Attachment 5

WIND COVERAGE STUDIES

A5.1. Applicability:

A5.1.1. Army. One factor in the determination of the runway orientation is wind coverage, as discussed in Chapter 3. Runway orientation based on wind coverage for Army airfields will be determined in accordance with the methodology presented in FAA AC 150/5300-13, *Airport Design*, Appendix 1, *Wind Analysis*. The runway orientation should obtain 95 percent wind coverage with a 19.5 kilometer-per-hour (10.5 knot) crosswind. If this coverage cannot be attained, a crosswind runway would be desirable.

A5.1.2. Air Force. One factor in the determination of the runway orientation is wind coverage, as discussed in Chapter 3. Runway orientation based on wind coverage for Air Force airfields will be determined in accordance with the methodology presented in FAA AC 150/5300-13, *Airport Design*, Appendix 1, *Wind Analysis*. Criteria for crosswind runway authorization will be in accordance with criteria presented in AFH 32-1084, *Facility Requirements Handbook*. HQ USAF/XOO must approve authorization for crosswind runways.

A5.1.3. Navy and Marine Corps. Runway orientation for Navy and Marine Corps airfields will be determined in accordance with this attachment. Criteria for the crosswind runway is found in Paragraph A5.6. of this attachment.

A5.2. Objective. This attachment provides guidance on the assembly and analysis of wind data to prepare a wind coverage study to determine runway orientation. It also provides guidance on analyzing the operational impact of winds on existing runways.

A5.3. General. A factor influencing runway orientation is wind. Ideally a runway should be aligned with the prevailing wind. Wind conditions affect all airplanes in varying degrees. Generally, the smaller the airplane, the more it is affected by wind, particularly crosswind components.

A5.3.1. Basic Conditions. The most desirable runway orientation based on wind is the one which has the largest wind coverage and minimum crosswind components. Wind coverage is that percent of time crosswind components are below an acceptable velocity. The desirable wind coverage for an airport is 95 percent, based on the total number of weather observations.

A5.3.2. Meteorological Conditions. The latest and best wind information should be used to carry out a wind coverage study. A record which covers the last five consecutive years of wind observations is preferred. Ascertain frequency of occurrence, singly and in combination, for: wind (direction and velocity), temperature, humidity, barometric pressure, clouds (type and amount), visibility (ceiling), precipitation (type and amount), thunderstorms, and any other unusual weather conditions peculiar to the area.

A5.3.2.1. Usable Data. Use only data which give representative average values. For example, do not consider extremes of wind velocity during infrequent thunderstorms of short duration.

A5.3.2.2. Source of Data. Obtain meteorological data from one or more of the following sources:

A5.3.2.2.1. National Oceanic and Atmospheric Administration, Environmental Data Service

A5.3.2.2.2. National Weather Service

A5.3.2.2.3. Bureau of Reclamation

A5.3.2.2.4. Forest Service

A5.3.2.2.5. Soil Conservation Service

A5.3.2.2.6. Federal Aviation Administration

A5.3.2.2.7. Army Corps of Engineers

A5.3.2.2.8. Navy Oceanographic Office

A5.3.2.2.9. Geological Survey

A5.4. Wind Velocity and Direction. The following are the most important meteorological factors determining runway orientation:

A5.4.1. Composite Windrose. When weather recording stations are located near a proposed site and intervening terrain is level or slightly rolling, prepare a composite windrose from data of surrounding stations.

A5.4.2. Terrain. If intervening terrain is mountainous or contains lakes or large rivers, allow for their effects on wind velocities and directions by judgment, after study of topographical information and available meteorological data.

A5.4.3. Additional Weather Data. Consider wind directions and velocities in conjunction with visibility, precipitation, and other pertinent weather information.

A5.4.4. Wind Distribution. Determine wind distribution to accompany Instrument Flight Rule (IFR) conditions when considering orientation of an instrument runway.

A5.5. Use of Windrose Diagrams. Prepare a windrose diagram for each new runway in the planning stage or to analyze the operational impact of wind on existing runways.

A5.5.1. Drawing the Windrose. The standard windrose (Figures A5.1 and A5.2) consists of a series of concentric circles cut by radial lines. The perimeter of each concentric circle represents the division between successive wind speed groupings. Radial lines are drawn so that the area between each successive pair is centered on the direction of the reported wind.

A5.5.2. Special Conditions. Windrose diagrams for special meteorological conditions, such as wind velocities and directions during IFR conditions, should be prepared when necessary for local airfield needs.

A5.5.2.1. Wind Direction. Use radial lines to represent compass directions based on true north, and concentric circles, drawn to scale, to represent wind velocities measured from the center of the circle.

A5.5.2.2. Calm Wind. Use the innermost circle to encompass calm periods and wind velocities up to the allowable crosswind component for the airfield under consideration.

A5.5.2.3. Computations. Compute percentages of time that winds of indicated velocities and directions occur, and insert them in the segments bounded by the appropriate radial direction lines and concentric wind velocity circles. Express percentages to the nearest tenth, which is adequate and consistent with wind data accuracy. Figure A5.3 displays a completed windrose.

Figure A5.1. Windrose Blank Showing Direction and Divisions [16-Sector (22.5°) Windrose].

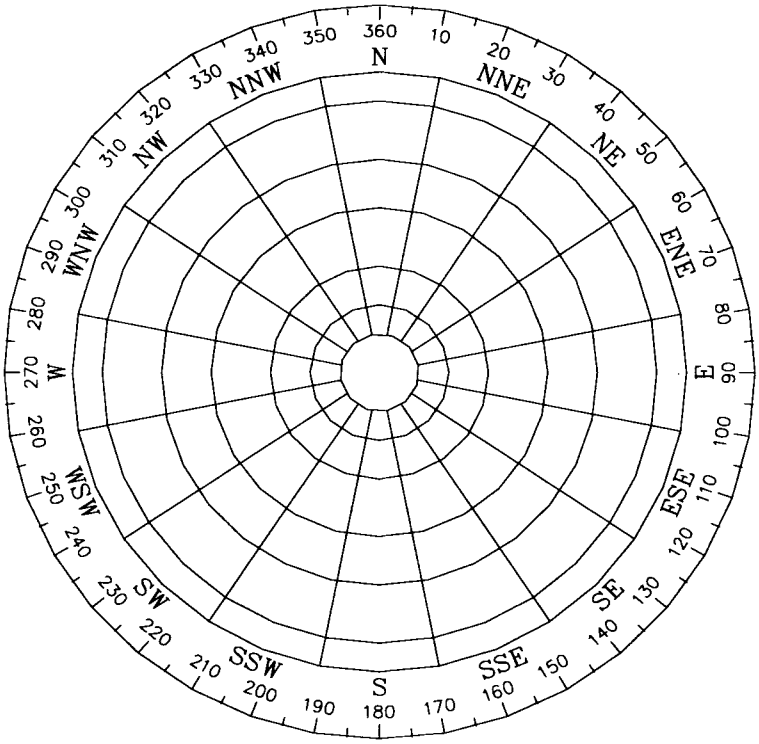


Figure A5.2. Windrose Blank Showing Direction and Divisions [36-Sector (10°) Windrose].

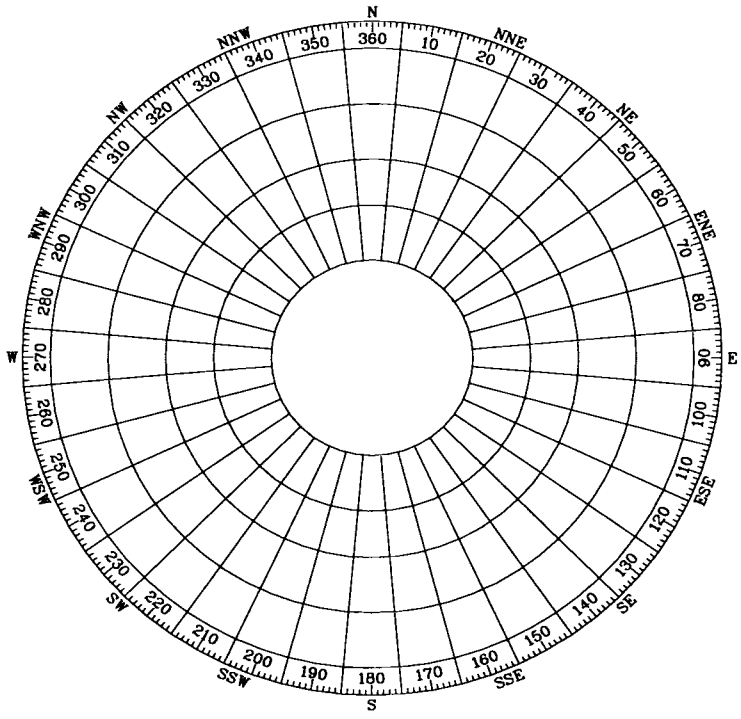
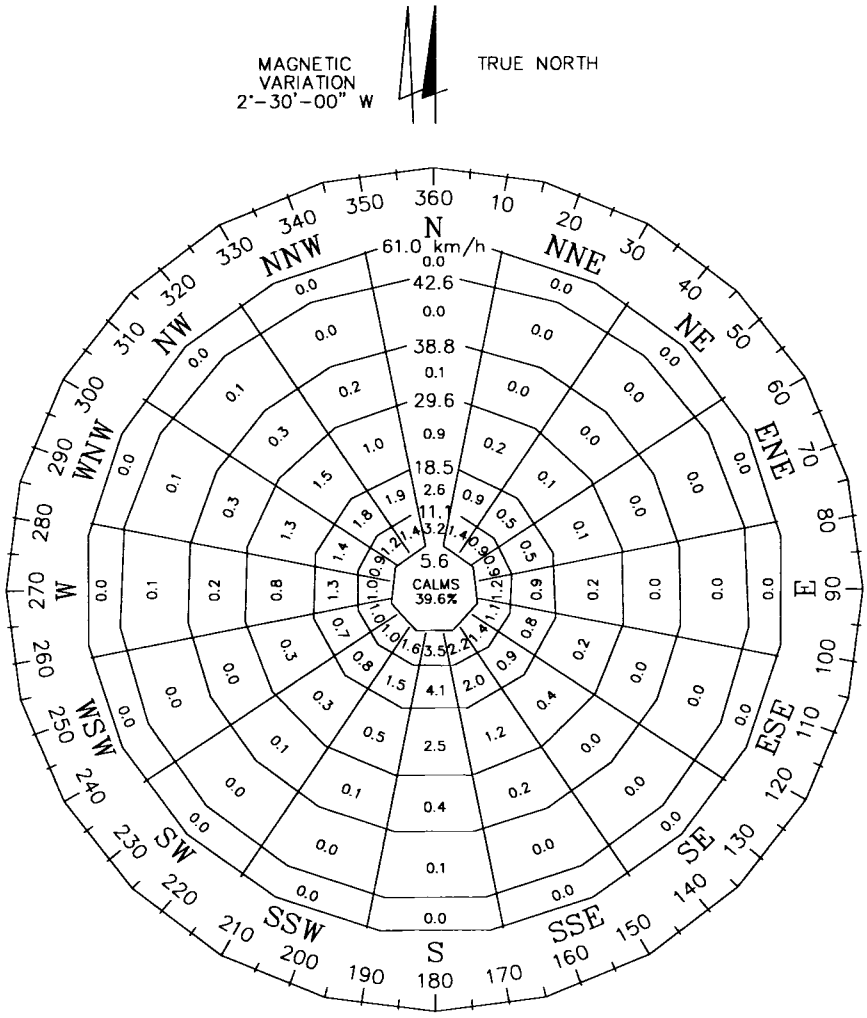


Figure A5.3. Completed Windrose and Wind Velocity Equivalents [16-Sector (22.5 Degree) Windrose].

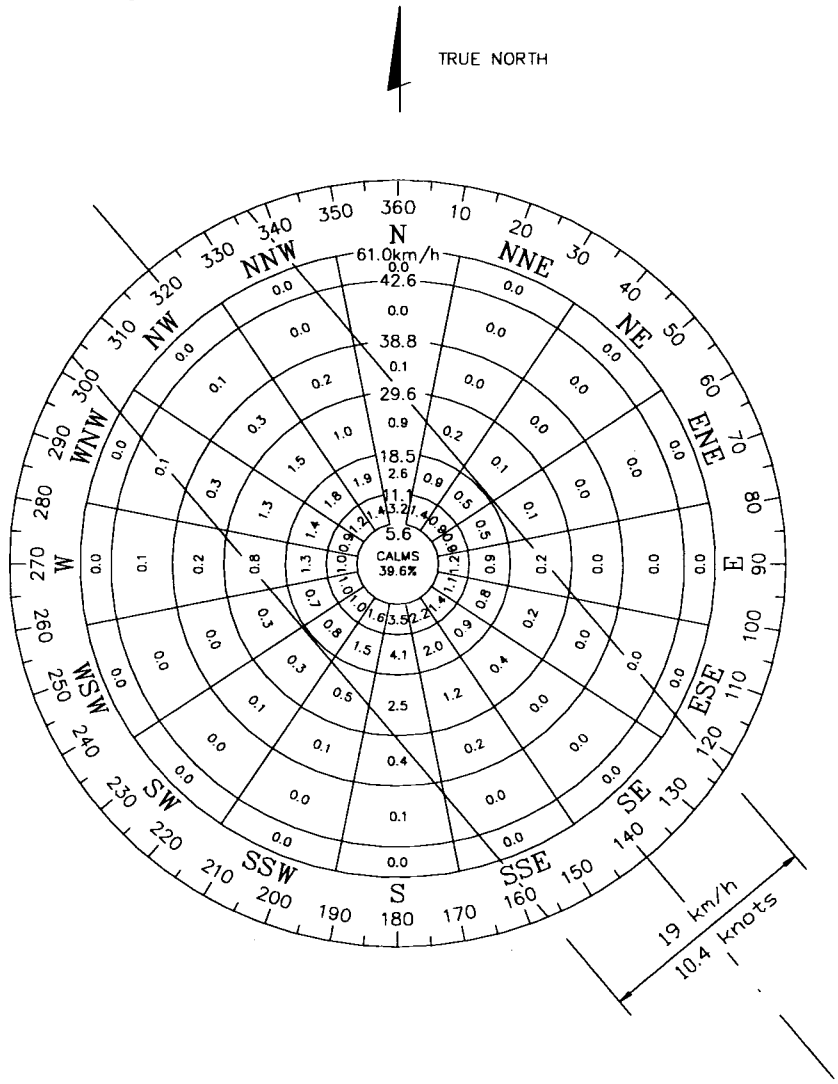


WIND VELOCITY EQUIVALENTS		
KNOTS	KM/H	MPH
3	5.6	2.6
6	11.1	5.2
10	18.5	8.7
16	29.6	13.9
21	38.8	18.3
23	42.6	20.0
33	61.0	28.7

A5.5.2.4. Crosswind Template. A transparent crosswind template is a useful aid in carrying out the windrose analysis. The template is essentially a series of three parallel lines drawn to the same scale as the windrose circles. The allowable crosswind for the runway width establishes the physical distance between the outer parallel lines and the centerline.

A5.5.3. Desired Runway Orientation. For the use of windrose diagrams and crosswind templates in determining desirable runway orientations with respect to wind coverage, see Figure A5.4.

Figure A5.4. Windrose Analysis.



NOTE: A runway oriented 140°—320° (true) would have 3.1 percent of winds exceeding the design crosswind component of 19 km/h.

A5.6. Wind Coverage Requirements for Runways. Determine the runway orientation which provides the greatest wind coverage within the allowable crosswind limits. Place runways to obtain at least 95 percent wind coverage of the maximum allowable crosswind components, as discussed in paragraph A5.6.3. It is accepted practice to total the percentages of the segments appearing outside the limit lines and to subtract this number from 100. For analysis purposes, winds are assumed to be uniformly distributed

throughout each of the individual segments. The larger the area or segment, the less accurate this presumption.

A5.6.1. Primary Runways. Orient a primary runway for the maximum possible wind coverage. See Figure A5.4 for the method of determining wind coverage.

A5.6.2. Secondary Runways. Where wind coverage of the primary runway is less than 95 percent, or in the case of some localities where during periods of restricted visibility the wind is from a direction other than the direction of the primary runway, a secondary (crosswind) runway is required. Normally, secondary runways will not be planned without prior authorization from Naval Air Systems Command. The secondary runway will be oriented so that the angle between the primary and secondary runway centerline is as near 90 degrees as is feasible, considering local site conditions and the need to provide maximum crosswind coverage.

A5.6.3. Maximum Allowable Crosswind Components (Navy Only). Select these components according to type of aircraft, as follows: (1) tricycle gear aircraft, 28.0 kilometers per hour [15.0 knots];and (2) conventional gear aircraft, 19.5 kilometers per hour [10.5 knots].

A5.6.4. Allowable Variations of Wind Direction. See Figure A5.5 for allowable wind directions.

Figure A5.5. Allowable Wind Variation for 19 Kilometer-per-Hour (10.4 Knot) and 28 Kilometer-per-Hour (15 Knot) Beam Wind Components.