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NAVAID SUPPORT OF HIGH-ALTITUDE AREA NAVIGATION ROUTES.(U)
FEB 77 A G HALVERSON, F B WOODSON

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# NAVAID SUPPORT OF HIGH-ALTITUDE AREA NAVIGATION ROUTES

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FEBRUARY 1977

INTERIM REPORT

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16. Abstract

A study was conducted at the National Aviation Facilities Experimental Center (NAFEC) in order to determine the capability of the present system of navigational aids (NAVAID's) to support an area navigation (RNAV) route structure. Coverage contours for each NAVAID were derived through application of radio line-of-sight (LOS) angles from the antenna to the surrounding terrain. A hypothetical high-altitude RNAV structure was tested against the coverage contours of the NAVAID's presently used in the airspace at 18,000 feet and above. Each parent route and its related parallel offsets were checked for areas of excessive route width as well as for areas of noncoverage at a flight altitude of 18,000 feet. Based on these results, it is concluded that the present NAVAID system will support a high-altitude RNAV route structure with only minor problems, principally in connection with route widths. But the extent of this problem depends upon air traffic control requirements and the assumed cross-course navigational errors. With definite information regarding these factors, the methodology developed at NAFEC can be effectively used to isolate and identify specific NAVAID coverage problems.

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# METRIC CONVERSION FACTORS

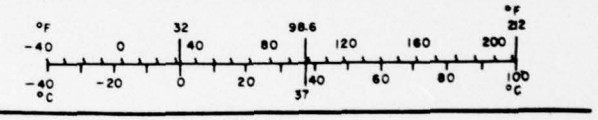
## Approximate Conversions to Metric Measures

| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| in | inches | *2.5 | centimeters | cm |
| ft | feet | 30 | centimeters | cm |
| yd | yards | 0.9 | meters | m |
| mi | miles | 1.6 | kilometers | km |
| | | **AREA** | | |
| $in^2$ | square inches | 6.5 | square centimeters | $cm^2$ |
| $ft^2$ | square feet | 0.09 | square meters | $m^2$ |
| $yd^2$ | square yards | 0.8 | square meters | $m^2$ |
| $mi^2$ | square miles | 2.6 | square kilometers | $km^2$ |
| | acres | 0.4 | hectares | ha |
| | | **MASS (weight)** | | |
| oz | ounces | 28 | grams | g |
| lb | pounds | 0.45 | kilograms | kg |
| | short tons (2000 lb) | 0.9 | tonnes | t |
| | | **VOLUME** | | |
| tsp | teaspoons | 5 | milliliters | ml |
| Tbsp | tablespoons | 15 | milliliters | ml |
| fl oz | fluid ounces | 30 | milliliters | ml |
| c | cups | 0.24 | liters | l |
| pt | pints | 0.47 | liters | l |
| qt | quarts | 0.95 | liters | l |
| gal | gallons | 3.8 | liters | l |
| $ft^3$ | cubic feet | 0.03 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.76 | cubic meters | $m^3$ |
| | | **TEMPERATURE (exact)** | | |
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

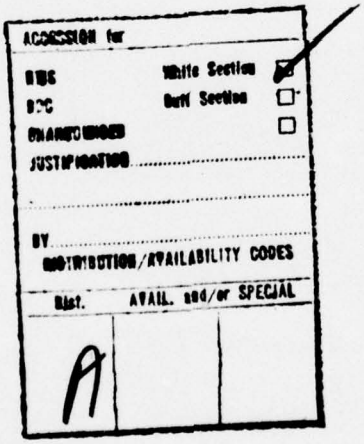

## Approximate Conversions from Metric Measures

| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| mm | millimeters | 0.04 | inches | in |
| cm | centimeters | 0.4 | inches | in |
| m | meters | 3.3 | feet | ft |
| m | meters | 1.1 | yards | yd |
| km | kilometers | 0.6 | miles | mi |
| | | **AREA** | | |
| $cm^2$ | square centimeters | 0.16 | square inches | $in^2$ |
| $m^2$ | square meters | 1.2 | square yards | $yd^2$ |
| $km^2$ | square kilometers | 0.4 | square miles | $mi^2$ |
| ha | hectares (10,000 $m^2$) | 2.5 | acres | |
| | | **MASS (weight)** | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.2 | pounds | lb |
| t | tonnes (1000 kg) | 1.1 | short tons | |
| | | **VOLUME** | | |
| ml | milliliters | 0.03 | fluid ounces | fl oz |
| l | liters | 2.1 | pints | pt |
| l | liters | 1.06 | quarts | qt |
| l | liters | 0.26 | gallons | gal |
| $m^3$ | cubic meters | 35 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.3 | cubic yards | $yd^3$ |
| | | **TEMPERATURE (exact)** | | |
| °C | Celsius temperature | 9/5 (then add 32) | Fahrenheit temperature | °F |



## PREFACE

The authors wish to express appreciation to Messrs. Stanley Safferman and Franklin Atwell of the Electromagnetic Compatibility Analysis Center, Annapolis, Maryland, for their cooperation and enthusiastic support in providing the terrain data used to derive the NAVAID coverage information presented in this report. Appreciation is also extended to Messrs. Shigetaka Kikkawa and Denton Harold, Jr. of Computer Sciences Corporation and to Messrs. Richard Soper and Thomas Choyce of the Analysis Branch, ANA-220, of the National Aviation Facilities Experimental Center, Atlantic City, New Jersey, for the development of computer software used in the study and for the critical review of the resulting data.



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# INTRODUCTION

## PURPOSE.

One of the questions concerning the application of area navigation (RNAV) in the National Airspace System (NAS) is the adequacy of the present system of navigational aids (NAVAID's) to support an efficient RNAV route structure. In this context, NAVAID support of a route structure involves signal coverage at specified altitudes, a route width to accommodate cross-course navigational errors, and the capability to utilize the RNAV offset function. To derive definitive answers to these questions requires that a proposed RNAV structure be tested against the known capabilities of the present NAVAID system, applying, as appropriate, valid assumptions and/or criteria relative to navigational errors, route structure requirements, RNAV avionics capabilities and other factors. At this point, however, such definition is not feasible, since RNAV route structure development has not reached the point where a sufficiently extensive and optimum structure exists, nor have the capabilities of the present NAVAID's been adequately determined. Accordingly, an approach has been taken which will (a) provide coarse-grained answers for planning purposes, and (b) produce a method by which more definitive information can be derived once such an implementation structure has been developed.

This approach involves the application of digitized topographic data to determine NAVAID coverage estimates and then to test a hypothetical RNAV route structure against the coverage contours so derived. The approach is centered around the use of large-scale data processing with the provision for manual review and evaluation.

The purpose of this interim report, therefore, is to describe the method developed for this purpose and to present some early results from its application on a hypothetical high-altitude RNAV route structure (reference 1).

## BACKGROUND.

As described in reference 1, the National Aviation Facilities Experimental Center (NAFEC) has been involved in the design of RNAV structures for the purpose of route structure concept development and system payoff analyses. In this work, one of the ground rules was that NAVAID requirements would be determined following route structure development in order that problem areas could be identified and appropriate trade-offs defined. Therefore, in parallel with the route structure design work, NAFEC was also engaged in developing a system of computer programs and other methodology which could be used to derive these requirements.

Since only a minimal amount of flight test data was available, it was decided to use the topographic data base being established in digital form at the Electromagnetic Compatibility Analyses Center (ECAC) Annapolis, Maryland. For several years, ECAC has been receiving digitized topographic data from the Defense Mapping Agency (DMA), which is used by ECAC in a wide range of projects

for the Department of Defense and the Federal Aviation Administration (FAA). At the time the RNAV route structure study was initiated, ECAC had received topographic data on most of the conterminous United States (U.S.), and it was estimated that the data base would be completed during the time that the NAFEC study was in progress. A contract with ECAC was established wherein ECAC would provide NAFEC with the topographic data surrounding each NAVAID in a form amenable for computer-based coverage determination. A system of computer programs was developed by NAFEC (a) to derive NAVAID coverage at any selected altitude, and (b) to test any given route structure against the coverage contours to determine coverage gaps, excessive cross-course errors, and other problems.

It is recognized that precise data, relative to the coverage provided by a navigational facility, can only be obtained by flight checking the facility at specified altitudes. It is not intended, therefore, that the use of topographic data to determine NAVAID coverage will obviate the need for standard flight checking operations associated with airway/route establishment and approval. These data can be useful in planning for RNAV implementation, however. In particular, by using the terrain surrounding a NAVAID to estimate coverage at any selected altitude, problem areas can be identified and more accurate data can then be derived through flight checking. It should be noted at this point that planning for RNAV implementation over the conterminous U.S. requires 360°-coverage data at several altitudes for as many as 1,100 facilities. It is obvious that acquisition of sufficient flight check data for this purpose would be prohibitive in cost and time. It is with this in mind that NAFEC developed a method to utilize topographic data to derive coarse-grained answers to the NAVAID coverage question.

In this report, a general description of the method of approach is given together with a description of the data base that has been established at NAFEC. In addition, the report contains a brief discussion on the results derived when the RNAV route structure presented in reference 1 was tested against the NAVAID coverage contours. More detailed description of the computer software, data validation procedures, and other information are available from the project files at NAFEC.

## DATA BASE PREPARATION AND DESCRIPTION

### OVERVIEW.

In general, the preparation of topographic data to determine NAVAID coverage involved several stages of manual and computer-based processing functions. The functions were performed at DMA, ECAC, and NAFEC and are summarized as follows:

1. DMA.

a. Converts topographic contour data to digital form on a rectangular grid.

b. Processes digitized contour data to produce a matrix of topographic data points spaced at 3-second intervals. Data at grid intersections are derived by interpolation between consecutive contour values.

c. Selects data points at 30-second intervals for input to the ECAC data base. This processing is accomplished over an area of 1° latitude by 1° longitude.

2. ECAC.

a. Merges data blocks from DMA to form a topographic data base (i.e., a topographic mosaic).

b. Performs manual and computer-based data validation to detect gross errors such as problems at the seams between adjacent blocks, etc.

c. Computes angles formed at the NAVAID antenna between the horizontal and terrain elevation at each 1/2-mile interval out to the radio line-of-sight (LOS). Elevation angles are computed for each 1° radial of the NAVAID for coverage processing by NAFEC.

3. NAFEC.

a. Converts ECAC data for machine compatibility.

b. Performs manual and computer-based data validation to detect errors in site location and site elevation and to uncover other problems in the data that are observable.

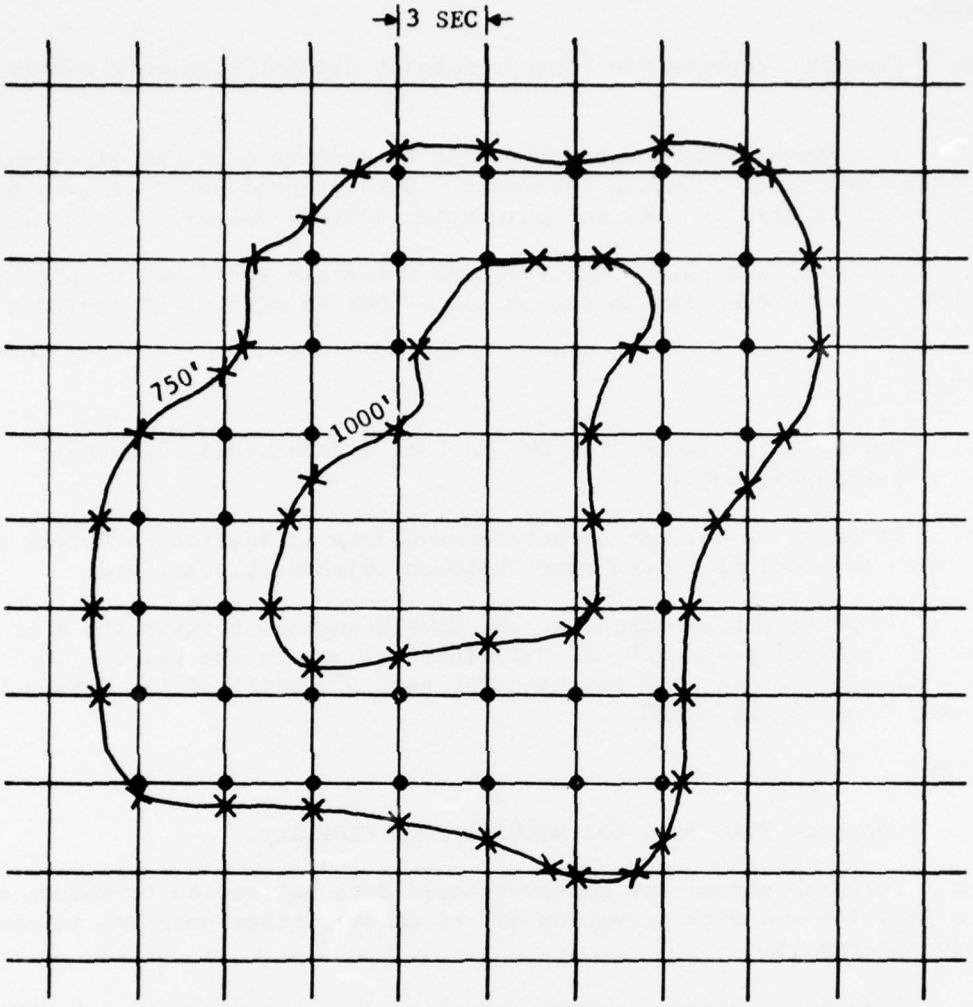
c. Computes coverage contours at selected altitudes for each NAVAID for which terrain data has been provided by ECAC.

d. Plots contours and compares these data with flight-check data where available.

e. Matches NAVAID coverage contours against RNAV route structures to determine coverage gaps, excessive cross-course errors, and other problems.

DETAILS OF THE APPROACH.

As can be seen from the above summary, the process starts at DMA where a contour digitizing technique has been developed. The technique involves recording the points where a specific contour line crosses the orthogonal lines of a rectangular grid (figure 1). After all contours for a particular area have been recorded, the data for the grid intersection points are




(A) POINTS MARKED "X" ARE RECORDED BY CONTOUR FOLLOWER

(B) POINTS MARKED "●" ARE COMPUTED BY INTERPOLATION BETWEEN CONTOUR LINES.

FIGURE 1. SCHEMATIC OF CONTOUR DIGITIZING

computed through interpolation between the closest contour values. The data are then organized into 1°x1° blocks. For this project the contour lines were derived from a topographic map with a scale of 1:250,000 (approximately 4 statute miles per inch). Because of the available computer storage, ECAC requested that DMA select every tenth data point, which produces a 30-second (approximately 1/2 mile) spacing of the terrain data. In addition to the reduced storage requirements, it was felt that the accuracy of 30-second spacing was consistent with the precision inherent in the use of the 1:250,000 scale map. Such granularity tends to reduce terrain heights (due to interpolation) and frequently terrain peaks are missed. Therefore, as will be shown later in the report, finer grain granularity is needed for NAVAID coverage determination.

A good deal of manual effort is involved in the DMA process; therefore, validation is required to detect human errors. Some of these errors cause gross aberrations in the data, which can be detected through the use of computer processing and manual analysis. ECAC developed a system of computer software which provides a cathode ray tube (CRT) display, CALCOMP plots, tabular data, and other information which facilitate visual observation of the digitized terrain data. Although blunders, such as data entry errors, can normally be detected in this manner, other more subtle errors may not be discovered. It is for this reason that NAFEC also established a method for data validation, discussed later in the report. In any event, after validation, ECAC merges the data blocks received from DMA to form a mosaic of the terrain data. This is referred to as the ECAC Topographic Data File (T-File). At present, the T-File covers the conterminous U.S., Hawaii, and part of Alaska.

In addition to the T-File, ECAC has developed an equipment-oriented file generated from data furnished by various government sources, including FAA. This file is referred to as the Environment Data Base (E-File). The E-File data furnished to NAFEC contain the following information for each NAVAID as appropriate:

1. Organization Unit Designation,
2. City,
3. State,
4. Latitude/Longitude,
5. Radar/Communication Indicator,
6. Equipment Nomenclature,
7. Equipment Function Code,
8. Frequency in Megahertz (MHz),
9. Horizontal Motion Rate--revolutions per minute (r/min) or scans per minute,
10. Site Elevation Above Sea Level--feet,
11. Height of Antenna Above Site--feet,
12. Pulse width--microseconds (μs),
13. Record identity (ID),
14. Linkage ID,
15. Trigger Rate--pulses per second,
16. Pulses per Trigger, and
17. Equipment Quantity.

For NAFEC, ECAC developed terrain profiles around selected NAVAID's (VOR's VORTAC's, TACAN's) and radar facilities. These terrain profiles are described in terms of takeoff angles ($\gamma$) formed at the antenna between the horizontal and the terrain elevations (figure 2). Angles are computed at 1/2-mile intervals out to a maximum distance of 100 miles. The line-of-sight (LOS) point is determined by finding the largest angle along the terrain profile, and all data past the LOS point are discarded. Terrain profiles are generated for each 1° radial around the facility.

The takeoff angles along the terrain profile are computed from the following equation:

$$\gamma = \text{Arctan}\left[\frac{(E-C) - (S+H)}{D}\right]$$

where:

E = terrain elevation
S = site elevation
H = antenna height above the site
D = distance to terrain elevation
C = correction for refractivity and earth curvature, and

$$C = \frac{D^2}{2\ ka}$$

where:

a = earth radius
k = 4/3 (effective earth radius factor)

Originally, ECAC used the site elevation contained in their E-File data; however, it was later found that fewer problems would arise if site elevation was derived from the data, itself. Also, to determine terrain elevation, ECAC originally employed a 4-point interpolation method. This was later replaced by a method which selects the highest of the four topographic grid points nearest the terrain point of interest (figure 3). These changes were made after the validation at NAFEC revealed that in several cases there was a severe mismatch with the coverage contours derived from flight checks. Since agreement was very good in most cases, it was felt by NAFEC that the cause for many of the mismatches was the interpolation method employed. A subsequent analysis by ECAC confirmed this, and therefore the "highest point" method was incorporated into the software.

NAFEC receives the data from ECAC in two forms. The terrain elevation angles are on magnetic tape, and the E-File data are on a computer printout. After keypunching the E-File data, the processing at NAFEC proceeds generally in the manner as shown in figure 4 and described below.

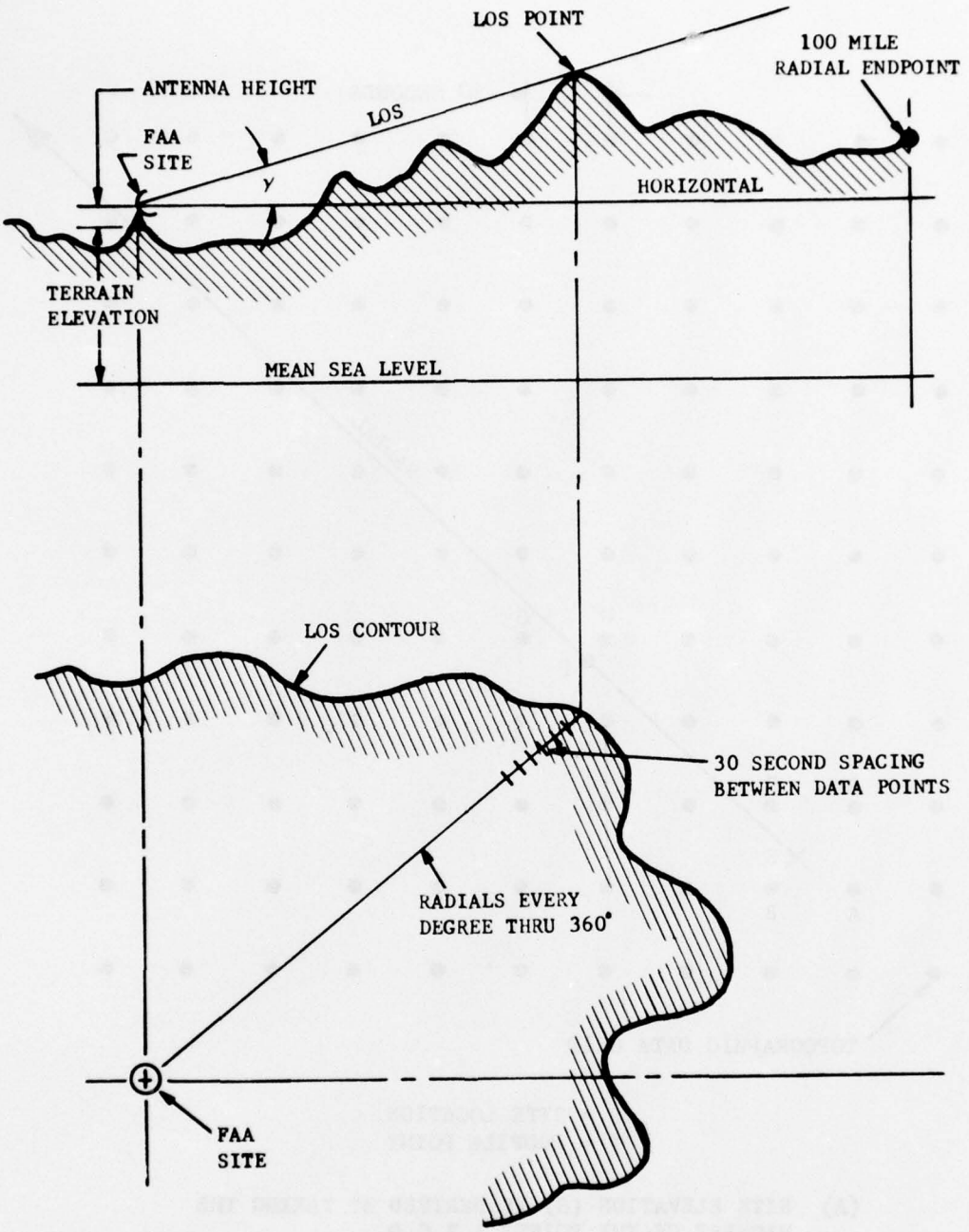
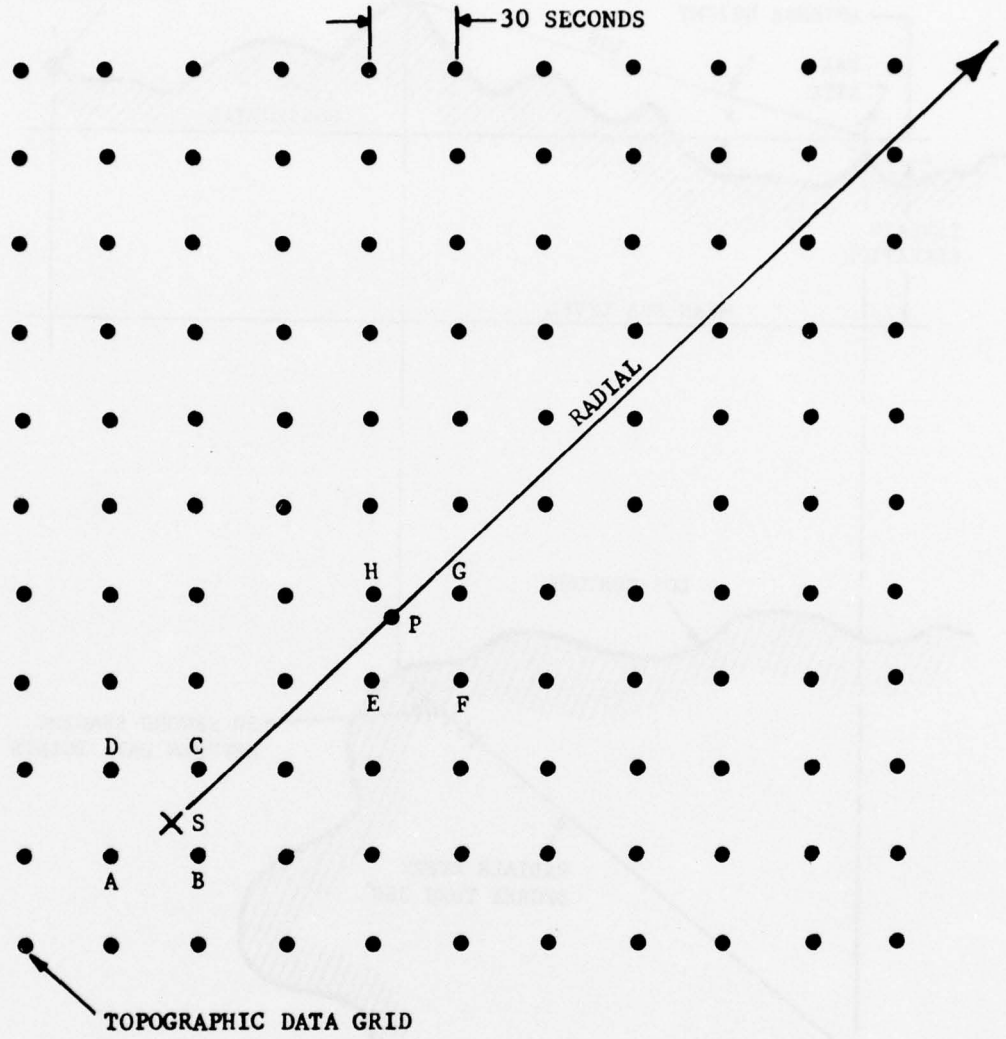



FIGURE 2. TERRAIN PROFILES




S = SITE LOCATION
P = PROFILE POINT

(A) SITE ELEVATION (S) IS DERIVED BY TAKING THE HIGHEST OF THE POINTS A,B,C,D.

(B) TERRAIN ELEVATION (P) IS DERIVED BY TAKING THE HIGHEST OF THE POINTS E,F,G,H. (THIS REPLACES THE ORIGINAL, 4-POINT INTERPOLATION METHOD.)

FIGURE 3. SCHEMATIC OF TERRAIN ELEVATION COMPUTATION

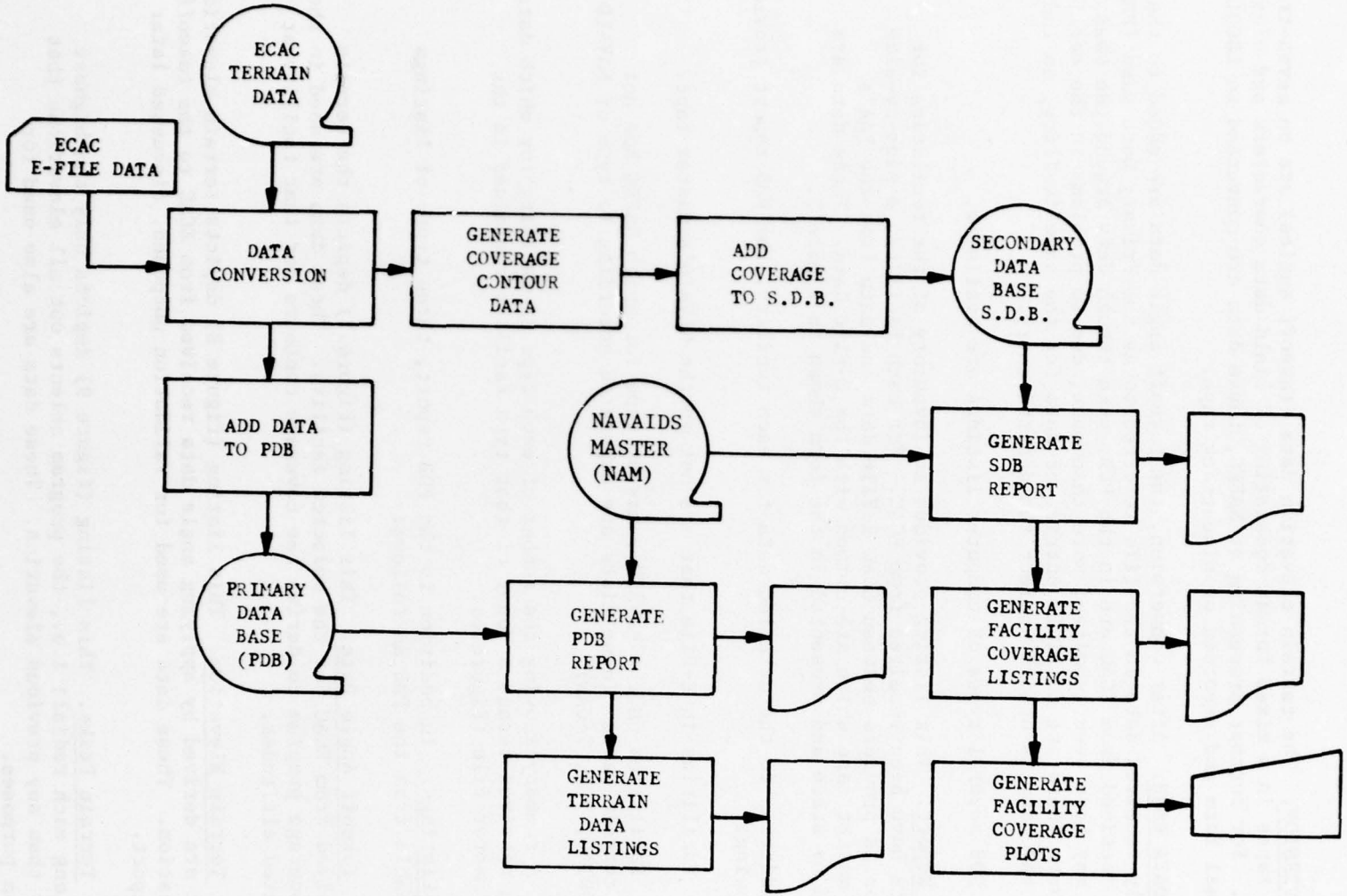



FIGURE 4. TERRAIN DATA PROCESSING AT NAFEC

DATA CONVERSION. The terrain elevation data (takeoff angles) are on seven-track magnetic tapes in a mixed format consisting of field data characters and binary integers. For further processing at NAFEC, these data are converted to EBCDIC, hexadecimal form and recorded on nine-track tape.

PRIMARY DATA BASE. After conversion, the takeoff angle data are added to the previously received data in the file referred to as the Primary Data Base (PDB). All data received from ECAC are in the PDB, even though data around the same facility may have been submitted more than once, due to problems in the earlier data. Where there are multiple entries of data for the same facility, an indicator in the data is used to select the desired entry.

From the PDB several types of computer listings are available.

PDB Report. This listing provides an inventory of the facilities for which data have been received from ECAC. For each facility, a side-by-side comparison is provided between ECAC E-File data and data from the FAA's NAVAID's master tape which are common with the E-File data. These data are organized by state and presented in the form shown in figure 5.

In addition to the detailed data for each facility, the PDB report provides the following:

a. Facilities in E-File that are not on the NAVAID's master tape.

b. Facilities on the NAVAID's master tape for which NAFEC has not received terrain data. These lists are separated according to type of NAVAID (i.e., VORTAC, VOR, TACAN).

c. A summary showing the number of each type of facility for which data have been received versus a count of that type facility contained in the NAVAID's master file (figure 6).

PDB Listings. In addition to the PDB report, three types of listings are available from the PDB as follows:

Takeoff Angle Data. This listing (figure 7) depicts the terrain data received from ECAC for the selected facility. These data are used in the NAVAID coverage program to derive the coverage contours for that facility at the selected altitudes.

Terrain Elevation. This listing (figure 8) depicts terrain elevation data that are derived by applying angle data received from ECAC to the takeoff angle equation. These data are used for validation purposes, discussed later in the report.

Terrain Peaks. This listing (figure 9) depicts only the highest points along each radial; i.e., the program selects out all elevations that are lower than any previous elevation. These data are also used for validation purposes.

| NAVAID MASTER TAPE | | | | | | | | | ECAC DATA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | TYPE/CLASS | LOCATION | | ELV | MAG VAR | STS | I | ECAC ID | TYPE/CLASS/RC | LOCATION | | ELV | ANT | TAPE | OTHER |
| GBN | C H | 325726 | 1124028 | 790 | -1400 | AZ | I | E1035488 | C/H/ | 325722 | 1124025 | 781 | 34 | -1 | |
| GCN | V L | 358737 | 1120843 | 6670 | -1500 | AZ | I | | | | | | | | |
| IGM | V L | 351537 | 1135552 | 3406 | -1500 | AZ | I | | | | | | | | |
| OLS | D L | 312453 | 1105054 | 0 | 0 | AZ | I | | | | | | | | |
| PGS | C H | 353729 | 1133237 | 4760 | -1500 | AZ | I | E1030874 | C/H/ | 353729 | 1133237 | 4780 | 16 | 9 | |
| PHX | C H | 332552 | 1115317 | 1180 | -1400 | AZ | I | E1049614 | C/H/ | 332553 | 1115317 | 1200 | 17 | 9 | |
| LLF | T L | 333209 | 1122306 | 1100 | -1400 | AZ | I | | | | | | | | |
| PRC | C H | 344209 | 1122846 | 4960 | -1400 | AZ | I | E1038924 | C/H/ | 344209 | 1122846 | 5000 | 16 | 9 | |
| SSE | C H | 321609 | 1091545 | 3600 | -1300 | AZ | I | E1069078 | C/H/ | 321609 | 1091545 | 3607 | 32 | -1 | |
| SLN | C H | 342526 | 1090834 | 6840 | -1400 | AZ | I | E1069784 | C/H/ | 342526 | 1090834 | 6860 | 16 | -1 | |
| TBC | C H | 360716 | 1111608 | 5045 | -1500 | AZ | I | E1071774 | C/H/ | 360717 | 1111608 | 5020 | 35 | 9 | |
| DMA | T L | 320936 | 1105249 | 2660 | -1300 | AZ | I | | | | | | | | |
| TUS | C H | 320721 | 1104912 | 2880 | -1300 | AZ | I | E1064364 | C/H/ | 320721 | 1104912 | 2847 | 18 | -1 | |
| INW | C H | 350341 | 1104739 | 4910 | -1400 | AZ | I | E1066544 | C/H/ | 350342 | 1104740 | 5020 | 16 | 9 | |
| NYL | T L | 323848 | 1143645 | 183 | -1400 | AZ | I | | | | | | | | |
| YUM | C H | 324605 | 1143607 | 130 | -1400 | AZ | I | E1023544 | C/H/ | 324605 | 1143607 | 130 | 34 | -1 | |
| BYH | T L | 355722 | 895625 | 260 | -500 | AR | I | | | | | | | | |
| BYH | V L | 355702 | 895628 | 252 | -500 | AR | I | | | | | | | | |
| ELD | C L | 331521 | 924437 | 232 | -700 | AR | I | | | | | | | | |
| DAK | V T | 360234 | 941151 | 1530 | -700 | AR | I | E0608024 | V/T/ | 360234 | 941151 | 5350 | 18 | -4 | |
| FYV | C H | 361446 | 940716 | 1350 | -700 | AR | I | E0608394 | C/H/ | 361447 | 940716 | 1330 | 18 | -1 | |
| FLP | V L | 361758 | 922729 | 780 | 9999 | AR | I | E0626684 | V/L/ | 361759 | 922730 | 8200 | 18 | -4 | |
| FSM | C L | 352317 | 941616 | 430 | -700 | AR | I | E0607714 | C/L/ | 352318 | 941617 | 431 | 41 | -1 | |
| HRO | V L | 361905 | 931247 | 1405 | -700 | AR | I | E0616184 | V/L/ | 361906 | 931247 | 4150 | 18 | -4 | |
| HOT | V L | 342842 | 930525 | 530 | -700 | AR | I | E0615354 | V/L/ | 342843 | 930526 | 2700 | 16 | -4 | |
| LRF | T L | 345504 | 922926 | 360 | -600 | AR | I | | | | | | | | |
| LBB | V T | 355229 | 903518 | 245 | -500 | AR | I | E1411254 | V/T/ | 355230 | 903518 | 4600 | 16 | -4 | |
| LIT | C H | 344039 | 921045 | 240 | -600 | AR | I | E0623694 | C/H/ | 344039 | 921045 | 241 | 16 | -1 | |
| MEM | C L | 333343 | 914256 | 0 | 0 | AR | I | E0629494 | C/L/ | 333343 | 914256 | 210 | 15 | -1 | |
| MEF | C L | 341448 | 915433 | 205 | -600 | AR | I | E0629944 | C/L/ | 341448 | 915434 | 230 | 44 | -1 | |
| TXK | C H | 333049 | 940422 | 270 | -700 | AR | I | E0606194 | C/H/R | 333050 | 940423 | 260 | 33 | 9 | |
| ARG | C H | 360635 | 905714 | 260 | -500 | AR | I | E0633464 | C/H/ | 360636 | 905713 | 275 | 16 | -1 | |
| ZBV | C H | 254215 | 791740 | 10 | 0 | BI | I | J1154078 | C/H/ | 254215 | 791740 | 4 | 36 | -1 | |
| ZFF | D H | 263319 | 784154 | 8 | 100 | BI | I | | | | | | | | |
| GT | T T | 212600 | 710900 | 0 | 0 | BI | I | | | | | | | | |
| BCA | T H | 322148 | 644118 | 0 | 0 | BI | I | | | | | | | | |
| KBV | V H | 322147 | 644142 | 0 | 0 | BI | I | | | | | | | | |
| ZGA | D H | 250140 | 772702 | 10 | 200 | BI | I | | | | | | | | |
| NG2 | T L | 374731 | 1221945 | 20 | -1600 | CA | I | | | | | | | | |
| ACV | V L | 405857 | 1240425 | 151 | -1854 | CA | I | | | | | | | | |
| AVE | C H | 353849 | 1195839 | 710 | -1600 | CA | I | F0900904 | C/H/ | 353849 | 1195839 | 655 | 15 | -7 | |

| Type | Class |
|---|---|
| C-VORTAC | H-High |
| D-VOR/DME | L-Low |
| V-VOR | T-Terminal |
| T-TACAN | |

FIGURE 5. SAMPLE OF PDB REPORT

***PROCESSING SUMMARY***

| | | ECAC | NAVAID MASTER |
|---|---|---|---|
| VORTAC | | | |
| | HIGH | 256 | 313 |
| | LOW | 348 | 406 |
| | TERM | 2 | 8 |
| | TOTL | 646 | 727 |
| VOR | | | |
| | HIGH | 3 | 12 |
| | LOW | 105 | 165 |
| | TERM | 48 | 126 |
| | TOTL | 156 | 303 |
| TACAN | | | |
| | HIGH | 0 | 23 |
| | LOW | 2 | 99 |
| | TERM | 1 | 16 |
| | TOTL | 3 | 138 |
| TOTAL | | 805 | 1168 |

FIGURE 6. PDB REPORT SUMMARY

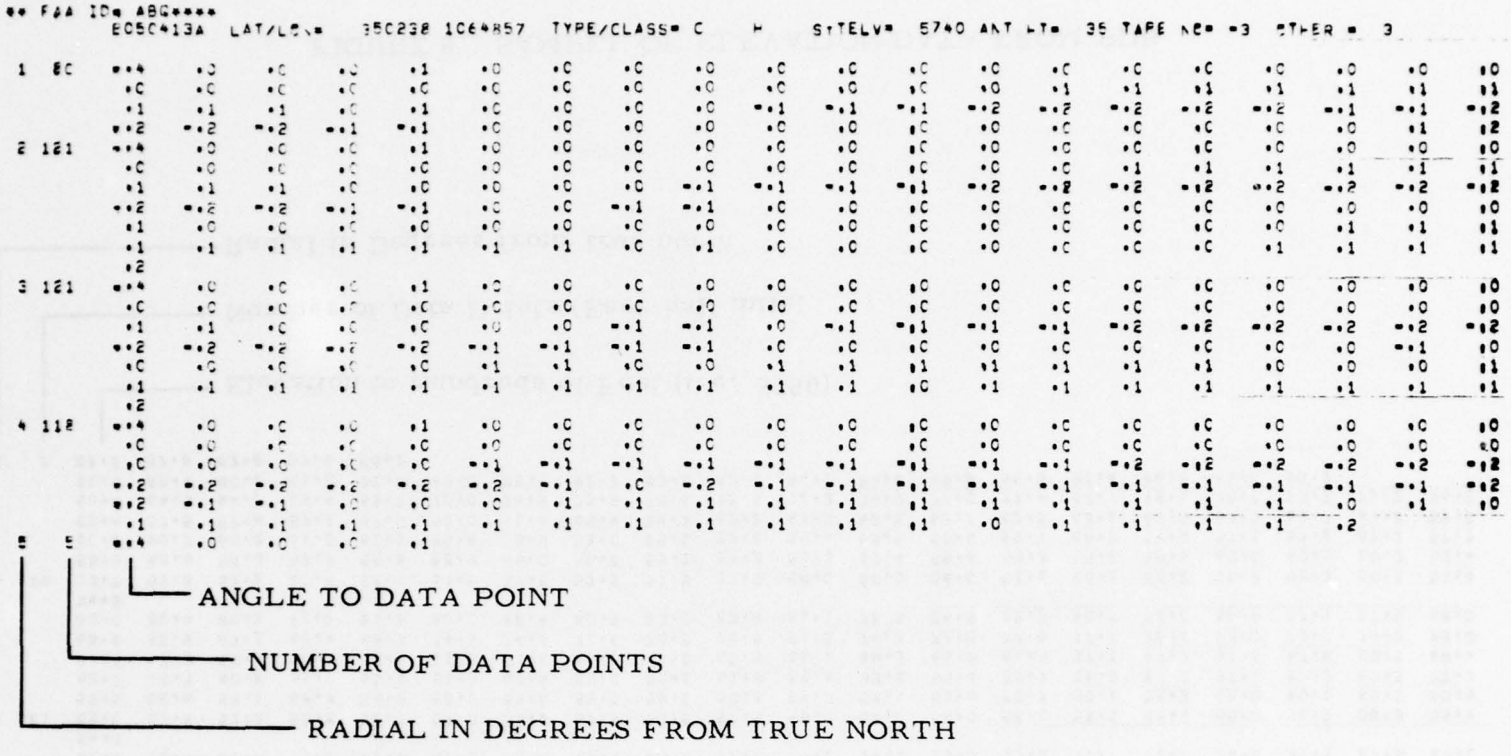
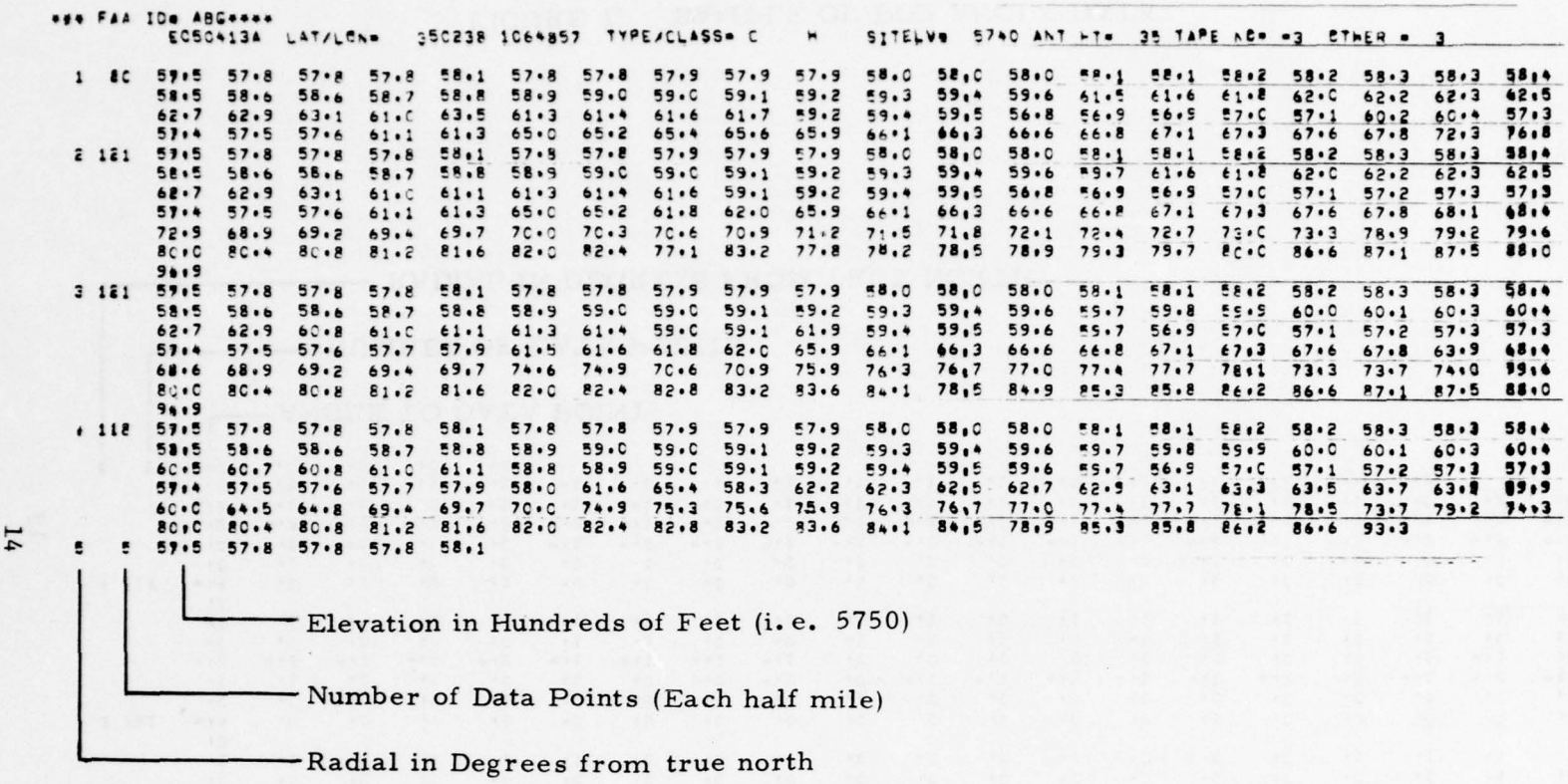



FIGURE 7. SAMPLE OF PDB ANGLE DATA



*** FAA ID= ABC**** EC504134 LAT/LON= 350238 1064857 TYPE/CLASS= C H SITELV= 5740 ANT HT= 35 TAPE NO= =3 OTHER = 3

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 80 | 59.5 | 57.8 | 57.8 | 57.8 | 58.1 | 57.8 | 57.8 | 57.9 | 57.9 | 57.9 | 58.0 | 58.0 | 58.0 | 58.1 | 58.1 | 58.2 | 58.2 | 58.3 | 58.3 | 58.4 |
| | | 58.5 | 58.6 | 58.6 | 58.7 | 58.8 | 58.9 | 59.0 | 59.0 | 59.1 | 59.2 | 59.3 | 59.4 | 59.6 | 61.5 | 61.6 | 61.8 | 62.0 | 62.2 | 62.3 | 62.5 |
| | | 62.7 | 62.9 | 63.1 | 61.0 | 63.5 | 61.3 | 61.4 | 61.6 | 61.7 | 59.2 | 59.4 | 59.5 | 56.8 | 56.9 | 56.9 | 57.0 | 57.1 | 60.2 | 60.4 | 57.3 |
| | | 57.4 | 57.5 | 57.6 | 61.1 | 61.3 | 65.0 | 65.2 | 65.4 | 65.6 | 65.9 | 66.1 | 66.3 | 66.6 | 66.8 | 67.1 | 67.3 | 67.6 | 67.8 | 72.3 | 76.8 |
| 2 | 161 | 59.5 | 57.8 | 57.8 | 57.8 | 58.1 | 57.8 | 57.8 | 57.9 | 57.9 | 57.9 | 58.0 | 58.0 | 58.0 | 58.1 | 58.1 | 58.2 | 58.2 | 58.3 | 58.3 | 58.4 |
| | | 58.5 | 58.6 | 58.6 | 58.7 | 58.8 | 58.9 | 59.0 | 59.0 | 59.1 | 59.2 | 59.3 | 59.4 | 59.6 | 59.7 | 61.6 | 61.8 | 62.0 | 62.2 | 62.3 | 62.5 |
| | | 62.7 | 62.9 | 63.1 | 61.0 | 61.1 | 61.3 | 61.4 | 61.6 | 59.1 | 59.2 | 59.4 | 59.5 | 56.8 | 56.9 | 56.9 | 57.0 | 57.1 | 57.2 | 57.3 | 57.3 |
| | | 57.4 | 57.5 | 57.6 | 61.1 | 61.3 | 65.0 | 65.2 | 61.8 | 62.0 | 65.9 | 66.1 | 66.3 | 66.6 | 66.8 | 67.1 | 67.3 | 67.6 | 67.8 | 68.1 | 68.4 |
| | | 72.9 | 68.9 | 69.2 | 69.4 | 69.7 | 70.0 | 70.3 | 70.6 | 70.9 | 71.2 | 71.5 | 71.8 | 72.1 | 72.4 | 72.7 | 73.0 | 73.3 | 78.9 | 79.2 | 79.6 |
| | | 80.0 | 80.4 | 80.8 | 81.2 | 81.6 | 82.0 | 82.4 | 77.1 | 83.2 | 77.8 | 78.2 | 78.5 | 78.9 | 79.3 | 79.7 | 80.0 | 86.6 | 87.1 | 87.5 | 88.0 |
| | | 96.9 | | | | | | | | | | | | | | | | | | | |
| 3 | 181 | 59.5 | 57.8 | 57.8 | 57.8 | 58.1 | 57.8 | 57.8 | 57.9 | 57.9 | 57.9 | 58.0 | 58.0 | 58.0 | 58.1 | 58.1 | 58.2 | 58.2 | 58.3 | 58.3 | 58.4 |
| | | 58.5 | 58.6 | 58.6 | 58.7 | 58.8 | 58.9 | 59.0 | 59.0 | 59.1 | 59.2 | 59.3 | 59.4 | 59.6 | 59.7 | 59.8 | 59.9 | 60.0 | 60.1 | 60.3 | 60.4 |
| | | 62.7 | 62.9 | 60.8 | 61.0 | 61.1 | 61.3 | 61.4 | 59.0 | 59.1 | 61.9 | 59.4 | 59.5 | 59.6 | 59.7 | 56.9 | 57.0 | 57.1 | 57.2 | 57.3 | 57.3 |
| | | 57.4 | 57.5 | 57.6 | 57.7 | 57.9 | 61.5 | 61.6 | 61.8 | 62.0 | 65.9 | 66.1 | 66.3 | 66.6 | 66.8 | 67.1 | 67.3 | 67.6 | 67.8 | 63.9 | 68.4 |
| | | 68.6 | 68.9 | 69.2 | 69.4 | 69.7 | 74.6 | 74.9 | 70.6 | 70.9 | 75.9 | 76.3 | 76.7 | 77.0 | 77.4 | 77.7 | 78.1 | 73.3 | 73.7 | 74.0 | 79.6 |
| | | 80.0 | 80.4 | 80.8 | 81.2 | 81.6 | 82.0 | 82.4 | 82.8 | 83.2 | 83.6 | 84.1 | 78.5 | 84.9 | 85.3 | 85.8 | 86.2 | 86.6 | 87.1 | 87.5 | 88.0 |
| | | 96.9 | | | | | | | | | | | | | | | | | | | |
| 4 | 118 | 59.5 | 57.8 | 57.8 | 57.8 | 58.1 | 57.8 | 57.8 | 57.9 | 57.9 | 57.9 | 58.0 | 58.0 | 58.0 | 58.1 | 58.1 | 58.2 | 58.2 | 58.3 | 58.3 | 58.4 |
| | | 58.5 | 58.6 | 58.6 | 58.7 | 58.8 | 58.9 | 59.0 | 59.0 | 59.1 | 59.2 | 59.3 | 59.4 | 59.6 | 59.7 | 59.8 | 59.9 | 60.0 | 60.1 | 60.3 | 60.4 |
| | | 60.5 | 60.7 | 60.8 | 61.0 | 61.1 | 58.8 | 58.9 | 59.0 | 59.1 | 59.2 | 59.4 | 59.5 | 59.6 | 59.7 | 56.9 | 57.0 | 57.1 | 57.2 | 57.3 | 57.3 |
| | | 57.4 | 57.5 | 57.6 | 57.7 | 57.9 | 58.0 | 61.6 | 65.4 | 58.3 | 62.2 | 62.3 | 62.5 | 62.7 | 62.9 | 63.1 | 63.3 | 63.5 | 63.7 | 63.8 | 69.9 |
| | | 60.0 | 64.5 | 64.8 | 69.4 | 69.7 | 70.0 | 74.9 | 75.3 | 75.6 | 75.9 | 76.3 | 76.7 | 77.0 | 77.4 | 77.7 | 78.1 | 78.5 | 73.7 | 79.2 | 74.3 |
| | | 80.0 | 80.4 | 80.8 | 81.2 | 81.6 | 82.0 | 82.4 | 82.8 | 83.2 | 83.6 | 84.1 | 84.5 | 78.9 | 85.3 | 85.8 | 86.2 | 86.6 | 93.3 | | |
| 5 | 5 | 59.5 | 57.8 | 57.8 | 57.8 | 58.1 | | | | | | | | | | | | | | | |

Elevation in Hundreds of Feet (i.e. 5750)

Number of Data Points (Each half mile)

Radial in Degrees from true north

FIGURE 8. SAMPLE OF ELEVATION DATA FROM PDB

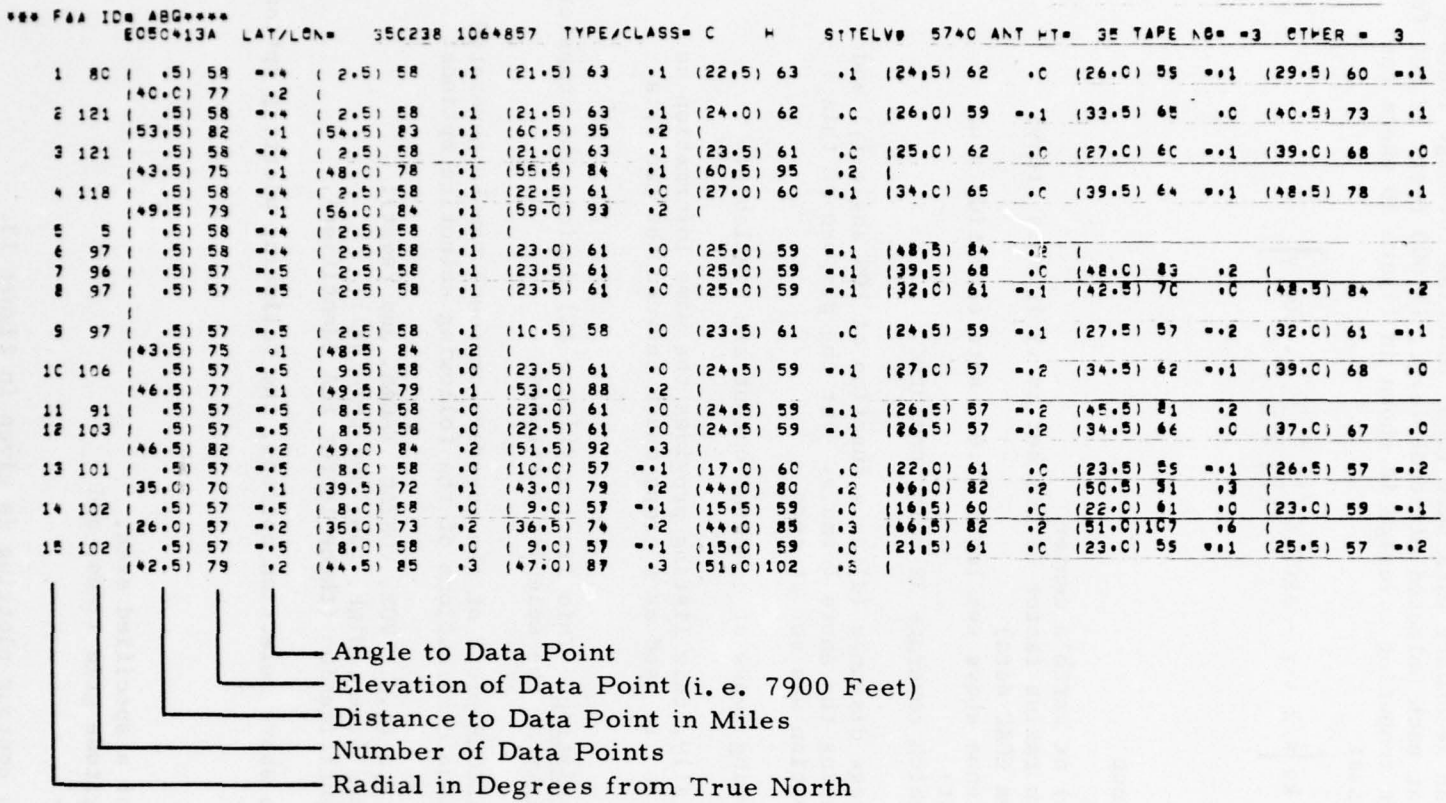



FIGURE 9. SAMPLE OF PEAK DATA FROM PDB

SECONDARY DATA BASE. The Secondary Data Base (SDB) contains coverage contour data for each facility at each selected altitude (e.g., 18,000 feet, 22,000 feet, etc.). The geometry for computing coverage is shown in figure 10 where the following equation applies:

$$d = ka\theta = ka\left[\pi/2 - \gamma - \text{ARCSIN}\left(\frac{ka + h_1}{ka + h}\right) \cdot \cos\gamma\right]$$

where:

d = coverage distance
a = earth's radius
$\theta$ = angle (radians) at earth's center
k = effective earth radius factor (k was set to .9 in this study)
$\gamma$ = LOS angle (from ECAC data)
$h_1$ = height of antenna above sea level (i.e., site elevation plus antenna height)
h = altitude for which coverage is being computed.

Figure 11 depicts coverage distance (d) as a function of LOS angle ($\gamma$) and aircraft altitude (h) using the above formula. For the purpose of this illustration, site elevation was set at zero.

From the SDB, the following types of computer output are available:

SDB Report. Basically, this listing provides the same information as that in the PDB report and is used as a cross-check between the two data bases.

Facility Coverage Listing. This listing (figure 12) depicts the computer coverage for each facility at the selected altitudes.

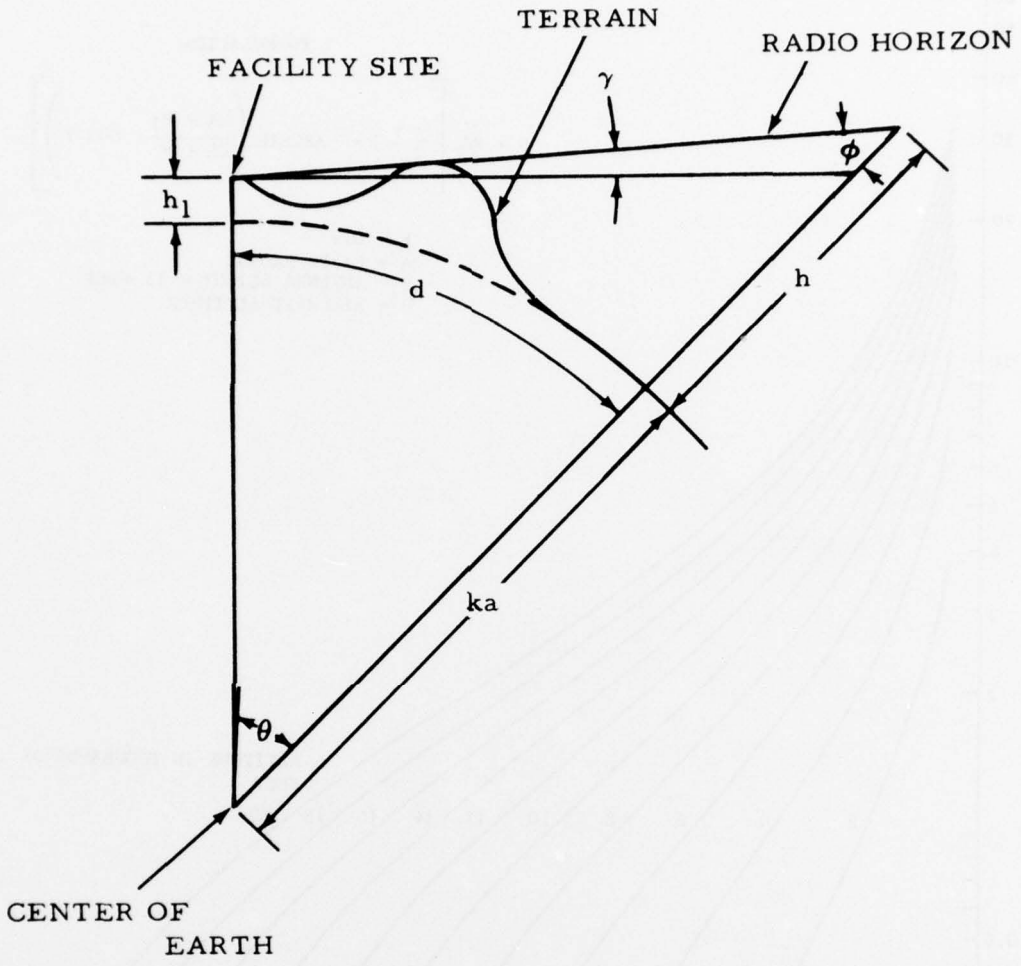
CALCOMP Plots. CALCOMP plots of the coverage contours can be generated from the SDB under various combinations of the following selection options:

a. By facility type (i.e., VOR, VORTAC, TACAN, and radar);
b. By NAVAID class (i.e., high, low, and terminal);
c. By NAVAID identification (three-letter FAA identifier).

In addition to the above selection options, the following plotting options are also available:

a. Scale,
b. Color,
c. Enlargement of a specified area,
d. Latitude/longitude grid lines, and
e. U.S. outline.

An example of this contour plotting is given in figure 13.




WHERE $h_1$ = ANTENNA HEIGHT
$h$ = ALTITUDE OF TARGET
$ka$ = EFFECTIVE EARTH RADIUS
$d$ = DISTANCE ALONG EARTH'S SURFACE
$\gamma$ = LINE-OF-SIGHT ANGLE TO TARGET

76-49-10

FIGURE 10. NAVAID's COVERAGE GEOMETRY

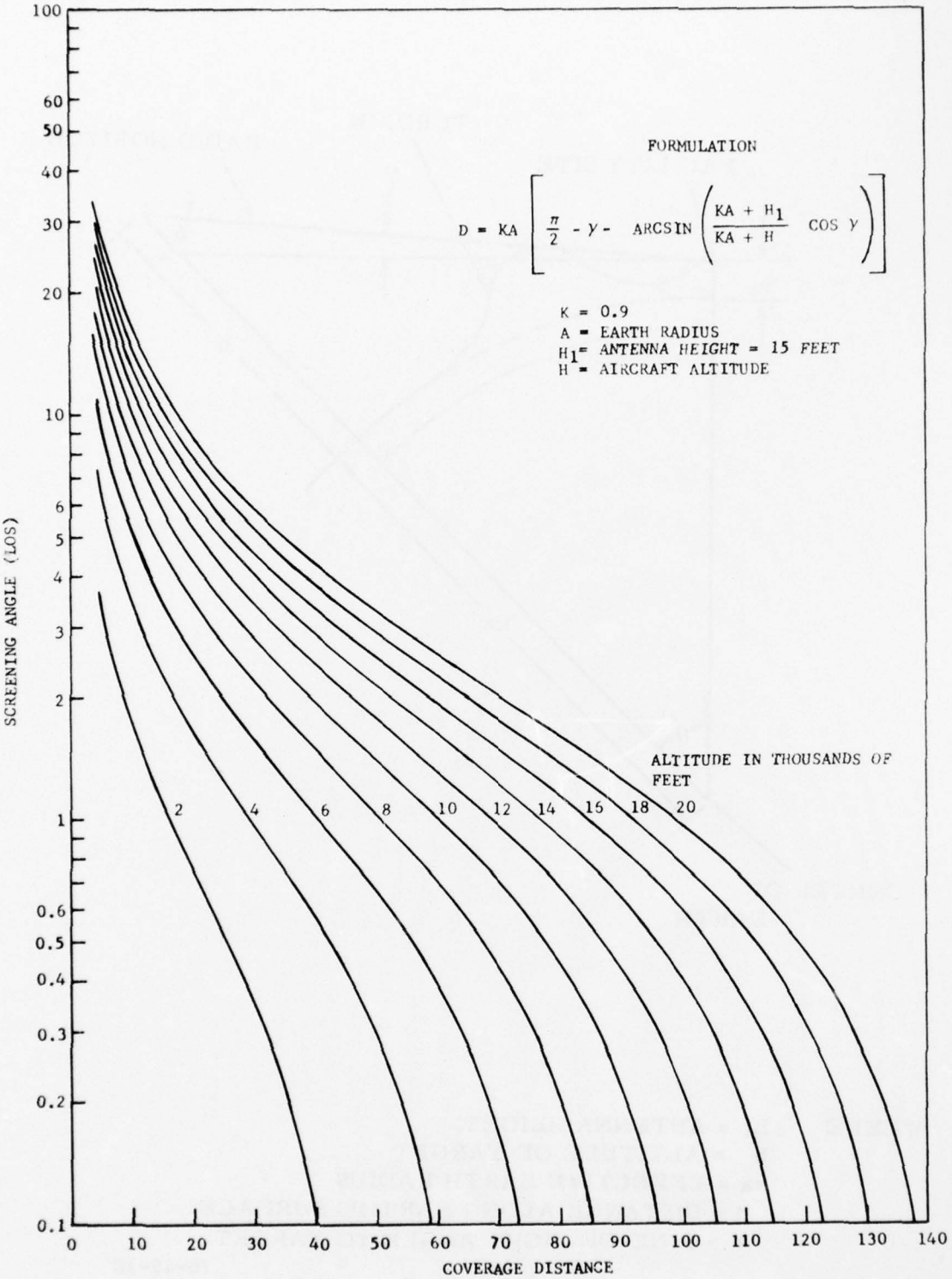



FIGURE 11. COVERAGE DISTANCE VERSUS LOS ANGLE

**** FAA ID= ABC****
BOSC413A LAT/LON= 350258 1064857 TYPE/CLASS= C H SITELV= 5740 ANT HT= 35 TAPE NO= 03 OTHER = 3

| RADIAL | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 105 | 152 | 183 | 209 |
| 2 | 105 | 152 | 183 | 209 |
| 3 | 105 | 152 | 183 | 209 |
| 4 | 105 | 152 | 183 | 209 |
| 5 | 110 | 158 | 188 | 215 |
| 6 | 105 | 152 | 183 | 209 |
| 7 | 105 | 152 | 183 | 209 |
| 8 | 105 | 152 | 183 | 209 |
| 9 | 105 | 152 | 183 | 209 |
| 10 | 105 | 152 | 183 | 209 |
| 11 | 105 | 152 | 183 | 209 |
| 12 | 100 | 147 | 177 | 204 |
| 13 | 100 | 147 | 177 | 204 |
| 14 | 86 | 132 | 162 | 188 |
| 15 | 90 | 137 | 167 | 193 |
| 16 | 90 | 137 | 167 | 193 |
| 17 | 95 | 142 | 172 | 199 |
| 18 | 95 | 142 | 172 | 199 |
| 19 | 100 | 147 | 177 | 204 |
| 20 | 95 | 142 | 172 | 199 |
| 21 | 100 | 147 | 177 | 204 |
| 22 | 95 | 142 | 172 | 199 |
| 23 | 105 | 152 | 183 | 209 |
| 24 | 110 | 158 | 188 | 215 |
| 25 | 110 | 158 | 188 | 215 |
| 26 | 116 | 163 | 194 | 221 |
| 27 | 110 | 158 | 188 | 215 |
| 28 | 116 | 163 | 194 | 221 |
| 29 | 116 | 163 | 194 | 221 |
| 30 | 116 | 163 | 194 | 221 |

COL. COVERAGE AT

1. 18000 Feet
2. 30000 Feet
3. 40000 Feet
4. 50000 Feet



FIGURE 12. SAMPLE OF SDB COVERAGE DATA

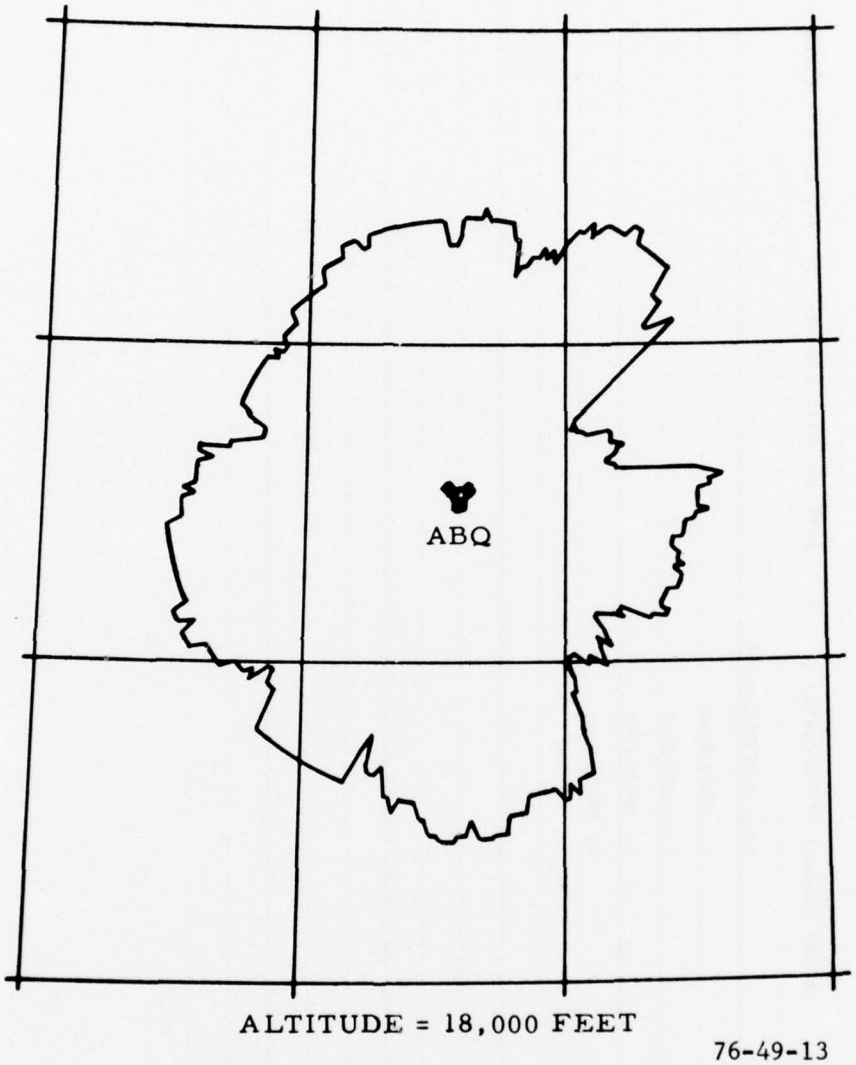



FIGURE 13. SAMPLE OF COVERAGE CONTOUR PLOT

## DATA BASE VALIDATION

From the previous discussion, it can be seen that the establishment of a reliable data base for use in NAVAID coverage determination requires careful validation at various steps in the process. An overview of the validation conducted at NAFEC is shown in figure 14. From this block diagram, it can be seen that the validation process is involved in three principal areas; namely, (1) environmental data (i.e., location, site elevation, etc.), (2) completeness, and (3) coverage contours. It should also be noted that the analysis and final resolution of problem areas are performed manually. This results from the fact that, in many cases, there are several sources for the data and, historically, errors have been found in data from each of these sources. Therefore, only by cross-checking the data from the various sources is one assured of selecting the correct value or other item of data.

### ENVIRONMENTAL (E-FILE) DATA.

The contents of this file were listed previously; however, of primary importance for NAVAID coverage purposes are location, site elevation, and facility class. Since these data are also on the NAVAID's master tape (NAM), a program (NAVCHK) was developed to facilitate this validation. When the program detects differences in location and site elevation that are greater than specified values (parameters), the data are flagged for manual analysis. Figure 15 is an example of the NAVCHK output. When the word "AGREES" does not appear, there will be a flag adjacent to the site elevation or adjacent to the location, or both. An asterisk adjacent to either latitude or longitude indicates a 3-second difference; a single asterisk adjacent to site elevation indicates a 350-foot difference; and a double asterisk by site elevation indicates a 100-foot difference. More than one line of data for the same facility results from the fact that ECAC resubmitted terrain data for that facility. The symbol ">" flags multiple entries, and the tape numbers identify the ECAC tape from which the data were derived (1 through 7, 9, and A through D). Note the TACAN facility, DLF, where the latitude differs by 5 seconds and the longitude by 9 seconds, and the station, DNY (tape 4), where the latitude differs by 38 seconds. These differences were resolved by examining aeronautical maps, various flight publications, and other sources where agreement in the location could be found.

In addition to location, site elevation is highly critical in the use of topographic data to derive NAVAID coverage. In figure 15, note the DLS VORTAC. On tape 3, the ECAC and NAM site elevations were the same. However, on the later tape (7), there is a difference of 386 feet. For the earlier data, ECAC used the published site elevation; but for tape 7, the site location was derived from the terrain data itself. This resulted from ECAC's analysis that NAVAID coverage would be more accurate if the data used in the LOS formula were derived from the same source. In other words, if errors in the data were relative, they would tend to cancel out. These findings were not confirmed through application in deriving facility coverage data, and therefore NAFEC elected to do so through use of flight check data. These analyses will be discussed later in the report. In any event, the NAVCHK output provided a quick method of identifying questionable site elevations in the ECAC file. Where these

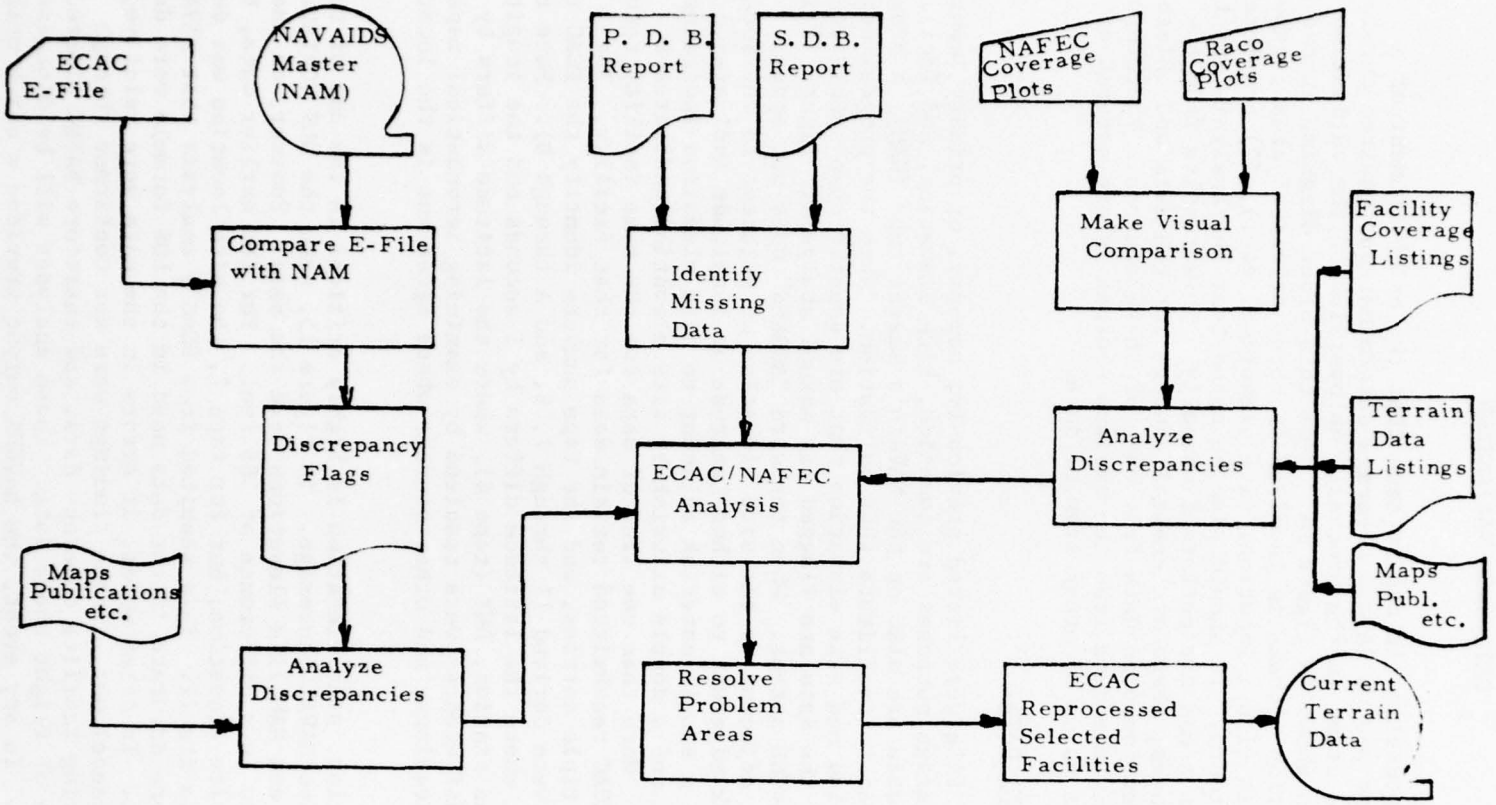



FIGURE 14. DATA BASE VALIDATION PROCESS

| Ident. NAM | Type/Class ECAC | | NAM | Latitude ECAC | | NAM | Longitude ECAC | | NAM | Site Elev ECAC | | NAM | Ant. HT. ECAC | | | Tape Number | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLF | H | C | H-VORTAC | 292139 | | 292139 | 1004613 | | 1004613A | 1060 | | 1088 | 25 | *** AGREES *** | | ( 9) | |
| CLF | H | T | H-TACAN | 292139 | * | 292144 | 1004613 | * | 1004622A | 1060 | | 1080 | 25 | | | ( 9) | |
| CLG | C H | C | H-VORTAC | 585942 | | 585942 | 1583255 | | 1583259P | 127 | | 157 | 16 | *** AGREES *** | | ( 1) | |
| CLH | H | C | H-BVORTAC | 464808 | | 464808 | 921210 | | 921210P | 860 | * | 1420 ** | 16 | | | ( 7) | |
| CLH | H | C | H-BVORTAC | 464808 | | 464808 | 921210 | | 921210P | 1400 | | 1420 | 34 | *** AGREES *** | | ( 9) | |
| CLH | H H | C | H-BVORTAC | 464808 | | 464808 | 921210 | | 921210P | 1420 | | 1420 | 34 | *** AGREES *** | | ( 2) | |
| CLL | H L | C | L-BVORTAC | 433303 | | 433303 | 894549 | | 894549G | 1023 | | 1020 | 35 | *** AGREES *** | | ( 3) | |
| CLN | C H | C | H-BVORTAC | 451455 | | 451455 | 1123247 | | 1123247G | 5250 | | 5260 | 15 | *** AGREES *** | | ( 2) | |
| CLS | L | C | H-BVORTAC | 454250 | | 454250 | 1210559 | | 1210559F | 2835 | * | 3221 ** | 3 | | | ( 7) | |
| CLS | H L | C | H-BVORTAC | 454250 | | 454250 | 1210559 | | 1210559F | 3221 | | 3221 | 15 | *** AGREES *** | | ( 3) | |
| CMA | L | C | L-BVORTAC | 321633 | | 321633 | 1073618 | | 1073618F | 4305 | | 4205 | 15 | *** AGREES *** | | ( 7) | |
| CMA | H L | C | L-BVORTAC | 321633 | | 321633 | 1073618 | | 1073618F | 4305 | | 4205 | 36 | *** AGREES *** | | ( 3) | |
| CNY | L | C | L-VORTAC | 401738 | | 401738 | 873326 | | 873326G | 698 | | 700 | 16 | *** AGREES *** | | ( 7) | |
| CNY | H L | C | L-BVORTAC | 434942 | | 434942 | 1102005 | | 1102005F | 7756 | | 7720 | 22 | *** AGREES *** | | ( 3) | |
| CNY | V L | V | L-BVOR | 421042 | | 421042 | 745726 | | 745726G | 2380 | | 2560 ** | 14 | | | ( A) | |
| CNY | V L | V | L-BVOR | 421004 | * | 421042 | 745727 | | 745726G | 2560 | | 2560 | 14 | | | ( 4) | |
| DPA | V T | D | LABVORDME | 415325 | | 415325 | 882100 | | 882100P | 801 | | 800 | 16 | *** AGREES *** | | ( 4) | |
| DPE | C L | C | L-VORTAC | 404730 | | 404730 | 731815 | | 731815P | 100 | | 119 | 16 | *** AGREES *** | | ( A) | |

FIGURE 15. NAVCHK SAMPLE PAGE

occurred, an examination of charts and maps was made in an attempt to determine the correct value. These findings were then forwarded to ECAC, and, in several cases, the facility data were reprocessed for NAFEC use.

The NAVCHK listing also displays the facility type and class contained in E-File adjacent to these data found on the NAM tape. (The existing program does not flag differences in these data; but this feature can be added easily.) Through manual review, several discrepancies were found and corrected. For example, note the DLS VORTAC where ECAC data shows this facility to be an "L"-VORTAC (low-altitude) where, in fact, the facility is an H-VORTAC (high altitude) as shown in NAM data.

MISSING DATA.

As discussed earlier, the PDB and SDB provide an inventory of facilities for which data have been received from ECAC. Facilities on the NAM which are missing from the ECAC data are identified, and, if these facilities are still operational, the terrain data are requested from ECAC. Figure 6 depicts the current status of the NAFEC data base.

NAVAID COVERAGE VALIDATION.

Obviously, validation of the coverage derived from the terrain data is the most important part of the validation process. It is also the most difficult, since, in the final analysis, only a flight check of the facility can verify signal coverage at a given position and altitude. Furthermore, errors in coverage data can be the result of several factors, such as location, site elevation, map contour data, and human error. For these reasons it was decided to obtain all available flight check data from the Flight Inspection Branch, Aeronautical Center, Oklahoma City, Oklahoma. These data, referred to as random coverage (RACO) plots, were received for 118 facilities for flight checks at 18,000 feet and at 14,500 feet. Figure 16 is an example of the RACO plots. In order to use the RACO data effectively, the contours were encoded and processed in a manner compatible with the coverage data derived from terrain. Overlays were then made using the CALCOMP plotter (figure 17) to identify questionable coverage contours.

When a contour appeared questionable, all possible sources of error were examined. In particular, the angular data received from ECAC were a prime suspect. To examine these data, it was necessary to convert angular data to terrain height as shown in figures 8 and 9. Also, a plastic overlay (figure 18) was constructed such that on a sectional chart, terrain heights along the radials of a NAVAID could be compared with the PDB listing. Numerous cases were examined, and it was observed that, in general, the ECAC terrain data were lower than the map data. These findings were reported to ECAC, and it was concluded that such "flattening" of the terrain resulted from the interpolation method used in their data processsing. After further analysis, ECAC concluded that use of the highest point within the 1/2-mile grid would produce an improvement in these data. The ECAC programs were revised, and facilities with questionable coverage were reprocessed for NAFEC use. At this point, it should be pointed out that further improvement can be achieved by reducing the grid size of the terrain data that ECAC processes. Although the minimum grid

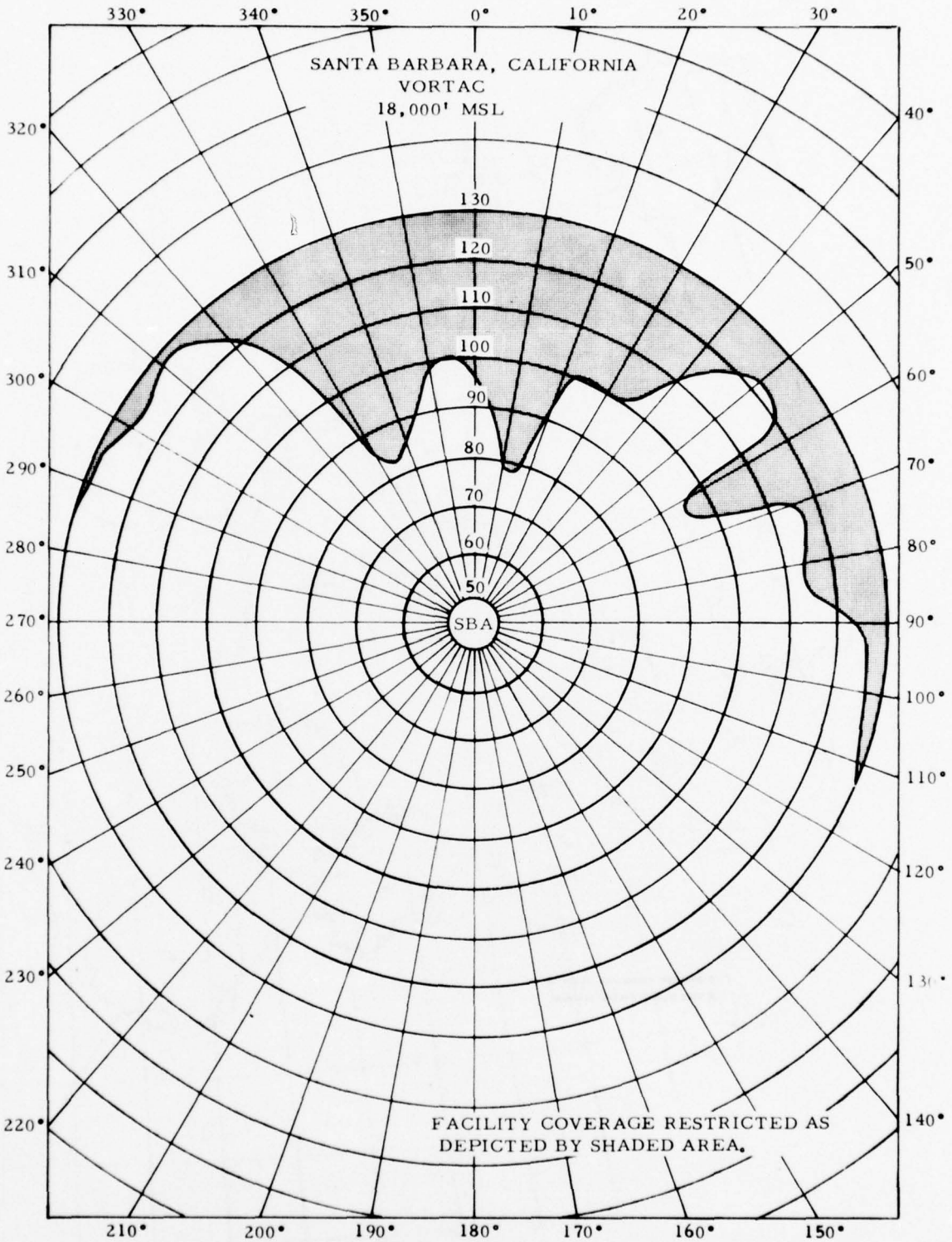



FIGURE 16. RACO COVERAGE PLOT

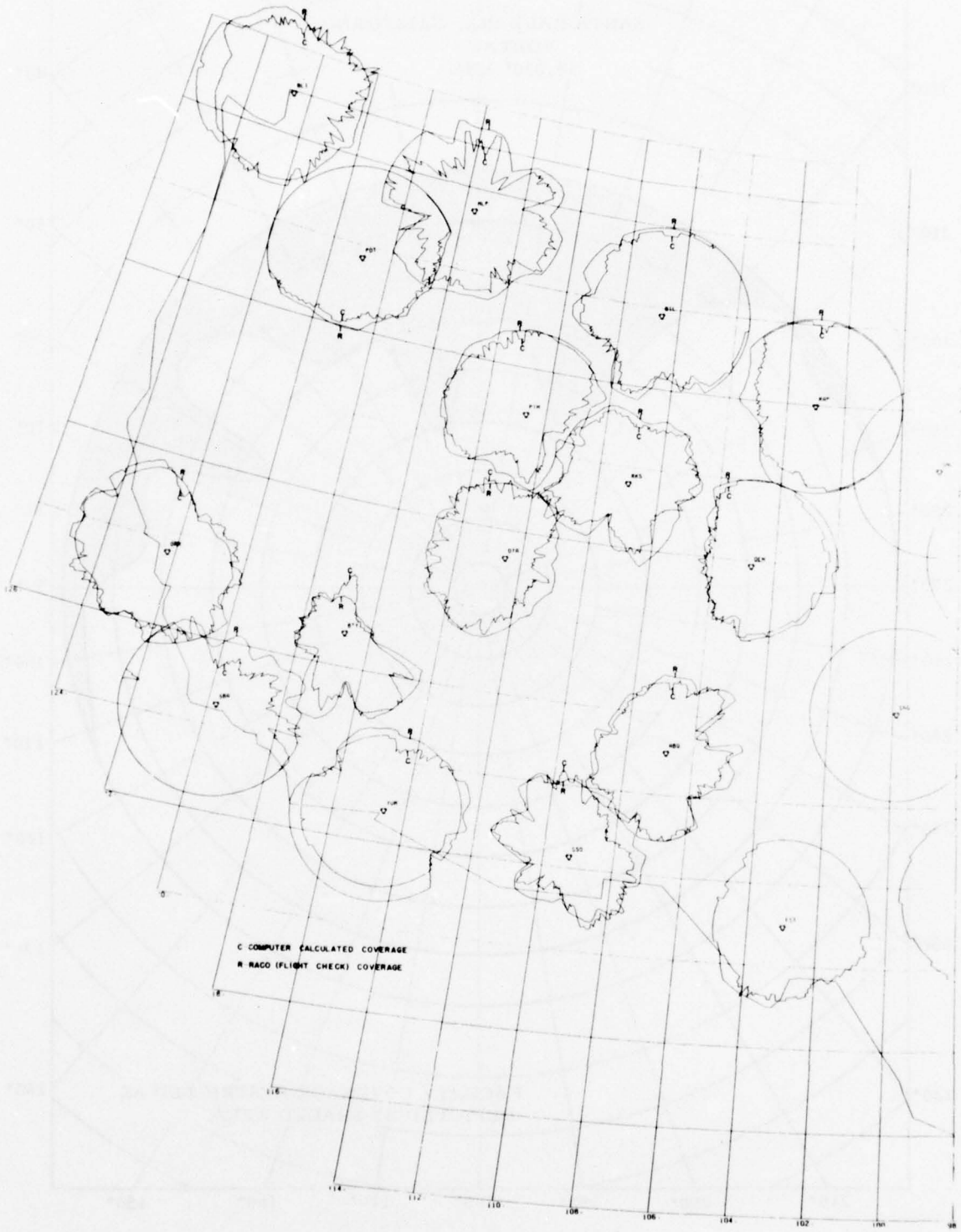



FIGURE 17. RACO AND TERRAIN-DERIVED COVERAGE PLOT

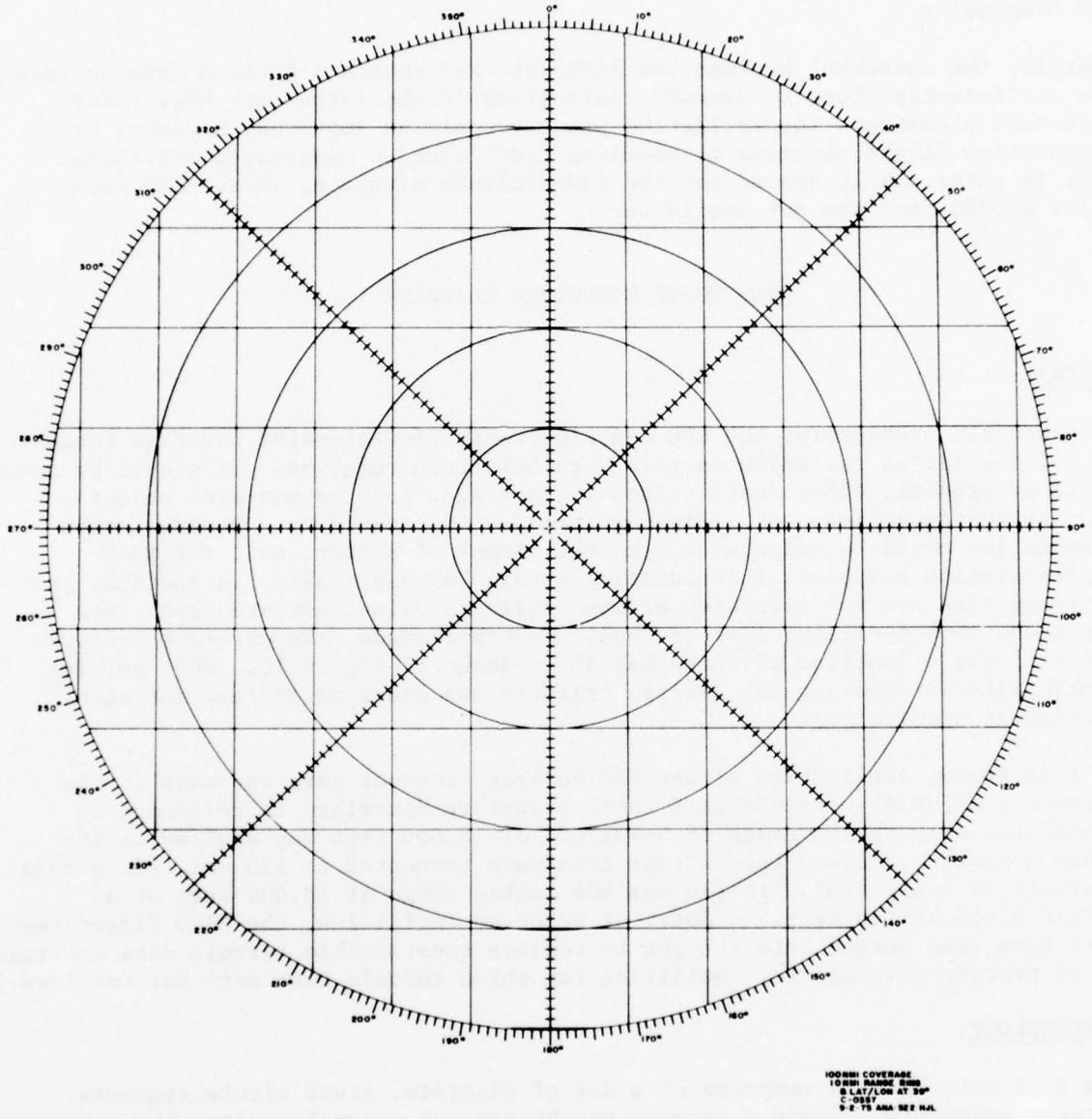



FIGURE 18. OVERLAY FOR TERRAIN ELEVATION VALIDATION

required has not, as yet, been determined, DMA produces data to within 3 seconds; therefore, considerable reduction is available without affecting DMA processing.

Overall, the agreement between the RACO data and coverage derived from terrain was sufficiently close to warrant application of the latter for RNAV route structure planning. The validation process could be improved, however, by cooperative flight checking of specific facilities at designated altitudes. This is particularly needed for the low-altitude airspace, where RACO data below 14,500 feet are not available.

## RNAV ROUTE STRUCTURE COVERAGE

### GENERAL.

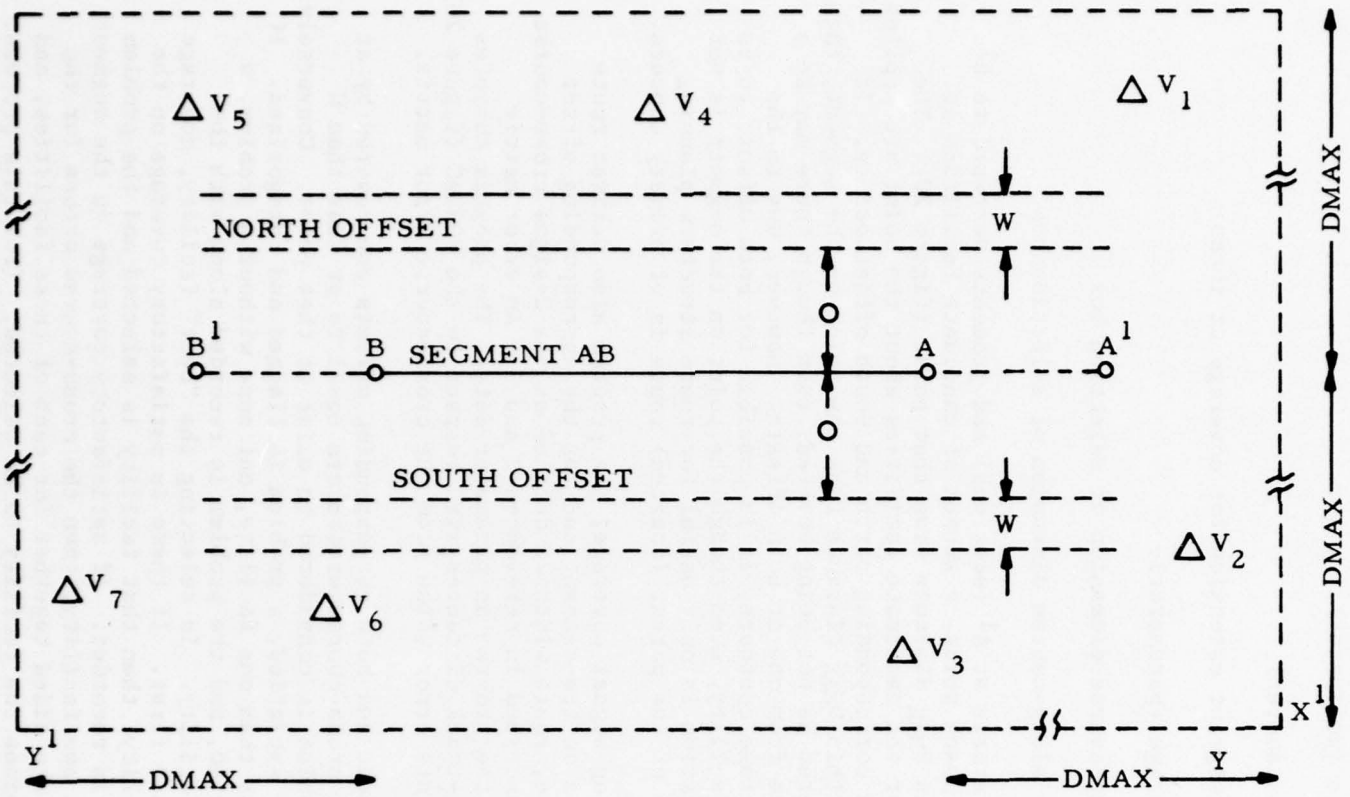
As discussed previously, the SDB contains radio line-of-sight coverage contours of all facilities for which terrain data have been received. It should be noted that, at present, other restrictions to coverage, such as man-made objects, propagation anomalies, etc., are not included in these data. However, such information could be added with a modest amount of effort, and, for RNAV implementation purposes, this addition should be made. Also, in the SDB, the coverage data are not truncated at any arbitrary value, nor are these data dependent upon facility class or type. In other words, the coverage contours are strictly a function of those variables shown in figure 10. This permits flexibility in imposing the desired criteria and other parameters for each particular application.

In this study, application of the SDB coverage contour data was made to the hypothetical, high-altitude RNAV route structure described in reference 1. Therefore, only the coverage of H-VORTACS at 18,000 feet was applied to the route structure. Also, the contour data were truncated at 130 nmi, since this distance is consistent with the maximum usable range at 18,000 feet of a VORTAC sited at sea level. (Note: At selected facilities, the RACO flight test data have been merged into the SDB to replace questionable terrain data coverage or to provide coverage for facilities for which terrain data were not received.)

### METHODOLOGY.

The RNAV structure is composed of a set of discrete, great circle segments between waypoints. Since a segment may be part of several routes, the coverage for the set of discrete segments is determined first. The coverage for each route is then determined by linking together the coverage of those segments making up the particular route.

SEGMENT COVERAGE. To derive coverage for a segment, a set of VORTAC's is selected which are candidates to provide NAVAID coverage for that segment. This set of candidate facilities fall in a rectangular box around the segment, as shown in figure 19, where:




DMAX = COVERAGE AT SPECIFIED ALTITUDE
$V_i$ = CANDIDATE VORTACS
W = ROUTE WIDTH CRITERIA (PARAMETER)
O = OFFSET DISTANCE (PARAMETER)
$AA^1 = BB^1 = W+O$ (SEGMENT EXTENSIONS FOR COVERAGE AT TURNS)

76-49-19

FIGURE 19. SELECTION BOX FOR CANDIDATE FACILITIES COVERING A SEGMENT

AB = segment

O = offset distance (parameter)

W = route width (parameter)

$AA^1 = BB^1 = O + W$ (segment extension for coverage at turns)

$D_{MAX}$ = maximum coverage (parameter)

$XX^1 = 2\ D_{MAX}$ = cross-course dimension of selection box

$YY^1 = AB + 2\ D_{MAX}$ = along-course dimension of selection box

The coverage processing starts at $A^1$ (east end) and proceeds westward to $B^1$ at 1-mile intervals. At each point, a subset of candidate facilities is selected which are within $D_{MAX}$ distance from that point (figure 20). The coverage contour data for the candidate facilities about the point are applied to that point and to the corresponding north and south offset points. If there are no VORTAC's within $D_{MAX}$ distance from the point on the segment, then both offsets are considered as not being covered, even though there may be a VORTAC with $D_{MAX}$ distance from one or both offsets. However, due to the irregularity of the coverage contours, it is possible for both offsets to be covered by a candidate facility, even though the point on the segment is not covered. This rare situation is only useful for route structure planning purposes, since coverage of the parent (charted) route is of primary concern.

In addition to determining signal coverage, the program also derives route width data for the points on the segment and for the corresponding offset points. For this purpose, route width is defined as the 2-sigma cross-course navigational error as described in references 2 and 3. An error matrix (figure 21) is input to the program as parameter data. The program computes the tangential and along-track distances with respect to the VORTAC (figure 20) and selects the appropriate error value from the cross-course error matrix.

If the point on the segment and both corresponding offsets are covered by at least one VORTAC and all cross-course errors are equal to or less than W (parameter), then no problem is considered to exist at that point. Conversely, if this condition is not satisfied, a problem is flagged and categorized. If there is coverage by more than one facility, but none without a problem, a "best" facility is selected, and the problem is recorded along with the identification of that facility. In selecting the "best" facility, coverage on the segment is examined first. If there is satisfactory coverage on the segment by only one facility, then that facility is selected and the problem for one or both offsets is recorded. If satisfactory coverage on the segment is provided by more than one facility, then the cross-course errors for the north and south offsets are added together for each of these facilities, and the minimum value determines the facility to be selected. (For this process, cross-course error for an offset is set at 99.9 miles when that offset is not covered.) If no facility provides satisfactory coverage on the segment, then the offset errors are added for all facilities that provide any coverage

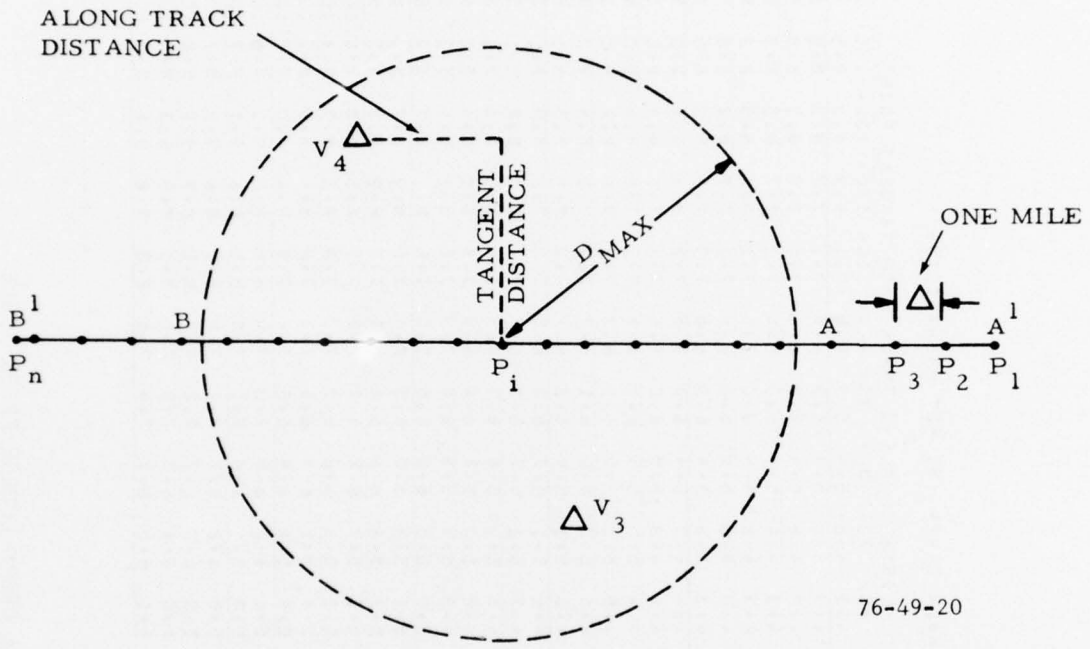



FIGURE 20. AREA CONTAINING CANDIDATE FACILITIES FOR COVERAGE

AREA NAVIGATION TRACK ERROR (90 PCT PROBABILITY)

| PERP. DIST. | DISTANCE ALONG TRACK FROM TANGENT POINT | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0. | 10. | 20. | 30. | 40. | 50. | 60. | 70. | 80. | 90. | 100. | 110. | 120. | 130. | 140. | 150. | 200. | 250. | 300. |
| 0 | 2.1 | 2.2 | 2.4 | 2.8 | 3.2 | 3.7 | 4.3 | 4.8 | 5.4 | 5.9 | 6.5 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 5 | 2.1 | 2.2 | 2.4 | 2.8 | 3.2 | 3.7 | 4.3 | 4.8 | 5.4 | 5.9 | 6.5 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 10 | 2.1 | 2.2 | 2.4 | 2.8 | 3.2 | 3.7 | 4.3 | 4.8 | 5.4 | 5.9 | 6.5 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 15 | 2.1 | 2.2 | 2.4 | 2.8 | 3.2 | 3.7 | 4.3 | 4.8 | 5.4 | 6.0 | 6.5 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 20 | 2.1 | 2.2 | 2.5 | 2.8 | 3.3 | 3.8 | 4.3 | 4.8 | 5.4 | 6.0 | 6.5 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 25 | 2.2 | 2.3 | 2.5 | 2.9 | 3.3 | 3.8 | 4.3 | 4.8 | 5.4 | 6.0 | 6.6 | 7.1 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 30 | 2.3 | 2.3 | 2.6 | 2.9 | 3.3 | 3.8 | 4.3 | 4.9 | 5.4 | 6.0 | 6.6 | 7.2 | 7.7 | 8.3 | 8.9 | 9.5 | 12.6 | 15.6 | 18.7 |
| 35 | 2.3 | 2.4 | 2.6 | 3.0 | 3.4 | 3.8 | 4.4 | 4.9 | 5.4 | 6.0 | 6.6 | 7.2 | 7.8 | 8.4 | 9.0 | 9.6 | 12.6 | 15.6 | 18.7 |
| 40 | 2.4 | 2.5 | 2.7 | 3.0 | 3.4 | 3.9 | 4.4 | 4.9 | 5.5 | 6.0 | 6.6 | 7.2 | 7.8 | 8.4 | 9.0 | 9.6 | 12.6 | 15.6 | 18.7 |
| 45 | 2.5 | 2.5 | 2.7 | 3.1 | 3.5 | 3.9 | 4.4 | 5.0 | 5.5 | 6.1 | 6.6 | 7.2 | 7.8 | 8.4 | 9.0 | 9.6 | 12.6 | 15.7 | 18.7 |
| 50 | 2.6 | 2.6 | 2.8 | 3.1 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.1 | 6.7 | 7.2 | 7.8 | 8.4 | 9.0 | 9.6 | 12.6 | 15.7 | 18.7 |
| 55 | 2.6 | 2.7 | 2.9 | 3.2 | 3.6 | 4.0 | 4.5 | 5.0 | 5.6 | 6.1 | 6.7 | 7.3 | 7.9 | 8.4 | 9.0 | 9.6 | 12.6 | 15.7 | 18.7 |
| 60 | 2.7 | 2.8 | 3.0 | 3.3 | 3.7 | 4.1 | 4.6 | 5.1 | 5.6 | 6.2 | 6.7 | 7.3 | 7.9 | 8.5 | 9.1 | 9.7 | 12.7 | 15.7 | 18.8 |
| 65 | 2.8 | 2.9 | 3.1 | 3.4 | 3.7 | 4.2 | 4.6 | 5.1 | 5.7 | 6.2 | 6.8 | 7.3 | 7.9 | 8.5 | 9.1 | 9.7 | 12.7 | 15.7 | 18.8 |
| 70 | 2.9 | 3.0 | 3.2 | 3.5 | 3.8 | 4.2 | 4.7 | 5.2 | 5.7 | 6.3 | 6.8 | 7.4 | 8.0 | 8.5 | 9.1 | 9.7 | 12.7 | 15.7 | 18.8 |
| 75 | 3.1 | 3.1 | 3.3 | 3.6 | 3.9 | 4.3 | 4.8 | 5.3 | 5.8 | 6.3 | 6.9 | 7.4 | 8.0 | 8.6 | 9.1 | 9.7 | 12.7 | 15.7 | 18.8 |
| 80 | 3.2 | 3.2 | 3.4 | 3.6 | 4.0 | 4.4 | 4.8 | 5.3 | 5.8 | 6.4 | 6.9 | 7.5 | 8.0 | 8.6 | 9.2 | 9.8 | 12.7 | 15.8 | 18.8 |
| 85 | 3.3 | 3.3 | 3.5 | 3.7 | 4.1 | 4.5 | 4.9 | 5.4 | 5.9 | 6.4 | 7.0 | 7.5 | 8.1 | 8.6 | 9.2 | 9.8 | 12.8 | 15.8 | 18.8 |
| 90 | 3.4 | 3.4 | 3.6 | 3.8 | 4.2 | 4.6 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.6 | 8.1 | 8.7 | 9.3 | 9.8 | 12.8 | 15.8 | 18.8 |
| 95 | 3.5 | 3.6 | 3.7 | 3.9 | 4.3 | 4.6 | 5.1 | 5.5 | 6.0 | 6.5 | 7.1 | 7.6 | 8.2 | 8.7 | 9.3 | 9.9 | 12.8 | 15.8 | 18.9 |
| 100 | 3.6 | 3.7 | 3.8 | 4.1 | 4.4 | 4.7 | 5.2 | 5.6 | 6.1 | 6.6 | 7.1 | 7.7 | 8.2 | 8.8 | 9.3 | 9.9 | 12.9 | 15.8 | 18.9 |
| 105 | 3.8 | 3.8 | 3.9 | 4.2 | 4.5 | 4.8 | 5.2 | 5.7 | 6.2 | 6.7 | 7.2 | 7.7 | 8.3 | 8.8 | 9.4 | 10.0 | 12.9 | 15.9 | 18.9 |
| 110 | 3.9 | 3.9 | 4.1 | 4.3 | 4.6 | 4.9 | 5.3 | 5.8 | 6.2 | 6.7 | 7.3 | 7.8 | 8.3 | 8.9 | 9.4 | 10.0 | 12.9 | 15.9 | 18.9 |
| 115 | 4.0 | 4.1 | 4.2 | 4.4 | 4.7 | 5.0 | 5.4 | 5.9 | 6.3 | 6.8 | 7.3 | 7.8 | 8.4 | 8.9 | 9.5 | 10.1 | 13.0 | 15.9 | 18.9 |
| 120 | 4.1 | 4.2 | 4.3 | 4.5 | 4.8 | 5.1 | 5.5 | 5.9 | 6.4 | 6.9 | 7.4 | 7.9 | 8.4 | 9.0 | 9.5 | 10.1 | 13.0 | 16.0 | 19.0 |
| 125 | 4.3 | 4.3 | 4.4 | 4.6 | 4.9 | 5.2 | 5.6 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 | 9.6 | 10.2 | 13.0 | 16.0 | 19.0 |
| 130 | 4.4 | 4.4 | 4.6 | 4.8 | 5.0 | 5.3 | 5.7 | 6.1 | 6.6 | 7.0 | 7.5 | 8.0 | 8.6 | 9.1 | 9.7 | 10.2 | 13.1 | 16.0 | 19.0 |
| 135 | 4.5 | 4.6 | 4.7 | 4.9 | 5.1 | 5.4 | 5.8 | 6.2 | 6.7 | 7.1 | 7.6 | 8.1 | 8.6 | 9.2 | 9.7 | 10.3 | 13.1 | 16.1 | 19.0 |
| 140 | 4.7 | 4.7 | 4.8 | 5.0 | 5.2 | 5.6 | 5.9 | 6.3 | 6.7 | 7.2 | 7.7 | 8.2 | 8.7 | 9.2 | 9.8 | 10.3 | 13.2 | 16.1 | 19.1 |
| 145 | 4.8 | 4.8 | 4.9 | 5.1 | 5.4 | 5.7 | 6.0 | 6.4 | 6.8 | 7.3 | 7.8 | 8.3 | 8.8 | 9.3 | 9.8 | 10.4 | 13.2 | 16.1 | 19.1 |
| 150 | 5.0 | 5.0 | 5.1 | 5.3 | 5.5 | 5.8 | 6.1 | 6.5 | 6.9 | 7.4 | 7.8 | 8.3 | 8.8 | 9.4 | 9.9 | 10.4 | 13.2 | 16.2 | 19.1 |

DISTANCE FROM VORTAC TO TANGENT POINT

FIGURE 21. AC 90-45A CROSS-COURSE ERROR TABLE

(either on the segment, or on either offset, or any combination), and the minimum value again determines the "best" facility. In this context, "best" refers only to the program logic used for recording coverage problem data, and therefore, no operational or other considerations are implied. For this logic, highest priority is given to coverage on the parent route, and it is also assumed that coverage on the offset nearest the VORTAC will be equal to or better than that on the parent route. Therefore, an attempt is made to select a facility with satisfactory cross-course error on the parent route, even though one offset may not be covered. Obviously, if there is more than one facility that provides satisfactory coverage on the parent route, then the best offset coverage determines the best facility for recording purposes.

Figure 22 depicts a representative sample of segment coverage data. For this coverage, route width criteria (W) was set at 4.0 nmi, and offset (O) was set at 8.0 nmi. Coverage was derived for 18,000 feet and only the coverage contours of H-VORTAC's were applied.

As shown at the top of the page, coverage data are for segment number 117B which is 162.7 nmi long and which forms part of the routes from Boston to Miami (BOSMIAR1) and from Boston to Fort Lauderdale (BOSFLLR1). These routes are part of the high-altitude RNAV structure described in reference 1. The candidate VORTAC's are shown along the top of the page, with their location with respect to the segment in brackets below the VORTAC identification. The top number in brackets is the along-course distance of the VORTAC from the eastern-most end of the segment (i.e., the end with the smaller longitude). If this distance is preceded by a minus sign (-), the VORTAC is located east of the segment's east end. The bottom number in brackets is the cross-course distance from the VORTAC to the segment (i,e,, the distance from the VORTAC to the tangent point). If this number is preceded by a minus sign, the VORTAC is on the south side of the segment.

The column headings "N," "R," and "S" identify coverage data for the north offset, parent route, and south offset, respectively. The columns of numbers down the left and right-hand sides of the page depict mileage points from the east end of the segment for which the adjacent coverage data apply. Note that although coverage is derived at 1-mile intervals, the listing only shows data where there is a change in the coverage data. Coverage computation starts at (O + W) distance preceding the segment end point, and mileage data on the east end segment extension are identified with a minus sign (in this case, "-12," since O equals 8 and W equals 4). The columnar coverage data are to the nearest 1/10 mile, with the decimal point implied (i.e., "48" means 4.8 nmi). The data on the far right adjacent to the mileage column indicate a problem at that mileage point. The problem is categorized for the parent route and for the north and south offsets as appropriate, where "Ø" means no coverage and "1" means cross-course error exceeds route width criterion. The three-letter identification shows the VORTAC for which the problem data were recorded and which was selected as the "best" facility at that point. Note that when there is more than one facility that provides satisfactory coverage on the segment and on both offsets, no attempt is made to select the "best" facility for coverage.

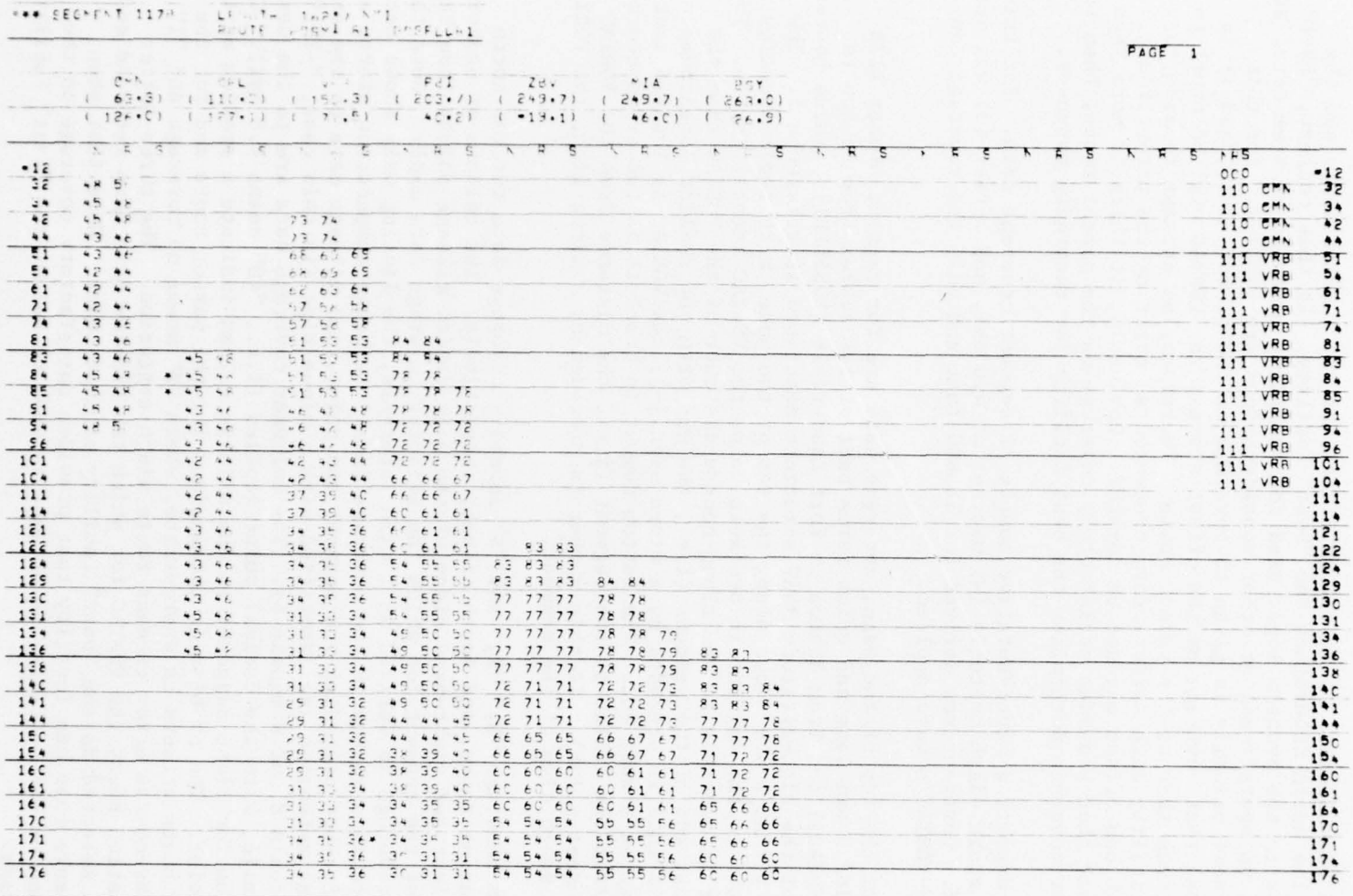


FIGURE 22. SEGMENT COVERAGE DATA

To understand the coverage data shown in figure 22, consider the following track along the segment:

a. Starting at mileage point -12 (i.e., east end of segment extension), there is no coverage (problem = 000) up to mile 32 on the segment.

b. At mile 32, coverage is provided by OMN for the segment (column R) and for the north offset (column N). However, the cross-course errors are 5.0 and 4.8 miles, respectively, which exceed the parameter W (4.0 nmi). Therefore, the problem at mile 32 is "110 OMN," which means that OMN is the best facility (in this case the only facility) at mile 32, but there is no coverage on the south offset and the cross-course errors on the segment and on the north offset exceed the route width criterion.

c. At mile 51, VRB replaces OMN as the "best" facility. Cross-course error exceeds the route width criterion for both facilities at this point. However, the south offset is not covered by OMN; therefore, the sum of 4.3 plus 99.9, as compared with 6.8 plus 6.9, results in the selection of VRB.

d. At mile 84, the asterisk (*) indicates that the cross-course error on the segment (4.8) is equal for both OMN and ORL. Note that VRB is still selected as the "best" facility.

e. After mile 111, there are no further problems recorded, since satisfactory coverage on the segment and on both offsets is provided by at least one facility.

f. At mile 154, both VRB and PBI provide satisfactory coverage, and at mile 171, the cross-course error for the two facilities is equal on the parent route segment.

g. Although the segment is 162.7 miles long, coverage data are derived up to mile 176, which encompasses the extension of the segment on the west end.

COVERAGE SUMMARIES. When the coverage processing of a segment is complete, the problem data are stored on magnetic tape as shown in figure 23. These data are then processed to produce summaries of coverage problems according to segments, routes, and overall network. For an explanation of these summaries, the following eight routes were selected from the high-altitude RNAV route structure described in reference 1:

Boston to Miami (BOSMIAR1)
Denver to Seattle (DENSEAR1)
Los Angeles to New York (LAXJFKR1)
Los Angeles to San Francisco (LAXSFOR1)
Los Angeles to San Francisco (LAXSFOR2)
Miami to Los Angeles (MIALAXR1)
Minneapolis to San Francisco (MSPSFOR1)
Seattle to New York (SEAJFKR1)

```
117B   26999999999
117B   27999999999
117B   28999999999
117B   29999999999
117B   30999999999
117B   31999999999
117B   32 48050999OMN
117B   33 48050999OMN
117B   34  45048999OMN
117B   35  45048999OMN
117B   36  45048999OMN
117B   37  45048999OMN
```

LEGEND

| | |
|---|---|
| 117B | Segment identification |
| 32 | Mileage point from segments east end |
| 48 | Cross course error on north offset = 4.8 mi. |
| 050 | Cross-course Error on Segment = 5.0 miles |
| 999 | South Offset not covered. (if not 999, data field gives cross-course error on the south offset) |
| OMN | VORTAC for which problem data apply and which was selected by the program as providing the best coverage at mile 32. |
| N | VORTAC is located north of segment |

FIGURE 23. PROBLEM SEGMENT DATA TABLE

These routes were composed of 32 discrete segments and, as shown in figure 24, are representative in length, location, and direction.

Summary by Segments. Figure 25 shows the summary by segments of the coverage problems that were recorded when coverage for the above routes was processed using the cross-course error data shown in figure 21. In the columnar data, the "COV" column indicates the number of miles for which there was no coverage, and "ERR" is the number of miles for which the cross-course error exceeded the route width criterion (i.e., W = 4.0). Note for segment 117B (discussed earlier), that there are 32 miles over which the parent route segment and the north offset are not covered, and 51 miles where the south offset is not covered. Where there was coverage, the cross-course error exceeded the route width criterion for 79 miles on the parent route and on the north offset and for 60 miles on the south offset. The "ERR" and "COV" data add to 111 miles where there is a problem which is consistent with the data shown in figure 22. Of the 32 segments, 19 are shown in figure 25 as having problems; the other 13 being problem free.

Summary by Routes. An example of this summary is shown in figure 26 for the route from Boston to Miami. Although this route consists of four segments (P117, 117A, 117B, D117), only the two shown have coverage problems and for the mileage indicated. These miles are route miles starting at the east (BOS) end. In these data, cross-course errors are those for the facility (on the right-hand side) which was selected as providing the best coverage. A minus (-) sign indicates no coverage. Note that for route coverage, the offset data are given as "left" and "right," which is consistent with the direction of flight, Boston to Miami. Thus, it can be seen that the "south" offset data in figure 22 (segment 117B) have been converted to "left" offset where the segment forms part of the BOSMIA route. If these data were applied to the MIABOS (Miami to Boston), the converse would be true.

Problem Route Summary. An example of the coverage problem summary for all routes processed is shown in figure 27. In this case, eight routes were processed; but only the six had coverage problems. In this listing, the percentage values have been truncated (not rounded) at the percent shown (i.e., 4.7 percent is shown as 4).

Network Summary. Coverage problems for the total network are also summarized as per the example shown in figure 28. Of the eight routes processed, two (25 percent) were problem free; however, 6,553 miles (69.5 percent) were problem free. The latter data include all problem-free miles in the eight routes processed, not just the mileage of the two problem-free routes. The network route miles and the network segment miles are both shown as 9,423. However, this is only because the routes selected for this discussion all used different segments. Normally this is not the case, and the route miles would exceed the discrete segment miles in the network. Note, however, that there is a difference in the problem miles of the routes as compared to the segments. This results from the offset data around the turns, where the problems on the segment extension are included in the problem data on the route. The "away offset" data are for those cases where

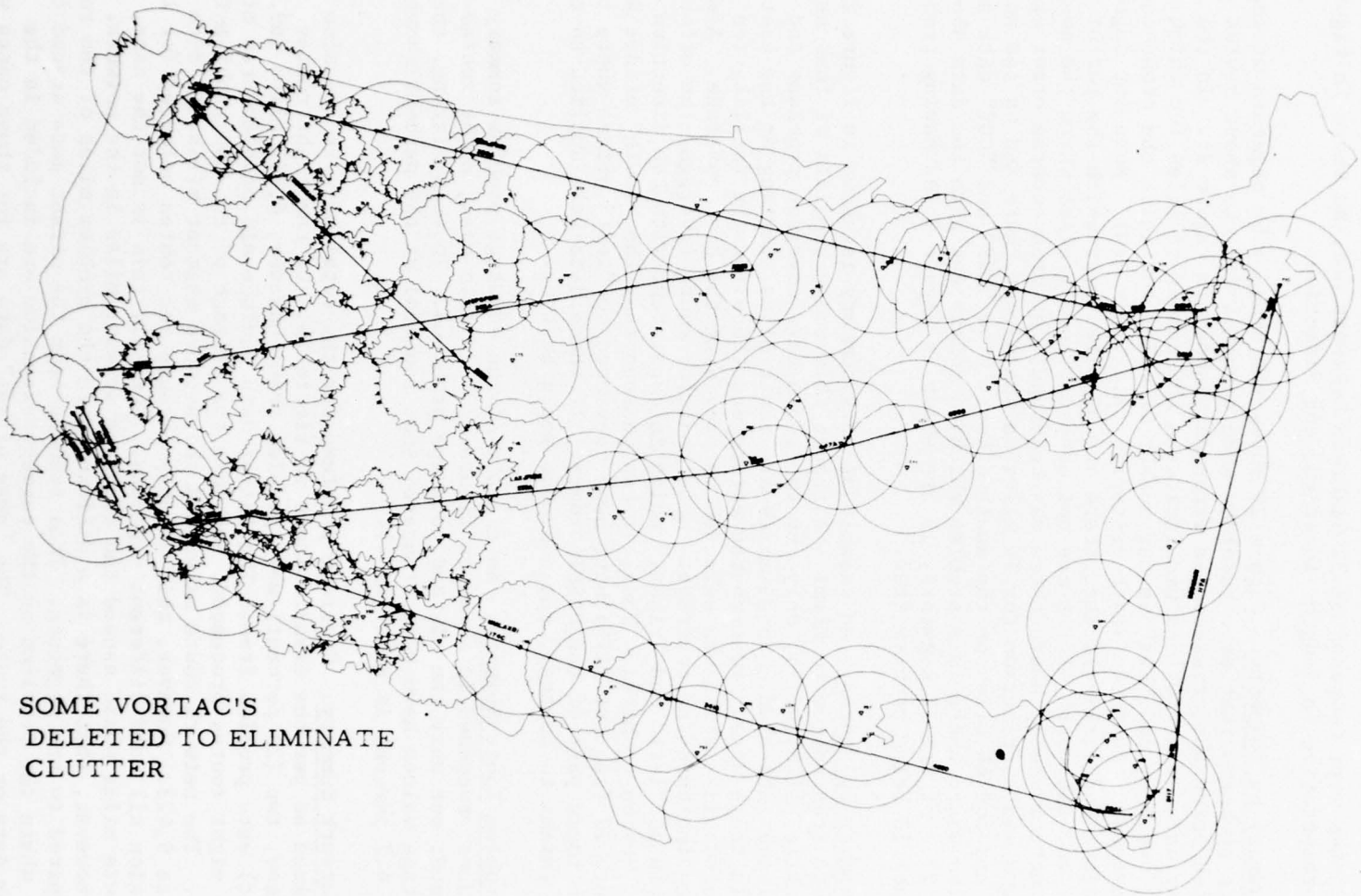



FIGURE 24. COVERAGE ON SELECTED ROUTES

**** SUMMARY BY SEGMENTS ****



| SEGID | ROUTE COV | ROUTE ERR | OFFSET N COV | OFFSET N ERR | OFFSET S COV | OFFSET S ERR | SEGMENT LENGTH | ROUTE ID |
|---|---|---|---|---|---|---|---|---|
| CC1C | C | 9 | 0 | 9 | C | C | 80 | LAXJFKR3 STLLGAR1 LAXEWRR2 STLEWRR1 LAXJFKR2 LAXLGAR2 LAXEWRR3 STLJFKR1 PHXJFKR1 LAXLGAR3 SDFLGAR1 |
| P341 | C | 33 | 0 | 23 | C | 33 | 61 | MIALAXR1 MIAIAHR1 |
| P364 | C | C | 15 | 0 | C | C | 54 | SEAJFKR1 SEAMSPR1 SEABALR1 SEAIADR1 |
| P29E | C | 20 | C | 20 | 11 | 9 | 56 | DENSEAR1 |
| C56A | C | 1 | 0 | 0 | C | 1 | 262 | LAXLGAR2 LAXJFKR2 STLLGAR1 STLJFKR1 JFKSTLR1 JFKPHXR1 LAXEWRR2 JFKLAXR2 PHXJFKR1 STLEWRR1 EWRSTLR1 EWRLAXR2 LGASTLR1 LGALAXR2 |
| 117A | 159 | 241 | 159 | 221 | 169 | 231 | 734 | BOSMIAR1 BOSFLLR1 FLLBOSR1 MIABOSR1 |
| 117E | 32 | 79 | 32 | 79 | 51 | 60 | 163 | BOSMIAR1 BOSFLLR1 |
| 174B | C | 31 | C | 31 | C | 28 | 202 | LAXMIAR1 LAXIAHR1 IAHLAXR1 MIALAXR1 |
| 174C | C | 30 | C | 30 | C | 2C | 674 | LAXMIAR1 LAXIAHR1 PHXIAHR1 IAHPHXR1 IAHLAXR1 MIALAXR1 |
| 238A | C | 78 | C | 78 | 7 | 78 | 896 | LAXLGAR2 LAXJFKR2 LAXIADR1 LAXEWRR2 LAXBALR1 STLLAXR1 JFKLAXR2 IADLAXR1 EWRLAXR2 LGALAXR2 BALLAXR1 LAXSTLR1 |
| 258C | 17 | 193 | 55 | 172 | 42 | 156 | 686 | DENSEAR1 SEADENR1 |
| 339A | C | 453 | 10 | 511 | 1 | 38C | 1746 | JFKSEAR1 SEAJFKR1 |
| 341A | C | 15 | C | 15 | C | 15 | 200 | LAXMIAR1 MIALAXR1 |
| 365A | 56 | 248 | 60 | 222 | 46 | 238 | 1005 | SFOMSPR1 MSPSFOR1 |
| 365C | C | 26 | C | 26 | C | 26 | 33 | MSPSFOR1 |
| 381B | C | 6 | C | C | C | 14 | 141 | LAXLGAR2 LAXJFKR2 LAXIADR1 LAXEWRR2 STLPHXR1 STLLAXR1 LAXBALR1 JFKPHXR1 JFKLAXR2 PHXSTLR1 PHXJFKR1 ICTLUKR1 ICTCVGR1 IADLAXR1 CVGICTR1 EWRLAXR2 LUKICTR1 LGALAXR2 BALLAXR1 LAXSTLR1 |
| 385B | C | C | C | C | 13 | C | 182 | BOSSFOR1 SLCSFOR1 JFKSFOR3 ORDSFOR3 MSPSFOR1 |
| 4C3C | 162 | 206 | 162 | 203 | 173 | 218 | 639 | LAXMIAR1 IAHMIAR1 MIALAXR1 MIAIAHR1 |
| 447A | C | 10 | C | C | C | 26 | 202 | LAXLGAR2 LAXJFKR2 LAXEWRR2 JFKPHXR1 JFKLAXR2 PHXJFKR1 EWRLAXR2 LGALAXR2 |



FIGURE 25. PROBLEM SUMMARY BY SEGMENTS

**** SUMMARY BY ROUTES ****

| ROUTE | | | CROSS-TRACK ERRORS OFFSET 1 (LEFT) | ROUTE | OFFSET 2 (RIGHT) | FACILITY |
|---|---|---|---|---|---|---|
| BCSP1AR1 | | | | | | |
| SEG 117A | 250.1 TO | 259.1 | 43 | 42 | 41 | SIEN |
| | 260.1 TO | 269.1 | 48 | 47 | 46 | SIEN |
| | 270.1 TO | 279.1 | 53 | 52 | 51 | SIEN |
| | 280.1 TO | 286.1 | 58 | 57 | 56 | SIEN |
| | 287.1 TO | 296.1 | 53 | 52 | 51 | ORFN |
| | 297.1 TO | 306.1 | 48 | 47 | 46 | ORFN |
| | 307.1 TO | 406.1 | 44 | 42 | 42 | ORFN |
| | 407.1 TO | 416.1 | 48 | 47 | 46 | ORFN |
| | 417.1 TO | 426.1 | 53 | 52 | 51 | ORFN |
| | 427.1 TO | 436.1 | 58 | 57 | 57 | ORFN |
| | 437.1 TO | 446.1 | 64 | 63 | 62 | ORFN |
| | 447.1 TO | 449.1 | 65 | 64 | 63 | ILMN |
| | 450.1 TO | 459.1 | 60 | 59 | 58 | ILMN |
| | 460.1 TO | 469.1 | 55 | 54 | 53 | ILMN |
| | 470.1 TO | 479.1 | 50 | 49 | 48 | ILMN |
| | 480.1 TO | 489.1 | 46 | 45 | 43 | ILMN |
| | 490.1 TO | 569.1 | 42 | 41 | 39 | ILMN |
| | 570.1 TO | 579.1 | 46 | 45 | 43 | ILMN |
| | 580.1 TO | 589.1 | 50 | 49 | 48 | ILMN |
| | 590.1 TO | 599.1 | 55 | 54 | 53 | ILMN |
| | 600.1 TO | 609.1 | 60 | 59 | 58 | ILMN |
| | 610.1 TO | 619.1 | 65 | 64 | 63 | ILMN |
| | 620.1 TO | 620.1 | 70 | 70 | 69 | ILMN |
| | 621.1 TO | 629.1 | - | 70 | 69 | ILMN |
| | 630.1 TO | 630.1 | - | 75 | 74 | ILMN |
| | 631.1 TO | 789.1 | - | - | - | |
| SEG 117B | 789.9 TO | 820.9 | - | - | - | |
| | 821.9 TO | 822.9 | - | 50 | 48 | OMAN |
| | 823.9 TO | 832.9 | - | 48 | 45 | OMAN |
| | 833.9 TO | 839.9 | - | 46 | 43 | OMAN |
| | 840.9 TO | 849.9 | 69 | 69 | 68 | VRBN |
| | 850.9 TO | 859.9 | 64 | 63 | 62 | VRBN |
| | 860.9 TO | 869.9 | 58 | 58 | 57 | VRBN |
| | 870.9 TO | 879.9 | 53 | 53 | 51 | VRBN |
| | 880.9 TO | 889.9 | 48 | 48 | 46 | VRBN |
| | 890.9 TO | 899.9 | 44 | 43 | 42 | VRBN |

FIGURE 26. PROBLEM SUMMARY BY ROUTE, SEGMENT, AND MILEAGE POINT

****** PROBLEM ROUTE SUMMARY ****** (SP)= 4.0 MILES ; OFFSET DIST. = 8.0MILES

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | | NO LEFT-ES COVERAGE | | NO RIGHT-ES COVERAGE | | ROUTE WIDTH >(SP) | | LEFT-ES >(SP) | | RIGHT-ES >(SP) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) |
| BOSMIAR1 | 1018.2 | 191.0 | ( 18) | 220.0 | ( 21) | 191.0 | ( 18) | 460.0 | ( 45) | 431.0 | ( 42) | 380.0 | ( 37) |
| CHISEAR1 | 798.1 | 17.0 | ( 2) | 53.0 | ( 6) | 59.0 | ( 7) | 396.0 | ( 49) | 365.0 | ( 45) | 392.0 | ( 49) |
| LAX_FAR2 | 2046.3 | .0 | ( 0) | .0 | ( 0) | 14.0 | ( 0) | 94.0 | ( 4) | 77.0 | ( 3) | 133.0 | ( 6) |
| MIALAXR1 | 1923.7 | 162.0 | ( 8) | 173.0 | ( 8) | 162.0 | ( 8) | 296.0 | ( 15) | 291.0 | ( 15) | 302.0 | ( 15) |
| MSPSFOR1 | 1274.8 | 56.0 | ( 4) | 61.0 | ( 4) | 60.0 | ( 4) | 354.0 | ( 27) | 424.0 | ( 33) | 338.0 | ( 26) |
| SEA_FAR1 | 2001.5 | .0 | ( 0) | 25.0 | ( 1) | 1.0 | ( 0) | 713.0 | ( 35) | 781.0 | ( 39) | 650.0 | ( 32) |
| TOTAL | 9062.6 | 426.0 | ( 4) | 532.0 | ( 5) | 487.0 | ( 5) | 2313.0 | ( 25) | 2369.0 | ( 26) | 2195.0 | ( 24) |



FIGURE 27. PROBLEM ROUTE SUMMARY

****** NETWORK SUMMARY ******

ROUTE WIDTH = 4.0
OFFSET DIST. = 8.0

(A) ROUTE

| | | | |
|---|---|---|---|
| NETWORK ROUTES | NUMBER | 8 | |
| | MILES | 9423 | |
| PROBLEM-FREE ROUTES | NUMBER | 2 | ( 25.00 % ) |
| | MILES | 6553 | ( 69.54 % ) |
| PROBLEM ROUTES | NUMBER | 6 | ( 75.00 % ) |
| | MILES | 2869 | ( 30.46 % ) |

(B) SEGMENT

| | | | |
|---|---|---|---|
| NETWORK SEGMENT | NUMBER | 32 | |
| | MILES | 9423 | |
| PROBLEM-FREE SEGMENT | NUMBER | 13 | ( 40.62 % ) |
| | MILES | 7112 | ( 75.48 % ) |
| PROBLEM SEGMENT | NUMBER | 19 | ( 59.37 % ) |
| | MILES | 2311 | ( 24.52 % ) |
| PARENT ROUTE HAS NO COVERAGE | MILES | 426 | ( 4.52 % ) |
| AWAY OFFSET HAS NO COVERAGE | MILES | 184 | ( 1.95 % ) |
| PARENT ROUTE WIDTH GT. (SP) | MILES | 1679 | ( 17.82 % ) |
| AWAY OFFSET RT. WIDTH GT.(SP) | MILES | 127 | ( 1.35 % ) |

FIGURE 28. NETWORK SUMMARY - SELECTED ROUTES

the offset is on the opposite side of the route from the VORTAC. These data are additive to the parent route data. For example, the away offset has 184 more miles of no coverage than the parent route and 127 more miles where the cross-course error exceeded route width criteria.

APPLICATION OF COVERAGE CONTOURS TO AN RNAV ROUTE STRUCTURE.

In order to provide estimates regarding the capability of the present NAVAID system to support RNAV routes at or above 18,000 feet, it was decided to test the RNAV structure described in reference 1 against the coverage contour data developed by the methodology described in this report.

The RNAV structure (figure 29) consists of 1,018 routes connecting 450 airport pairs. Routes were formed by the interconnection of great circle segments starting at the boundary of the departure terminal and ending at the boundary of the arrival terminal. Each discrete segment could be used by several routes, which accounts for the difference between the number of segment-miles (151,309) and the number of route-miles (579,008). The selected airport pairs generate approximately 67 percent of the domestic, high-altitude traffic and, with only minor extensions, the structure could accommodate over 90 percent of the traffic in the high-altitude airspace. Although the structure is only hypothetical, the coverage data derived by using it as a test case should provide useful information for RNAV implementation planning.

Of the 297 H-VORTAC's in the conterminous U.S., 290 contours developed from terrain data were used for deriving route coverage data, while the remaining seven contours were taken from the RACO flight check data. Although terrain data were available for these facilities, the coverage contours developed from the data appeared somewhat questionable when compared with the flight-check data, and it was therefore decided to use the latter for this report.

In addition to signal coverage, route width and RNAV offset requirements must also be considered when examining the capability of a NAVAID system to support an RNAV route structure. Furthermore, these factors are directly related to air traffic control (ATC) requirements and to the assumed values for cross-course navigational errors. At the present time, the navigational errors being applied to RNAV routes are those published in Advisory Circular 90-45A, dated February 21, 1975. These data are shown in figure 21 of this report. The RNAV task force (reference 2) proposed that these errors could be substantially reduced provided certain improvements were made in the various elements which contribute to cross-course error. The task force error table is shown in figure 30. By assumption, route width is equal to the 2-sigma cross-course error value. Therefore, it can be seen from figures 21 and 30 that with a given route width requirement (i.e., $\pm$4 miles), the task force data permit substantially greater spacing between VORTAC's. Stated differently, with a given set of VORTAC's, application of the task force error data to an RNAV structure should render substantially fewer problem areas than the AC 90-45A data.

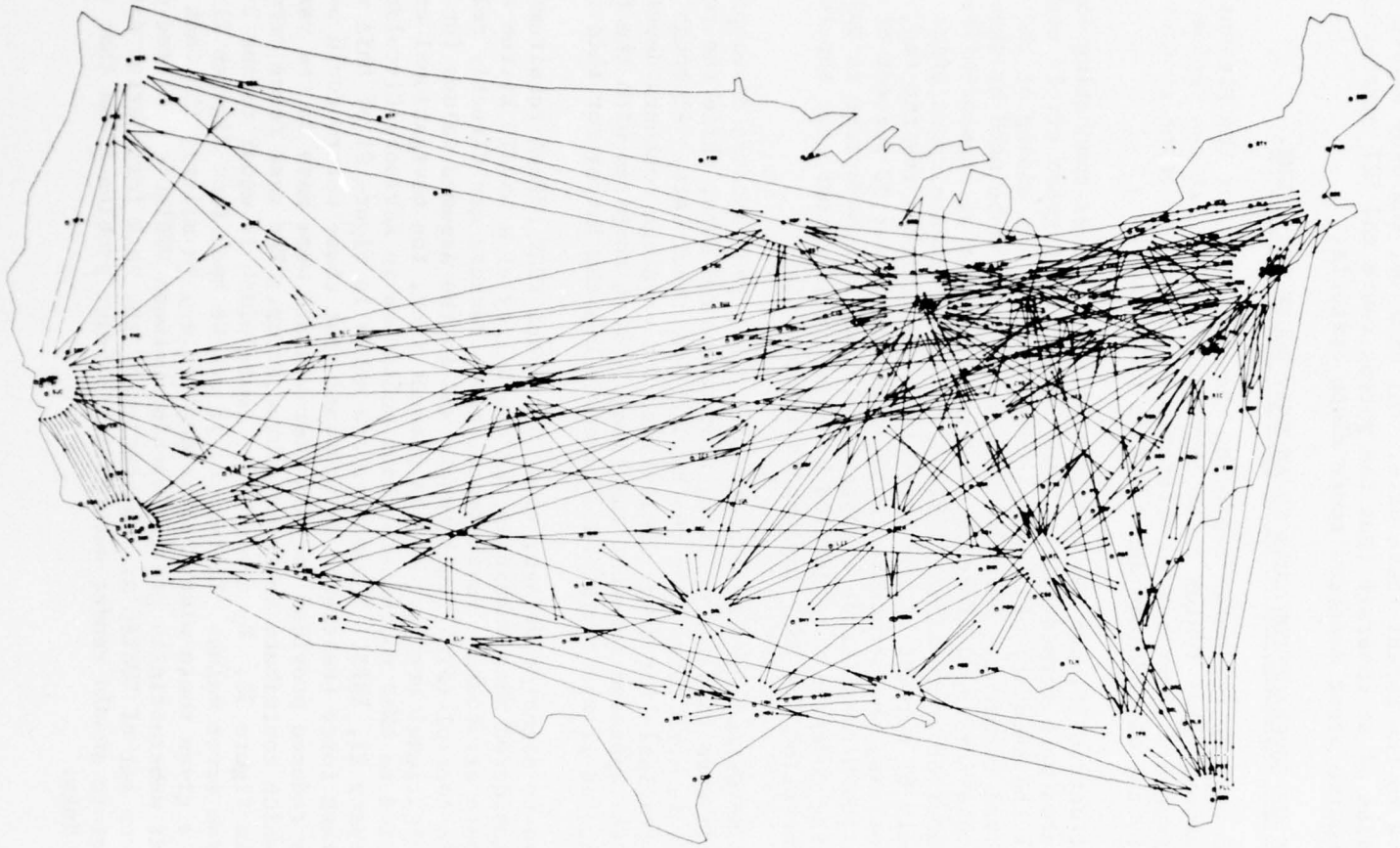


FIGURE 29. HYPOTHETICAL HIGH-ALTITUDE RNAV ROUTE STRUCTURE

** IMPROVED RNAV X-TRACK ERROR TABLE -- 95 PCT PROBABILITY-- **

| DISTANCE FROM VORTAC TO TANGENT POINT / DISTANCE ALONG TRACK FROM TANGENT POINT | 0. | 10. | 20. | 30. | 40. | 50. | 60. | 70. | 80. | 90. | 100. | 110. | 120. | 130. | 140. | 150. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0. | 1.1 | 1.2 | 1.3 | 1.5 | 1.8 | 2.1 | 2.5 | 2.8 | 3.1 | 3.5 | 3.8 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 5. | 1.1 | 1.2 | 1.3 | 1.5 | 1.8 | 2.1 | 2.5 | 2.8 | 3.1 | 3.5 | 3.8 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 10. | 1.2 | 1.2 | 1.3 | 1.5 | 1.8 | 2.1 | 2.5 | 2.8 | 3.1 | 3.5 | 3.8 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 15. | 1.2 | 1.2 | 1.3 | 1.5 | 1.8 | 2.1 | 2.5 | 2.8 | 3.1 | 3.5 | 3.9 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 20. | 1.2 | 1.2 | 1.3 | 1.6 | 1.8 | 2.1 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 25. | 1.2 | 1.2 | 1.3 | 1.6 | 1.8 | 2.1 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 30. | 1.2 | 1.2 | 1.3 | 1.6 | 1.8 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 35. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 4.9 | 5.3 | 5.7 |
| 40. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 |
| 45. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 |
| 50. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 |
| 55. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 |
| 60. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 |
| 65. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.5 | 3.9 | 4.3 | 4.6 | 5.0 | 5.3 | 5.7 |
| 70. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.5 | 3.9 | 4.3 | 4.6 | 5.0 | 5.3 | 5.7 |
| 75. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.3 | 5.7 |
| 80. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.3 | 5.7 |
| 85. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.3 | 5.7 |
| 90. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 5.7 |
| 95. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 5.7 |
| 100. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 5.7 |
| 105. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 5.7 |
| 110. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 5.7 |
| 115. | 1.2 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.7 | 5.0 | 5.4 | 5.7 |
| 120. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.7 | 5.0 | 5.4 | 5.7 |
| 125. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.7 | 5.0 | 5.4 | 5.7 |
| 130. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 3.9 | 4.3 | 4.7 | 5.0 | 5.4 | 5.7 |
| 135. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.3 | 2.6 | 2.9 | 3.3 | 3.6 | 4.0 | 4.3 | 4.7 | 5.0 | 5.4 | 5.7 |
| 140. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.3 | 2.6 | 2.9 | 3.3 | 3.6 | 4.0 | 4.3 | 4.7 | 5.0 | 5.4 | 5.8 |
| 145. | 1.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.3 | 2.6 | 2.9 | 3.3 | 3.6 | 4.0 | 4.3 | 4.7 | 5.0 | 5.4 | 5.8 |
| 150. | 1.2 | 1.2 | 1.4 | 1.7 | 2.0 | 2.3 | 2.6 | 2.9 | 3.3 | 3.6 | 4.0 | 4.3 | 4.7 | 5.0 | 5.4 | 5.8 |

FIGURE 30. RNAV TASK FORCE CROSS-COURSE ERROR TABLE

To determine the magnitude of this difference, RNAV route coverage data were derived using each of these error tables. A comparison was also made with different route width criterion; viz, ±4 miles and ±5 miles. This comparison was made only with the AC 90-45A error data, since the 2-sigma error in the RNAV task force data is equal to or less than 5 miles when the along-track distance is 130 miles or less, which is the maximum distance for 18,000-foot coverage. For a higher altitude, the maximum distance would be increased, and the task force data would then be pertinent (figures 11 and 30). For each application, the "offset" parameter was set at twice the route width parameter, which, in effect, treats the coverage of the offset as an uncharted route, contiguous to the parent route, with centerline spacing consistent with the route width criterion.

From the above it can be seen that three sets of RNAV route coverage data were derived; namely:

1. AC 90-45A error; route width = ±4 miles; offset = 8 miles,

2. RNAV task force error; route width = ±4 miles; offset = 8 miles, and

3. AC 90-45A error; route width = ±5 miles; offset = 10 miles.

As discussed under the METHODOLOGY section, these data sets consist of:

1. Detailed coverage data for each segment,

2. A list of the segments which have coverage problems, with a summary by segment of these problems,

3. A list of the routes which have coverage problems showing where the problems are by segment and by mileage along the route,

4. An overall summary of the problem routes, and

5. A network summary.

Due to the volume of data, only the last two items were included in this report. Computer output of the other, more detailed data is retained in the project files for ready examination, which may be desirable to show more precisely where the NAVAID coverage problems are for the high-altitude airspace. Appendices A, B, and C contain the overall summaries for the routes with coverage problems tested under the three conditions shown above. The network summaries for these tests are depicted in figures 31, 32, and 33, respectively.

By comparing the data in figure 32 with those in figure 31, it can be seen that reductions in the cross-course error proposed by the RNAV Task Force would substantially reduce the RNAV route coverage problems. For example, of the 1,018 high-altitude RNAV routes in the hypothetical route structure, the routes with coverage problems were reduced from 664 (65.2 percent) to

****** NETWORK SUMMARY ******

ROUTE WIDTH = 4.0
OFFSET DIST. = 8.0

(A) ROUTE

| | | | |
|---|---|---|---|
| NETWORK ROUTES | NUMBER | 1018 | |
| | MILES | 579008 | |
| PROBLEM-FREE ROUTES | NUMBER | 354 | ( 34.77 % ) |
| | MILES | 507519 | ( 87.65 % ) |
| PROBLEM ROUTES | NUMBER | 664 | ( 65.23 % ) |
| | MILES | 71489 | ( 12.35 % ) |

(B) SEGMENT

| | | | |
|---|---|---|---|
| NETWORK SEGMENT | NUMBER | 1206 | |
| | MILES | 151309 | |
| PROBLEM-FREE SEGMENT | NUMBER | 755 | ( 62.60 % ) |
| | MILES | 134050 | ( 88.59 % ) |
| PROBLEM SEGMENT | NUMBER | 451 | ( 37.40 % ) |
| | MILES | 17259 | ( 11.41 % ) |
| PARENT ROUTE HAS NO COVERAGE | MILES | 1164 | ( .77 % ) |
| AWAY OFFSET HAS NO COVERAGE | MILES | 2010 | ( 1.33 % ) |
| PARENT ROUTE WIDTH GT. (SP) | MILES | 13482 | ( 8.91 % ) |
| AWAY OFFSET RT. WIDTH GT.(SP) | MILES | 1371 | ( .91 % ) |

FIGURE 31. NETWORK SUMMARY--HYPOTHETICAL RNAV ROUTE STRUCTURE (AC 90-45A CROSS-COURSE ERROR, ROUTE WIDTH = ±4 nmi)

****** NETWORK SUMMARY ******

ROUTE WIDTH = 4.0
OFFSET DIST. = 8.0

(A) ROUTE

| | | | |
|---|---|---|---|
| NETWORK ROUTES | NUMBER | 1018 | |
| | MILES | 579008 | |
| PROBLEM-FREE ROUTES | NUMBER | 867 | ( 85.17 % ) |
| | MILES | 570131 | ( 98.47 % ) |
| PROBLEM ROUTES | NUMBER | 151 | ( 14.83 % ) |
| | MILES | 8876 | ( 1.53 % ) |

(B) SEGMENT

| | | | |
|---|---|---|---|
| NETWORK SEGMENT | NUMBER | 1206 | |
| | MILES | 151309 | |
| PROBLEM-FREE SEGMENT | NUMBER | 1142 | ( 94.69 % ) |
| | MILES | 148957 | ( 98.45 % ) |
| PROBLEM SEGMENT | NUMBER | 64 | ( 5.31 % ) |
| | MILES | 2352 | ( 1.55 % ) |
| PARENT ROUTE HAS NO COVERAGE | MILES | 1161 | ( .77 % ) |
| AWAY OFFSET HAS NO COVERAGE | MILES | 1110 | ( .73 % ) |
| PARENT ROUTE WIDTH GT. (SP) | MILES | 114 | ( .08 % ) |
| AWAY OFFSET RT. WIDTH GT.(SP) | MILES | 0 | ( .00 % ) |

FIGURE 32. NETWORK SUMMARY--HYPOTHETICAL RNAV ROUTE STRUCTURE (RNAV TASK FORCE CROSS-COURSE ERROR, ROUTE WIDTH = ±4 nmi)

****** NETWORK SUMMARY ******

ROUTE WIDTH = 5.0
OFFSET DIST. = 10.0

(A) ROUTE

| | | | |
|---|---|---|---|
| NETWORK ROUTES | NUMBER | 1018 | |
| | MILES | 579008 | |
| PROBLEM-FREE ROUTES | NUMBER | 710 | ( 69.74 % ) |
| | MILES | 556607 | ( 96.13 % ) |
| PROBLEM ROUTES | NUMBER | 308 | ( 30.26 % ) |
| | MILES | 22400 | ( 3.87 % ) |

(B) SEGMENT

| | | | |
|---|---|---|---|
| NETWORK SEGMENT | NUMBER | 1206 | |
| | MILES | 151309 | |
| PROBLEM-FREE SEGMENT | NUMBER | 1030 | ( 85.41 % ) |
| | MILES | 145906 | ( 96.43 % ) |
| PROBLEM SEGMENT | NUMBER | 176 | ( 14.59 % ) |
| | MILES | 5403 | ( 3.57 % ) |
| PARENT ROUTE HAS NO COVERAGE | MILES | 1164 | ( .77 % ) |
| AWAY OFFSET HAS NO COVERAGE | MILES | 2445 | ( 1.62 % ) |
| PARENT ROUTE WIDTH GT. (SP) | MILES | 2139 | ( 1.41 % ) |
| AWAY OFFSET RT. WIDTH GT.(SP) | MILES | 117 | ( .08 % ) |

FIGURE 33. NETWORK SUMMARY--HYPOTHETICAL RNAV ROUTE STRUCTURE (AC 90-45A CROSS-COURSE ERROR, ROUTE WIDTH = ±5 nmi)

151 (14.8 percent). When looking at all route miles in the structure (579,008), the number of miles where coverage problems occurred was 8,876 (1.5 percent) when the task force error data were applied, as compared to 71,489 miles (12.4 percent) for the AC 90-45A error data. The problem data for the discrete line segments in the structure (1,206) also show a reduction of from 451 (37.4 percent) to 64 (5.3 percent). The reduction in problem miles along the segments is about the same as that accumulated over the routes. Also, the number of network miles where the route width exceeds $\pm 4$ miles was reduced from 13,482 (8.9 percent) to 114 (.08 percent). It is apparent that with the RNAV task force cross-course error data, route width is not a problem with the number and location of H-VORTAC's presently in operation. The primary concern is whether or not here is signal coverage. Furthermore, of the 151,309 network miles, only 1,164 (less than 1 percent) were not within the coverage contours of the present system of H-VORTAC's. This is highly significant, since (a) the routes were designed without considering VORTAC location, (b) several routes are over water, and (c) coverage is computed at 18,000 feet, which is well below the normal flight plan altitude. For example, of the 1,164 miles that were not covered, 576 miles were on routes connecting to the Miami area. These routes, with long over-water segments, are normally flown at altitudes above 30,000 feet, and coverage distances at these altitudes are substantially increased (approximately proportional to the square root of the altitude). However, at greater distances route width also increases; therefore, the solution would probably be a trade-off between moving the routes closer to shore or using a wider route width. Also, L-VORTAC's may be available to cover the routes where H-VORTAC's do not.

Coverage problems on the offset located on the opposite side of the route from the VORTAC (AWAY OFFSET) also appear to be minimal. Note that, while the number of miles that the away offset is not covered when the parent route is covered is small in all cases, these data should not be affected by the cross-course error being applied. The difference in these data between figures 31 and 32 results from the logic used to select the preferred VORTAC (METHODOLOGY section). Revised logic has been developed, but was not applied for this data report.

The impact of different route width and offset criteria can be observed by comparing figure 33 with figure 31. Overall, the problem areas are reduced by a factor of over 3 to 1. In particular, the number of route miles where the route width criterion is exceeded is reduced from 13,482 (8.9 percent) to 2,139 (1.4 percent). As discussed in reference 1, route width requirements depend to a large extent on route density. Therefore, to more realistically assess this problem area, it would be necessary to localize where route width exceeds required values. The data generated by the NAFEC route coverage process are amenable to this type of analysis; however, the actual tabulation of these data is beyond the scope of this study.

## SUMMARY AND CONCLUSIONS

Systematic implementation of area navigation in the National Airspace System requires that a continuous effort be made to identify NAVAID support requirements and to resolve potential problem areas. For the near-term planning phase, gross answers to the NAVAID support question are needed in order define the magnitude of the problem at an early date so that appropriate actions can be initiated in a timely manner. As the development of RNAV route structures progresses, and system requirements become firm, more detailed and specific data concerning NAVAID support will be required. The study reported on herein was established to support RNAV implementation in this area, both for the near-term period as well as for the longer range activities. This interim report reflects the work accomplished during the initial phase of this effort.

During this phase, a methodology was developed to provide needed information regarding the NAVAID support problem. This methodology is primarily computer-based and involves the application of topographic data to derive estimates of NAVAID coverage. Through data processing, RNAV routes can be tested against NAVAID coverage contours to identify problem areas and to derive other data associated with the support of RNAV routes provided by the NAVAID system. From the discussions in this report, it seems evident that the approach taken to derive the NAVAID support data is valid. Areas where the methodology should be improved upon are recognized, however. A limited amount of cooperative flight checking should be conducted, particularly in the low-altitude airspace, in order to further validate the process. Also, restrictions to coverage not caused by surrounding terrain should be accounted for. In addition, the software should be expanded to derive data not currently provided. For example, at present, only problems in route coverage, such as gaps and excessive route widths, are identified. For RNAV implementation, other data are needed including waypoint definition and frequency change-over points. This information can be derived manually from the data base developed by the present system. However, computer processing would greatly facilitate this effort.

Following the software development, a hypothetical high-altitude RNAV route structure was tested against the estimated coverage of the existing system of H-VORTAC's. This test demonstrated the usability of the methodology and, at the same time, produced some coarse-grained answers currently needed for RNAV implementation planning. From the resulting data, it appears that the present NAVAID system will support a high-altitude route structure with only a modest number of problem areas. Furthermore, the results should be considered as conservative estimates of the actual situation, due to certain limitations in the test itself. First, of course, the route structure was developmental in nature and was designed without consideration of NAVAID location and coverage. Therefore, many of the indicated problems could easily be resolved through minor route modifications which would not impact the efficiency of the structure. Also, the coverage data were computed for an altitude of 18,000 feet throughout the total network. This is not representative of the

normal enroute altitudes over the long, over-water segments and over the Rocky Mountain area. Also Canadian stations were not included, because data were not available. Thus, coverage gaps occurred in some of the northern routes where, in fact, adequate coverage exists. In addition to these limitations, no attempt was made to examine alternative solutions that may be possible; i.e., the use of L-VORTAC's and/or the upgrading of VOR's and TACAN's. Terrain data for these facilities are available, and their use to resolve coverage gaps can easily be determined. In connection with route width problems, it should be pointed out that these data are related to ATC requirements and to assumed values for cross-course navigational errors. The impact of applying different route width requirements and cross-course errors was demonstrated by the test. However, the extent that route width would be a problem with the present NAVAID system requires more definitive information regarding these factors.

The foregoing comments and qualifications notwithstanding, it can be concluded from this initial NAVAID support study that:

1. The use of topographic data to derive estimates of NAVAID coverage is a viable approach provided that:

   a. The terrain data base, facility locations, and site elevations are carefully verified,

   b. Computational parameters used to account for atmospheric refractivity, signal attenuation, etc., have been validated through an appropriate amount of flight testing, and

   c. Other restrictions to coverage, caused by man-made objects, propagation anomalies, and the like, are taken into account.

2. Terrain-derived coverage data can provide a valuable supplement to flight-check activities associated with RNAV implementation. In particular, these data can serve as a filter to reduce flight-checking costs by identifying potential restrictions to NAVAID coverage caused by surrounding terrain. Guidance for flight-check altitudes can be provided as can the identification of the radials on which the potential problems exist.

3. The present NAVAID system should support a high-altitude RNAV structure with only a modest number of problems to be resolved. More specifically:

   a. The problem of signal gaps on RNAV routes should be insignificant when all factors are considered and available solutions examined.

   b. With reduced cross-course navigational errors as depicted in the RNAV task force report, the route width problem is also insignificant. Where route width requirements are relaxed to $\pm 5$ miles, the problem is also greatly reduced. Thus the final solution to this problem rests first, in the determination of ATC requirements (i.e., centerline spacing, minimum enroute altitudes (MEA), etc.) and second, in the directed improvement of specific NAVAID's.

4. The NAFEC methodology, with appropriate improvements, should become an integral part of the RNAV implementation program for application in determining NAVAID support requirements.

5. Implicit in the techniques, methodologies, and analyses in this report is the application to other types of facilities and usages. Among these would be radar, communications, and selection of proposed sites for all types of facilities.

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# APPENDIX A

PROBLEM ROUTE SUMMARY, HYPOTHETICAL RNAV ROUTE STRUCTURE, AC 90-45A CROSS-COURSE ERROR, ROUTE WIDTH = $\pm$4 NMI

****** PROBLEM ROUTE SUMMARY ****** (SP)= 4.0 MILES / OFFSET DIST. = 8.0MILES

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ABGATLR1 | 1017.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 120.0 ( 11) | 129.0 ( 12) | 96.0 ( 9) |
| ABGDALR1 | 401.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 12) | 60.0 ( 14) | 60.0 ( 14) |
| ABGDENR1 | 205.5 | .0 ( 0) | 3.0 ( 1) | 18.0 ( 8) | 15.0 ( 7) | 15.0 ( 7) | 18.0 ( 8) |
| ABGLANR1 | 489.1 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ABGMCCR1 | 667.8 | .0 ( 0) | 15.0 ( 2) | 15.0 ( 2) | 66.0 ( 9) | 66.0 ( 9) | 66.0 ( 9) |
| ABGMDAR1 | 870.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 4) | 45.0 ( 5) | 27.0 ( 3) |
| ABGMIAR1 | 1374.5 | 78.0 ( 5) | 78.0 ( 5) | 108.0 ( 7) | 291.0 ( 21) | 255.0 ( 18) | 303.0 ( 22) |
| ABGMSVR1 | 792.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 102.0 ( 12) | 114.0 ( 14) | 111.0 ( 14) |
| ABGORDR1 | 870.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 4) | 45.0 ( 5) | 27.0 ( 3) |
| ABGPHXR1 | 200.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 2) | 6.0 ( 2) | .0 ( 0) |
| ABGSFOR1 | 671.0 | 12.0 ( 1) | 12.0 ( 1) | 48.0 ( 7) | 24.0 ( 3) | 30.0 ( 4) | 6.0 ( 0) |
| ABGTLSR1 | 189.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) |
| ACHBKFR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 4) | 39.0 ( 3) | 48.0 ( 4) |
| ALBBLER1 | 128.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 6) | 6.0 ( 4) | 9.0 ( 6) |
| AMACALR1 | 185.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 63.0 ( 33) | 63.0 ( 33) | 72.0 ( 38) |
| ATLABGR1 | 1020.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 120.0 ( 11) | 96.0 ( 9) | 129.0 ( 12) |
| ATLBALR1 | 385.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 33.0 ( 8) | 15.0 ( 3) |
| ATLBOSR1 | 742.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 33.0 ( 4) | 15.0 ( 2) |
| ATLBLER1 | 530.9 | .0 ( 0) | 12.0 ( 2) | .0 ( 0) | 51.0 ( 9) | 48.0 ( 9) | 51.0 ( 9) |
| ATLCLER1 | 395.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 63.0 ( 15) | 63.0 ( 15) | 63.0 ( 15) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-CS COVERAGE | % RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ATLCLTR1 | 107.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 11) | 9.0 ( 8) | 12.0 ( 11) |
| ATLCALR1 | 55..1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 13) | 66.0 ( 11) | 75.0 ( 13) |
| ATLCCAR1 | 385.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 33.0 ( 8) | 15.0 ( 3) |
| ATLCTAR1 | 427.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 66.0 ( 15) | 66.0 ( 15) | 66.0 ( 15) |
| ATLEARR1 | 557.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 33.0 ( 5) | 15.0 ( 2) |
| ATLGSCR1 | 177.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 6) | 18.0 ( 10) | 12.0 ( 6) |
| ATLIACR1 | 385.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 33.0 ( 8) | 15.0 ( 3) |
| ATLIARR1 | 514.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 18.0 ( 3) | 21.0 ( 4) |
| ATLLFKR1 | 557.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 33.0 ( 5) | 15.0 ( 2) |
| ATLLARR1 | 1590.4 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 120.0 ( 7) | 96.0 ( 6) | 129.0 ( 8) |
| ATLLCAR1 | 557.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 33.0 ( 5) | 15.0 ( 2) |
| ATLMEMR1 | 204.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 69.0 ( 33) | 65.0 ( 33) | 66.0 ( 32) |
| ATLPHLR1 | 493.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 33.0 ( 6) | 15.0 ( 3) |
| ATLPITR1 | 370.4 | .0 ( 0) | 12.0 ( 3) | .0 ( 0) | 48.0 ( 12) | 48.0 ( 12) | 48.0 ( 12) |
| ATLRDLR1 | 223.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 5) | 18.0 ( 8) | 12.0 ( 5) |
| ATLSFOR1 | 1754.9 | .0 ( 0) | 12.0 ( 0) | 30.0 ( 1) | 276.0 ( 15) | 276.0 ( 15) | 297.0 ( 16) |
| ATLSTLR1 | 331.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| ATLTPAR1 | 265.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 5) | 3.0 ( 1) | 48.0 ( 18) |
| ALSELPR1 | 370.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 15) | 57.0 ( 15) | 48.0 ( 12) |
| BALATLR1 | 377.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 36.0 ( 9) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| BALBNAR1 | 390.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 19) | 75.0 ( 19) | 78.0 ( 19) |
| BALCMAR1 | 179.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 11) | 33.0 ( 18) | 12.0 ( 6) |
| BALCALR1 | 936.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 201.0 ( 21) | 201.0 ( 21) | 204.0 ( 21) |
| BALCAYR1 | 238.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 15) | 36.0 ( 15) | 36.0 ( 15) |
| BALCENR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 4) | 39.0 ( 3) | 48.0 ( 4) |
| BALLAMR1 | 1885.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 138.0 ( 7) | 174.0 ( 9) | 111.0 ( 5) |
| BALMCMR1 | 413.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| BALMIAR1 | 703.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 12) | 141.0 ( 20) | 66.0 ( 9) |
| BALMEYR1 | 744.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 6) | 33.0 ( 4) | 66.0 ( 8) |
| BALOMAR1 | 777.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 2) | 33.0 ( 4) | 12.0 ( 1) |
| BALORDR1 | 413.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| BALPITR1 | 93.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 9) | 9.0 ( 5) | .0 ( 0) |
| BALSEAR1 | 1921.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 282.0 ( 14) | 264.0 ( 13) | 330.0 ( 17) |
| BALSTLR1 | 524.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 6) | 42.0 ( 8) | 33.0 ( 6) |
| BDLCLER1 | 325.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| BDLMIAR1 | 950.9 | 75.0 ( 7) | 138.0 ( 14) | 75.0 ( 7) | 321.0 ( 33) | 408.0 ( 42) | 294.0 ( 30) |
| BDLORDR1 | 591.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| BDLPITR1 | 266.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 7) | 21.0 ( 7) | 21.0 ( 7) |
| BHMLANR1 | 94.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 19) | 18.0 ( 19) | 18.0 ( 19) |
| BHMLGAR1 | 650.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 78.0 ( 11) | 78.0 ( 11) | 75.0 ( 11) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-BS COVERAGE | NO RIGHT-BS COVERAGE | ROUTE WIDTH >(SP) | LEFT-BS >(SP) | RIGHT-BS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| BWMMEMR1 | 93.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 61) | 48.0 ( 51) | 66.0 ( 70) |
| BWMERDR1 | 40.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| BWRADWR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 4) | 54.0 ( 4) | 48.0 ( 4) |
| BWABALR1 | 387.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 23) | 90.0 ( 23) | 75.0 ( 19) |
| BWACALR1 | 458.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 126.0 ( 27) | 126.0 ( 27) | 126.0 ( 27) |
| BWACCAR1 | 387.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 23) | 90.0 ( 23) | 75.0 ( 19) |
| BWAMEMR1 | 87.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 86) | 75.0 ( 86) | 75.0 ( 86) |
| BWAPPLR1 | 503.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 17) | 75.0 ( 14) | 90.0 ( 17) |
| BWAPITR1 | 312.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 15) | 57.0 ( 18) | 57.0 ( 18) |
| BCICEMR1 | 469.8 | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 132.0 ( 28) | 138.0 ( 29) | 132.0 ( 28) |
| BCIFDWR1 | 209.6 | .0 ( 0) | 9.0 ( 4) | .0 ( 0) | 42.0 ( 20) | 42.0 ( 20) | 42.0 ( 20) |
| BCISFCR1 | 348.9 | 48.0 ( 13) | 54.0 ( 15) | 42.0 ( 12) | 42.0 ( 12) | 36.0 ( 10) | 51.0 ( 14) |
| BCISLOR1 | 16.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 29) | 48.0 ( 29) | 54.0 ( 32) |
| BCSATLR1 | 741.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 2) | 30.0 ( 4) | 36.0 ( 4) |
| BCSBLBR1 | 256.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 6.0 ( 2) | 9.0 ( 3) |
| BCSCLBR1 | 402.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| BCSCALR1 | 1270.8 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 108.0 ( 8) | 135.0 ( 10) | 90.0 ( 7) |
| BCSCTWR1 | 467.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 6.0 ( 1) | 15.0 ( 3) |
| BCSFLLR1 | 1018.2 | 192.0 ( 18) | 219.0 ( 21) | 192.0 ( 18) | 459.0 ( 45) | 432.0 ( 42) | 378.0 ( 37) |
| BCSLAWR1 | 2162.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 39.0 ( 1) | 33.0 ( 1) | 39.0 ( 1) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| BCSMIAR1 | 1218.2 | 198.0 ( 18) | 219.0 ( 21) | 192.0 ( 18) | 459.0 ( 45) | 432.0 ( 42) | 378.0 ( 37) |
| BCSORDR1 | 664.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 3) | 6.0 ( 0) | 24.0 ( 3) |
| BCSPITR1 | 343.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 6) | 21.0 ( 6) | 21.0 ( 6) |
| BCSSFOR1 | 2243.5 | 315.0 ( 14) | 387.0 ( 17) | 414.0 ( 18) | 612.0 ( 27) | 423.0 ( 18) | 699.0 ( 31) |
| BCSSTLR1 | 826.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| BLFALBR1 | 132.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 6) | 9.0 ( 6) | 9.0 ( 6) |
| BLFATLR1 | 529.2 | .0 ( 0) | .0 ( 0) | 12.0 ( 2) | 51.0 ( 9) | 51.0 ( 9) | 48.0 ( 9) |
| BLFBOSR1 | 260.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 9.0 ( 3) | 9.0 ( 3) |
| BLFDTWR1 | 123.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 4) |
| BLFORDR1 | 314.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) |
| CHSDCAR1 | 290.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 9.0 ( 3) | 9.0 ( 3) |
| CLEATLR1 | 392.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 63.0 ( 16) | 63.0 ( 16) | 63.0 ( 16) |
| CLEBOLR1 | 330.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| CLEBOSR1 | 405.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| CLECALR1 | 806.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 27.0 ( 3) | 96.0 ( 11) |
| CLELAXR1 | 1680.6 | .0 ( 0) | 30.0 ( 1) | .0 ( 0) | 36.0 ( 2) | 36.0 ( 2) | 45.0 ( 2) |
| CLETPAR1 | 716.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 21.0 ( 2) |
| CLTATLR1 | 110.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 2) | .0 ( 0) | 12.0 ( 10) |
| CLTCCAR1 | 191.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 12.0 ( 6) | 3.0 ( 1) |
| CLTEXRR1 | 364.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 12.0 ( 3) | 3.0 ( 0) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-OS COVERAGE | % RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CLTWFKA1 | 364.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 12.0 ( 3) | 3.0 ( 0) |
| CLTLCAA1 | 364.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 12.0 ( 3) | 3.0 ( 0) |
| CLTMIAA1 | 476.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| CLTGRCA1 | 417.3 | .0 ( 0) | 9.0 ( 2) | .0 ( 0) | 30.0 ( 7) | 30.0 ( 7) | 18.0 ( 4) |
| CLTFHLA1 | 300.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 12.0 ( 3) | 3.0 ( 0) |
| CLTFITA1 | 229.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | 9.0 ( 3) |
| CMHBALA1 | 175.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 11) | 21.0 ( 11) | 33.0 ( 18) |
| CMHDCAA1 | 175.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 11) | 21.0 ( 11) | 33.0 ( 18) |
| CMHLGAA1 | 307.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| CMHMIAA1 | 774.8 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 15.0 ( 1) | 12.0 ( 1) | 15.0 ( 1) |
| CESMKCA1 | 380.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 4) | 18.0 ( 4) | 18.0 ( 4) |
| CVGICTA1 | 250.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 19) | 54.0 ( 21) | 42.0 ( 16) |
| DALABGA1 | 406.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 11) | 57.0 ( 14) | 48.0 ( 11) |
| DALAMAA1 | 184.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 63.0 ( 34) | 72.0 ( 39) | 54.0 ( 29) |
| DALATLA1 | 550.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 78.0 ( 14) | 78.0 ( 14) | 72.0 ( 13) |
| DALBALA1 | 934.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 24) | 201.0 ( 21) | 219.0 ( 23) |
| DALBNAA1 | 457.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 135.0 ( 29) | 126.0 ( 27) | 129.0 ( 28) |
| DALBRGA1 | 1277.2 | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 90.0 ( 7) | 75.0 ( 5) | 105.0 ( 8) |
| DALCLEA1 | 801.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 90.0 ( 11) | 27.0 ( 3) |
| DALDCAA1 | 934.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 24) | 201.0 ( 21) | 219.0 ( 23) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | SB LEFT-ES COVERAGE | NB RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CALCENR1 | 474.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 15.0 ( 3) | .0 ( 0) |
| CALCTYR1 | 769.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 7) | 60.0 ( 7) | 45.0 ( 5) |
| CALELPR1 | 391.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 13) | 42.0 ( 10) | 48.0 ( 12) |
| CALIMPR1 | 934.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 24) | 201.0 ( 21) | 219.0 ( 23) |
| CALLAXR1 | 1110.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 20) | 201.0 ( 18) | 219.0 ( 19) |
| CALLAXR1 | 962.5 | .0 ( 0) | 21.0 ( 2) | .0 ( 0) | 90.0 ( 9) | 72.0 ( 7) | 84.0 ( 8) |
| CALLBER1 | 153.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 7) | 12.0 ( 7) | 24.0 ( 15) |
| CALLGAR1 | 1110.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 20) | 201.0 ( 18) | 219.0 ( 19) |
| CALLITR1 | 177.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 60.0 ( 33) | 54.0 ( 30) | 51.0 ( 28) |
| CALMAPR1 | 182.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | .0 ( 0) | 6.0 ( 3) |
| CALMEXR1 | 28.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 60.0 ( 21) | 51.0 ( 17) | 54.0 ( 18) |
| CALMIAR1 | 888.9 | 78.0 ( 8) | 78.0 ( 8) | 108.0 ( 12) | 228.0 ( 25) | 189.0 ( 21) | 243.0 ( 27) |
| CALMKCR1 | 313.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | 21.0 ( 6) |
| CALMSYR1 | 306.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 12) | 48.0 ( 15) | 51.0 ( 16) |
| CALORCR1 | 593.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 225.0 ( 37) | 246.0 ( 41) | 264.0 ( 44) |
| CALPMXR1 | 671.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 13) | 72.0 ( 10) | 84.0 ( 12) |
| CALSFER1 | 1162.4 | 12.0 ( 1) | 12.0 ( 1) | 48.0 ( 4) | 72.0 ( 6) | 87.0 ( 7) | 54.0 ( 4) |
| CALSTLR1 | 390.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 13) | 54.0 ( 13) | 42.0 ( 10) |
| CAYBALR1 | 237.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 15) | 36.0 ( 15) | 36.0 ( 15) |
| CAYDCAR1 | 237.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 15) | 36.0 ( 15) | 36.0 ( 15) |

| ROUTE ID | ROUTE MILES | [illegible] COVERAGE | LEFT-CS COVERAGE | RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| DAYLPAP1 | 371.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| DAYLCAP1 | 371.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| DAYTBEP1 | 371.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| DCAATLP1 | 377.- | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 36.0 ( 9) |
| DCABENP1 | 390.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 19) | 75.0 ( 19) | 78.0 ( 19) |
| DCACHEP1 | 291.- | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 9.0 ( 3) | 9.0 ( 3) |
| DCACLTP1 | 19+.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 4) | 9.0 ( 4) | 18.0 ( 9) |
| DCACMPP1 | 175.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 11) | 33.0 ( 18) | 12.0 ( 6) |
| DCADALP1 | 33+.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 201.0 ( 21) | 201.0 ( 21) | 204.0 ( 21) |
| DCADAYP1 | 23+.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 15) | 36.0 ( 15) | 36.0 ( 15) |
| DCAGSEP1 | 12?.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 9) | 15.0 ( 12) | 12.0 ( 9) |
| DCALAXP1 | +57.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| DCAMCLP1 | +13.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| DCAMEMP1 | 56?.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 150.0 ( 26) | 150.0 ( 26) | 153.0 ( 27) |
| DCAMIDP1 | 7_3.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 12) | 141.0 ( 20) | 66.0 ( 9) |
| DCAMKEP1 | ++6.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| DCAMSFP1 | 7?1.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 21.0 ( 2) |
| DCAPROP1 | +13.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| DCAPITP1 | 93.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 9) | 9.0 ( 9) | .0 ( 0) |
| DCASCRP1 | 312.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 99.0 ( 31) | 111.0 ( 35) | 42.0 ( 13) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| DCASTLR1 | 524.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 6) | 42.0 ( 8) | 33.0 ( 6) |
| DCATYBR1 | 284.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 84.0 ( 29) | 78.0 ( 27) | 84.0 ( 29) |
| DENABGR1 | 207.7 | .0 ( 0) | 15.0 ( 7) | 3.0 ( 1) | 24.0 ( 11) | 24.0 ( 11) | 24.0 ( 11) |
| DENBALR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 4) | 54.0 ( 4) | 48.0 ( 4) |
| DENBCIR1 | 474.9 | .0 ( 0) | 12.0 ( 2) | 9.0 ( 1) | 150.0 ( 31) | 141.0 ( 29) | 141.0 ( 29) |
| DENCALR1 | 475.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 15.0 ( 3) |
| DENCTYR1 | 900.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 2) | 24.0 ( 2) | 24.0 ( 2) |
| DENIACR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 4) | 54.0 ( 4) | 48.0 ( 4) |
| DENIAWR1 | 665.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 15.0 ( 2) |
| DENICTR1 | 286.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 10) | 33.0 ( 11) | 45.0 ( 15) |
| DENJFKR1 | 1312.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 1) | 21.0 ( 1) | 18.0 ( 1) |
| DENLASR1 | 446.3 | 24.0 ( 5) | 39.0 ( 8) | 42.0 ( 9) | 27.0 ( 6) | 33.0 ( 7) | 39.0 ( 8) |
| DENLAXR1 | 632.4 | 6.0 ( 0) | 15.0 ( 2) | 48.0 ( 7) | 147.0 ( 23) | 144.0 ( 22) | 138.0 ( 21) |
| DENLGAR1 | 1312.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 1) | 21.0 ( 1) | 18.0 ( 1) |
| DENMARR1 | 397.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 9) | 48.0 ( 12) | 27.0 ( 6) |
| DENMEMR1 | 683.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 3) | 24.0 ( 3) | 24.0 ( 3) |
| DENMKER1 | 383.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 4) | 9.0 ( 2) | 24.0 ( 6) |
| DENMKER1 | 701.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 4) | 45.0 ( 6) | 39.0 ( 5) |
| DENMSPR1 | 514.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 11) | 69.0 ( 13) | 57.0 ( 11) |
| DENOMAR1 | 333.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 7) | 24.0 ( 7) | 24.0 ( 7) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE MILES (%) | % LEFT-ES COVERAGE MILES (%) | % RIGHT-ES COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-ES >(SP) MILES (%) | RIGHT-ES >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| DENMAD51 | 683.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 3) | 24.0 ( 3) | 24.0 ( 3) |
| DENPDX51 | 77.1 | .0 ( 0) | 12.0 ( 1) | 15.0 ( 1) | 186.0 ( 24) | 177.0 ( 22) | 189.0 ( 24) |
| DENPHX51 | 426.7 | .0 ( 0) | 3.0 ( 0) | 21.0 ( 4) | 33.0 ( 7) | 33.0 ( 7) | 33.0 ( 7) |
| DENSEA51 | 798.1 | .0 ( 0) | 42.0 ( 5) | 36.0 ( 4) | 234.0 ( 29) | 231.0 ( 28) | 237.0 ( 29) |
| DENSFO51 | 721.4 | .0 ( 0) | 21.0 ( 2) | 12.0 ( 1) | 108.0 ( 14) | 90.0 ( 12) | 111.0 ( 15) |
| DENSLC51 | 721.4 | .0 ( 0) | 21.0 ( 2) | 12.0 ( 1) | 108.0 ( 14) | 90.0 ( 12) | 111.0 ( 15) |
| DENSLC-1 | 242.6 | .0 ( 0) | 3.0 ( 1) | .0 ( 0) | 42.0 ( 17) | 42.0 ( 17) | 42.0 ( 17) |
| DENSTL51 | 591.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 8) | 30.0 ( 5) | 51.0 ( 8) |
| DETMKE51 | 129.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 2) |
| DSMLAX51 | 1155.6 | .0 ( 0) | 3.0 ( 0) | 51.0 ( 4) | 171.0 ( 14) | 165.0 ( 14) | 153.0 ( 13) |
| DTWATL51 | 428.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 66.0 ( 15) | 66.0 ( 15) | 66.0 ( 15) |
| DTWBOS51 | 469.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 15.0 ( 3) | 12.0 ( 2) |
| DTWBLF51 | 119.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 5) | 3.0 ( 2) | 6.0 ( 5) |
| DTWDAL51 | 779.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 6) | 45.0 ( 5) | 66.0 ( 8) |
| DTWDEN51 | 805.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 2) | 15.0 ( 1) | 24.0 ( 2) |
| DTWEWR52 | 333.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| DTWJFK52 | 333.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| DTWLAX51 | 1616.1 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 39.0 ( 2) | 33.0 ( 2) | 39.0 ( 2) |
| DTWLGA52 | 333.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| DTWMIA51 | 909.6 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 15.0 ( 1) | 15.0 ( 1) | 15.0 ( 1) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-OS COVERAGE MILES (%) | NO RIGHT-OS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-OS >(SP) MILES (%) | RIGHT-OS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| DTWMKER1 | 123.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 2) |
| DTWMSR1 | 369.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 21.0 ( 5) |
| DTWSFR1 | 1706.1 | .0 ( 0) | 9.0 ( 0) | 18.0 ( 1) | 150.0 ( 8) | 141.0 ( 8) | 156.0 ( 9) |
| DTWSYR1 | 236.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 6) | 15.0 ( 6) | 12.0 ( 5) |
| DTWTPR1 | 765.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 5) | 36.0 ( 4) | 57.0 ( 7) |
| ELPALR1 | 367.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 11) | 42.0 ( 11) | 75.0 ( 20) |
| ELPCAR1 | 390.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 69.0 ( 17) | 60.0 ( 15) | 72.0 ( 18) |
| ELPLAR1 | 507.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| ELPLSR1 | 418.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| ELPMAR1 | 125.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 7) | 21.0 ( 16) | 9.0 ( 7) |
| ELPPXR1 | 211.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 12) | 18.0 ( 8) | 27.0 ( 12) |
| ELPSAR1 | 342.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 21) | 57.0 ( 16) | 81.0 ( 23) |
| ELPTLR1 | 145.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 16) | 24.0 ( 16) | 15.0 ( 10) |
| EWRATLR1 | 554.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 3) | 30.0 ( 5) | 36.0 ( 6) |
| EWRCLR1 | 259.8 | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| EWRCLTR1 | 370.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 9.0 ( 2) | 18.0 ( 4) |
| EWRFLR1 | 847.3 | 75.0 ( 8) | 138.0 ( 16) | 75.0 ( 8) | 318.0 ( 37) | 405.0 ( 47) | 282.0 ( 33) |
| EWRGSR1 | 296.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 18.0 ( 6) | 9.0 ( 3) |
| EWRIAR1 | 1126.6 | .0 ( 0) | .0 ( 0) | 27.0 ( 2) | 90.0 ( 7) | 96.0 ( 8) | 192.0 ( 17) |
| EWRLAR1 | 618.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 60.0 ( 9) | 24.0 ( 3) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | LEFT-OS COVERAGE | RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| EWRLAWR1 | 2622.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 42.0 ( 2) | 27.0 ( 1) |
| EWRLAWR2 | 2731.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 102.0 ( 5) | 144.0 ( 7) | 66.0 ( 3) |
| EWRLAWR3 | 2746.3 | .0 ( 0) | 12.0 ( 0) | 3.0 ( 0) | 126.0 ( 6) | 135.0 ( 6) | 114.0 ( 5) |
| EWRMCWR1 | 514.3 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| EWRMIWR1 | 847.0 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | 249.0 ( 29) | 360.0 ( 42) | 216.0 ( 25) |
| EWRMKCR1 | 858.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| EWRRCWR1 | 514.3 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| EWRSFCR1 | 2123.0 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 0) | 177.0 ( 8) | 177.0 ( 8) | 306.0 ( 14) |
| EWRSTLR1 | 667.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 12.0 ( 1) | .0 ( 0) |
| EWRTPAR1 | 772.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 4) | 60.0 ( 7) | 24.0 ( 3) |
| FLLBCSR1 | 1720.5 | 177.0 ( 17) | 177.0 ( 17) | 213.0 ( 20) | 477.0 ( 46) | 366.0 ( 35) | 441.0 ( 43) |
| FLLEWRR1 | 458.8 | 75.0 ( 8) | 75.0 ( 8) | 180.0 ( 20) | 375.0 ( 43) | 327.0 ( 38) | 369.0 ( 42) |
| FLLWFKR1 | 458.8 | 75.0 ( 8) | 75.0 ( 8) | 180.0 ( 20) | 375.0 ( 43) | 327.0 ( 38) | 369.0 ( 42) |
| FLLFPLR1 | 798.0 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | 210.0 ( 26) | 165.0 ( 20) | 273.0 ( 34) |
| FLLFITR1 | 793.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 15.0 ( 1) |
| GEGSFCR1 | 536.5 | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | 189.0 ( 35) | 198.0 ( 36) | 186.0 ( 34) |
| GSCATLR1 | 184.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | .0 ( 0) | 12.0 ( 6) |
| GSCDCAR1 | 119.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 5) | 6.0 ( 5) | 15.0 ( 12) |
| GSCEWBR1 | 292.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 15.0 ( 5) | 3.0 ( 1) |
| GSCHPNR1 | 292.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 15.0 ( 5) | 3.0 ( 1) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-ES COVERAGE | NO RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| GSCIADR1 | 115.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 5) | 6.0 ( 5) | 15.0 ( 12) |
| GSCLGAR1 | 292.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 15.0 ( 5) | 3.0 ( 1) |
| GSCORDR1 | 410.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 5) | 24.0 ( 5) | 15.0 ( 3) |
| GSCTEBR1 | 292.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 15.0 ( 5) | 3.0 ( 1) |
| HCLORDR1 | 704.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| HRNGSBR1 | 296.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 18.0 ( 6) | 9.0 ( 3) |
| HRNMCWR1 | 514.3 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| IADCATR1 | 377.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 36.0 ( 9) |
| IADDALR1 | 936.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 201.0 ( 21) | 201.0 ( 21) | 204.0 ( 21) |
| IADDEMR1 | 1189.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 4) | 39.0 ( 3) | 48.0 ( 4) |
| IADGSCR1 | 127.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 9) | 15.0 ( 12) | 12.0 ( 9) |
| IADLAXR1 | 1885.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 138.0 ( 7) | 174.0 ( 9) | 111.0 ( 5) |
| IADMCWR1 | 413.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| IADMEMR1 | 585.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 150.0 ( 26) | 150.0 ( 26) | 153.0 ( 27) |
| IADMIAR1 | 703.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 90.0 ( 12) | 141.0 ( 20) | 66.0 ( 9) |
| IADMSYR1 | 744.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 6) | 33.0 ( 4) | 66.0 ( 8) |
| IADOMAR1 | 777.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 2) | 33.0 ( 4) | 12.0 ( 1) |
| IADORDR1 | 413.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 30.0 ( 7) | 9.0 ( 2) |
| IADPITR1 | 93.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 9) | 9.0 ( 9) | .0 ( 0) |
| IADSEAR1 | 1921.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 282.0 ( 14) | 264.0 ( 13) | 330.0 ( 17) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | % LEFT-OS COVERAGE | % RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| IACSFCR1 | 1998.7 | .0 ( 0) | 18.0 ( 0) | 12.0 ( 0) | 159.0 ( 7) | 132.0 ( 6) | 156.0 ( 7) |
| IACSTLR1 | 524.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 6) | 42.0 ( 8) | 33.0 ( 6) |
| IAHATLR1 | 519.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 21.0 ( 4) | 18.0 ( 3) |
| IAHALCR1 | 32.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 27) | .0 ( 0) | 9.0 ( 27) |
| IAHCEMR1 | 663.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 15.0 ( 2) | .0 ( 0) |
| IAHEWRR1 | 1132.5 | .0 ( 0) | 27.0 ( 2) | .0 ( 0) | 90.0 ( 7) | 192.0 ( 16) | 96.0 ( 8) |
| IAHJFWR1 | 1132.5 | .0 ( 0) | 27.0 ( 2) | .0 ( 0) | 90.0 ( 7) | 192.0 ( 16) | 96.0 ( 8) |
| IAHLAWR1 | 1178.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 5) | 45.0 ( 4) | 84.0 ( 7) |
| IAHLBER1 | 312.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 15) | 48.0 ( 15) | 57.0 ( 18) |
| IAHMIAR1 | 748.9 | 162.0 ( 21) | 162.0 ( 21) | 174.0 ( 23) | 228.0 ( 30) | 228.0 ( 30) | 252.0 ( 33) |
| IAHMSAR1 | 178.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 16) | 30.0 ( 16) | 30.0 ( 16) |
| IAHORDR1 | 704.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| IAHPHWR1 | 785.( | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 7) | 48.0 ( 6) | 78.0 ( 9) |
| IAHSFCR1 | 1312.4 | .0 ( 0) | 12.0 ( 0) | 24.0 ( 1) | 114.0 ( 8) | 99.0 ( 7) | 90.0 ( 6) |
| IAHSTLR1 | 503.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| ICTCWCR1 | 253.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 20) | 60.0 ( 23) | 45.0 ( 17) |
| ICTDEMR1 | 286.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 11) | 12.0 ( 4) | 33.0 ( 11) |
| ICTLLWR1 | 253.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 20) | 60.0 ( 23) | 45.0 ( 17) |
| ICTMCWR1 | 419.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 9.0 ( 2) | 36.0 ( 8) |
| ICTMKCR1 | 74.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 20) | 27.0 ( 36) | 15.0 ( 20) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-CS COVERAGE | % RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ICTERCR1 | 409.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 9.0 ( 2) | 36.0 ( 8) |
| INDEWBR1 | 468.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| IND_FWR1 | 468.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) |
| INDMEPR1 | 241.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 11) | 93.0 ( 38) | 27.0 ( 11) |
| _ANBHPR1 | 94.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 19) | 18.0 ( 19) | 18.0 ( 19) |
| _ANSHWR1 | 101.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 26) | 15.0 ( 14) | 27.0 ( 26) |
| _AXCCAR1 | 456.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| _AXEWBR1 | 618.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 24.0 ( 3) | 60.0 ( 9) |
| _AX_FWR1 | 618.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 24.0 ( 3) | 60.0 ( 9) |
| _AXLCAR1 | 618.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 24.0 ( 3) | 60.0 ( 9) |
| _FKATLR1 | 554.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 3) | 30.0 ( 5) | 36.0 ( 6) |
| _FKCLER1 | 259.8 | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| _FKCLTR1 | 370.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 9.0 ( 2) | 18.0 ( 4) |
| _FKCALR1 | 1103.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 201.0 ( 18) | 201.0 ( 18) | 204.0 ( 18) |
| _FKCENR1 | 1316.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 9.0 ( 0) | 9.0 ( 0) |
| _FKFLLR1 | 847.3 | 75.0 ( 8) | 138.0 ( 16) | 75.0 ( 8) | 318.0 ( 37) | 405.0 ( 47) | 282.0 ( 33) |
| _FKIAWR1 | 1125.6 | .0 ( 0) | .0 ( 0) | 27.0 ( 2) | 90.0 ( 7) | 96.0 ( 8) | 192.0 ( 17) |
| _FK_AXR1 | 618.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 60.0 ( 9) | 24.0 ( 3) |
| _FKLABR1 | 1846.7 | .0 ( 0) | 3.0 ( 0) | 21.0 ( 1) | 15.0 ( 0) | 111.0 ( 6) | 24.0 ( 1) |
| _FKLAXR1 | 2[illegible]2.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 42.0 ( 2) | 27.0 ( 1) |

| BELTE IC | BELTE MILES | BELTE COVERAGE | LEFT-EB COVERAGE | RIGHT-EB COVERAGE | BELTE WIDTH >(SF) | LEFT-EB >(SF) | RIGHT-EB >(SF) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ↓FKLA↑R2 | 2131.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 102.0 ( 5) | 144.0 ( 7) | 66.0 ( 3) |
| ↓FKLA↑R3 | 2 [illegible] | .0 ( 0) | 12.0 ( 0) | 3.0 ( 0) | 126.0 ( 6) | 135.0 ( 6) | 114.0 ( 5) |
| ↓FKMIAR1 | [illegible] | 7[illegible].0 ( 8) | 138.0 ( 16) | 75.0 ( 8) | 318.0 ( 37) | 405.0 ( 47) | 282.0 ( 33) |
| ↓FKMSFR1 | 7[illegible] | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 5) | 135.0 ( 17) | 42.0 ( 5) |
| ↓FKMSMR1 | 918.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 5) | 33.0 ( 3) | 66.0 ( 7) |
| ↓FKPAMR1 | 2123.0 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 0) | 177.0 ( 8) | 177.0 ( 8) | 306.0 ( 14) |
| ↓FKPRDR1 | 514.3 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| ↓FKPRFR1 | 152.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 35) | 54.0 ( 35) | 54.0 ( 35) |
| ↓FKFBIR1 | 791.0 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | 249.0 ( 31) | 360.0 ( 45) | 216.0 ( 27) |
| ↓FKFH↑R1 | 1765.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 4) | 117.0 ( 6) | 57.0 ( 3) |
| ↓FKSAMR1 | 2[illegible]17.8 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 33.0 ( 1) | 30.0 ( 1) | 30.0 ( 1) |
| ↓FKSE↑R1 | 1[illegible]5.5 | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 723.0 ( 36) | 663.0 ( 33) | 795.0 ( 39) |
| ↓FKSFBR1 | 2123.0 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 0) | 177.0 ( 8) | 177.0 ( 8) | 306.0 ( 14) |
| ↓FKSFBR2 | 2125.3 | .0 ( 0) | 18.0 ( 0) | 12.0 ( 0) | 120.0 ( 5) | 102.0 ( 4) | 117.0 ( 5) |
| ↓FKSFBR3 | 2141.1 | 24.0 ( 1) | 54.0 ( 2) | 84.0 ( 3) | 249.0 ( 11) | 225.0 ( 10) | 219.0 ( 10) |
| ↓FKS↓CR1 | 2123.0 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 0) | 177.0 ( 8) | 177.0 ( 8) | 306.0 ( 14) |
| ↓FKSTLR1 | 667.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 12.0 ( 1) | .0 ( 0) |
| ↓FKTFAR1 | 772.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 4) | 60.0 ( 7) | 24.0 ( 3) |
| LASDEMR1 | 452.2 | 6.0 ( 1) | 57.0 ( 12) | 39.0 ( 8) | 24.0 ( 5) | 18.0 ( 3) | 21.0 ( 4) |
| LAS↓FBR1 | 1[illegible]41.7 | .0 ( 0) | 21.0 ( 1) | 3.0 ( 0) | 21.0 ( 1) | 30.0 ( 1) | 111.0 ( 6) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | | NO LEFT-OS COVERAGE | | NO RIGHT-OS COVERAGE | | ROUTE WIDTH >(SP) | | LEFT-OS >(SP) | | RIGHT-OS >(SP) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) |
| LASCAWR1 | 252.2 | .0 | ( 0) | 12.0 | ( 4) | 24.0 | ( 9) | 27.0 | ( 10) | 15.0 | ( 5) | 12.0 | ( 4) |
| LASCRDR1 | 1220.1 | 6.0 | ( 1) | 42.0 | ( 3) | 39.0 | ( 3) | 51.0 | ( 4) | 54.0 | ( 4) | 57.0 | ( 4) |
| LASPKWR1 | 130.7 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 12.0 | ( 9) | 21.0 | ( 16) | 12.0 | ( 9) |
| LASRNCR1 | 210.8 | .0 | ( 0) | 9.0 | ( 4) | 57.0 | ( 27) | 3.0 | ( 1) | .0 | ( 0) | 3.0 | ( 1) |
| LASSFCR1 | 252.2 | .0 | ( 0) | 12.0 | ( 4) | 24.0 | ( 9) | 27.0 | ( 10) | 15.0 | ( 5) | 12.0 | ( 4) |
| LASSLGR1 | 252.2 | .0 | ( 0) | 12.0 | ( 4) | 24.0 | ( 9) | 27.0 | ( 10) | 15.0 | ( 5) | 12.0 | ( 4) |
| LASSLOR1 | 233.5 | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 1) | 51.0 | ( 21) | 51.0 | ( 21) | 51.0 | ( 21) |
| LAXABGR1 | 482.5 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 3.0 | ( 0) | 3.0 | ( 0) |
| LAXATLR1 | 1583.7 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 120.0 | ( 7) | 129.0 | ( 8) | 96.0 | ( 6) |
| LAXBALR1 | 1883.7 | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 144.0 | ( 7) | 117.0 | ( 6) | 174.0 | ( 9) |
| LAXBGSR1 | 2160.5 | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 39.0 | ( 1) | 39.0 | ( 1) | 33.0 | ( 1) |
| LAXCLER1 | 1674.3 | .0 | ( 0) | .0 | ( 0) | 30.0 | ( 1) | 36.0 | ( 2) | 45.0 | ( 2) | 36.0 | ( 2) |
| LAXDAL1 | 961.5 | .0 | ( 0) | .0 | ( 0) | 21.0 | ( 2) | 90.0 | ( 9) | 84.0 | ( 8) | 72.0 | ( 7) |
| LAXDENR1 | 629.9 | .0 | ( 0) | 45.0 | ( 7) | 9.0 | ( 1) | 141.0 | ( 22) | 132.0 | ( 20) | 135.0 | ( 21) |
| LAXDSMR1 | 1152.8 | .0 | ( 0) | 51.0 | ( 4) | 3.0 | ( 0) | 171.0 | ( 14) | 153.0 | ( 13) | 165.0 | ( 14) |
| LAXDTWR1 | 1612.5 | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 39.0 | ( 2) | 39.0 | ( 2) | 33.0 | ( 2) |
| LAXELPR1 | 503.1 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) |
| LAXEWRR1 | 2016.1 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 33.0 | ( 1) | 33.0 | ( 1) | 36.0 | ( 1) |
| LAXEWRR2 | 2046.3 | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 93.0 | ( 4) | 75.0 | ( 3) | 132.0 | ( 6) |
| LAXEWRR3 | 2052.1 | .0 | ( 0) | 3.0 | ( 0) | 9.0 | ( 0) | 117.0 | ( 5) | 123.0 | ( 5) | 123.0 | ( 5) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | LEFT-BS COVERAGE | RIGHT-BS COVERAGE | ROUTE WIDTH >(SF) | LEFT-BS >(SF) | RIGHT-BS >(SF) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| LAXIADR1 | 1[illegible].7 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 144.0 ( 7) | 117.0 ( 6) | 174.0 ( 9) |
| LAXIABR1 | 1[illegible].5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 4) | 75.0 ( 6) | 39.0 ( 3) |
| LAXLFKR1 | 2016.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 1) | 33.0 ( 1) | 36.0 ( 1) |
| LAXLFKR2 | 2[illegible].3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 93.0 ( 4) | 75.0 ( 3) | 132.0 ( 6) |
| LAXLFKR3 | 2052.1 | .0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 117.0 ( 5) | 123.0 ( 5) | 123.0 ( 5) |
| LAXLGAR1 | 2016.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 1) | 33.0 ( 1) | 36.0 ( 1) |
| LAXLGAR2 | 2[illegible].3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 93.0 ( 4) | 75.0 ( 3) | 132.0 ( 6) |
| LAXLGAR3 | 2052.1 | .0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 117.0 ( 5) | 123.0 ( 5) | 123.0 ( 5) |
| LAXMDWR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 30.0 ( 2) | 36.0 ( 2) | 45.0 ( 3) | 36.0 ( 2) |
| LAXMEWR1 | 129[illegible].3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 129.0 ( 9) | 30.0 ( 2) | 138.0 ( 10) |
| LAXMIAR1 | 1819.9 | [illegible].0 ( 8) | 162.0 ( 8) | 174.0 ( 9) | 291.0 ( 15) | 306.0 ( 15) | 291.0 ( 15) |
| LAXMKCR1 | 1[illegible].1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 2) | 27.0 ( 2) | 36.0 ( 3) |
| LAXMSER1 | 1226.6 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 213.0 ( 17) | 222.0 ( 18) | 213.0 ( 17) |
| LAXMSWR1 | 1330.5 | .0 ( 0) | 12.0 ( 0) | 21.0 ( 1) | 105.0 ( 7) | 120.0 ( 8) | 102.0 ( 7) |
| LAXPMAR1 | 1[illegible].8 | .0 ( 0) | 51.0 ( 4) | 3.0 ( 0) | 171.0 ( 16) | 153.0 ( 14) | 165.0 ( 15) |
| LAXSRDR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 30.0 ( 2) | 36.0 ( 2) | 45.0 ( 3) | 36.0 ( 2) |
| LAXSRDR2 | 1393.8 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 39.0 ( 2) | 39.0 ( 2) | 33.0 ( 2) |
| LAXTCWR1 | 645.7 | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 210.0 ( 32) | 213.0 ( 32) | 198.0 ( 30) |
| LAXTHLR1 | 198[illegible].9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 1) | 33.0 ( 1) | 51.0 ( 2) |
| LAXSATR1 | 9[illegible].6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 7) | 72.0 ( 7) | 84.0 ( 8) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| LAXSEAR1 | 736.0 | 3.0 ( 0) | .0 ( 0) | 15.0 ( 2) | 210.0 ( 28) | 213.0 ( 28) | 198.0 ( 26) |
| LAXSLOR1 | 417.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 7) | 42.0 ( 10) | 30.0 ( 7) |
| LAXSTLR1 | 1275.2 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 93.0 ( 7) | 66.0 ( 5) | 135.0 ( 10) |
| LBBCALR1 | 160.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 13) | 21.0 ( 13) | 21.0 ( 13) |
| LBBIAMR1 | 310.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 10) | 36.0 ( 11) | 33.0 ( 10) |
| LGAATLR1 | 554.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 3) | 30.0 ( 5) | 36.0 ( 6) |
| LGABHMR1 | 644.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 78.0 ( 12) | 75.0 ( 11) | 78.0 ( 12) |
| LGACLER1 | 259.8 | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| LGACLYR1 | 370.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 9.0 ( 2) | 18.0 ( 4) |
| LGADALR1 | 1103.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 201.0 ( 18) | 201.0 ( 18) | 204.0 ( 18) |
| LGADENR1 | 1315.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 9.0 ( 0) | 9.0 ( 0) |
| LGAGERR1 | 296.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 18.0 ( 6) | 9.0 ( 3) |
| LGALAXR1 | 618.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 60.0 ( 9) | 24.0 ( 3) |
| LGALAXR2 | 2022.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 42.0 ( 2) | 27.0 ( 1) |
| LGALAXR2 | 2031.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 102.0 ( 5) | 144.0 ( 7) | 66.0 ( 3) |
| LGALAXR3 | 2040.3 | .0 ( 0) | 12.0 ( 0) | 3.0 ( 0) | 126.0 ( 6) | 135.0 ( 6) | 114.0 ( 5) |
| LGAMDOR1 | 514.3 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| LGAMEMR1 | 732.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 150.0 ( 20) | 150.0 ( 20) | 153.0 ( 20) |
| LGAMIAR1 | 847.0 | 30.0 ( 4) | 69.0 ( 8) | 33.0 ( 4) | 249.0 ( 29) | 360.0 ( 42) | 216.0 ( 25) |
| LGAMKCR1 | 858.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE MILES (%) | % LEFT-BS COVERAGE MILES (%) | % RIGHT-BS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-BS >(SP) MILES (%) | RIGHT-BS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| LGAMSBR1 | 784.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 5) | 138.0 ( 17) | 42.0 ( 5) |
| LGACRBR1 | 158.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 35) | 54.0 ( 35) | 54.0 ( 35) |
| LGAFEIR1 | 781.0 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | 249.0 ( 31) | 360.0 ( 45) | 216.0 ( 27) |
| LGASCBR1 | 467.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 8) | 51.0 ( 10) | 30.0 ( 6) |
| LGASPBR1 | 2183.0 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 0) | 177.0 ( 8) | 177.0 ( 8) | 306.0 ( 14) |
| LGASTLR1 | 667.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 12.0 ( 1) | .0 ( 0) |
| LITCALR1 | 174.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 29) | 51.0 ( 29) | 51.0 ( 29) |
| LLKICTR1 | 250.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 19) | 54.0 ( 21) | 42.0 ( 16) |
| MAFCENR1 | 358.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 6) | 18.0 ( 4) | 30.0 ( 7) |
| MAFELBR1 | 125.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 9) | 12.0 ( 9) | 3.0 ( 2) |
| MCCABGR1 | 665.3 | .0 ( 0) | 12.0 ( 1) | 15.0 ( 2) | 69.0 ( 10) | 69.0 ( 10) | 69.0 ( 10) |
| MCWABGR1 | 669.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 4) | 27.0 ( 3) | 45.0 ( 5) |
| MCWBALR1 | 418.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 7) | 33.0 ( 7) | 33.0 ( 7) |
| MCWDCAR1 | 418.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 7) | 33.0 ( 7) | 33.0 ( 7) |
| MCWDENR1 | 687.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 3) | 15.0 ( 2) | 24.0 ( 3) |
| MCWIADR1 | 418.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 7) | 33.0 ( 7) | 33.0 ( 7) |
| MCWICTR1 | 407.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 9.0 ( 2) | 9.0 ( 2) |
| MCWLAKR1 | 1396.5 | .0 ( 0) | 30.0 ( 2) | .0 ( 0) | 36.0 ( 2) | 36.0 ( 2) | 45.0 ( 3) |
| MCWPHXR1 | 1149.7 | .0 ( 0) | .0 ( 0) | 18.0 ( 1) | 18.0 ( 1) | 30.0 ( 2) | 15.0 ( 1) |
| MCWSFBR1 | 1486.2 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 1) | 177.0 ( 11) | 177.0 ( 11) | 306.0 ( 20) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | NB LEFT-ES COVERAGE | NB RIGHT-ES COVERAGE | ROUTE WIDTH >(SF) | LEFT-ES >(SF) | RIGHT-ES >(SF) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MEMATLR1 | 202.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 69.0 ( 34) | 66.0 ( 32) | 69.0 ( 34) |
| MEMBHMR1 | 96.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 69.0 ( 71) | 60.0 ( 62) | 72.0 ( 75) |
| MEMBNGR1 | 84.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 88) | 75.0 ( 88) | 75.0 ( 88) |
| MEMCALR1 | 285.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 17) | 51.0 ( 17) | 51.0 ( 17) |
| MEMDCAR1 | 562.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 165.0 ( 29) | 150.0 ( 26) | 165.0 ( 29) |
| MEMIADR1 | 562.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 165.0 ( 29) | 150.0 ( 26) | 165.0 ( 29) |
| MEMINDR1 | 243.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 13) | 18.0 ( 7) | 84.0 ( 34) |
| MEMLAXR1 | 1303.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 129.0 ( 9) | 138.0 ( 10) | 30.0 ( 2) |
| MEMLGAR1 | 738.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 165.0 ( 22) | 150.0 ( 20) | 165.0 ( 22) |
| MEMMCWR1 | 321.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | .0 ( 0) | 9.0 ( 2) |
| MEMORDR1 | 321.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | .0 ( 0) | 9.0 ( 2) |
| MEMSCFR1 | 188.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 69.0 ( 36) | 75.0 ( 39) | 48.0 ( 25) |
| MEMSHVR1 | 159.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 15) | 36.0 ( 22) | 24.0 ( 15) |
| MIAABGR1 | 1381.9 | 78.0 ( 5) | 108.0 ( 7) | 78.0 ( 5) | 303.0 ( 21) | 294.0 ( 21) | 267.0 ( 19) |
| MIABALR1 | 710.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 81.0 ( 11) | 63.0 ( 8) | 129.0 ( 18) |
| MIABCLR1 | 959.7 | 75.0 ( 7) | 75.0 ( 7) | 180.0 ( 18) | 375.0 ( 39) | 327.0 ( 34) | 369.0 ( 38) |
| MIABGSR1 | 1020.5 | 177.0 ( 17) | 177.0 ( 17) | 213.0 ( 20) | 477.0 ( 46) | 366.0 ( 35) | 441.0 ( 43) |
| MIACLYR1 | 475.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) |
| MIACMBR1 | 772.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) |
| MIACALR1 | 888.1 | 78.0 ( 8) | 108.0 ( 12) | 78.0 ( 8) | 213.0 ( 23) | 228.0 ( 25) | 171.0 ( 19) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MIADC*R1 | 710.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 81.0 ( 11) | 63.0 ( 8) | 129.0 ( 18) |
| MIADT*R1 | 905.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 15.0 ( 1) | 15.0 ( 1) | 15.0 ( 1) |
| MIAE*RR1 | 859.8 | 75.0 ( 8) | 75.0 ( 8) | 180.0 ( 20) | 375.0 ( 43) | 327.0 ( 38) | 369.0 ( 42) |
| MIAIADR1 | 710.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 81.0 ( 11) | 63.0 ( 8) | 129.0 ( 18) |
| MIAIA*R1 | 755.0 | 162.0 ( 21) | 174.0 ( 23) | 162.0 ( 21) | 237.0 ( 31) | 249.0 ( 32) | 228.0 ( 30) |
| MIAL*RR1 | 859.8 | 75.0 ( 8) | 75.0 ( 8) | 180.0 ( 20) | 375.0 ( 43) | 327.0 ( 38) | 369.0 ( 42) |
| MIALA*R1 | 1923.7 | 162.0 ( 8) | 174.0 ( 9) | 162.0 ( 8) | 300.0 ( 15) | 288.0 ( 14) | 306.0 ( 15) |
| MIALG*R1 | 859.8 | 75.0 ( 8) | 75.0 ( 8) | 180.0 ( 20) | 375.0 ( 43) | 327.0 ( 38) | 369.0 ( 42) |
| MIAM*YR1 | 506.8 | 78.0 ( 15) | 108.0 ( 21) | 78.0 ( 15) | 195.0 ( 38) | 189.0 ( 37) | 153.0 ( 30) |
| MIAP*LR1 | 795.0 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | 210.0 ( 26) | 165.0 ( 20) | 273.0 ( 34) |
| MIAPITR1 | 793.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 15.0 ( 1) |
| MIAS*RR1 | 2138.0 | 90.0 ( 4) | 120.0 ( 5) | 126.0 ( 5) | 327.0 ( 15) | 324.0 ( 15) | 273.0 ( 12) |
| MIASYLR1 | 841.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 24.0 ( 2) | 9.0 ( 1) |
| MKCC*SR1 | 382.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 4) | 18.0 ( 4) | 18.0 ( 4) |
| MKCDENR1 | 394.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 6) | 30.0 ( 7) | 15.0 ( 3) |
| MKCE*RR1 | 860.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| MKCICTR1 | 76.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 27) | 21.0 ( 27) | 21.0 ( 27) |
| MKCLA*R1 | 1076.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 2) | 36.0 ( 3) | 27.0 ( 2) |
| MKCLG*R1 | 860.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| MKCSF*R1 | 1194.2 | 6.0 ( 0) | 21.0 ( 1) | 12.0 ( 1) | 129.0 ( 10) | 120.0 ( 10) | 120.0 ( 10) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MKCSTLR1 | 118.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 17) | 21.0 ( 17) | 21.0 ( 17) |
| MKECEAR1 | 699.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 4) | 30.0 ( 4) | 30.0 ( 4) |
| MKECETR1 | 119.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 2) | .0 ( 0) |
| MKECTWR1 | 119.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 2) | .0 ( 0) |
| MKEMSBR1 | 170.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) |
| MSPCCAR1 | 706.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 2) | 9.0 ( 1) |
| MSPCENR1 | 510.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 57.0 ( 11) | 57.0 ( 11) | 69.0 ( 13) |
| MSPCTWR1 | 371.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 9.0 ( 2) |
| MSPWFKR1 | 794.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 5) | 42.0 ( 5) | 135.0 ( 16) |
| MSPLAXR1 | 1230.6 | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 213.0 ( 17) | 213.0 ( 17) | 222.0 ( 18) |
| MSPLGAR1 | 794.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 5) | 42.0 ( 5) | 135.0 ( 16) |
| MSPMKER1 | 168.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | .0 ( 0) |
| MSPSEAR1 | 1131.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 282.0 ( 24) | 255.0 ( 22) | 309.0 ( 27) |
| MSPSFOR1 | 1274.8 | 57.0 ( 4) | 57.0 ( 4) | 60.0 ( 4) | 198.0 ( 15) | 270.0 ( 21) | 180.0 ( 14) |
| MSYABQR1 | 793.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 102.0 ( 12) | 99.0 ( 12) | 114.0 ( 14) |
| MSYATLR1 | 288.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | .0 ( 0) | 12.0 ( 4) |
| MSYBALR1 | 747.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 6) | 66.0 ( 8) | 33.0 ( 4) |
| MSYCALR1 | 299.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 4) | 33.0 ( 11) | 18.0 ( 6) |
| MSYIACR1 | 747.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 51.0 ( 6) | 66.0 ( 8) | 33.0 ( 4) |
| MSYIAHR1 | 176.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 23) | 42.0 ( 23) | 30.0 ( 16) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | | LEFT-OS COVERAGE | | NO RIGHT-OS COVERAGE | | ROUTE WIDTH >(SP) | | LEFT-OS >(SP) | | RIGHT-OS >(SP) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) | MILES | (%) |
| MSYLFNR1 | 929.8 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 51.0 | ( 5) | 66.0 | ( 7) | 33.0 | ( 3) |
| MSYLANR1 | 1337.1 | .0 | ( 0) | 21.0 | ( 1) | 12.0 | ( 0) | 111.0 | ( 8) | 99.0 | ( 7) | 114.0 | ( 8) |
| MSYMINR1 | 498.2 | 78.0 | ( 15) | 78.0 | ( 15) | 108.0 | ( 21) | 180.0 | ( 36) | 141.0 | ( 28) | 195.0 | ( 39) |
| MSYORCR1 | 624.9 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 3.0 | ( 0) | 3.0 | ( 0) |
| MSYTFNR1 | 336.2 | .0 | ( 0) | .0 | ( 0) | 45.0 | ( 13) | 201.0 | ( 59) | 162.0 | ( 48) | 204.0 | ( 60) |
| OAKLFNR1 | 2130.4 | .0 | ( 0) | 18.0 | ( 0) | 18.0 | ( 0) | 171.0 | ( 8) | 300.0 | ( 14) | 171.0 | ( 8) |
| OAKLANR1 | 248.6 | .0 | ( 0) | 24.0 | ( 9) | 12.0 | ( 4) | 27.0 | ( 10) | 12.0 | ( 4) | 15.0 | ( 6) |
| OAKORCR1 | 1481.6 | .0 | ( 0) | 3.0 | ( 0) | .0 | ( 0) | 165.0 | ( 11) | 171.0 | ( 11) | 156.0 | ( 10) |
| OAKFCNR1 | 378.9 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 21.0 | ( 5) | 21.0 | ( 5) | 21.0 | ( 5) |
| OAKRNCR1 | 57.8 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 6.0 | ( 10) | 6.0 | ( 10) | .0 | ( 0) |
| OAKSEAR1 | 486.9 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 21.0 | ( 4) | 21.0 | ( 4) | 21.0 | ( 4) |
| OKCLANR1 | 228.2 | .0 | ( 0) | 3.0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 3.0 | ( 0) | 3.0 | ( 0) |
| OKCORCR1 | 499.8 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 33.0 | ( 6) | 15.0 | ( 3) | 39.0 | ( 7) |
| OMABALR1 | 774.1 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 21.0 | ( 2) | 21.0 | ( 2) | 33.0 | ( 4) |
| OMACENR1 | 336.6 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 24.0 | ( 7) | 15.0 | ( 4) | 24.0 | ( 7) |
| OMAIACR1 | 774.1 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 21.0 | ( 2) | 21.0 | ( 2) | 33.0 | ( 4) |
| OMALANR1 | 1056.6 | .0 | ( 0) | 3.0 | ( 0) | 51.0 | ( 4) | 171.0 | ( 16) | 165.0 | ( 15) | 153.0 | ( 14) |
| ONTERCR1 | 1388.9 | .0 | ( 0) | .0 | ( 0) | 30.0 | ( 2) | 36.0 | ( 2) | 45.0 | ( 3) | 36.0 | ( 2) |
| ORDABCR1 | 869.7 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 36.0 | ( 4) | 27.0 | ( 3) | 45.0 | ( 5) |
| ORDBALR1 | 418.6 | .0 | ( 0) | .0 | ( 0) | .0 | ( 0) | 33.0 | ( 7) | 33.0 | ( 7) | 33.0 | ( 7) |

| ROUTE ID | ROUTE MILES | NE ROUTE COVERAGE | NE LEFT-OS COVERAGE | NE RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CRDBCSR1 | 671.8 | .C ( C) | .C ( C) | .C ( C) | 15.C ( 2) | 15.C ( 2) | 3.C ( C) |
| CRDBLBR1 | 309.9 | .C ( C) | .C ( C) | .C ( C) | .C ( C) | 12.C ( 3) | .C ( C) |
| CRDCLTR1 | 422.8 | .C ( C) | .C ( C) | .C ( C) | 30.C ( 7) | 27.C ( 6) | 30.C ( 7) |
| CRDDALR1 | 601.5 | .C ( C) | .C ( C) | .C ( C) | 69.C ( 11) | 60.C ( 9) | 69.C ( 11) |
| CRDDCAR1 | 418.6 | .C ( C) | .C ( C) | .C ( C) | 33.C ( 7) | 33.C ( 7) | 33.C ( 7) |
| CRDDEAR1 | 679.9 | .C ( C) | .C ( C) | .C ( C) | 21.C ( 3) | 21.C ( 3) | 27.C ( 3) |
| CRDEWBR1 | 519.4 | .C ( C) | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) |
| CRDGSCR1 | 408.9 | .C ( C) | .C ( C) | .C ( C) | 24.C ( 5) | 15.C ( 3) | 24.C ( 5) |
| CRDHCLR1 | 679.7 | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) | 9.C ( 1) |
| CRDIADR1 | 418.6 | .C ( C) | .C ( C) | .C ( C) | 33.C ( 7) | 33.C ( 7) | 33.C ( 7) |
| CRDIAWR1 | 679.7 | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) | 9.C ( 1) |
| CRDICTR1 | 424.7 | .C ( C) | .C ( C) | .C ( C) | 42.C ( 9) | 39.C ( 9) | 42.C ( 9) |
| CRDLFWR1 | 519.4 | .C ( C) | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) |
| CRDLASR1 | 1222.9 | 2.C ( 1) | 35.C ( 3) | 42.C ( 3) | 57.C ( 4) | 57.C ( 4) | 60.C ( 4) |
| CRDLAWR1 | 1396.6 | .C ( C) | 30.C ( 2) | .C ( C) | 36.C ( 2) | 36.C ( 2) | 45.C ( 3) |
| CRDLAWR2 | 1399.5 | .C ( C) | 3.C ( C) | .C ( C) | 39.C ( 2) | 33.C ( 2) | 39.C ( 2) |
| CRDLGAR1 | 519.4 | .C ( C) | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) |
| CRDMBYR1 | 628.6 | .C ( C) | .C ( C) | .C ( C) | 3.C ( C) | 3.C ( C) | 3.C ( C) |
| CRDOAKR1 | 1486.2 | .C ( C) | 9.C ( C) | 21.C ( 1) | 177.C ( 11) | 177.C ( 11) | 306.C ( 20) |
| CRDOKCR1 | 503.3 | .C ( C) | .C ( C) | .C ( C) | 33.C ( 6) | 39.C ( 7) | 15.C ( 2) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-CS COVERAGE | NO RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CRCENTR1 | 1396.6 | .0 ( 0) | 30.0 ( 2) | .0 ( 0) | 36.0 ( 2) | 36.0 ( 2) | 45.0 ( 3) |
| CRCFCNR1 | 1411.7 | 6.0 ( 0) | 39.0 ( 2) | 24.0 ( 1) | 183.0 ( 12) | 288.0 ( 20) | 156.0 ( 11) |
| CRCFMNR1 | 1149.7 | .0 ( 0) | .0 ( 0) | 18.0 ( 1) | 18.0 ( 1) | 30.0 ( 2) | 15.0 ( 1) |
| CRCRCLR1 | 459.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| CRCRCCR1 | 357.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 3) | .0 ( 0) |
| CRCSANR1 | 1397.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 417.0 ( 29) | 408.0 ( 29) | 417.0 ( 29) |
| CRCSER1 | 1397.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 471.0 ( 33) | 471.0 ( 33) | 462.0 ( 33) |
| CRCSFCR1 | 1486.2 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 1) | 177.0 ( 11) | 177.0 ( 11) | 306.0 ( 20) |
| CRCSFCR2 | 1493.3 | .0 ( 0) | .0 ( 0) | 12.0 ( 0) | 111.0 ( 7) | 111.0 ( 7) | 114.0 ( 7) |
| CRCSFCR3 | 1495.1 | 24.0 ( 1) | 54.0 ( 3) | 84.0 ( 5) | 246.0 ( 16) | 222.0 ( 14) | 213.0 ( 14) |
| CRCSLCR1 | 1486.2 | .0 ( 0) | 9.0 ( 0) | 21.0 ( 1) | 177.0 ( 11) | 177.0 ( 11) | 306.0 ( 20) |
| CRCSLCR1 | 989.2 | 6.0 ( 0) | 3.0 ( 0) | 81.0 ( 8) | 99.0 ( 10) | 102.0 ( 10) | 141.0 ( 14) |
| CRCSYRR1 | 427.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 21.0 ( 4) | 9.0 ( 2) |
| CRCTFAR1 | 774.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 3.0 ( 0) | 48.0 ( 6) |
| CRCTLLR1 | 411.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 8) | 33.0 ( 8) | 15.0 ( 3) |
| CRCTLSR1 | 1147.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 3) | 30.0 ( 2) | 48.0 ( 4) |
| CRFLFNR1 | 165.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 27) | 27.0 ( 16) | 45.0 ( 27) |
| CRFLGAR1 | 165.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 27) | 27.0 ( 16) | 45.0 ( 27) |
| FBILFNR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | 249.0 ( 31) | 192.0 ( 24) | 303.0 ( 38) |
| FBILGAR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | 249.0 ( 31) | 192.0 ( 24) | 303.0 ( 38) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | NB LEFT-ES COVERAGE | NB RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-SE >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| FDXBGIR1 | 213.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 19) | 51.0 ( 23) | 33.0 ( 15) |
| FDXDENR1 | 768.6 | .0 ( 0) | 15.0 ( 1) | 15.0 ( 1) | 168.0 ( 21) | 186.0 ( 24) | 168.0 ( 21) |
| FDXLAXR1 | 63.7 | .0 ( 0) | 3.0 ( 0) | 6.0 ( 0) | 216.0 ( 34) | 213.0 ( 33) | 216.0 ( 34) |
| FDXSANR1 | 378.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 6) | 24.0 ( 6) | 24.0 ( 6) |
| FDXSFOR1 | 1422.8 | 6.0 ( 0) | 24.0 ( 1) | 39.0 ( 2) | 183.0 ( 12) | 156.0 ( 10) | 288.0 ( 20) |
| FDXSFOR1 | 378.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 6) | 24.0 ( 6) | 24.0 ( 6) |
| FDXSLCR1 | 378.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 6) | 24.0 ( 6) | 24.0 ( 6) |
| FDXSLCR1 | 466.1 | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | 102.0 ( 21) | 102.0 ( 21) | 75.0 ( 16) |
| FHLATLR1 | 491.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 30.0 ( 6) | 36.0 ( 7) |
| FHLBNAR1 | 499.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 75.0 ( 15) | 75.0 ( 15) | 78.0 ( 15) |
| FHLCLTR1 | 308.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 9.0 ( 2) | 18.0 ( 5) |
| FHLFLLR1 | 791.9 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | 213.0 ( 26) | 345.0 ( 43) | 168.0 ( 21) |
| FHLLAXR1 | 1983.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 1) | 51.0 ( 2) | 33.0 ( 1) |
| FHLMIAR1 | 791.9 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | 213.0 ( 26) | 345.0 ( 43) | 168.0 ( 21) |
| FHLSFOR1 | 2093.6 | .0 ( 0) | 9.0 ( 0) | 18.0 ( 0) | 150.0 ( 7) | 141.0 ( 6) | 156.0 ( 7) |
| FHLSTLR1 | 618.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) |
| FHXABQR1 | 200.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 4) | 9.0 ( 4) | 9.0 ( 4) |
| FHXCALR1 | 665.8 | .0 ( 0) | .0 ( 0) | 18.0 ( 2) | 96.0 ( 14) | 90.0 ( 13) | 78.0 ( 11) |
| FHXDENR1 | 423.1 | .0 ( 0) | 15.0 ( 3) | 3.0 ( 0) | 48.0 ( 11) | 36.0 ( 8) | 48.0 ( 11) |
| FHXELPR1 | 216.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 8) | 30.0 ( 13) | 18.0 ( 8) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-ES COVERAGE MILES (%) | NO RIGHT-ES COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-ES >(SP) MILES (%) | RIGHT-ES >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| FHXIAHA1 | 793.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 42.0 ( 5) | 72.0 ( 9) | 42.0 ( 5) |
| FHX_FHA1 | 1781.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 4) | 75.0 ( 4) | 114.0 ( 6) |
| FHXLASA1 | 135.4 | .0 ( 0) | 6.0 ( 4) | .0 ( 0) | 3.0 ( 2) | 3.0 ( 2) | 12.0 ( 8) |
| FHXLAXA1 | 204.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| FHXMDWA1 | 1153.3 | .0 ( 0) | 18.0 ( 1) | .0 ( 0) | 18.0 ( 1) | 15.0 ( 1) | 18.0 ( 1) |
| FHXONTA1 | 204.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| FHXORCA1 | 1153.3 | .0 ( 0) | 18.0 ( 1) | .0 ( 0) | 18.0 ( 1) | 15.0 ( 1) | 18.0 ( 1) |
| FHXSFCA1 | 452.7 | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | 15.0 ( 3) | 12.0 ( 2) | 36.0 ( 7) |
| FHXSNA1 | 204.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| FHXSTLA1 | 1010.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 7) | 66.0 ( 6) | 117.0 ( 11) |
| FITATLA1 | 366.7 | .0 ( 0) | .0 ( 0) | 12.0 ( 3) | 57.0 ( 15) | 57.0 ( 15) | 48.0 ( 13) |
| FITBOLA1 | 263.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 7) | 21.0 ( 7) | 21.0 ( 7) |
| FITBNA1 | 314.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 15) | 57.0 ( 18) | 57.0 ( 18) |
| FITBOSA1 | 348.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 6) | 21.0 ( 6) | 21.0 ( 6) |
| FITCLTA1 | 232.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 6) | 15.0 ( 6) | 6.0 ( 2) |
| FITE_SA1 | 180.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | .0 ( 0) |
| FITFLLA1 | 792.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 21.0 ( 2) | 6.0 ( 0) |
| FIT_FKA1 | 180.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | .0 ( 0) |
| FITLCAA1 | 180.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | .0 ( 0) |
| FITMIAA1 | 792.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 21.0 ( 2) | 6.0 ( 0) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | NB LEFT-PS COVERAGE | NB RIGHT-PS COVERAGE | ROUTE WIDTH >(SP) | LEFT-PS >(SP) | RIGHT-PS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| PITSCPR1 | 202.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 23) | 48.0 ( 23) | 42.0 ( 20) |
| PNSATLR1 | 147.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 10) | .0 ( 0) |
| RDLATLR1 | 220.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | .0 ( 0) | 12.0 ( 5) |
| RDLCRCR1 | 461.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| RNCLASR1 | 214.2 | .0 ( 0) | 45.0 ( 21) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| RSCCRCR1 | 362.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) |
| SANJFKR1 | 2014.5 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 39.0 ( 1) | 36.0 ( 1) | 24.0 ( 1) |
| SANCRCR1 | 1392.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 417.0 ( 29) | 417.0 ( 29) | 408.0 ( 29) |
| SATLERR1 | 342.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 20) | 81.0 ( 23) | 72.0 ( 20) |
| SATLAXR1 | 936.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 7) | 84.0 ( 8) | 72.0 ( 7) |
| SCFCCAR1 | 308.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 108.0 ( 34) | 75.0 ( 24) | 114.0 ( 36) |
| SCFLGAR1 | 484.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 9) | 54.0 ( 11) | 45.0 ( 9) |
| SCFMEMR1 | 188.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 78.0 ( 41) | 66.0 ( 35) | 75.0 ( 39) |
| SCFFITR1 | 203.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 14) | 30.0 ( 14) | 39.0 ( 19) |
| SEABALR1 | 1920.6 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | 267.0 ( 13) | 315.0 ( 16) | 249.0 ( 12) |
| SEACENR1 | 800.9 | .0 ( 0) | 39.0 ( 4) | 60.0 ( 7) | 222.0 ( 27) | 225.0 ( 28) | 222.0 ( 27) |
| SEAIADR1 | 1920.6 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | 267.0 ( 13) | 315.0 ( 16) | 249.0 ( 12) |
| SEALFKR1 | 2001.5 | .0 ( 0) | 18.0 ( 0) | 3.0 ( 0) | 708.0 ( 35) | 780.0 ( 38) | 648.0 ( 32) |
| SEALAXR1 | 735.9 | .0 ( 0) | 3.0 ( 0) | 6.0 ( 0) | 216.0 ( 29) | 213.0 ( 28) | 216.0 ( 29) |
| SEAMSPR1 | 1126.5 | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | 267.0 ( 23) | 294.0 ( 26) | 240.0 ( 21) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | NO LEFT-ES COVERAGE | NO RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SEACAKR1 | 487.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 4) | 24.0 ( 4) | 24.0 ( 4) |
| SEACRDR1 | 1399.4 | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 222.0 ( 15) | 228.0 ( 16) | 246.0 ( 17) |
| SEASPER1 | 487.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 4) | 24.0 ( 4) | 24.0 ( 4) |
| SEAS_CR1 | 487.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 24.0 ( 4) | 24.0 ( 4) | 24.0 ( 4) |
| SFCAEGR1 | 666.0 | 18.0 ( 1) | 48.0 ( 7) | 12.0 ( 1) | 24.0 ( 3) | 6.0 ( 0) | 30.0 ( 4) |
| SFCATLR1 | 1750.4 | .0 ( 0) | 6.0 ( 0) | 12.0 ( 0) | 273.0 ( 15) | 294.0 ( 16) | 282.0 ( 16) |
| SFCBCIR1 | 348.2 | 48.0 ( 13) | 42.0 ( 12) | 54.0 ( 15) | 42.0 ( 12) | 51.0 ( 14) | 36.0 ( 10) |
| SFCBCSR1 | 2248.9 | 345.0 ( 15) | 414.0 ( 18) | 396.0 ( 17) | 615.0 ( 27) | 699.0 ( 31) | 435.0 ( 19) |
| SFCCAL1 | 1159.6 | 18.0 ( 1) | 48.0 ( 4) | 12.0 ( 1) | 75.0 ( 6) | 66.0 ( 5) | 90.0 ( 7) |
| SFCDEN1 | 729.4 | 18.0 ( 1) | 18.0 ( 2) | 9.0 ( 1) | 102.0 ( 13) | 102.0 ( 13) | 96.0 ( 13) |
| SFCDTAR1 | 1698.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 165.0 ( 9) | 171.0 ( 10) | 156.0 ( 9) |
| SFCEWRR1 | 2130.4 | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 171.0 ( 8) | 300.0 ( 14) | 171.0 ( 8) |
| SFCGEGR1 | 535.8 | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | 189.0 ( 35) | 186.0 ( 34) | 192.0 ( 35) |
| SFCIACR1 | 2002.1 | .0 ( 0) | 3.0 ( 0) | 21.0 ( 1) | 165.0 ( 8) | 162.0 ( 8) | 138.0 ( 6) |
| SFCIAHR1 | 1307.5 | .0 ( 0) | 24.0 ( 1) | 12.0 ( 0) | 123.0 ( 9) | 99.0 ( 7) | 108.0 ( 8) |
| SFC_FWR1 | 2130.4 | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 171.0 ( 8) | 300.0 ( 14) | 171.0 ( 8) |
| SFC_FWR2 | 2119.7 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 132.0 ( 6) | 138.0 ( 6) | 132.0 ( 6) |
| SFC_FWR3 | 2138.6 | 24.0 ( 1) | 87.0 ( 4) | 60.0 ( 2) | 261.0 ( 12) | 231.0 ( 10) | 237.0 ( 11) |
| SFCLASR1 | 248.6 | .0 ( 0) | 24.0 ( 9) | 12.0 ( 4) | 27.0 ( 10) | 12.0 ( 4) | 15.0 ( 6) |
| SFCLGAR1 | 2130.4 | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 171.0 ( 8) | 300.0 ( 14) | 171.0 ( 8) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | NB LEFT-ES COVERAGE | NB RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SFCMDAR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 165.0 ( 11) | 171.0 ( 11) | 156.0 ( 10) |
| SFCMIAR1 | 2132.4 | 90.0 ( 4) | 126.0 ( 5) | 120.0 ( 5) | 315.0 ( 14) | 261.0 ( 12) | 333.0 ( 15) |
| SFCMKCR1 | 1194.9 | 6.0 ( 0) | 3.0 ( 0) | 24.0 ( 2) | 135.0 ( 11) | 126.0 ( 10) | 126.0 ( 10) |
| SFCMSFR1 | 1278.1 | 57.0 ( 4) | 60.0 ( 4) | 54.0 ( 4) | 177.0 ( 13) | 159.0 ( 12) | 249.0 ( 19) |
| SFCORDR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 165.0 ( 11) | 171.0 ( 11) | 156.0 ( 10) |
| SFCORDR2 | 1482.2 | .0 ( 0) | 18.0 ( 1) | 18.0 ( 1) | 171.0 ( 11) | 300.0 ( 20) | 171.0 ( 11) |
| SFCPDXR1 | 378.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 21.0 ( 5) | 21.0 ( 5) |
| SFCPWLR1 | 2090.8 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 165.0 ( 7) | 171.0 ( 8) | 156.0 ( 7) |
| SFCPWXR1 | 457.6 | .0 ( 0) | 6.0 ( 1) | .0 ( 0) | .0 ( 0) | 12.0 ( 2) | .0 ( 0) |
| SFCRNCR1 | 57.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 10) | 6.0 ( 10) | .0 ( 0) |
| SFCSEAR1 | 488.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 21.0 ( 4) | 21.0 ( 4) |
| SFCSLCR1 | 415.7 | 21.0 ( 5) | 66.0 ( 15) | 30.0 ( 7) | 87.0 ( 20) | 78.0 ( 18) | 87.0 ( 20) |
| SFCSTLR1 | 1403.3 | 6.0 ( 0) | 3.0 ( 0) | 24.0 ( 1) | 165.0 ( 11) | 147.0 ( 10) | 153.0 ( 10) |
| SHVWAN1 | 101.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 27.0 ( 26) | 27.0 ( 26) | 36.0 ( 35) |
| SHVMEMR1 | 160.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 11) | 27.0 ( 16) | 18.0 ( 11) |
| SWCDENR1 | 729.4 | 12.0 ( 1) | 18.0 ( 2) | 9.0 ( 1) | 102.0 ( 13) | 102.0 ( 13) | 96.0 ( 13) |
| SWCWFKR1 | 2130.4 | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 171.0 ( 8) | 300.0 ( 14) | 171.0 ( 8) |
| SWCLASR1 | 248.6 | .0 ( 0) | 24.0 ( 9) | 12.0 ( 4) | 27.0 ( 10) | 12.0 ( 4) | 15.0 ( 6) |
| SWCORDR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 165.0 ( 11) | 171.0 ( 11) | 156.0 ( 10) |
| SWCPDXR1 | 378.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 21.0 ( 5) | 21.0 ( 5) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SLCSEAR1 | 488.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 21.0 ( 4) | 21.0 ( 4) |
| SLCBCIR1 | 166.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 32) | 54.0 ( 32) | 54.0 ( 32) |
| SLCCENR1 | 244.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 48.0 ( 19) | 48.0 ( 19) | 48.0 ( 19) |
| SLCLASR1 | 233.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 23) | 54.0 ( 23) | 54.0 ( 23) |
| SLCLAXR1 | 412.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 30.0 ( 7) | 30.0 ( 7) | 42.0 ( 10) |
| SLCERCR1 | 986.4 | 6.0 ( 0) | 78.0 ( 7) | 3.0 ( 0) | 96.0 ( 9) | 138.0 ( 13) | 99.0 ( 10) |
| SLCPCXR1 | 461.3 | .0 ( 0) | 15.0 ( 3) | .0 ( 0) | 102.0 ( 22) | 75.0 ( 16) | 102.0 ( 22) |
| SLCSFCR1 | 411.9 | 21.0 ( 5) | 24.0 ( 5) | 63.0 ( 15) | 75.0 ( 18) | 75.0 ( 18) | 66.0 ( 16) |
| STLATLR1 | 333.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) |
| STLBALR1 | 526.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 7) | 39.0 ( 7) | 42.0 ( 7) |
| STLBCSR1 | 824.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| STLCALR1 | 397.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 63.0 ( 15) | 42.0 ( 10) | 69.0 ( 17) |
| STLCCAR1 | 526.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 7) | 39.0 ( 7) | 42.0 ( 7) |
| STLCENR1 | 599.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 5) | 39.0 ( 6) | 24.0 ( 4) |
| STLEXRR1 | 689.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) |
| STLIACR1 | 526.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 7) | 39.0 ( 7) | 42.0 ( 7) |
| STLIAHR1 | 493.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 9.0 ( 1) |
| STLLFKR1 | 689.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) |
| STLLAXR1 | 1272.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 102.0 ( 8) | 132.0 ( 10) | 72.0 ( 5) |
| STLLCAR1 | 689.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-ES COVERAGE MILES (%) | NO RIGHT-ES COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-ES >(SP) MILES (%) | RIGHT-ES >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| STLMIAR1 | 839.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 9.0 ( 1) | 24.0 ( 2) |
| STLMKCR1 | 118.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 7) | 18.0 ( 15) | 9.0 ( 7) |
| STLPHLR1 | 625.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) |
| STLPHXR1 | 1007.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 72.0 ( 7) | 105.0 ( 10) | 63.0 ( 6) |
| STLSFOR1 | 1399.8 | 6.0 ( 0) | 21.0 ( 1) | 12.0 ( 0) | 138.0 ( 9) | 129.0 ( 9) | 129.0 ( 9) |
| STLTULR1 | 218.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 17) | 39.0 ( 17) | 48.0 ( 22) |
| SYRCTAR1 | 237.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 6.0 ( 2) | 15.0 ( 6) |
| SYRERCR1 | 428.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 6.0 ( 1) | 15.0 ( 3) |
| TEBCLER1 | 259.8 | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| TEBGSCR1 | 296.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 18.0 ( 6) | 9.0 ( 3) |
| TPAATLR1 | 265.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 4) | 27.0 ( 10) | 3.0 ( 1) |
| TPACLER1 | 718.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 21.0 ( 2) | 3.0 ( 0) |
| TPACTAR1 | 766.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 5) | 54.0 ( 7) | 36.0 ( 4) |
| TPAEXAR1 | 769.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 4) | 24.0 ( 3) | 60.0 ( 7) |
| TPALPKR1 | 769.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 4) | 24.0 ( 3) | 60.0 ( 7) |
| TPAMSYR1 | 340.2 | .0 ( 0) | 45.0 ( 13) | .0 ( 0) | 210.0 ( 61) | 213.0 ( 62) | 168.0 ( 49) |
| TPASCCR1 | 776.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 1) | 27.0 ( 3) | 3.0 ( 0) |
| TULMKCR1 | 104.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 20) | 6.0 ( 5) |
| TULSRCR1 | 407.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 8) | 15.0 ( 3) | 33.0 ( 8) |
| TULSTLR1 | 215.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 25) | 54.0 ( 25) | 42.0 ( 19) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-ES COVERAGE MILES (%) | NO RIGHT-ES COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-ES >(SP) MILES (%) | RIGHT-ES >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| TLSAEL-1 | 193.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) |
| TLSELP-1 | 143.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 8) | 12.0 ( 8) | 3.0 ( 2) |
| TLSERC-1 | 1157.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 36.0 ( 3) | 48.0 ( 4) | 30.0 ( 2) |
| TYSCCAR1 | 280.2 | .0 ( 0) | 16.0 ( 6) | .0 ( 0) | 66.0 ( 23) | 69.0 ( 24) | 66.0 ( 23) |
| TOTAL | 490711.5 | 4786.0 ( 0) | 7233.0 ( 1) | 7641.0 ( 1) | 48919.8 ( 10) | 52109.8 ( 10) | 51428.8 ( 10) |

AD-A036 388 NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER ATL--ETC F/G 17/7
NAVAID SUPPORT OF HIGH-ALTITUDE AREA NAVIGATION ROUTES.(U)
FEB 77 A G HALVERSON, F B WOODSON

UNCLASSIFIED FAA-NA-76-49 FAA/RD-76-210 NL

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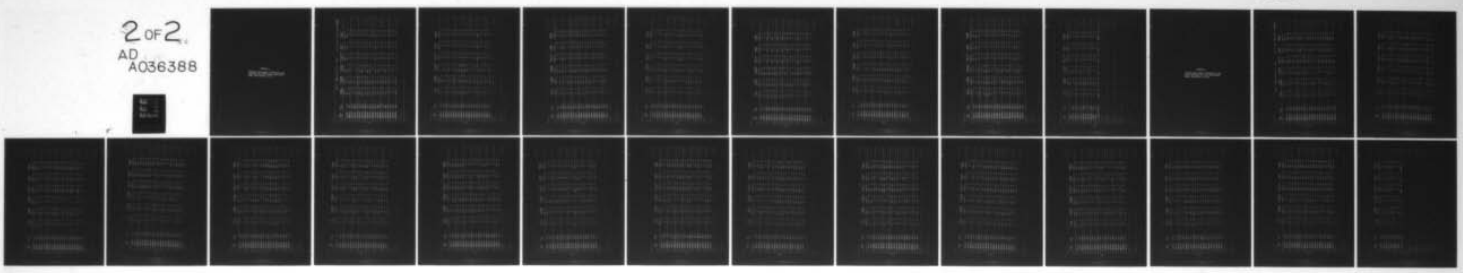

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## APPENDIX B

PROBLEM ROUTE SUMMARY, HYPOTHETICAL RNAV STRUCTURE, RNAV TASK FORCE CROSS-COURSE ERROR, ROUTE WIDTH = $\pm$4 NMI

****** PROBLEM ROUTE SUMMARY ****** (SP)= 4.0 MILES ; OFFSET DIST. = 8.0MILES

| ROUTE ID | ROUTE MILES | NC ROUTE COVERAGE MILES (%) | NC LEFT-OS COVERAGE MILES (%) | NC RIGHT-OS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-OS >(SP) MILES (%) | RIGHT-OS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| ABGMIAR1 | 1374.5 | 78.0 ( 5) | 78.0 ( 5) | 108.0 ( 7) | 21.0 ( 1) | 21.0 ( 1) | 15.0 ( 1) |
| ABGSFCR1 | 671.0 | 12.0 ( 1) | 12.0 ( 1) | 33.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ATLSFCR1 | 1754.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BALLAXR1 | 1885.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCLMIAR1 | 950.9 | 75.0 ( 7) | 150.0 ( 15) | 75.0 ( 7) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCISFCR1 | 348.9 | 48.0 ( 13) | 54.0 ( 15) | 36.0 ( 10) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCSFLLR1 | 1018.2 | 192.0 ( 18) | 219.0 ( 21) | 192.0 ( 18) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCSLAXR1 | 2162.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCSMIAR1 | 1018.2 | 192.0 ( 18) | 219.0 ( 21) | 192.0 ( 18) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BCSSFCR1 | 2243.6 | 315.0 ( 14) | 321.0 ( 14) | 363.0 ( 16) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CLELAXR1 | 1680.6 | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CALMIAR1 | 888.9 | 78.0 ( 8) | 78.0 ( 8) | 108.0 ( 12) | 21.0 ( 2) | 21.0 ( 2) | 15.0 ( 1) |
| CALSFCR1 | 1162.4 | 12.0 ( 1) | 12.0 ( 1) | 33.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENBCIR1 | 474.9 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENLASR1 | 446.3 | 24.0 ( 5) | 24.0 ( 5) | 30.0 ( 6) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENLAXR1 | 632.4 | 6.0 ( 0) | 18.0 ( 2) | 33.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENFCXR1 | 770.1 | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENFPXR1 | 426.0 | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENSEAR1 | 798.1 | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENSFCR1 | 721.4 | 3.0 ( 0) | 21.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | NB ROUTE COVERAGE | NB LEFT-OS COVERAGE | NB RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CENSUS1 | 721.4 | 3.0 ( 0) | 21.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CSPLAN1 | 1155.6 | .0 ( 0) | 3.0 ( 0) | 39.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CTHLAN1 | 1616.1 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EWRFLL1 | 847.3 | 75.0 ( 8) | 150.0 ( 17) | 75.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EWRLAN2 | 2031.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EWRMIA1 | 847.0 | 39.0 ( 4) | 65.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EWRSFO1 | 2123.0 | .0 ( 0) | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FLLBOS1 | 1020.5 | 177.0 ( 17) | 177.0 ( 17) | 213.0 ( 20) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FLLEWR1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 192.0 ( 22) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FLLJFK1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 192.0 ( 22) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FLLPHL1 | 795.0 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| GEGSFO1 | 536.5 | .0 ( 0) | 18.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| IADLAN1 | 1885.9 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| IADSFO1 | 1999.7 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| IAHMIA1 | 748.9 | 162.0 ( 21) | 162.0 ( 21) | 177.0 ( 23) | 36.0 ( 4) | 36.0 ( 4) | 24.0 ( 3) |
| IAHSFO1 | 1312.4 | .0 ( 0) | 12.0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| JFKFLL1 | 847.3 | 75.0 ( 8) | 150.0 ( 17) | 75.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| JFKLAS1 | 1846.7 | .0 ( 0) | 3.0 ( 0) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| JFKLAX2 | 2031.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| JFKMIA1 | 847.3 | 75.0 ( 8) | 150.0 ( 17) | 75.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-OS COVERAGE MILES (%) | NO RIGHT-OS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-OS >(SP) MILES (%) | RIGHT-OS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| _FKCAKR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| _FKPBIR1 | 791.0 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| _FKEEAR1 | 1998.5 | .0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| _FKSFR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| _FKSFR2 | 2125.3 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| _FKSFR3 | 2141.1 | 24.0 ( 1) | 42.0 ( 1) | 63.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| _FKS_CR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASCEAR1 | 452.2 | 6.0 ( 1) | 45.0 ( 9) | 24.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAS_FER1 | 1841.7 | .0 ( 0) | 6.0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASCAKR1 | 252.2 | .0 ( 0) | 12.0 ( 4) | 15.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASCFCR1 | 1220.1 | 6.0 ( 1) | 30.0 ( 2) | 24.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASFAER1 | 210.8 | .0 ( 0) | 3.0 ( 1) | 12.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASSFCR1 | 252.2 | .0 ( 0) | 12.0 ( 4) | 15.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASS_CR1 | 252.2 | .0 ( 0) | 12.0 ( 4) | 15.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXBALR1 | 1883.7 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXBCSR1 | 2162.5 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCLER1 | 1674.3 | .0 ( 0) | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCEAR1 | 629.9 | .0 ( 0) | 33.0 ( 5) | 9.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCSAR1 | 1152.8 | .0 ( 0) | 39.0 ( 3) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCTAR1 | 1612.5 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | LEFT-DS COVERAGE | RIGHT-DS COVERAGE | ROUTE WIDTH >(SP) | LEFT-DS >(SP) | RIGHT-DS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| LAXEARR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXIADR1 | 1883.7 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXLBRR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXLGAR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXMDWR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXMIAR1 | 1919.0 | 162.0 ( 8) | 162.0 ( 8) | 177.0 ( 9) | 36.0 ( 1) | 36.0 ( 1) | 24.0 ( 1) |
| LAXMSYR1 | 1336.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXOMAR1 | 1049.8 | .0 ( 0) | 39.0 ( 3) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXORDR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXORDR2 | 1393.8 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXPDXR1 | 645.7 | 3.0 ( 0) | .0 ( 0) | 15.0 ( 2) | 27.0 ( 4) | 27.0 ( 4) | 15.0 ( 2) |
| LAXSEAR1 | 736.0 | 3.0 ( 0) | .0 ( 0) | 15.0 ( 2) | 27.0 ( 3) | 27.0 ( 3) | 15.0 ( 2) |
| LAXSTLR1 | 1278.2 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LGALAXR2 | 2031.0 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LGAMIAR1 | 847.0 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LGAPBIR1 | 791.0 | 36.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LGASFOR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MDWLAXR1 | 1396.6 | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MDWSFOR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIAABQR1 | 1381.9 | 72.0 ( 5) | 108.0 ( 7) | 78.0 ( 5) | 21.0 ( 1) | 15.0 ( 1) | 21.0 ( 1) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-CS COVERAGE | NO RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MIABCLR1 | 959.7 | 75.0 ( 7) | 75.0 ( 7) | 192.0 ( 20) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIABESR1 | 1,20.5 | 177.0 ( 17) | 177.0 ( 17) | 213.0 ( 20) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIACALR1 | 888.1 | 7.0 ( 8) | 108.0 ( 12) | 78.0 ( 8) | 21.0 ( 2) | 15.0 ( 1) | 21.0 ( 2) |
| MIAE.6R1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 192.0 ( 22) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIAIABR1 | 755.0 | 162.0 ( 21) | 177.0 ( 23) | 162.0 ( 21) | 36.0 ( 4) | 24.0 ( 3) | 36.0 ( 4) |
| MIA.FAR1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 192.0 ( 22) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIALABR1 | 1923.7 | 162.0 ( 8) | 177.0 ( 9) | 162.0 ( 8) | 36.0 ( 1) | 24.0 ( 1) | 36.0 ( 1) |
| MIALCAR1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 192.0 ( 22) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIAMEYR1 | 506.8 | 75.0 ( 15) | 108.0 ( 21) | 78.0 ( 15) | 21.0 ( 4) | 15.0 ( 2) | 21.0 ( 4) |
| MIAPMLR1 | 755.0 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MIASPER1 | 2138.0 | 90.0 ( 4) | 120.0 ( 5) | 111.0 ( 5) | 21.0 ( 0) | 15.0 ( 0) | 21.0 ( 0) |
| MNCSPER1 | 1194.2 | 6.0 ( 0) | 21.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MSPSPER1 | 1274.8 | 57.0 ( 4) | 42.0 ( 3) | 63.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MSYLABR1 | 1337.1 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MSYMIAR1 | 498.2 | 78.0 ( 15) | 78.0 ( 15) | 108.0 ( 21) | 21.0 ( 4) | 21.0 ( 4) | 15.0 ( 3) |
| MSYTPAR1 | 336.2 | .0 ( 0) | .0 ( 0) | 84.0 ( 24) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| OAK.FAR1 | 2130.4 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| OAKLABR1 | 248.6 | .0 ( 0) | 15.0 ( 6) | 12.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| OPALABR1 | 1056.6 | .0 ( 0) | 3.0 ( 0) | 39.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ONTCHCR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ERCLASR1 | 1222.9 | 6.0 ( 1) | 24.0 ( 1) | 30.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCLAXR1 | 1396.6 | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCLAXR2 | 1399.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCOAKR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCONTR1 | 1396.6 | .0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCRCXR1 | 1411.7 | 6.0 ( 0) | 30.0 ( 2) | 21.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCSFCR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCSFCR3 | 1495.1 | 9.0 ( 1) | 42.0 ( 2) | 63.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCS_CR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCSLCR1 | 589.2 | 6.0 ( 0) | 3.0 ( 0) | 39.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBILFKR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBILGAR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 69.0 ( 8) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FCXLAXR1 | 634.7 | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 27.0 ( 4) | 27.0 ( 4) | 24.0 ( 3) |
| FCXERCR1 | 1422.8 | 6.0 ( 0) | 21.0 ( 1) | 30.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FCXSLCR1 | 466.1 | .0 ( 0) | .0 ( 0) | 15.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBLFLLR1 | 791.9 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBLMIAR1 | 791.9 | 39.0 ( 4) | 69.0 ( 8) | 39.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBXCENR1 | 423.1 | .0 ( 0) | 15.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FACLASR1 | 214.2 | .0 ( 0) | 30.0 ( 14) | 3.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SEACENR1 | 800.8 | .0 ( 0) | 5.0 ( 1) | 18.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SEA_FKR1 | 2001.5 | .0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| SEALARR1 | 735.9 | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 27.0 ( 3) | 27.0 ( 3) | 24.0 ( 3) |
| SFCABGR1 | 666.0 | 18.0 ( 1) | 33.0 ( 4) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCATLR1 | 1750.4 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCBCIR1 | 348.2 | 48.0 ( 13) | 36.0 ( 10) | 54.0 ( 15) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCBCSR1 | 2248.9 | 348.0 ( 15) | 369.0 ( 16) | 333.0 ( 14) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCDALR1 | 1159.6 | 12.0 ( 1) | 33.0 ( 2) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCDENR1 | 729.4 | 9.0 ( 1) | 12.0 ( 1) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCELPR1 | 2130.4 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCGEOR1 | 535.8 | .0 ( 0) | .0 ( 0) | 18.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCIADR1 | 2002.1 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCIAHR1 | 1307.5 | .0 ( 0) | 15.0 ( 1) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFC_FKR1 | 2130.4 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFC_FKR3 | 2138.6 | 24.0 ( 1) | 63.0 ( 2) | 42.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCLASR1 | 248.6 | .0 ( 0) | 15.0 ( 6) | 12.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCLGAR1 | 2130.4 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCMIAR1 | 2132.4 | 90.0 ( 4) | 111.0 ( 5) | 120.0 ( 5) | 21.0 ( 0) | 21.0 ( 0) | 15.0 ( 0) |
| SFCMKER1 | 1194.9 | 6.0 ( 0) | .0 ( 0) | 21.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCMSPR1 | 1278.1 | 57.0 ( 4) | 63.0 ( 4) | 42.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFCORDR2 | 1482.2 | .0 ( 0) | 15.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SFESLCR1 | 415.7 | 61.0 ( 5) | 60.0 ( 14) | 12.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SFESTLR1 | 1403.3 | 6.0 ( 0) | .0 ( 0) | 21.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCDEXR1 | 729.6 | 9.0 ( 1) | 12.0 ( 1) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCLFSR1 | 2130.6 | .0 ( 0) | 15.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCLASR1 | 248.6 | .0 ( 0) | 15.0 ( 6) | 12.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCORDR1 | 986.6 | 6.0 ( 0) | 39.0 ( 3) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCPDXR1 | 461.3 | .0 ( 0) | 15.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SLCSFCR1 | 411.9 | 61.0 ( 5) | 12.0 ( 2) | 60.0 ( 14) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| STLLAXR1 | 1272.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| STLSFCR1 | 1399.8 | 6.0 ( 0) | 21.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| TRAMSYR1 | 340.2 | .0 ( 0) | 84.0 ( 24) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| TOTAL | 182671.2 | 4362.0 ( 2) | 6075.0 ( 3) | 6405.0 ( 3) | 426.0 ( 0) | 378.0 ( 0) | 348.0 ( 0) |

# APPENDIX C

PROBLEM ROUTE SUMMARY, HYPOTHETICAL RNAV ROUTE STRUCTURE, AC 90-45A CROSS-COURSE ERROR, ROUTE WIDTH = $\pm$5 NMI

****** PROBLEM ROUTE SUMMARY ****** (SP)= 5.0 MILES ; OFFSET DIST. =10.0MILES

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ABGATLR1 | 1017.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 9.0 ( 0) | 18.0 ( 1) |
| ABGCALR1 | 401.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 2) | 18.0 ( 4) | 9.0 ( 2) |
| ABGCENR1 | 205.5 | .0 ( 0) | .0 ( 0) | 27.0 ( 13) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| ABGMCCR1 | 667.8 | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 30.0 ( 4) | 30.0 ( 4) | 21.0 ( 3) |
| ABGMCWR1 | 870.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ABGMIAR1 | 1374.5 | 75.0 ( 5) | 78.0 ( 5) | 126.0 ( 9) | 78.0 ( 5) | 87.0 ( 6) | 60.0 ( 4) |
| ABGMSVR1 | 792.0 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 18.0 ( 2) | 9.0 ( 1) |
| ABGORDR1 | 870.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ABGSFOR1 | 671.0 | 12.0 ( 1) | 18.0 ( 2) | 36.0 ( 5) | 3.0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| AMACALR1 | 185.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 11) | 9.0 ( 4) | 21.0 ( 11) |
| ATLABGR1 | 1020.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 18.0 ( 1) | 9.0 ( 0) |
| ATLBLER1 | 530.9 | .0 ( 0) | 15.0 ( 2) | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | 6.0 ( 1) |
| ATLCLER1 | 395.0 | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ATLCALR1 | 554.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| ATLLAXR1 | 1590.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 18.0 ( 1) | 9.0 ( 0) |
| ATLMEMR1 | 204.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 8) | 18.0 ( 8) | 27.0 ( 13) |
| ATLPITR1 | 370.4 | .0 ( 0) | 15.0 ( 4) | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | 6.0 ( 1) |
| ATLSFOR1 | 1754.9 | .0 ( 0) | 21.0 ( 1) | 21.0 ( 1) | 36.0 ( 2) | 39.0 ( 2) | 36.0 ( 2) |
| BALBNAR1 | 390.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 21.0 ( 5) | 21.0 ( 5) |
| BALCALR1 | 936.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 5) | 54.0 ( 5) | 54.0 ( 5) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-ES COVERAGE | NO RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| BALLAAR1 | 1885.9 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| BALMIAR1 | 703.2 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| BALSEAR1 | 1921.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 27.0 ( 1) |
| BDLMIAR1 | 950.9 | 78.0 ( 7) | 228.0 ( 23) | 75.0 ( 7) | 60.0 ( 6) | 162.0 ( 17) | 45.0 ( 4) |
| BHMLGAR1 | 650.7 | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| BHMMEAR1 | 93.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 3) | .0 ( 0) | .0 ( 0) | 3.0 ( 3) |
| BNAEALR1 | 387.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 4) | 6.0 ( 1) | 18.0 ( 4) |
| BNADALR1 | 458.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 7) | 33.0 ( 7) | 33.0 ( 7) |
| BNADCAR1 | 387.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 4) | 6.0 ( 1) | 18.0 ( 4) |
| BNAMEMR1 | 87.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 33.0 ( 37) | 33.0 ( 37) | 33.0 ( 37) |
| BNAPELR1 | 503.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 3) | 18.0 ( 3) | 6.0 ( 1) |
| BNAPITR1 | 312.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | 15.0 ( 4) | 15.0 ( 4) |
| BOICEAR1 | 469.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 39.0 ( 8) | 51.0 ( 10) | 39.0 ( 8) |
| BOIFCAR1 | 209.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 4) |
| BOISFOR1 | 348.9 | 48.0 ( 13) | 69.0 ( 19) | 36.0 ( 10) | .0 ( 0) | 6.0 ( 1) | 9.0 ( 2) |
| BOISLOR1 | 164.0 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| BOSDALR1 | 1270.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| BOSFLLR1 | 1018.2 | 198.0 ( 19) | 267.0 ( 26) | 192.0 ( 18) | 240.0 ( 23) | 345.0 ( 33) | 240.0 ( 23) |
| BOSLAAR1 | 2162.0 | .0 ( 0) | 12.0 ( 0) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| BOSMIAR1 | 1018.2 | 198.0 ( 19) | 267.0 ( 26) | 192.0 ( 18) | 240.0 ( 23) | 345.0 ( 33) | 240.0 ( 23) |

| ROUTE ID | ROUTE MILES | NS ROUTE COVERAGE | NS LEFT-OS COVERAGE | NS RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| BCSSFCR1 | 2243.5 | 315.0 ( 14) | 336.0 ( 14) | 414.0 ( 18) | 99.0 ( 4) | 87.0 ( 3) | 279.0 ( 12) |
| BLFATLR1 | 529.2 | .0 ( 0) | .0 ( 0) | 15.0 ( 2) | 6.0 ( 1) | 6.0 ( 1) | 6.0 ( 1) |
| CLEATLR1 | 392.1 | .0 ( 0) | 21.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CLELAXR1 | 1683.6 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CVGICTR1 | 250.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 2) | .0 ( 0) | 6.0 ( 2) |
| DALABGR1 | 406.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| DALAMAR1 | 184.5 | .0 ( 0) | 6.0 ( 3) | .0 ( 0) | 3.0 ( 1) | 3.0 ( 1) | 3.0 ( 1) |
| DALATLR1 | 550.5 | .0 ( 0) | 15.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| DALBALR1 | 93.6 | .0 ( 0) | 21.0 ( 2) | .0 ( 0) | 33.0 ( 3) | 33.0 ( 3) | 27.0 ( 2) |
| DALBNAR1 | 457.2 | .0 ( 0) | 21.0 ( 4) | .0 ( 0) | 15.0 ( 3) | 15.0 ( 3) | 21.0 ( 4) |
| DALBCSR1 | 1277.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| DALCCAR1 | 93.6 | .0 ( 0) | 21.0 ( 2) | .0 ( 0) | 33.0 ( 3) | 33.0 ( 3) | 27.0 ( 2) |
| DALELBR1 | 391.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) | 6.0 ( 1) |
| DALIADR1 | 93.6 | .0 ( 0) | 21.0 ( 2) | .0 ( 0) | 33.0 ( 3) | 33.0 ( 3) | 27.0 ( 2) |
| DALLFKR1 | 1110.8 | .0 ( 0) | 21.0 ( 1) | .0 ( 0) | 33.0 ( 2) | 33.0 ( 2) | 27.0 ( 2) |
| DALLAXR1 | 962.5 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 21.0 ( 2) | 24.0 ( 2) | 33.0 ( 3) |
| DALLBBR1 | 153.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| DALLGAR1 | 1110.8 | .0 ( 0) | 21.0 ( 1) | .0 ( 0) | 33.0 ( 2) | 33.0 ( 2) | 27.0 ( 2) |
| DALLITR1 | 177.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | .0 ( 0) |
| DALMEMR1 | 284.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 2) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| CALMIAR1 | 888.9 | 72.0 ( 8) | 72.0 ( 8) | 120.0 ( 13) | 69.0 ( 7) | 69.0 ( 7) | 51.0 ( 5) |
| CALPHAR1 | 671.[illegible] | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 21.0 ( 3) | 24.0 ( 3) | 33.0 ( 4) |
| CALSFBR1 | 1162.4 | 12.0 ( 1) | 18.0 ( 1) | 36.0 ( 3) | 6.0 ( 0) | 6.0 ( 0) | 3.0 ( 0) |
| CCABNAR1 | 390.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 5) | 21.0 ( 5) | 21.0 ( 5) |
| CCACALR1 | 936.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 5) | 54.0 ( 5) | 54.0 ( 5) |
| CCAMEMR1 | 565.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 9) | 54.0 ( 9) | 54.0 ( 9) |
| CCAMIAR1 | 703.2 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| CCATYSR1 | 288.9 | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) |
| CENABGR1 | 207.7 | .0 ( 0) | 21.0 ( 10) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENBCIR1 | 474.9 | .0 ( 0) | 21.0 ( 4) | 27.0 ( 5) | 33.0 ( 6) | 33.0 ( 6) | 33.0 ( 6) |
| CENICTR1 | 286.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 2) |
| CENLASR1 | 446.3 | 24.0 ( 5) | 9.0 ( 2) | 45.0 ( 10) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENLAXR1 | 632.4 | 6.0 ( 0) | 18.0 ( 2) | 39.0 ( 6) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| CENMSFR1 | 514.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | .0 ( 0) |
| CENPCXR1 | 770.1 | .0 ( 0) | 18.0 ( 2) | 21.0 ( 2) | 39.0 ( 5) | 48.0 ( 6) | 39.0 ( 5) |
| CENPHXR1 | 426.[illegible] | .0 ( 0) | 3.0 ( 0) | 12.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| CENSEAR1 | 798.1 | .0 ( 0) | 39.0 ( 4) | 30.0 ( 3) | 30.0 ( 3) | 30.0 ( 3) | 18.0 ( 2) |
| CENSFGR1 | 721.4 | 3.0 ( 0) | 27.0 ( 3) | .0 ( 0) | 30.0 ( 4) | 21.0 ( 2) | 30.0 ( 4) |
| CENSLOR1 | 721.4 | 3.0 ( 0) | 27.0 ( 3) | .0 ( 0) | 30.0 ( 4) | 21.0 ( 2) | 30.0 ( 4) |
| CENSLOR1 | 282.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 9.0 ( 3) | 9.0 ( 3) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-OS COVERAGE MILES (%) | NO RIGHT-OS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-OS >(SP) MILES (%) | RIGHT-OS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| DSMLAKR1 | 1155.6 | .0 ( 0) | 12.0 ( 1) | 54.0 ( 4) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| DTWLAKR1 | 1616.1 | .0 ( 0) | 12.0 ( 0) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| DTWSFCR1 | 1706.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 45.0 ( 2) | 36.0 ( 2) | 45.0 ( 2) |
| ELFCALR1 | 390.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | .0 ( 0) |
| ELFLEVR1 | 418.1 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ELFSATR1 | 342.0 | .0 ( 0) | .0 ( 0) | 12.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EMRFLLR1 | 847.3 | 75.0 ( 8) | 228.0 ( 26) | 75.0 ( 8) | 57.0 ( 6) | 159.0 ( 18) | 42.0 ( 4) |
| EMRIAMR1 | 1125.6 | .0 ( 0) | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| EMRLAKR2 | 2031.0 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| EMRLAKR3 | 2046.3 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) |
| EMRMIAR1 | 847.0 | 39.0 ( 4) | 99.0 ( 11) | 39.0 ( 4) | 54.0 ( 6) | 15.0 ( 1) | 45.0 ( 5) |
| EMRSFCR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 2) | 45.0 ( 2) | 36.0 ( 1) |
| FLLBCSR1 | 1020.5 | 177.0 ( 17) | 177.0 ( 17) | 270.0 ( 26) | 252.0 ( 24) | 252.0 ( 24) | 345.0 ( 33) |
| FLLEMRR1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 315.0 ( 36) | 48.0 ( 5) | 33.0 ( 3) | 159.0 ( 18) |
| FLLMFKR1 | 858.8 | 75.0 ( 8) | 75.0 ( 8) | 315.0 ( 36) | 48.0 ( 5) | 33.0 ( 3) | 159.0 ( 18) |
| FLLPHLR1 | 795.0 | 39.0 ( 4) | 39.0 ( 4) | 105.0 ( 13) | 63.0 ( 7) | 54.0 ( 6) | 24.0 ( 3) |
| GEGSFCR1 | 536.5 | .0 ( 0) | 36.0 ( 6) | 6.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| IADCALR1 | 936.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 5) | 54.0 ( 5) | 54.0 ( 5) |
| IADLAKR1 | 1885.9 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| IADMEMR1 | 565.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 9) | 54.0 ( 9) | 54.0 ( 9) |

| ROUTE ID | ROUTE MILES | NP ROUTE COVERAGE | NP LEFT-ES COVERAGE | NP RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| IADMIAR1 | 703.2 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 9.0 ( 1) | 3.0 ( 0) |
| IADSEAR1 | 1921.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 18.0 ( 0) | 27.0 ( 1) |
| IADSFOR1 | 1999.7 | .0 ( 0) | 24.0 ( 1) | 3.0 ( 0) | 21.0 ( 1) | 21.0 ( 1) | 21.0 ( 1) |
| IAHEWRR1 | 1132.5 | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| IAHLFKR1 | 1132.5 | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| IAHLEER1 | 312.3 | .0 ( 0) | 6.0 ( 1) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| IAHMIAR1 | 745.9 | 162.0 ( 21) | 162.0 ( 21) | 177.0 ( 23) | 123.0 ( 16) | 123.0 ( 16) | 108.0 ( 14) |
| IAHSFOR1 | 1312.- | .0 ( 0) | 9.0 ( 0) | 21.0 ( 1) | 15.0 ( 1) | 12.0 ( 0) | .0 ( 0) |
| ICTCVOR1 | 253.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| ICTLLKR1 | 253.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 1) |
| LFKDALR1 | 1103.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 4) | 54.0 ( 4) | 54.0 ( 4) |
| LFKFLLR1 | 847.3 | 75.0 ( 8) | 228.0 ( 26) | 75.0 ( 8) | 57.0 ( 6) | 159.0 ( 18) | 42.0 ( 4) |
| LFKIAHR1 | 1125.6 | .0 ( 0) | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LFKLASR1 | 1846.7 | .0 ( 0) | 9.0 ( 0) | 6.0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) |
| LFKLAXR2 | 2031.0 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| LFKLAXR3 | 2046.3 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) |
| LFKMIAR1 | 847.3 | 75.0 ( 8) | 228.0 ( 26) | 75.0 ( 8) | 57.0 ( 6) | 159.0 ( 18) | 42.0 ( 4) |
| LFKOAKR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 2) | 45.0 ( 2) | 36.0 ( 1) |
| LFKORFR1 | 152.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | 6.0 ( 3) | .0 ( 0) |
| LFKPEIR1 | 791.0 | 39.0 ( 4) | 99.0 ( 12) | 39.0 ( 4) | 54.0 ( 6) | 15.0 ( 1) | 45.0 ( 5) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-OS COVERAGE MILES (%) | NO RIGHT-OS COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-OE >(SP) MILES (%) | RIGHT-OS >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| LFKFFXF1 | 1765.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| LFKSEAF1 | 1994.5 | .0 ( 0) | 3.0 ( 0) | 48.0 ( 2) | 75.0 ( 3) | 75.0 ( 3) | 84.0 ( 4) |
| LFKSFOF1 | 2123.0 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 2) | 45.0 ( 2) | 36.0 ( 1) |
| LFKSFOF2 | 2125.3 | .0 ( 0) | 24.0 ( 1) | 3.0 ( 0) | 21.0 ( 0) | 21.0 ( 0) | 21.0 ( 0) |
| LFKSFOF3 | 2141.1 | 24.0 ( 1) | 42.0 ( 1) | 138.0 ( 6) | 45.0 ( 2) | 30.0 ( 1) | 42.0 ( 1) |
| LFKS_OF1 | 2123.0 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 2) | 45.0 ( 2) | 36.0 ( 1) |
| LASDENF1 | 452.2 | 6.0 ( 1) | 51.0 ( 11) | 12.0 ( 2) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAS_FKF1 | 1841.7 | .0 ( 0) | 6.0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) |
| LASOAKF1 | 252.2 | .0 ( 0) | 9.0 ( 3) | 21.0 ( 8) | 15.0 ( 5) | 12.0 ( 4) | .0 ( 0) |
| LASORDF1 | 1220.1 | 21.0 ( 1) | 45.0 ( 3) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASRNDF1 | 210.8 | .0 ( 0) | 3.0 ( 1) | 51.0 ( 24) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LASSFOF1 | 252.2 | .0 ( 0) | 9.0 ( 3) | 21.0 ( 8) | 15.0 ( 5) | 12.0 ( 4) | .0 ( 0) |
| LASS_OF1 | 252.2 | .0 ( 0) | 9.0 ( 3) | 21.0 ( 8) | 15.0 ( 5) | 12.0 ( 4) | .0 ( 0) |
| LASSLOF1 | 233.9 | .0 ( 0) | 6.0 ( 2) | 6.0 ( 2) | 18.0 ( 7) | 18.0 ( 7) | 18.0 ( 7) |
| LAXATLF1 | 1583.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 9.0 ( 0) | 18.0 ( 1) |
| LAXBALF1 | 1883.7 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LAXBOSF1 | 2162.5 | .0 ( 0) | 6.0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCLEF1 | 1674.3 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXCALF1 | 961.5 | .0 ( 0) | .0 ( 0) | 6.0 ( 0) | 21.0 ( 2) | 33.0 ( 3) | 24.0 ( 2) |
| LAXDENF1 | 629.9 | .0 ( 0) | 57.0 ( 9) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-ES COVERAGE | % RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| LAXCSMR1 | 1152.8 | .0 ( 0) | 54.0 ( 4) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| LAXCTOR1 | 1612.5 | .0 ( 0) | 6.0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXEARR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LAXEARR3 | 2052.1 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 3.0 ( 0) |
| LAXIADR1 | 1883.7 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LAXLFRR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LAXLFRR3 | 2052.1 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 3.0 ( 0) |
| LAXLGAR2 | 2046.3 | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LAXLGAR3 | 2052.1 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) | 3.0 ( 0) |
| LAXMDNR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXMEMR1 | 129.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 0) |
| LAXMIAR1 | 1919.6 | 162.0 ( 8) | 162.0 ( 8) | 177.0 ( 9) | 123.0 ( 6) | 123.0 ( 6) | 108.0 ( 5) |
| LAXMSER1 | 1226.6 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | 24.0 ( 1) | 24.0 ( 1) | 9.0 ( 0) |
| LAXMSYR1 | 1336.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 15.0 ( 1) | .0 ( 0) |
| LAXOMAR1 | 1049.8 | .0 ( 0) | 54.0 ( 5) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| LAXORCR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXORCR2 | 1393.8 | .0 ( 0) | 6.0 ( 0) | 12.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LAXPCAR1 | 645.7 | 3.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 57.0 ( 8) | 57.0 ( 8) | 57.0 ( 8) |
| LAXSATR1 | 935.5 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | 12.0 ( 1) |
| LAXSEAR1 | 736.0 | 3.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 57.0 ( 7) | 57.0 ( 7) | 57.0 ( 7) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-CS COVERAGE | % RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| LAXSLCR1 | 417.1 | .0 ( 0) | 6.0 ( 1) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| LAXSTLR1 | 1275.2 | .0 ( 0) | .0 ( 0) | 18.0 ( 1) | 6.0 ( 0) | 6.0 ( 0) | .0 ( 0) |
| LBBIABR1 | 310.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | 6.0 ( 1) | 6.0 ( 1) |
| LGABRMR1 | 644.9 | .0 ( 0) | .0 ( 0) | 12.0 ( 1) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| LGACALR1 | 1103.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 4) | 54.0 ( 4) | 54.0 ( 4) |
| LGALABR2 | 2031.0 | .0 ( 0) | 18.0 ( 0) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| LGALABR3 | 2046.3 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 9.0 ( 0) |
| LGAMEMR1 | 732.1 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 54.0 ( 7) | 54.0 ( 7) | 54.0 ( 7) |
| LGAMIAR1 | 847.0 | 39.0 ( 4) | 99.0 ( 11) | 39.0 ( 4) | 54.0 ( 6) | 15.0 ( 1) | 45.0 ( 5) |
| LGAORRR1 | 152.3 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 3) | 6.0 ( 3) | .0 ( 0) |
| LGAPEIR1 | 791.0 | 39.0 ( 4) | 99.0 ( 12) | 39.0 ( 4) | 54.0 ( 6) | 15.0 ( 1) | 45.0 ( 5) |
| LGASFCR1 | 2123.0 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 2) | 45.0 ( 2) | 36.0 ( 1) |
| LSVELER1 | 419.2 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| LLKICTR1 | 250.9 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 2) | .0 ( 0) | 6.0 ( 2) |
| MCCABGR1 | 665.3 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 30.0 ( 4) | 21.0 ( 3) | 30.0 ( 4) |
| MCHABGR1 | 869.7 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MCHLABR1 | 1396.6 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MCHPHBR1 | 1149.7 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| MCHSFCR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 3) | 45.0 ( 3) | 36.0 ( 2) |
| MEPATLR1 | 202.9 | .0 ( 0) | .0 ( 0) | 6.0 ( 2) | 15.0 ( 7) | 15.0 ( 7) | 21.0 ( 10) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-ES COVERAGE | NO RIGHT-ES COVERAGE | ROUTE WIDTH >(SP) | LEFT-ES >(SP) | RIGHT-ES >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MEMBHAR1 | 9e.C | .C ( C) | 12.C ( 12) | .C ( C) | 6.C ( 6) | 6.C ( 6) | 6.C ( 6) |
| MEMENAR1 | 84.6 | .C ( C) | .C ( C) | 21.C ( 24) | 15.C ( 17) | 15.C ( 17) | 15.C ( 17) |
| MEMCCAR1 | 562.C | .C ( C) | 21.C ( 3) | .C ( C) | 33.C ( 5) | 33.C ( 5) | 21.C ( 3) |
| MEMIACR1 | 562.C | .C ( C) | 21.C ( 3) | .C ( C) | 33.C ( 5) | 33.C ( 5) | 21.C ( 3) |
| MEMLANR1 | 1303.6 | .C ( C) | .C ( C) | .C ( C) | .C ( C) | 9.C ( C) | .C ( C) |
| MEMLGAR1 | 738.2 | .C ( C) | 21.C ( 2) | .C ( C) | 33.C ( 4) | 33.C ( 4) | 21.C ( 2) |
| MEMSCRR1 | 188.6 | .C ( C) | 30.C ( 15) | .C ( C) | .C ( C) | .C ( C) | .C ( C) |
| MIAABGR1 | 1381.9 | 78.C ( 5) | 126.C ( 9) | 78.C ( 5) | 78.C ( 5) | 60.C ( 4) | 87.C ( 6) |
| MIABALR1 | 710.3 | .C ( C) | .C ( C) | 6.C ( C) | 3.C ( C) | 3.C ( C) | 9.C ( 1) |
| MIABCLR1 | 959.7 | 75.C ( 7) | 75.C ( 7) | 315.C ( 32) | 48.C ( 5) | 33.C ( 3) | 159.C ( 16) |
| MIABGSR1 | 1020.5 | 177.C ( 17) | 177.C ( 17) | 270.C ( 26) | 252.C ( 24) | 252.C ( 24) | 345.C ( 33) |
| MIACALR1 | 888.1 | 75.C ( 8) | 123.C ( 13) | 78.C ( 8) | 69.C ( 7) | 51.C ( 5) | 69.C ( 7) |
| MIACCAR1 | 710.3 | .C ( C) | .C ( C) | 6.C ( C) | 3.C ( C) | 3.C ( C) | 9.C ( 1) |
| MIAEWRR1 | 858.8 | 75.C ( 8) | 75.C ( 8) | 315.C ( 36) | 48.C ( 5) | 33.C ( 3) | 159.C ( 18) |
| MIAIAER1 | 710.3 | .C ( C) | .C ( C) | 6.C ( C) | 3.C ( C) | 3.C ( C) | 9.C ( 1) |
| MIAIAWR1 | 755.C | 162.C ( 21) | 177.C ( 23) | 162.C ( 21) | 123.C ( 16) | 108.C ( 14) | 123.C ( 16) |
| MIALFWR1 | 858.8 | 75.C ( 8) | 75.C ( 8) | 315.C ( 36) | 48.C ( 5) | 33.C ( 3) | 159.C ( 18) |
| MIALANR1 | 1963.7 | 162.C ( 8) | 177.C ( 9) | 162.C ( 8) | 123.C ( 6) | 108.C ( 5) | 123.C ( 6) |
| MIALGAR1 | 858.8 | 75.C ( 8) | 75.C ( 8) | 315.C ( 36) | 48.C ( 5) | 33.C ( 3) | 159.C ( 18) |
| MIAMSYR1 | 806.8 | 78.C ( 15) | 123.C ( 24) | 78.C ( 15) | 69.C ( 13) | 51.C ( 10) | 69.C ( 13) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-CS COVERAGE | % RIGHT-CS COVERAGE | ROUTE WIDTH >(SP) | LEFT-CS >(SP) | RIGHT-CS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| MIAPPLR1 | 795.0 | 39.0 ( 4) | 39.0 ( 4) | 105.0 ( 13) | 63.0 ( 7) | 54.0 ( 6) | 24.0 ( 3) |
| MIASPCR1 | 2139.0 | 9 .0 ( 4) | 144.0 ( 6) | 114.0 ( 5) | 81.0 ( 3) | 63.0 ( 2) | 87.0 ( 4) |
| MNCSPCR1 | 1194.2 | 6.0 ( 0) | 24.0 ( 2) | .0 ( 0) | 30.0 ( 2) | 21.0 ( 1) | 30.0 ( 2) |
| MSPCEAR1 | 510.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 1) | .0 ( 0) | 9.0 ( 1) |
| MSPLAKR1 | 1230.6 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | 24.0 ( 1) | 9.0 ( 0) | 24.0 ( 1) |
| MSPSEAR1 | 1131.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 1) | 18.0 ( 1) | 27.0 ( 2) |
| MSPSPCR1 | 1274.8 | 57.0 ( 4) | 42.0 ( 3) | 51.0 ( 4) | 258.0 ( 20) | 249.0 ( 19) | 243.0 ( 19) |
| MSYABGR1 | 793.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 9.0 ( 1) | 9.0 ( 1) | 18.0 ( 2) |
| MSYLAKR1 | 1337.1 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | .0 ( 0) | 15.0 ( 1) |
| MSYPIAR1 | 498.2 | 78.0 ( 15) | 78.0 ( 15) | 123.0 ( 24) | 69.0 ( 13) | 69.0 ( 13) | 51.0 ( 10) |
| MSYTEAR1 | 330.2 | .0 ( 0) | .0 ( 0) | 117.0 ( 34) | 33.0 ( 9) | 21.0 ( 6) | 12.0 ( 3) |
| OAK_FAR1 | 2130.4 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 1) | 33.0 ( 1) | 42.0 ( 1) |
| OAKLAKR1 | 248.6 | .0 ( 0) | 21.0 ( 8) | 9.0 ( 3) | 15.0 ( 6) | .0 ( 0) | 12.0 ( 4) |
| OAKSPCR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 2) |
| OPALAKR1 | 1056.6 | .0 ( 0) | 12.0 ( 1) | 54.0 ( 5) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) |
| OWYSPCR1 | 1388.9 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SRCABGR1 | 869.7 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| SRCCALR1 | 601.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| SRCICTR1 | 424.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 6.0 ( 1) | .0 ( 0) | 6.0 ( 1) |
| SRCLAKR1 | 1222.9 | 6.0 ( 1) | 12.0 ( 0) | 45.0 ( 3) | .0 ( 0) | .0 ( 0) | .0 ( 0) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| ERCLAXR1 | 1356.6 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCLAXR2 | 1399.5 | .0 ( 0) | 12.0 ( 0) | 6.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCOAXR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 3) | 45.0 ( 3) | 36.0 ( 2) |
| ERCONTR1 | 1396.6 | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCPCXR1 | 1411.7 | .0 ( 0) | 42.0 ( 2) | 21.0 ( 1) | 36.0 ( 2) | 30.0 ( 2) | 18.0 ( 1) |
| ERCPHXR1 | 1149.7 | .0 ( 0) | .0 ( 0) | 9.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| ERCSEAR1 | 1397.6 | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 15.0 ( 1) | 15.0 ( 1) | 15.0 ( 1) |
| ERCSFCR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 3) | 45.0 ( 3) | 36.0 ( 2) |
| ERCSFCR2 | 1493.3 | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 33.0 ( 2) | 39.0 ( 2) | 45.0 ( 3) |
| ERCSFCR3 | 1496.1 | 24.0 ( 1) | 42.0 ( 2) | 138.0 ( 9) | 45.0 ( 3) | 30.0 ( 2) | 42.0 ( 2) |
| ERCSLCR1 | 1486.2 | .0 ( 0) | .0 ( 0) | 27.0 ( 1) | 45.0 ( 3) | 45.0 ( 3) | 36.0 ( 2) |
| ERCSLCR1 | 989.2 | 6.0 ( 0) | .0 ( 0) | 57.0 ( 5) | 18.0 ( 1) | 27.0 ( 2) | 18.0 ( 1) |
| ERCTLSR1 | 1147.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| FBILFXR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 105.0 ( 13) | 63.0 ( 7) | 54.0 ( 6) | 24.0 ( 3) |
| FBILGAR1 | 792.5 | 39.0 ( 4) | 39.0 ( 4) | 105.0 ( 13) | 63.0 ( 7) | 54.0 ( 6) | 24.0 ( 3) |
| FCXCENR1 | 768.6 | .0 ( 0) | 21.0 ( 2) | 3.0 ( 0) | 39.0 ( 5) | 51.0 ( 6) | 48.0 ( 6) |
| FCXLAXR1 | 634.7 | .0 ( 0) | 30.0 ( 4) | 3.0 ( 0) | 57.0 ( 8) | 51.0 ( 8) | 54.0 ( 8) |
| FCXSFCR1 | 1422.8 | 6.0 ( 0) | 21.0 ( 1) | 42.0 ( 2) | 36.0 ( 2) | 18.0 ( 1) | 30.0 ( 2) |
| FCXSLCR1 | 466.1 | .0 ( 0) | 3.0 ( 0) | 24.0 ( 5) | 27.0 ( 5) | 27.0 ( 5) | 6.0 ( 1) |
| FNLBNAR1 | 499.7 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 4) | 21.0 ( 4) | 21.0 ( 4) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| FRLFLLR1 | 791.9 | 39.C ( 4) | 96.C ( 12) | 39.C ( 4) | 54,C ( 6) | 15.C ( 1) | 45.C ( 5) |
| FRLMIAR1 | 791.9 | 39.C ( 4) | 96.C ( 12) | 39.C ( 4) | 54.C ( 6) | 15.C ( 1) | 45.C ( 5) |
| FRLSFCR1 | 2093.6 | .C ( C) | .C ( C) | .C ( C) | 45,C ( 2) | 36.C ( 1) | 45.C ( 2) |
| FRXCALR1 | 665.8 | .C ( C) | .C ( 0) | 6.C ( C) | 21,C ( 3) | 33.C ( 4) | 24.C ( 3) |
| FRXCENR1 | 423.1 | .C ( C) | 15.C ( 3) | 3.C ( C) | 9,C ( 2) | .C ( C) | 9.C ( 2) |
| FRX_FXR1 | 1781.7 | .C ( C) | .C ( C) | .C ( C) | 3,C ( C) | 3.C ( C) | 3.C ( 0) |
| FRXMC.R1 | 1153.3 | .C ( C) | 9.C ( C) | .C ( C) | ,C ( 0) | .C ( C) | .C ( 0) |
| FRXORCR1 | 1153.3 | .C ( C) | 9.C ( 0) | .C ( C) | ,C ( 0) | .C ( C) | .C ( 0) |
| FRXSTLR1 | 1010.6 | .C ( C) | .C ( C) | .C ( C) | 3,C ( 0) | 3.C ( C) | 3.C ( 0) |
| FITATLR1 | 368.7 | .C ( C) | .C ( C) | 15.C ( 4) | 6,C ( 1) | 6.C ( 1) | 6.C ( 1) |
| FITENNR1 | 314.9 | .C ( C) | .C ( C) | .C ( C) | 6,C ( 1) | 15.C ( 4) | 15.C ( 4) |
| FITSCFR1 | 202.7 | .C ( C) | 3.C ( 1) | .C ( C) | ,C ( 0) | .C ( C) | .C ( 0) |
| RNCLASR1 | 214.2 | .C ( C) | 51.C ( 23) | 3.C ( 1) | ,C ( 0) | .C ( C) | .C ( 0) |
| SATELFR1 | 342.9 | .C ( C) | 15.C ( 4) | .C ( C) | ,C ( 0) | .C ( C) | .C ( 0) |
| SATLAXR1 | 936.8 | .C ( C) | 9.C ( C) | .C ( C) | ,C ( 0) | 12.C ( 1) | .C ( 0) |
| SCFCCAR1 | 308.8 | .C ( C) | .C ( 0) | 3.C ( C) | .C ( 0) | .C ( C) | .C ( 0) |
| SCFLGAR1 | 484.7 | .C ( C) | .C ( 0) | .C ( C) | ,C ( 0) | .C ( C) | 6.C ( 1) |
| SCFMEMR1 | 188.4 | .C ( C) | 33.C ( 17) | .C ( C) | ,C ( 0) | 3.C ( 1) | .C ( 0) |
| SEABALR1 | 1920.6 | .C ( C) | .C ( 0) | .C ( C) | 18.C ( 0) | 27.C ( 1) | 18.C ( 0) |
| SEADENR1 | 800.9 | .C ( C) | 36.C ( 4) | 60.C ( 7) | 30.C ( 3) | 18.C ( 2) | 30.C ( 3) |

| ROUTE ID | ROUTE MILES | % ROUTE COVERAGE | % LEFT-OS COVERAGE | % RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SEAIADR1 | 1920.6 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 0) | 27.0 ( 1) | 18.0 ( 0) |
| SEA_FKR1 | 2001.5 | .0 ( 0) | 48.0 ( 2) | 3.0 ( 0) | 75.0 ( 3) | 84.0 ( 4) | 75.0 ( 3) |
| SEALAXR1 | 735.9 | .0 ( 0) | 30.0 ( 4) | 3.0 ( 0) | 57.0 ( 7) | 51.0 ( 6) | 54.0 ( 7) |
| SEAMSFR1 | 1126.5 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 18.0 ( 1) | 27.0 ( 2) | 18.0 ( 1) |
| SEABRDR1 | 1399.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 15.0 ( 1) | 15.0 ( 1) | 18.0 ( 1) |
| SFCABGR1 | 666.0 | 12.0 ( 1) | 36.0 ( 5) | 18.0 ( 2) | 3.0 ( 0) | .0 ( 0) | 3.0 ( 0) |
| SFCATLR1 | 1750.4 | .0 ( 0) | 9.0 ( 0) | 24.0 ( 1) | 36.0 ( 2) | 36.0 ( 2) | 48.0 ( 2) |
| SFCBCIR1 | 348.2 | 48.0 ( 13) | 36.0 ( 10) | 69.0 ( 19) | .0 ( 0) | 9.0 ( 2) | 6.0 ( 1) |
| SFCBCSR1 | 2248.9 | 345.0 ( 15) | 408.0 ( 18) | 363.0 ( 16) | 99.0 ( 4) | 279.0 ( 12) | 81.0 ( 3) |
| SFCDALR1 | 1159.6 | 12.0 ( 1) | 36.0 ( 3) | 18.0 ( 1) | 12.0 ( 1) | 18.0 ( 1) | 12.0 ( 1) |
| SFCDENR1 | 729.4 | 12.0 ( 1) | 18.0 ( 2) | 18.0 ( 2) | 27.0 ( 3) | 27.0 ( 3) | 21.0 ( 2) |
| SFCDTWR1 | 1698.5 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 1) |
| SFCEWBR1 | 2130.4 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 1) | 33.0 ( 1) | 42.0 ( 1) |
| SFCGEGR1 | 535.8 | .0 ( 0) | 6.0 ( 1) | 36.0 ( 6) | 9.0 ( 1) | 9.0 ( 1) | 9.0 ( 1) |
| SFCIADR1 | 2002.1 | .0 ( 0) | 6.0 ( 0) | 30.0 ( 1) | 21.0 ( 1) | 21.0 ( 1) | 21.0 ( 1) |
| SFCIAHR1 | 1307.5 | .0 ( 0) | 21.0 ( 1) | 9.0 ( 0) | 15.0 ( 1) | .0 ( 0) | 12.0 ( 0) |
| SFC_FKR1 | 2130.4 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 1) | 33.0 ( 1) | 42.0 ( 1) |
| SFC_FKR2 | 2119.7 | .0 ( 0) | 9.0 ( 0) | 3.0 ( 0) | 27.0 ( 1) | 39.0 ( 1) | 27.0 ( 1) |
| SFC_FKR3 | 2138.6 | 24.0 ( 1) | 138.0 ( 6) | 45.0 ( 2) | 48.0 ( 2) | 45.0 ( 2) | 33.0 ( 1) |
| SFCLASR1 | 248.6 | .0 ( 0) | 21.0 ( 8) | 9.0 ( 3) | 15.0 ( 6) | .0 ( 0) | 12.0 ( 4) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE MILES (%) | NO LEFT-ES COVERAGE MILES (%) | NO RIGHT-ES COVERAGE MILES (%) | ROUTE WIDTH >(SP) MILES (%) | LEFT-ES >(SP) MILES (%) | RIGHT-ES >(SP) MILES (%) |
|---|---|---|---|---|---|---|---|
| SFCLGAR1 | 2130.4 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 1) | 33.0 ( 1) | 42.0 ( 1) |
| SFCMDAR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 2) |
| SFCMIAR1 | 2132.4 | 9[illegible].0 ( 4) | 114.0 ( 5) | 144.0 ( 6) | 81.0 ( 3) | 87.0 ( 4) | 63.0 ( 2) |
| SFCMKCR1 | 1194.9 | .0 ( 0) | 3.0 ( 0) | 30.0 ( 2) | 30.0 ( 2) | 30.0 ( 2) | 21.0 ( 1) |
| SFCMSFR1 | 1278.1 | 57.0 ( 4) | 51.0 ( 3) | 42.0 ( 3) | 252.0 ( 19) | 237.0 ( 18) | 243.0 ( 19) |
| SFCORCR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 2) |
| SFCORCR2 | 1482.2 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 2) | 33.0 ( 2) | 42.0 ( 2) |
| SFCPHLR1 | 2090.8 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 1) |
| SFCSLCR1 | 415.7 | 6[illegible].0 ( 5) | 78.0 ( 18) | 3.0 ( 0) | 24.0 ( 5) | 15.0 ( 3) | 30.0 ( 7) |
| SFCSTLR1 | 1403.3 | .0 ( 0) | 3.0 ( 0) | 30.0 ( 2) | 30.0 ( 2) | 30.0 ( 2) | 21.0 ( 1) |
| SWCDENR1 | 729.4 | 16.0 ( 1) | 18.0 ( 2) | 18.0 ( 2) | 27.0 ( 3) | 27.0 ( 3) | 21.0 ( 2) |
| SWCLFKR1 | 2130.4 | .0 ( 0) | 27.0 ( 1) | 3.0 ( 0) | 42.0 ( 1) | 33.0 ( 1) | 42.0 ( 1) |
| SWCLASR1 | 248.0 | .0 ( 0) | 21.0 ( 8) | 9.0 ( 3) | 15.0 ( 6) | .0 ( 0) | 12.0 ( 4) |
| SWCORCR1 | 1481.6 | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | 42.0 ( 2) | 42.0 ( 2) | 33.0 ( 2) |
| SLCBCIR1 | 166.8 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 21.0 ( 12) | 21.0 ( 12) | 21.0 ( 12) |
| SLCDENR1 | 244.2 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 9.0 ( 3) | 9.0 ( 3) | 9.0 ( 3) |
| SLCLASR1 | 233.3 | .0 ( 0) | .0 ( 0) | 3.0 ( 1) | 21.0 ( 9) | 21.0 ( 5) | 21.0 ( 9) |
| SLCLAXR1 | 412.4 | .0 ( 0) | 3.0 ( 0) | 6.0 ( 1) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| SLCORCR1 | 986.4 | 6[illegible].0 ( 0) | 63.0 ( 6) | .0 ( 0) | 18.0 ( 1) | 18.0 ( 1) | 21.0 ( 2) |
| SLCPDXR1 | 461.3 | .0 ( 0) | 24.0 ( 5) | 3.0 ( 0) | 27.0 ( 5) | 6.0 ( 1) | 27.0 ( 5) |

| ROUTE ID | ROUTE MILES | NO ROUTE COVERAGE | NO LEFT-OS COVERAGE | NO RIGHT-OS COVERAGE | ROUTE WIDTH >(SP) | LEFT-OS >(SP) | RIGHT-OS >(SP) |
|---|---|---|---|---|---|---|---|
| | | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) | MILES (%) |
| SLCSPCR1 | 411.9 | 21.0 ( 5) | .0 ( 0) | 78.0 ( 18) | 21.0 ( 5) | 27.0 ( 6) | 12.0 ( 2) |
| STLLARR1 | 1272.6 | .0 ( 0) | 18.0 ( 1) | .0 ( 0) | 6.0 ( 0) | .0 ( 0) | 6.0 ( 0) |
| STLPHAR1 | 1007.4 | .0 ( 0) | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | 3.0 ( 0) | 3.0 ( 0) |
| STLSPCR1 | 1399.8 | 6.0 ( 0) | 24.0 ( 1) | .0 ( 0) | 30.0 ( 2) | 21.0 ( 1) | 30.0 ( 2) |
| TRAMSAR1 | 340.2 | .0 ( 0) | 99.0 ( 29) | .0 ( 0) | 54.0 ( 15) | 33.0 ( 9) | 42.0 ( 12) |
| TLLSTLR1 | 215.4 | .0 ( 0) | 12.0 ( 5) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| TLSBADR1 | 1150.2 | .0 ( 0) | .0 ( 0) | 3.0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| TVSCCAR1 | 280.2 | .0 ( 0) | 12.0 ( 4) | .0 ( 0) | .0 ( 0) | .0 ( 0) | .0 ( 0) |
| TOTAL | 308528.6 | 4368.0 ( 1) | 8154.0 ( 2) | 8751.0 ( 2) | 8196.0 ( 2) | 8349.0 ( 2) | 8622.0 ( 2) |