Albany	ABY	31.32	84.12	196	5,000
Albany, N. Y., USA	Albany Mun.	ALB	42.45	73.48	288	5,000
Albuquerque, N. Mex., USA	Kirtland AFB	ABQ	35.03	106.36	5352	12,800
Alexandria, La., USA	England AFB	AEX	31.20	92.33	89	9,300
Allentown, Pa., USA	Allentown-Bethlehem-Easton	ABE	40.39	75.26	391	6,100
Amarillo, Texas, USA	Amarillo AFB/Muni	AMA	35.14	101.42	3607	13,500
Anchorage, Alaska, USA	Anchorage Int'l	ANC	61.11	150.00	124	10,600
Anderson, S. C., USA	Anderson Muni	AND	34.30	82.43	782	5,000
Annette Island, Alaska, USA	Annette	ANN	55.02	131.34	119	7,500
Asheville, N. C., USA	Asheville-Hendersonville	AVL	35.26	82.32	2161	6,500
Atlanta, Ga., USA	Atlanta Muni.	ATL	33.39	84.26	1024	7,800
Atlantic City, N. J., USA	Atlantic City NAFEC	NBB	39.27	74.35	76	10,000
Augusta, Ga., USA	Bush Field	AGS	33.22	81.58	142	5,300
Augusta, Me., USA	Augusta State	AUG	44.19	69.47	357	4,200
Austin, Texas, USA	Mueller Muni.	AUS	30.18	97.42	632	6,400
Bakersfield, Calif., USA	Meadows Field	BFL	35.26	119.03	514	5,700
Baltimore, Md., USA	Friendship Int'l	BAL	39.10	76.40	146	9,400
Bangor, Me., USA	Dow AFB	BGR	44.48	68.49	202	11,400
Baton Rouge, La., USA	Ryan	BTR	30.32	91.09	70	6,000
Beaumont, Texas, USA	Jefferson Co.	BUJ	29.57	94.01	15	5,700
Big Mountain, Alaska, USA		BMX	59.22	155.15	663	4,200
Big Spring, Texas, USA	Webb AFB	BGS	32.13	101.31	2561	8,800
Billings, Mont., USA	Logan Field	BIL	45.48	108.32	3606	8,600
Binghampton, N. Y., USA	Broome Co.	BGM	42.13	75.59	1629	5,600
Birmingham, Ala., USA	Birmingham Muni.	BGM	33.34	86.45	643	10,000
Bisbee, Ariz., USA	Bisbee-Douglas Int'l	DUG	31.28	109.36	4158	7,500
Bismark, N. Dak., USA	Bismark Muni.	BIS	46.47	100.45	1653	5,200
Boise, Idaho, USA	Boise Air Terminal	BOI	43.34	116.13	2858	9,000
Boston, Mass., USA	Logan Int'l	BOS	42.22	71.00	19	10,000
Bowling Green, Ky., USA	Warren Co. Muni.	BWG	36.58	86.26	539	5,200
Bozeman, Mont., USA	Gallatin Field	BZN	45.47	111.10	4461	5,200
Bristol, Tenn., USA	Tri-City Muni.	TRI	36.29	82.24	1519	6,600
Brownsville, Texas, USA	Harlingen AFB	HRL	26.13	97.39	35	6,000
Brunswick, Ga., USA	McKinnon	SSI	31.09	81.23	20	4,300
Buffalo, N. Y., USA	Greater Buffalo Int'l	BUF	42.56	78.44	711	5,600
Burbank, Calif., USA	Lockheed Air Terminal	BUR	34.12	118.22	775	6,500
Burlington, Vt., USA	Burlington Muni.	BTV	44.28	73.09	335	7,800
Butte, Mont., USA	Silver Bow Co. Apt.	BTM	45.57	112.30	5554	6,800
Calgary, Alb., CANADA	Calgary	YYC	51.06	114.01	3557	8,700
Carlsbad, N. Mex., USA	Carlsbad Muni.	CNM	32.30	104.16	3276	6,600
Casper, Wyo., USA	Casper Air Terminal	CPR	42.55	106.28	5348	10,600
Castlegar, B. C., CANADA		YCG	49.18	117.38	1620	4,800

CITY	AIRPORT	CODE	LAT. ° 'N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Cedar Rapids, Iowa, USA	Cedar Rapids Muni.	CID	41.53	91.42	863	5,400
Charleston, S. C., USA	Charleston AFB/Muni.	CHS	32.54	80.02	45	9,000
Charleston, W. Va., USA	Kanawha Co.	CHW	38.22	81.36	982	5,600
Charlotte, N. C., USA	Douglas Muni.	CLT	35.13	80.56	748	7,500
Chattanooga, Tenn., USA	Lovell Field	CHA	35.02	85.12	682	6,200
Cheyenne, Wyo., USA	Cheyenne Muni.	CYS	41.09	104.49	6156	9,300
Chicago, Ill., USA	O'Hare Chicago Int'l	ORD	41.59	87.54	667	11,600
Cincinnati, Ohio, USA	Greater Cincinnati	CUG	39.03	84.40	890	8,600
Cleveland, Ohio, USA	Cleveland-Hopkins	CLE	41.25	81.51	789	9,000
College Station, Texas, USA	Easterwood Field	CLL	30.35	96.22	319	5,200
Colorado Springs, Colo., USA	Peterson Field	COS	38.49	104.43	6172	9,100
Columbia, S. C., USA	Columbia	CAE	33.57	81.07	244	5,200
Columbus, Ga., USA	Muscogee Co.	CSG	32.31	84.57	397	5,000
Columbus, Ohio, USA	Port Columbus	CMH	40.00	82.53	816	10,700
Comox, B. C., CANADA		YQQ	49.43	124.54	83	8,000
Concord, N. H., USA	Concord Muni.	CON	43.12	71.31	345	5,000
Corpus Christi, Texas, USA	Corpus Christi Int'l	CRP	27.46	97.30	44	5,600
Cranbrook, B. C., CANADA		YXC	49.32	115.46	2997	4,900
Dallas, Texas, USA	Love Field	DAL	32.51	96.51	485	7,700
Dawson City, Y. T., CANADA		YQD	64.03	139.05	1211	4,000
Dayton, Ohio, USA	Dayton Muni.	DAY	39.54	84.13	1008	7,000
Daytona Beach, Fla., USA	Daytona Beach Muni.	DAB	29.11	81.03	34	5,700
Denver, Colo., USA	Stapleton Airfield	DEN	39.46	104.53	5331	10,000
Des Moines, Iowa, USA	Des Moines	DSM	41.32	93.39	957	7,500
Detroit, Mich., USA	Detroit Metropolitan Wayne Co.	YIP	42.14	83.21	639	10,500
Dothan, Ala., USA	Dothan	DHN	31.14	85.27	330	4,000
Easton, Pa., USA	Easton	ABE	40.44	75.15	380	2,200
Edmonton, Alb., CANADA	Edmonton Int'l	YXD	53.19	113.35	2373	11,000
Elko, Nev., USA	Elko	EKO	40.50	115.48	5135	6,400
Elmira, N. Y., USA	Chemung Co.	ELM	42.09	76.54	951	4,700
El Paso, Texas, USA	El Paso Int'l	ELP	31.48	106.23	3939	11,000
Ely, Nev., USA	Ely	ELY	39.18	114.51	6258	6,000
Eugene, Ore., USA	Mahlon-Sweet Field	EUG	44.08	123.13	365	5,500
Evansville, Ind., USA	Dress Memorial	EVV	38.03	87.32	389	6,000
Fairbanks, Alas., USA	Fairbanks Int'l	FAI	64.49	147.51	434	10,300
Fargo, N. Dak., USA	Hector Field	FAR	46.55	96.49	900	7,100
Fayetteville, Ark., USA	Fayetteville-Drake Field	FYV	36.00	94.10	1250	5,000
Fitchburg, Mass., USA	Fitchburg Muni.	FIT	42.33	71.45	350	4,500
Flint, Mich., USA	Bishop	FNT	42.58	83.45	781	5,000
Florence, S. C., USA	Florence Muni.	FLO	34.11	79.43	146	6,000
Ft. Lauderdale, Fla., USA	Broward Co. Int'l	FLL	26.04	80.10	10	6,500
Ft. Meyers, Fla., USA	Page Field	FMY	26.35	81.52	17	5,000
Ft. Nelson, B. C., CANADA		YYE	58.50	122.35	1253	6,400
Ft. St. John, B. C., CANADA		YXJ	56.14	120.44	2280	6,700
Ft. Smith, Ark., USA	Ft. Smith Muni.	FSM	35.20	94.22	468	8,000

CITY	AIRPORT	CODE	LAT. ° ' N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Ft. Wayne, Ind., USA	Baer Field	FWA	40.59	85.12	801	7,000
Ft. William, Ont., CANADA	Lakehead	YQT	48.20	89.23	653	6,200
Ft. Worth, Texas, USA	Amon Carter Field	ACF	32.50	97.03	568	8,400
Fredericton, N. Brunswick, CANADA		YFC	45.52	66.32	67	6,000
Fresno, Calif., USA	Fresno Air Terminal	FAT	36.46	119.43	331	7,100
Gainesville, Fla., USA	Gainesville	GNV	29.42	82.16	155	5,000
Gander, Nfld., CANADA	Gander Int'l	YQX	48.57	53.34	496	8,600
Glens Falls, N. Y., USA	Warren Co.	GFL	43.21	73.37	328	5,000
Goose Bay, Lab., Nfld, CAN.	Goose	YYR	53.19	60.25	150	11,000
Grand Forks, N. Dak., USA	Grand Forks Int'l	GFK	47.56	97.06	836	4,900
Grand Junction, Colo., USA	Walker Field	GJT	39.06	108.32	4858	5,400
Grand Prairie, Alb., CANADA		YQU	55.11	118.53	2193	6,500
Grand Rapids, Mich., USA	Kent Co.	GRR	42.54	85.40	692	5,700
Great Falls, Mont., USA	Great Falls Int'l	GTF	47.29	111.22	3671	9,000
Greensboro, N. C., USA	Greensboro-High Point	GSO	36.06	79.57	922	5,500
Greenville, S. C., USA	Greenville Muni.	GRL	34.51	82.21	1047	5,400
Halifax, N. S., CANADA	Halifax Int'l	YXF	44.53	63.31	476	8,800
Harrisburg, Pa., USA	Harrisburg-York State	HAR	40.13	76.51	347	5,000
Hartford, Conn., USA	Brainard	BDL	41.44	72.39	18	3,400
Helena, Mont., USA	Helena	HLN	46.36	111.59	3881	5,100
Hobbs, N. Mex., USA	Hobbs Muni.	HOB	32.46	103.13	3707	8,800
Homer, Alaska, USA	Homer Muni.	HOM	59.38	151.29	96	5,000
Honolulu, Hawaii, USA	Honolulu Int'l	HNL	21.10	157.51	13	12,380
Hot Springs, Ark., USA	Memorial Field	HOT	34.29	93.06	535	5,000
Houlton, Me., USA	Houlton Int'l	HUL	46.07	67.48	493	5,000
Houston, Texas, USA	Houston Int'l	HOU	29.39	95.16	50	7,600
Huntington, W. Va., USA	Tri-State,	HTS	38.22	82.33	828	5,300
Huntsville, Ala., USA	Huntsville Muni.	HSV	34.41	86.35	619	5,200
Huron, S. Dak., USA	Howes Muni.	HON	44.23	98.14	1287	5,100
Hyannis, Mass., USA	Barnstable Muni.	HYA	41.40	70.17	52	5,000
Idaho Falls, Idaho, USA	Fanning Field	IDA	43.31	112.04	4738	6,600
Indianapolis, Ind., USA	Weir Cook	IND	39.44	86.17	797	7,300
Jackson, Miss., USA	Hawkins Field	JAN	32.20	90.14	343	5,400
Jacksonville, Fla., USA	Imeson Field	JAX	30.25	81.38	52	7,000
Jamestown, N. Dak., USA	Jamestown Muni.	JMS	46.56	98.41	1498	5,700
Joplin, Mo., USA	Joplin	JLN	37.09	94.30	980	5,500
Juneau, Alaska, USA	Juneau Muni.	JNU	58.21	134.35	26	6,400
Kansas City, Mo., USA	Kansas City Muni.	MKC	39.07	94.36	758	7,000
Keene, N. H., USA	Dillant-Hopkins	EEN	42.54	72.16	482	4,500
Key West, Fla., USA	Key West Int'l	EYW	24.34	81.46	4	4,800
King Salmon, Alaska, USA		AKN	58.41	156.39	55	7,500
Knoxvllle, Tenn., USA	McGhee-Tyson	TYS	35.49	83.59	989	7,500
Kodiak, Alaska, USA	Kodiak NAS	NBH	57.45	152.29	77	7,500

CITY	AIRPORT	CODE	LAT. ° 'N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Laconia, N. H., USA	Laconia Muni.	LCI	43.34	71.26	552	3,500
Lafayette, La., USA	Lafayette Muni.	LFT	30.13	92.00	41	5,000
Lake Charles, La., USA	Chennault AFB/Muni.	LKC	30.13	93.10	19	11,400
Lakeland, Fla., USA	Drane Field	LAL	28.00	82.01	142	5,000
Lancaster, Pa., USA	Lancaster	LNS	40.07	76.18	403	5,000
Land O'Lakes, Wisc., USA	Kings Gateway	LNL	46.09	89.12	1706	4,400
Lansing, Mich., USA	Capital City	LAN	42.47	84.35	859	5,000
Las Vegas, Nev., USA	McCarran Field	LAS	36.05	115.10	2171	10,000
Lawrence, Mass., USA	Lawrence	LWM	42.43	71.08	165	5,000
Lawton, Okla., USA	Lawton Muni.	LAW	34.34	98.24	1108	5,400
Lebanon, N. H., USA	Lebanon Regional	LEB	43.38	72.18	580	5,500
Lethbridge, Alberta, CANADA		YLQ	49.38	112.48	3047	6,500
Lewiston, Me., USA	College Road	LEW	44.07	70.11	210	
Lexington, Ky., USA	Blue Grass Field	LEX	38.02	84.36	978	5,500
Lincoln, Neb., USA	Lincoln AFB	LNK	40.51	96.46	1195	12,900
Little Rock, Ark., USA	Adams Field	LIT	34.44	92.14	257	7,000
Long Beach, Calif., USA	Long Beach	LGB	33.49	118.09	56	10,000
Los Angeles, Calif., USA	Los Angeles Int'l	LAX	33.56	118.24	126	12,000
Louisville, Ky., USA	Standiford	SDF	38.11	85.44	497	7,800
Lubbock, Texas, USA	Lubbock Muni.	LBB	33.40	101.49	3256	8,500
Macon, Ga., USA	Macon Muni.	MCN	32.41	83.39	354	5,000
Madison, Wisc., USA	Madison Muni.	MSN	43.09	89.20	859	7,600
Manchester, N. H., USA	Hooksett-Manchester	MHT	43.04	71.28	187	7,000
Martha's Vineyard, Vineyard Haven, Mass., USA	Martha's Vineyard	MVY	41.24	70.37	68	5,000
Massena, N. Y., USA	Richards Field	MSS	44.56	74.51	215	5,000
Mayo, Y. T., CANADA		YMA	63.37	135.52	1625	3,200
McAlester, Okla., USA	McAlester Muni.	MLC	34.53	95.47	770	4,000
Medford, Ore., USA	Medford Muni.	MFR	42.23	122.53	1330	5,400
Melbourne, Fla., USA	Melbourne-Eau Gallie	MLB	28.06	80.38	26	5,200
Memphis, Tenn., USA	Memphis Muni.	MEM	35.04	89.59	291	8,900
Merced, Calif., USA	Merced Muni.	MCE	37.17	120.31	155	4,700
Meridian, Miss., USA	Key Field	MEI	33.21	88.45	297	8,000
Miami, Fla., USA	Miami Int'l	MIA	25.48	80.17	9	10,500
Midland, Texas, USA	Midland Air Terminal	MAF	31.57	102.12	2867	6,600
Milwaukee, Wisc., USA	Gen. Mitchell Field	MKE	42.57	87.54	702	9,900
Minneapolis/St. Paul, Minn., USA	Minneapolis/St. Paul Int'l	MSP	44.53	93.13	840	8,200
Missoula, Mont., USA	Missoula Co.	MSO	46.55	114.05	3203	7,000
Mobile, Ala., USA	Bates Field	MOB	30.41	88.14	217	6,000
Modesto, Calif., USA	Modesto-City-County	MOD	37.38	120.57	96	5,000
Moline, Ill., USA	Quad-City	MLI	41.27	90.31	590	5,500
Moncton, New Bruns., CANADA		YQM	46.07	64.41	232	6,200
Monroe, La., USA	Selman Field	MLU	32.30	92.02	79	5,000
Monterey, Calif., USA	Monterey Peninsula	MRY	36.35	121.51	220	5,000
Montgomery, Ala., USA	Dannelly Field	MGM	32.18	86.24	221	8,000
Montpelier, Vt., USA	Barre-Montpelier Muni.	MPV	44.12	72.34	1157	4,500
Montreal, Que., CANADA	Montreal Int'l	YUL	45.28	73.45	117	9,600

CITY	AIRPORT	CODE	LAT. ° ' N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Muscle Shoals, Ala., USA	Muscle Shoals	MSL	34.45	87.37	548	4,900
Muskegon, Mich., USA	Muskegon Co.	MKG	43.11	86.14	628	5,000
Nantucket, Mass., USA	Nantucket Memorial	ACK	41.16	70.04	48	5,000
Nashville, Tenn., USA	Nashville-Berry-Field	BNA	36.08	86.41	597	8,000
New Bedford, Mass., USA	New Bedford Muni.	EWB	41.40	70.58	79	5,000
New Bern, N. C., USA	Simmons-Nott	EWN	35.04	77.03	18	4,800
New Haven, Conn., USA	New Haven Muni.	NHV	41.16	72.53	15	4,700
New Orleans, La., USA	Moisant Int'l	MSV	20.00	90.15	3	8,500
Newport News, Va., USA	Patrick Henry	PHF	37.08	76.30	41	5,600
New York, N. Y., USA	N.Y. Int'l (Idlewild)	IDL	40.38	73.47	12	14,600
Norfolk, Va., USA	Norfolk Muni.	ORF	36.54	76.12	26	5,000
North Bay, Ont., CANADA		YYB	46.22	79.25	1215	8,200
Oakland, Calif., USA	Oakland	OAK	37.44	122.13	5	6,200
Ocala, Fla., USA	Taylor Field	OCF	29.11	82.09	84	4,000
Oklahoma City, Okla., USA	Will Rogers	OKC	35.24	97.37	1284	9,800
Omaha, Nebr., USA	Lincoln AFB	OMH	40.51	96.46	1195	12,900
Ontario, Calif., USA	Ontario Int'l	ONT	34.03	117.37	952	8,200
Orlando, Fla., USA	Orlando Muni-Herndon	ORL	28.33	81.20	113	6,000
Ottawa, Ont., CANADA		YOW	45.19	75.40	374	8,800
Owensboro, Ky., USA	Owensboro-Daviess Co.	OWB	37.45	87.10	407	5,000
Paducah, Ky., USA	Barkley Field	PUK	37.04	88.46	407	5,000
Palm Springs, Calif., USA	Palm Springs	PSP	33.50	116.30	448	7,000
Panama City, Fla., USA	Fannin	PFN	30.13	85.41	14	4,900
Pendleton, Ore., USA	Pendleton Field	PDT	45.41	118.50	1493	6,300
Pensacola, Fla., USA	Pensacola Muni.	PNS	30.28	87.12	121	5,000
Penticton, B. C., CANADA		YYF	49.28	119.36	1129	6,000
Philadelphia, Pa., USA	Philadelphia Int'l	PHL	39.53	75.14	14	9,500
Phoenix, Ariz., USA	Phoenix-Sky Harbor Muni.	PHX	33.26	112.01	1122	8,800
Pierre, S. Dak., USA	Pierre Muni.	PIR	44.23	100.17	1742	7,200
Pittsburgh, Pa., USA	Greater Pittsburgh	PIT	40.29	80.13	1168	7,500
Pittsfield, Mass., USA	Pittsfield Muni.	PSF	42.26	73.18	1170	3,500
Pocatello, Ida., USA	Pocatello Muni.	PIH	42.55	112.36	4448	8,300
Port Hardy, B. C., CANADA		YZT	50.41	127.22	80	5,000
Portland, Me., USA	Portland Muni.	PWM	43.39	70.19	66	5,000
Portland, Ore., USA	Portland Int'l	PDX	45.35	122.36	23	8,800
Presque Isle, Me., USA	Presque Isle Muni.	PQI	46.41	68.03	534	7,400
Prince George, B. C., CAN.		YXS	53.53	122.41	2268	5,700
Prince Rupert, B. C., CAN.		YPR	54.17	130.27	111	6,000
Providence, R. I., USA	Green	PVD	41.44	71.26	56	5,400
Pueblo, Colo., USA	Pueblo Memorial	PUB	38.18	104.30	4725	8,800
Quebec, Que., CANADA		YQB	46.48	71.23	239	6,000
Quesnel, B. C., CANADA		YQZ	53.05	122.31	1789	5,500
Raleigh, N. C., USA	Raleigh-Durham	RDU	35.52	78.47	435	5,500
Rapid City, S. Dak., USA	Rapid City Muni.	RAP	44.03	103.03	3181	6,200

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Reading, Pa., USA	Gen. Spaatz Field	RDG	40.23	75.58	343	5,100
Regina, Sask., CANADA		YQR	50.26	104.40	1893	6,900
Reno, Nev., USA	Reno Muni.	RNO	39.30	119.46	4411	7,800
Richmond, Va., USA	Byrd Field	RIC	37.30	77.19	167	8,000
Roanoke, Va., USA	Roanoke Muni.	ROA	37.19	79.58	1174	5,400
Rochester, Minn., USA	Rochester Muni. Aprt.	RST	43.55	92.30	1310	6,400
Rochester, N. Y., USA	Rochester-Monroe	ROC	43.07	77.40	560	5,000
Rockland, Me., USA	Rockland Muni.	RKD	44.04	69.06	60	4,500
Rome, Ga., USA	Russell Field	RMG	34.21	85.10	644	4,500
Roswell, N. Mex., USA	Roswell Muni.	ROW	33.25	104.33	3623	5,600
Rouyn-Noranda, Que., CANADA		YUY	48.13	79.05	987	5,600
Sacramento, Calif., USA	Sacramento	SAC	38.31	121.19	21	
Saginaw, Mich., USA	Tri-City	MBS	43.32	84.05	667	5,600
Saguenay, Que., CANADA		YBG	48.30	71.00		
St. John, N. B., CANADA	St. John Muni.	YSJ	45.19	65.53	356	5,500
St. Johns, Nfld., CANADA	Torbay	YYT	47.47	52.45	484	7,000
St. Louis, Mo., USA	Lambert-St. Louis Muni.	STL	38.45	90.22	571	10,000
St. Petersburg, Fla., USA	St. Petersburg-Clearwater Int'l	PIE	27.55	82.42	10	8,000
Salem, Ore., USA	Salem-McNary Field	SLE	44.55	123.00	207	5,500
Salinas, Calif., USA	Salinas Muni.	SNS	36.40	121.36	84	5,000
Salt Lake City, Utah, USA	Salt Lake City Muni.	SLC	40.47	111.58	4226	10,000
San Angelo, Texas, USA	Mathis Field	SJT	31.22	100.30	1915	5,900
San Antonio, Texas, USA	San Antonio Int'l	SAT	29.32	98.28	800	8,500
San Diego, Calif., USA	Lindbergh Field	SAN	32.44	117.11	15	8,100
Sandspit, B. C., CANADA		YZP	53.15	131.49	16	5,100
San Francisco/Oakland, Calif., USA	San Francisco Int'l	SFO	37.38	122.23	10	9,500
Santa Barbara, Calif., USA	Santa Barbara Muni.	SBA	34.26	119.50	14	4,700
Santa Fe, N. Mex., USA	Santa Fe Co. Muni.	SAF	35.37	106.05	6344	8,300
Sarasota, Fla., USA	Sarasota-Branden	SRQ	27.24	82.33	24	5,000
Saskatoon, Sask., CANADA		YXE	52.10	106.41	1653	8,300
Sault Ste. Marie, Ont., CAN.			46.29	84.30	631	6,000
Savannah, Ga., USA	Hunter Field (Muni.)	SAV	32.01	81.08	40	11,400
Scranton, Pa., USA	Scranton	AVP	41.29	75.46	1179	2,400
Seattle, Wash., USA	Seattle-Tacoma Int'l	SEA	47.27	122.19	428	9,800
Seven Islands, Que., CAN.		YZV	50.13	66.16	180	6,600
Sharon, Pa., USA	Sharon	YNG	41.13	80.27	1140	2,400
Sheridan, Wyo., USA	Sheridan Co.	SHR	44.47	106.58	4021	6,000
Shreveport, La., USA	Greater Shreveport	SHV	32.27	93.49	251	6,400
Sioux City, Iowa, USA	Sioux City Muni.	SUX	42.24	96.23	1097	9,000
Sioux Falls, S. Dak., USA	Foss Field	FSD	43.35	96.45	1426	7,100
Smithers, B. C., CANADA		YZV	54.49	127.11	1719	5,000
South Bend, Ind., USA	St. Joseph Co.	SBN	41.42	86.19	778	5,000
Spartanburg, S. C., USA	Spartanburg Muni.	SPA	34.55	81.58	816	5,000
Spokane, Wash., USA	Spokane Int'l	GEG	47.38	117.38	2462	13,900
Springfield, Ill., USA	Capital	SPI	39.15	89.40	593	7,000
Springfield, Mo., USA	Springfield Muni.	SGV	37.15	93.23	1267	5,600

CITY	AIRPORT	CODE	LAT. ° ' N	LONG. ° ' W	ELEV. Ft.	RUNWAY Ft.
Stephenville, Nfld., CAN.	Ernst Harmon AFB	YJT	48.32	58.33	86	10,000
Stockton, Calif., USA	Stockton Muni.	SCK	37.54	121.15	27	8,600
Sudbury, Ont., CANADA		YSB	46.37	80.48	1120	6,600
Swift Current, Sask., CANADA		YYN	50.17	107.41	2680	4,200
Sydney, N. S., CANADA		YQY	46.10	60.03	202	6,000
Syracuse, N. Y., USA	Hancock	SYR	43.07	76.07	421	8,000
Tallahassee, Fla., USA	Tallahassee Muni.	TLH	30.24	84.21	82	6,100
Tampa, Fla., USA	Tampa Int'l	TPA	27.58	82.32	27	8.300
Temple, Texas, USA	Draughon-Miller Muni.	TPL	31.09	97.25	698	5,000
Terrace, B. C., CANADA		YXT	54.28	128.35	713	5,200
Terre Haute, Ind., USA	Hulman Field	HUF	39.27	87.19	585	8,000
Texarkana, Ark., USA	Texarkana Muni	TXK	33.27	94.00	389	5,200
Timmins, Ont., USA		YTS	48.34	81.22	967	5,700
Toledo, Ohio, USA	Toledo Express	TOL	41.35	83.48	684	7,000
Toronto, Ont., CANADA	Toronto Int'l (Malton)	YYZ	43.41	79.38	567	11,000
Tucson, Ariz., USA	Tucson Muni.	TUS	32.07	110.57	2630	12,000
Tulsa, Okla., USA	Tulsa Muni.	TUL	36.12	95.53	674	10,000
Val D'Or, Que., CANADA		YVO	48.03	77.47	1109	8,200
Vancouver, B. C., CANADA	Sea Island	YVR	49.11	123.10	9	8,600
Vero Beach, Fla., USA	Vero Beach Muni.	VRB	27.39	80.25	24	7,200
Victoria, B. C., CANADA	Victoria Int'l	YYJ	48.39	123.26	63	5,000
Visalia, Calif., USA	Visalia Muni.	VIS	36.19	119.24	292	5,300
Waco, Texas, USA	Waco Muni.	ACT	31.37	97.14	515	5,700
Washington, D. C., USA	Washington Nat'l	DCA	38.51	77.02	15	6,900
Waterloo, Iowa, USA	Waterloo Muni.	ALO	42.34	92.24	870	5,400
Waterville, Maine, USA	Waterville Muni.	WVL	44.32	69.40	332	4,000
Watson Lake, Y. T., CANADA		YQH	60.07	128.49	2255	5,500
Waycross, Ga., USA	Waycross-Ware Co.	AYS	31.15	82.24	142	5,000
West Palm Beach, Fla., USA	Palm Beach Int'l	PBI	26.41	80.06	19	8,000
Whitehorse, Y. T., CANADA		YXE	60.43	135.04	2303	7,200
Wichita, Kan., USA	Wichita	ICT	37.39	97.26	1332	7,300
Wichita Falls, Texas, USA	Wichita Falls	SPS	33.59	98.30	1015	13,100
Williams Lake, B. C., CAN.		YWL	52.11	122.03	3085	7,000
Williamsport, Pa., USA	Williamsport-Lycoming Co.	IPT	41.14	76.55	528	5,000
Wilmington, Del., USA	Greater Wilmington	ILG	39.41	75.36	79	7,100
Wilmington, N. C., USA	New Hanover Co.	IMN	34.16	77.54	31	8,000
Windsor, Ont., CANADA		YQG	46.16	82.58	622	6,200
Winnipeg, Man., CANADA	Winnipeg Int'l	YWG	49.54	97.14	785	8,700
Worcester, Mass., USA	Worcester Muni.	ORH	42.16	71.52	1009	5,500
Yakima, Wash., USA	Yakima Muni.	YKM	46.34	120.32	1082	5,500
Yarmouth, N. S., CANADA		YQI	43.50	66.05	157	5,800
Yorkton, Sask., CANADA		YQV	51.16	102.28	1635	4,800
Youngstown, Ohio, USA	Youngstown Muni.	YNG	41.16	80.41	1196	7,500

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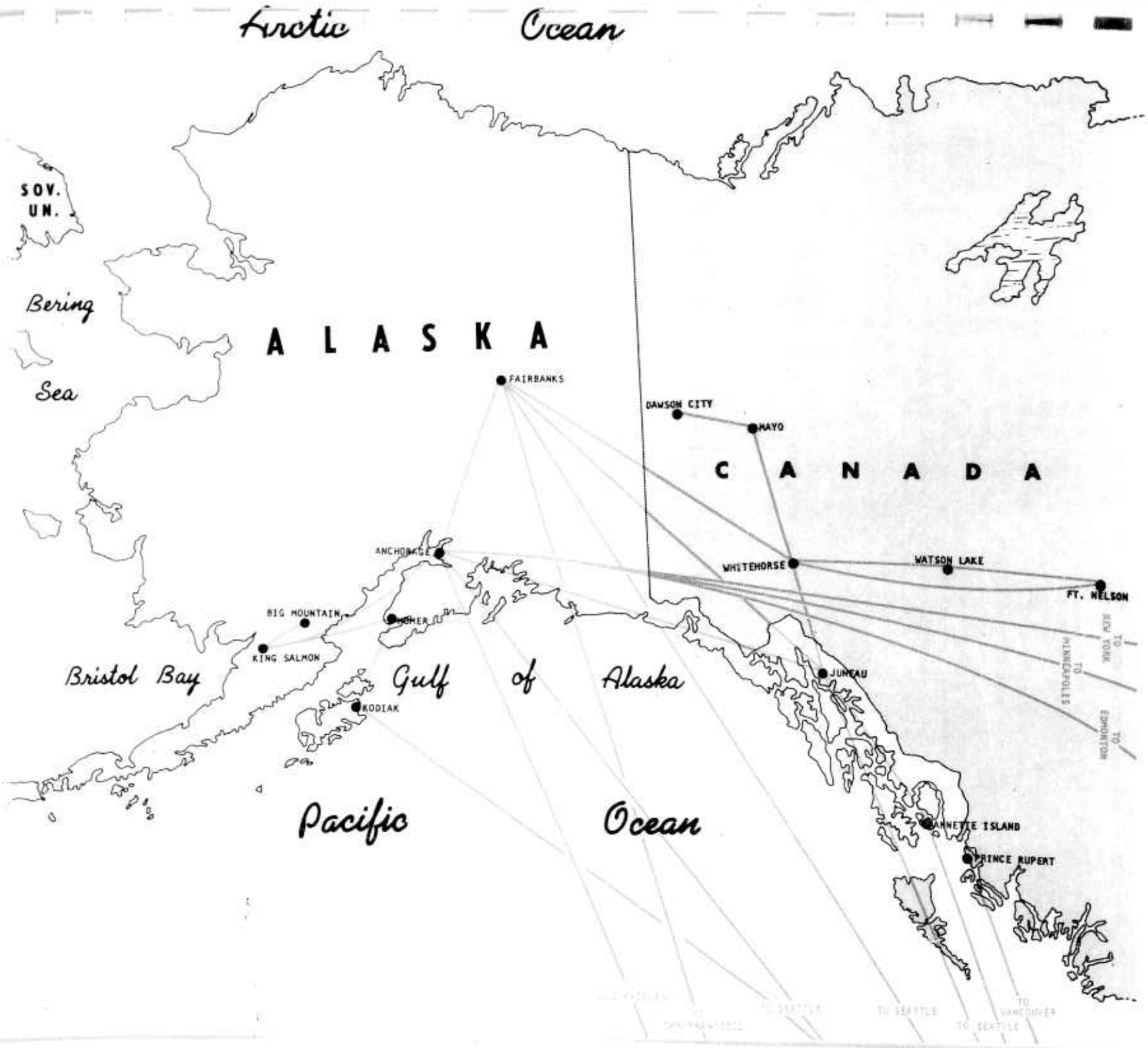
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Bering Sea
ALASKA
FAIRBANKS
DAWSON CITY
MAYO
CANADA
ANCHORAGE
WHITEHORSE
WATSON LAKE
FT. NELSON
BIG MOUNTAIN
KING SALMON
Bristol Bay
Gulf of Alaska
KODIAK
JUNEAU
TO NEW YORK
TO MINNEAPOLIS
TO EDMONTON
Pacific Ocean
ANNETTE ISLAND
PRINCE RUPERT
TO SEATTLE
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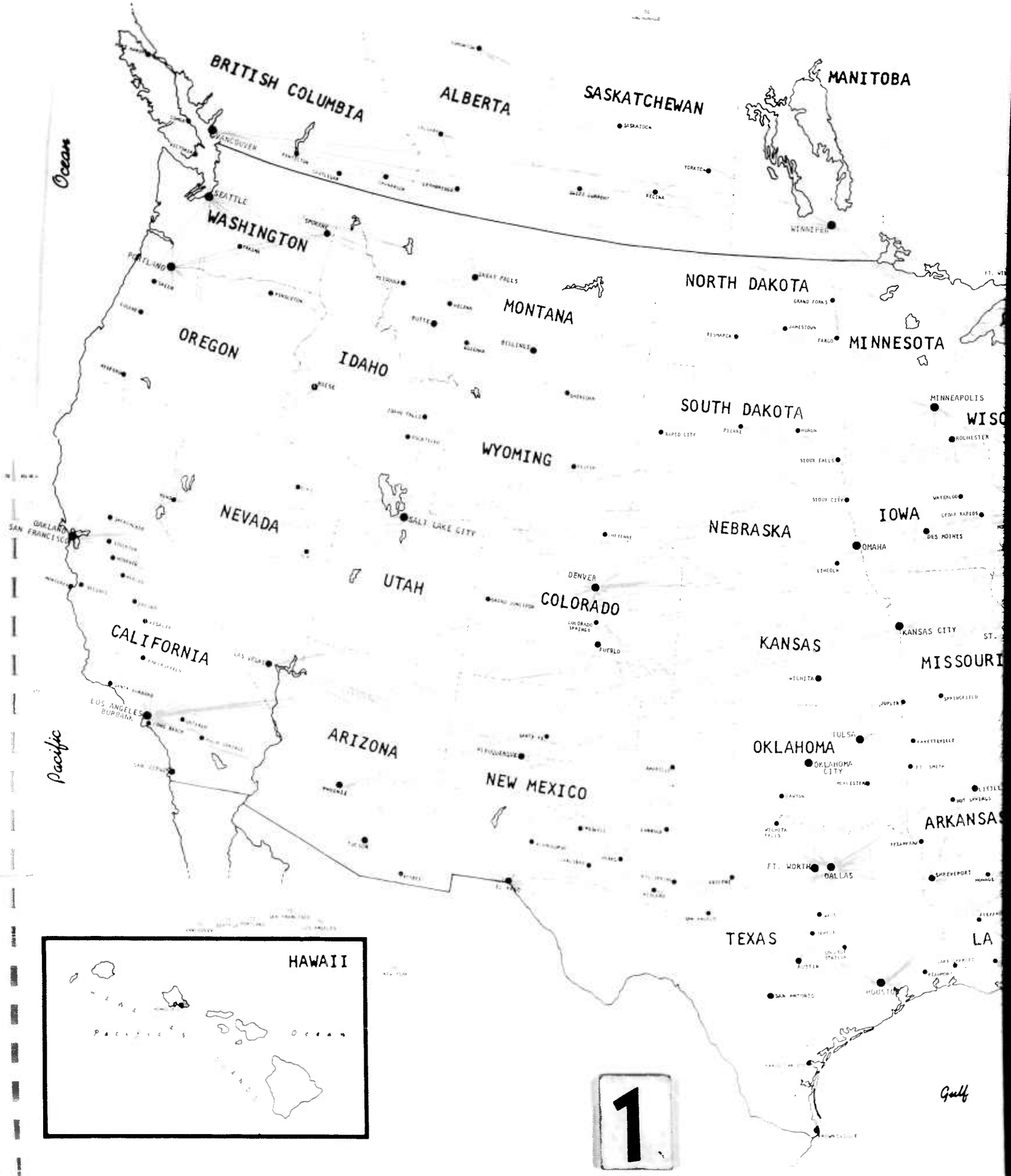
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FT. WORTH
DALLAS
TEXAS
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Pacific
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Gulf
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Pacific Ocean
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ATCHEWAN
MANITOBA
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QUEBEC
James Bay
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MAINE
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MINNESOTA
Lake Superior
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SOUTH DAKOTA
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MICH
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Lake Huron
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NEW YORK
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INDIANA
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PUERTO RICO