3.0 RUNWAY CAPACITY ALTERNATIVES ANALYSIS

An analysis of future demand relative to existing capacity at both ANC and FAI was performed to determine future airfield delay levels and to identify when action may need to be taken (trigger points) to maintain an efficient and attractive airport system. The purpose of this analysis is to understand how the existing airfield infrastructure of the AIAS will be able to accommodate increased future demand. The unique aspects of cargo operations at ANC and FAI, due to the airports' locations and importance to international trans-Pacific cargo transport, dictate that the airfield demand/capacity analysis focus on peak periods and not on average annual delay, which is the more-common metric utilized for major passenger hub airports.

3.1 Method of Analysis

The demand/capacity analysis used detailed AIAS forecast information from Chapter 2.0 of this report to provide demand. The primary element of the forecast used to estimate demand capacity is the gated flight schedule. The gated flight schedule is a detailed forecast that includes every single aircraft operation expected to occur on an average day of the peak month of aircraft activity. The schedule contains information on the type of aircraft, its origin and destination (O&D), its parking position, and the time the aircraft will either arrive to, or depart from, the subject airport. This information is necessary to ascertain a representative capacity for the airfield, since capacity is highly dependent on the type of aircraft and peaking characteristics.

Gated flight schedules were prepared for ANC and FAI for two future activity levels corresponding to baseline forecast operations in 2020 and 2030 (Future 1 and Future 2). The Future 1 and Future 2 terminology is used because the demand/capacity analysis is based on a future activity level, not based on a clearly known calendar year. For ANC, the activity levels represent 242,275 (Future 1) and 281,942 (Future 2) annual operations, respectively. These equate to average day peak month operations of 860 and 1,004, respectively. For FAI, the activity levels represent 136,248 (Future 1) and 156,128 (Future 2) annual operations, respectively, and average day peak month operations of 602 and 690. Exhibits 3.1 through 3.4 show the hourly demands for these traffic levels at both ANC and FAI.

Figure 3.1

Anchorage International Airport
Future 1 Hourly Operations

Equates to Annual Operations
of Approximately 242,000
Average Day Peak Month = 860 Operations

Source: Anchorage gated flight schedule, HNTB

Total Hourly Operations

Time	Count
12 AM	28
1 AM	20
2 AM	11
3 AM	13
4 AM	15
5 AM	16
6 AM	34
7 AM	32
8 AM	32
9 AM	55
10 AM	44
11 AM	48
12 PM	51
1 PM	53
2 PM	56
3 PM	60
4 PM	52
5 PM	47
6 PM	36
7 PM	31
8 PM	40
9 PM	32
10 PM	27
11 PM	27
Total	860

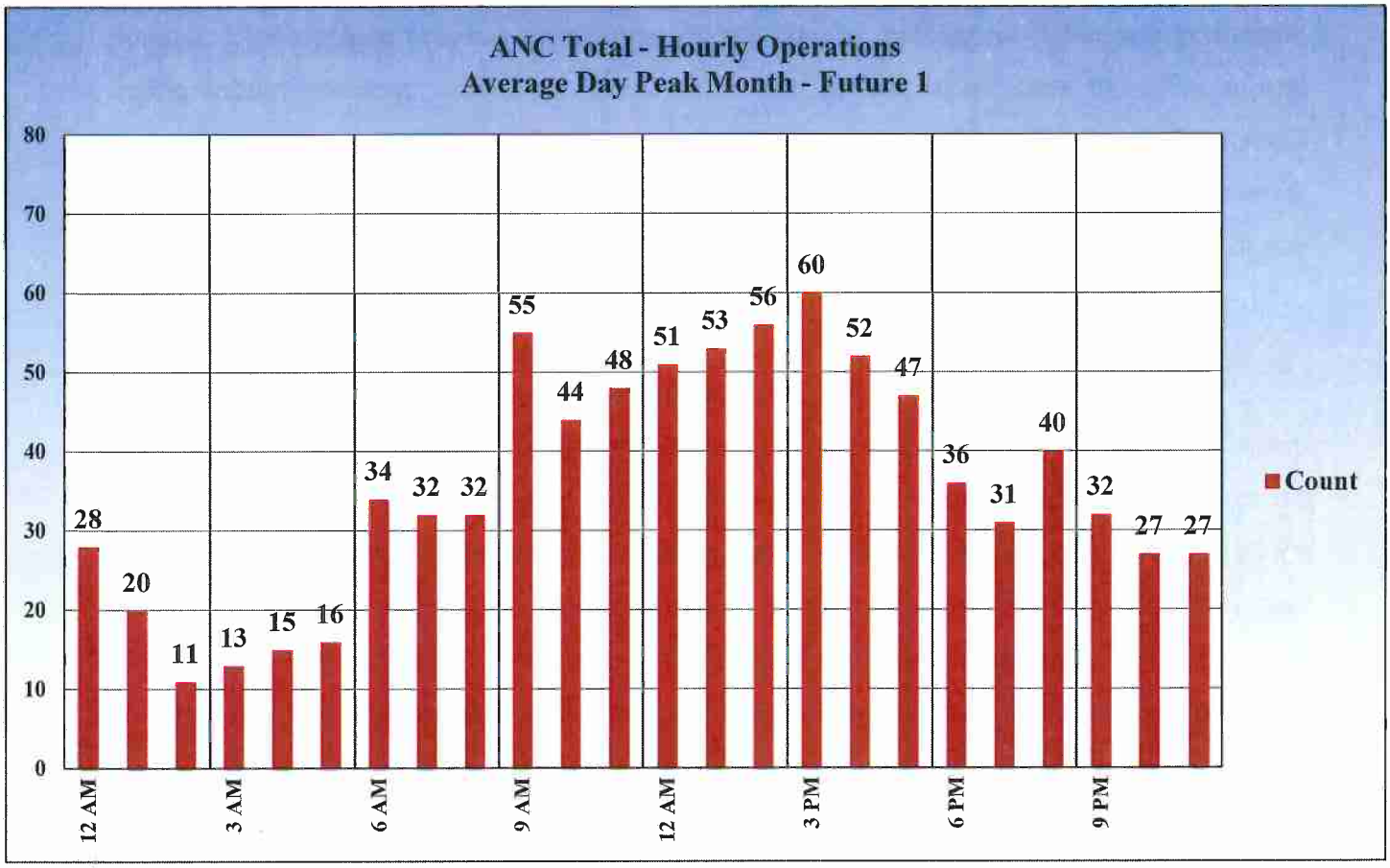


Figure 3.2

Anchorage International Airport
Future 2 Hourly Operations

Equates to Annual Operations
of Approximately 282,000
Average Day Peak Month = 1,004 Operations

Total Hourly Operations

Time	Count
12 AM	33
1 AM	23
2 AM	14
3 AM	16
4 AM	19
5 AM	17
6 AM	37
7 AM	36
8 AM	38
9 AM	61
10 AM	51
11 AM	60
12 PM	64
1 PM	60
2 PM	63
3 PM	73
4 PM	58
5 PM	54
6 PM	39
7 PM	38
8 PM	50
9 PM	40
10 PM	30
11 PM	30
Total	1004

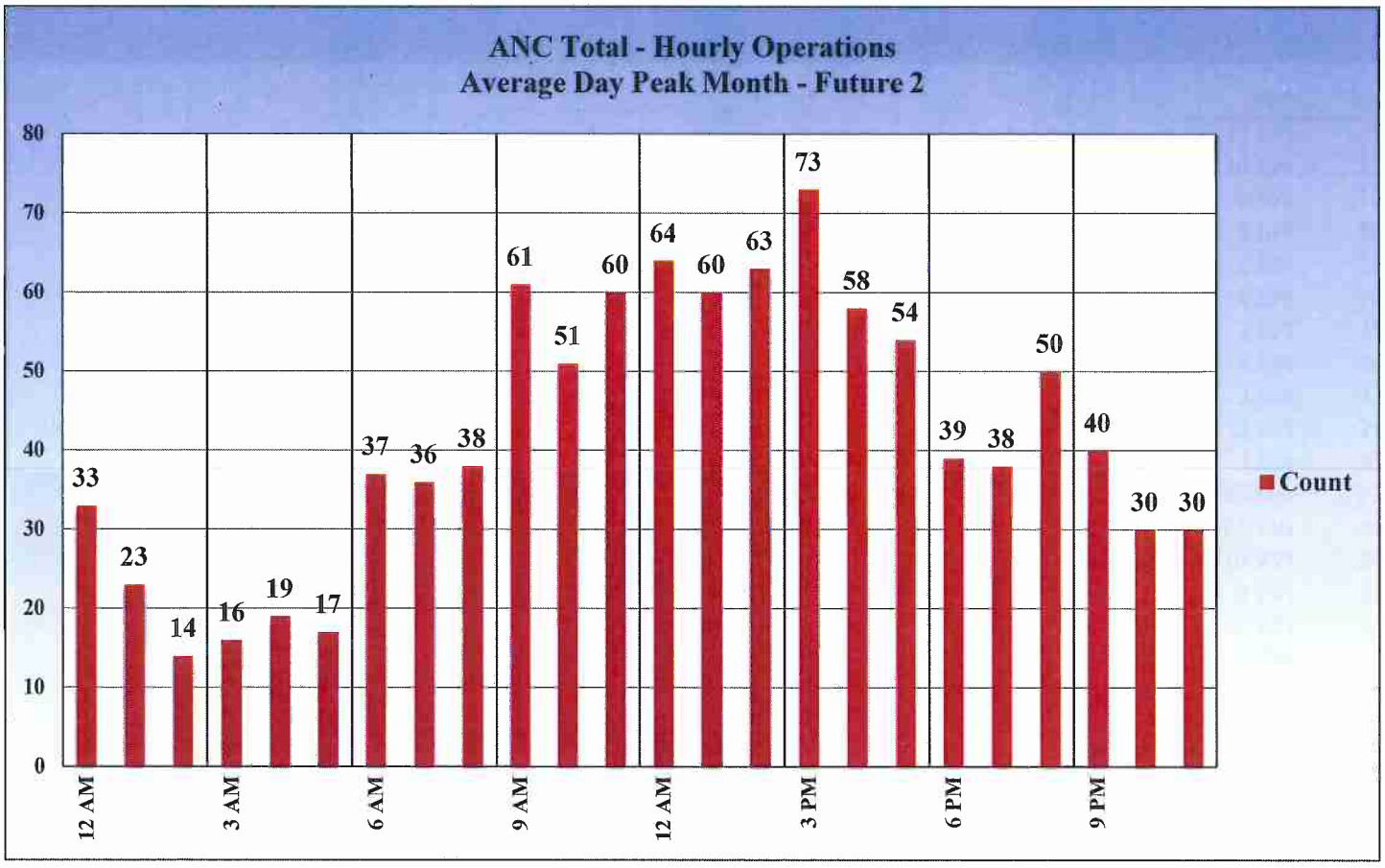


Figure 3.3

Fairbanks International Airport
Future 1 Hourly Operations

Equates to Annual Operations
of Approximately 136,000
Average Day Peak Month = 602 Operations

Source: Anchorage gated fligh: schedule, HNTB

Total Hourly Operations

Time	Count
12 AM	17
1 AM	17
2 AM	4
3 AM	3
4 AM	3
5 AM	9
6 AM	14
7 AM	32
8 AM	37
9 AM	34
10 AM	26
11 AM	41
12 PM	52
1 PM	32
2 PM	34
3 PM	47
4 PM	29
5 PM	42
6 PM	30
7 PM	33
8 PM	26
9 PM	16
10 PM	13
11 PM	11
Total	602

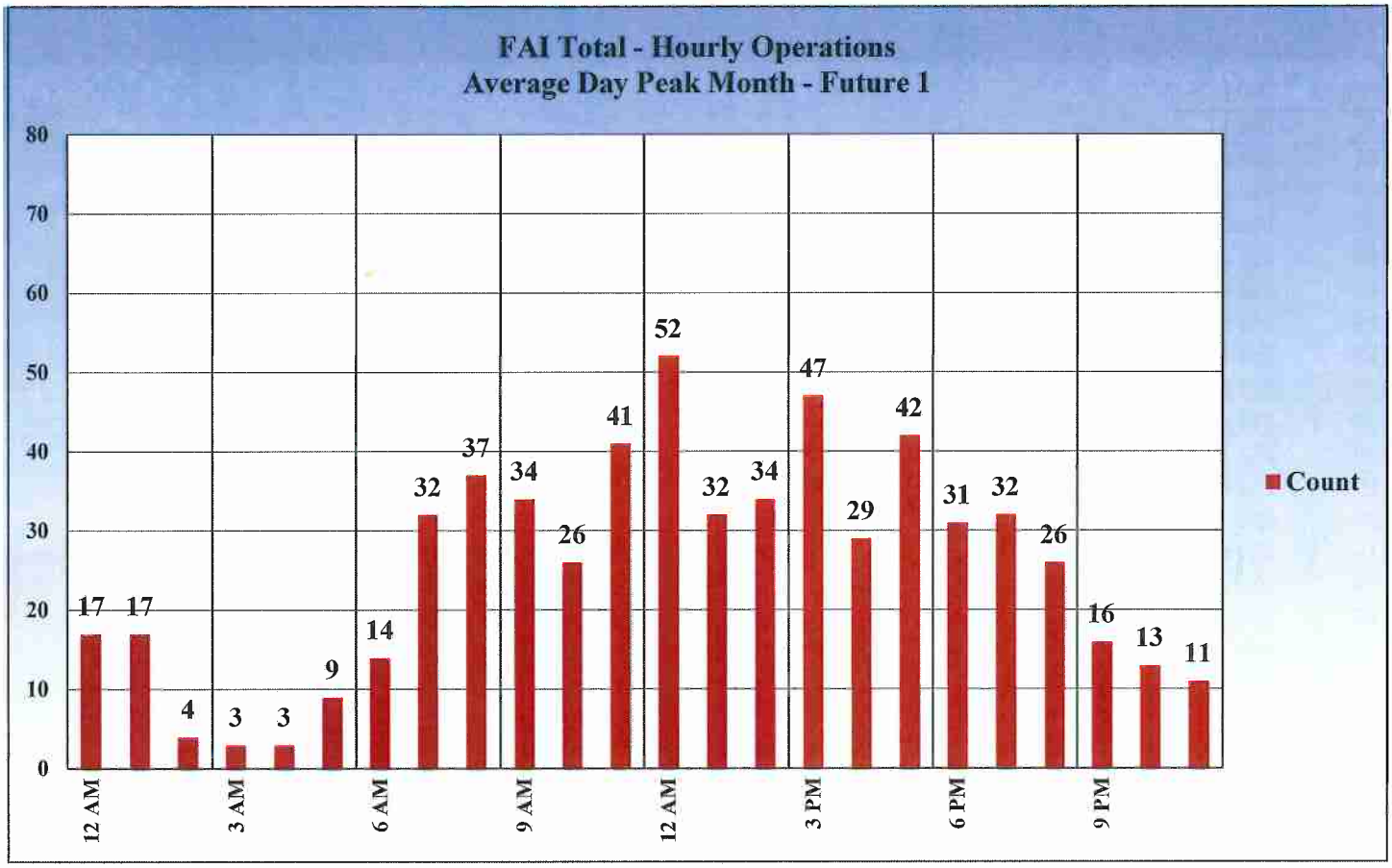


Figure 3.4

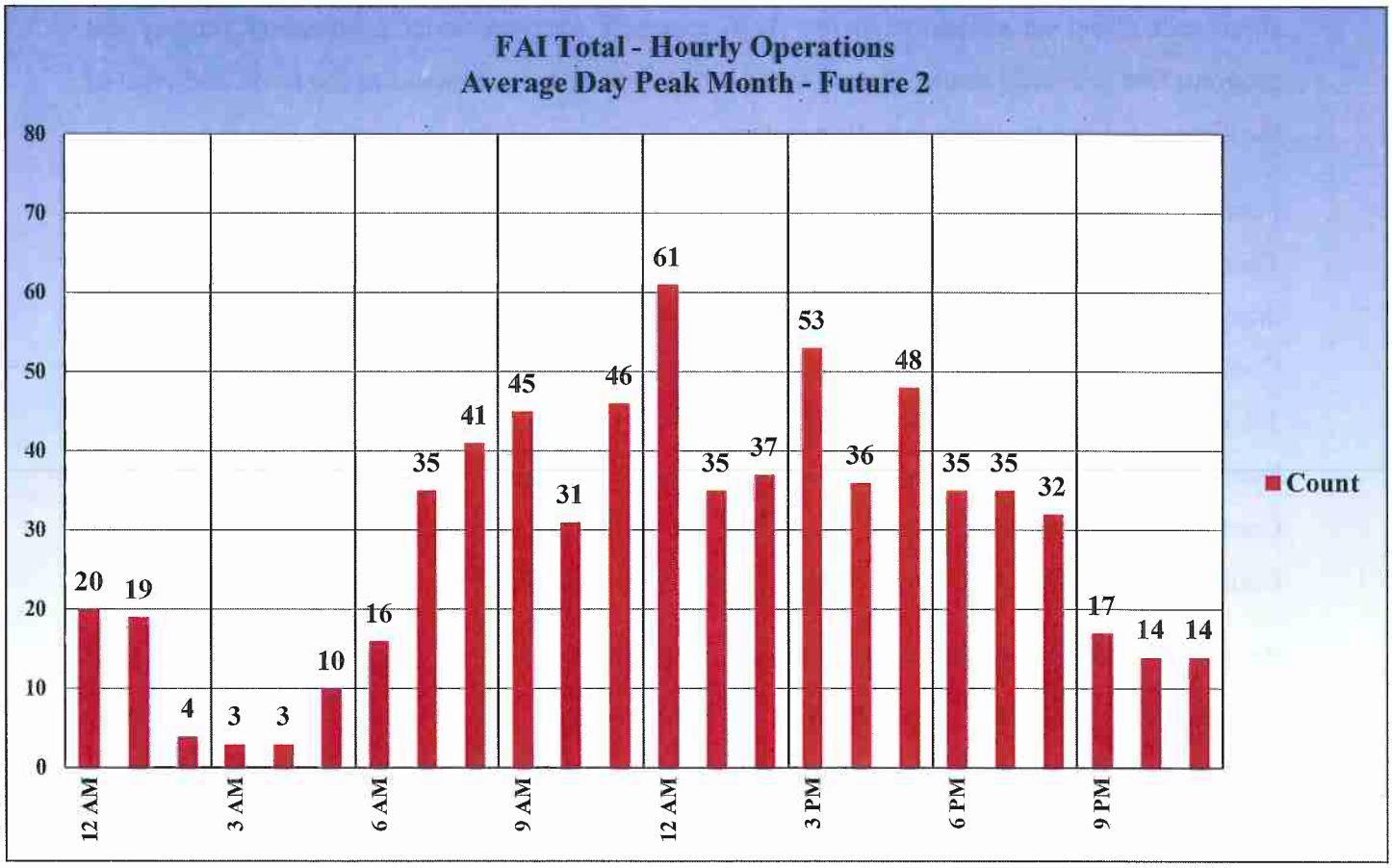
Fairbanks International Airport
Future 2 Hourly Operations

Equates to Annual Operations
of Approximately 156,000
Average Day Peak Month = 690 Operations

Source: Anchorage gated flight schedule, HNTB

Total Hourly Operations

Time	Count
12 AM	20
1 AM	19
2 AM	4
3 AM	3
4 AM	3
5 AM	10
6 AM	16
7 AM	35
8 AM	41
9 AM	45
10 AM	31
11 AM	46
12 PM	61
1 PM	35
2 PM	37
3 PM	53
4 PM	36
5 PM	48
6 PM	35
7 PM	35
8 PM	32
9 PM	17
10 PM	14
11 PM	14
Total	690



The demand/capacity levels were determined by using an FAA-developed computer simulation tool called SIMMOD. SIMMOD is a useful tool for quantifying delay and capacity for an airport and/or airspace system given varying traffic levels, and measuring the benefits of physical or procedural modifications. Three types of data go into a SIMMOD study: (1) the airport and airspace infrastructure, (2) the Air Traffic Control rules and procedures, and (3) the aircraft schedule. SIMMOD simulates the step-by-step movement of all aircraft, resolving conflicts and keeping track of the travel and delay time along each segment. SIMMOD then produces tabular results of aircraft travel and delay time, and displays an animation playback. SIMMOD was especially useful for this study since a SIMMOD model has been used for ANC airfield and airspace modeling since the late 1990s. A complete new SIMMOD model needed to be created for FAI. Exhibit 3.5 shows the link node structure for the ANC model while Exhibit 3.6 shows the link node structure for the FAI model.

3.1.1 Airfield Operating Modes

The manner in which an airfield is used has a significant impact on the capacity of the airfield. Weather conditions (visual flight rules [VFR] or instrument flight rules [IFR]) also have a significant effect on airfield capacity. ANC currently operates under a voluntary runway use program that primarily routes aircraft arrivals and departures over water to the north and west of the airport, subject to winds and other factors.

Four different runway use/weather conditions scenarios were analyzed for this study for ANC. Those operating modes, shown in Exhibits 3.7 through 3.10, are used approximately 97% of the time. All other operating modes occur 1% of the time or less, with the exception of Configuration 3-VFR (Exhibit 3.11). In certain years, Configuration 3-VFR has occurred close to 3% of the time. However, using other analytic tools, Configuration 3-VFR has been found to have similar capacity to some of the other higher capacity operating modes. Therefore Configuration 3-VFR was not modeled in SIMMOD and Configuration 4-VFR and Configuration 1-IFR, which have lower capacity, were modeled instead.

For FAI, the airport operates in either north flow or south flow and operates under both VFR and IFR weather conditions. The geometry of the airfield at FAI is such that the capacity is essentially the same, whether the airport is operating to the north or the south. For this reason, only north flow was modeled in VFR and IFR. See Exhibits 3.12 and 3.13.

Figure 3.5

Anchorage International Airport
SIMMOD Link-Node Structure

Figure 3.6

Fairbanks International Airport
SIMMOD Link-Node Structure

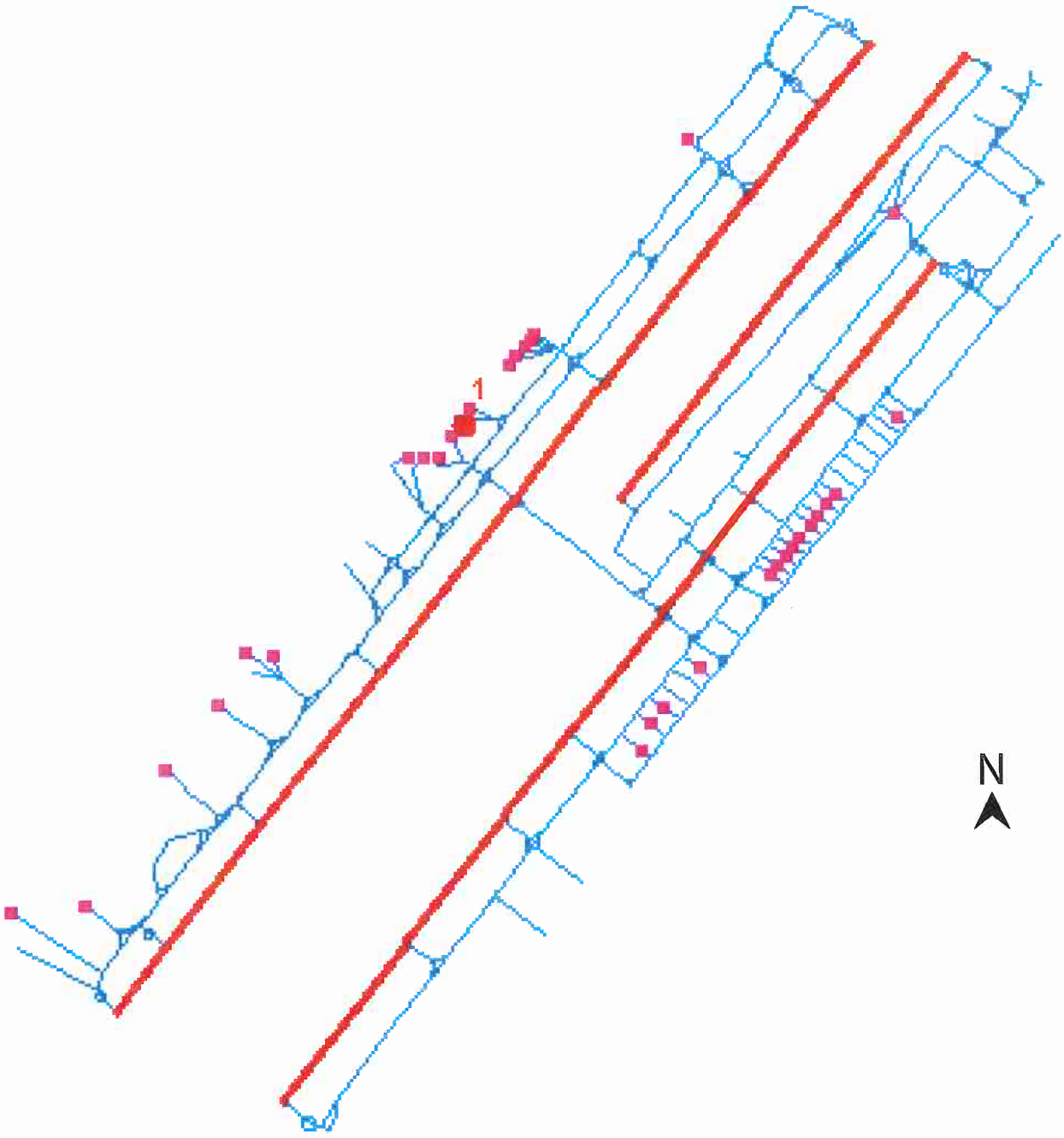
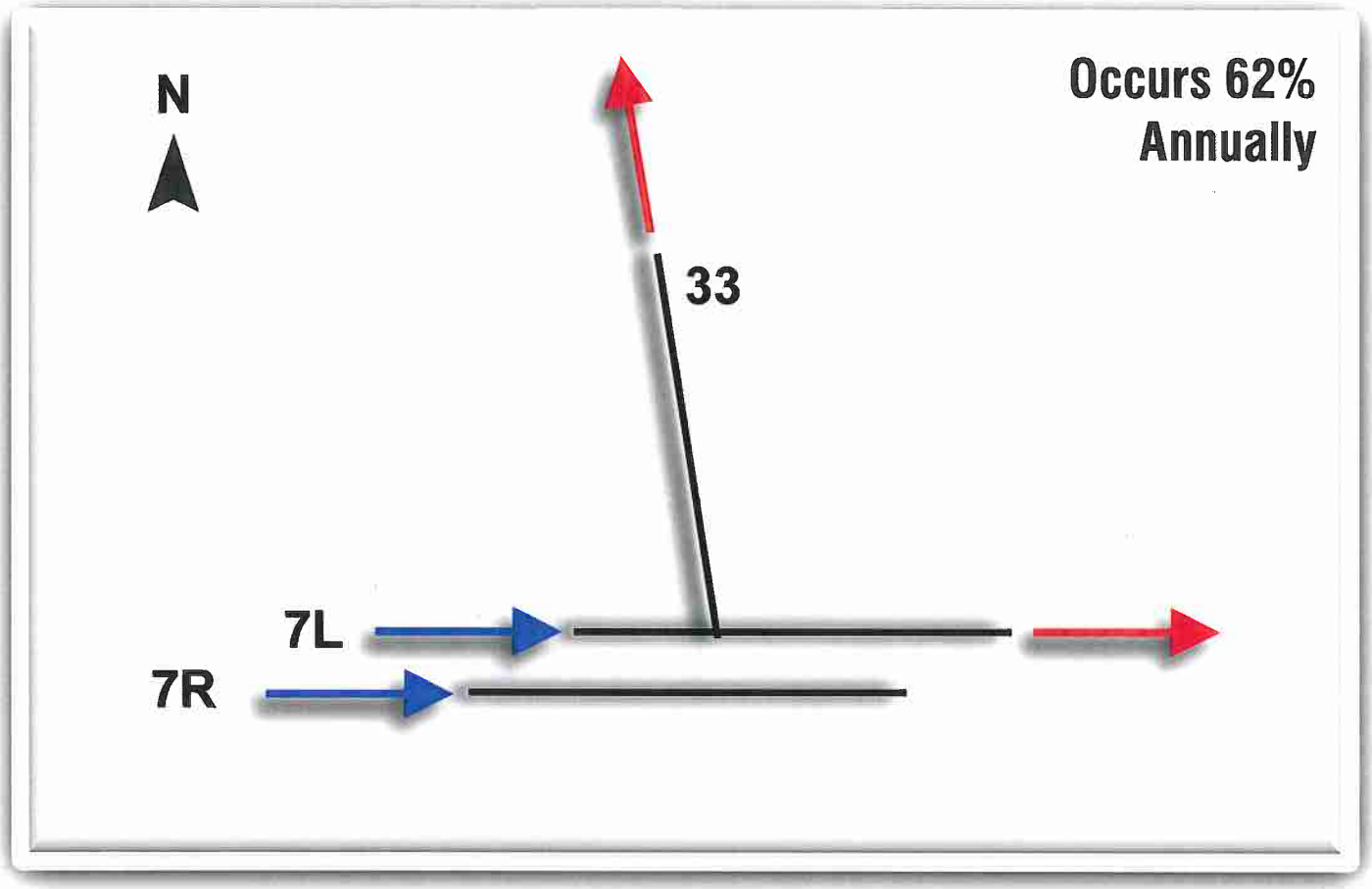


Figure 3.7

Anchorage International Airport
Configuration 1 Diagram
VFR

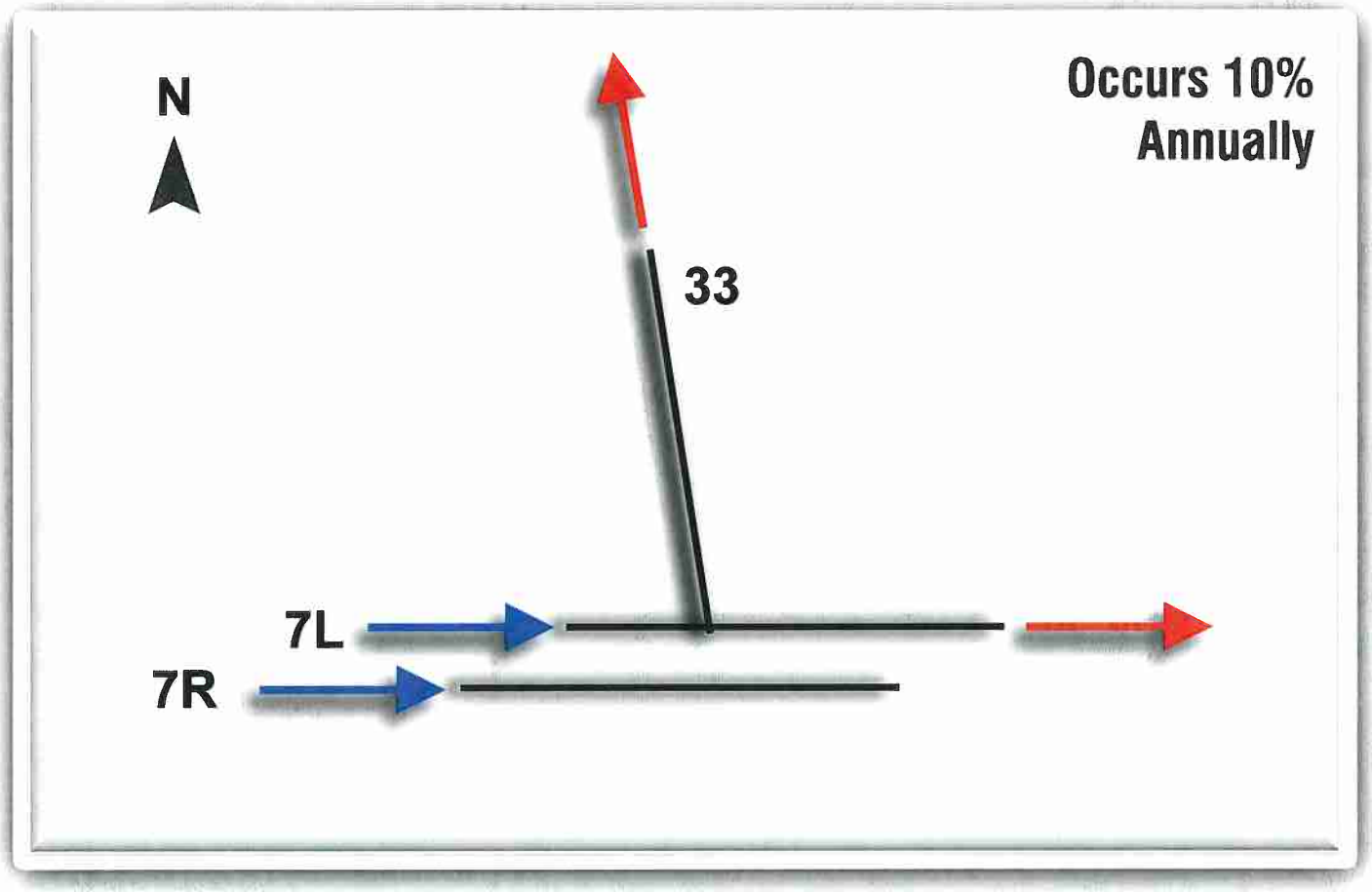


Legend:

7L	Runway Number (Typical)
→	Departure
→	Arrival

Figure 3.8

Anchorage International Airport
Configuration 1 Diagram
IFR



Legend:

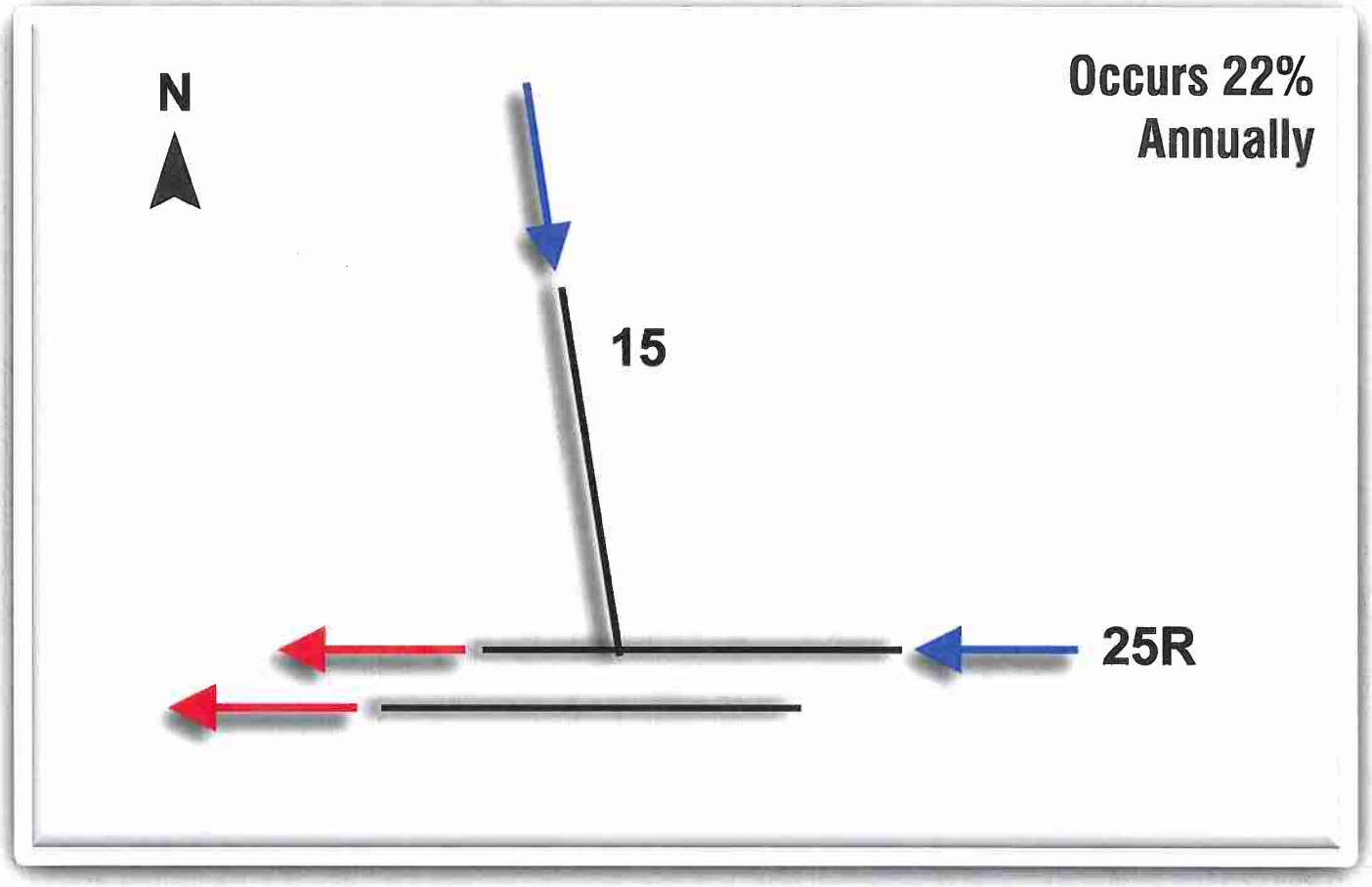
7L Runway Number (Typical)

Departure

Arrival

Figure 3.9

Anchorage International Airport
Configuration 2 Diagram
VFR

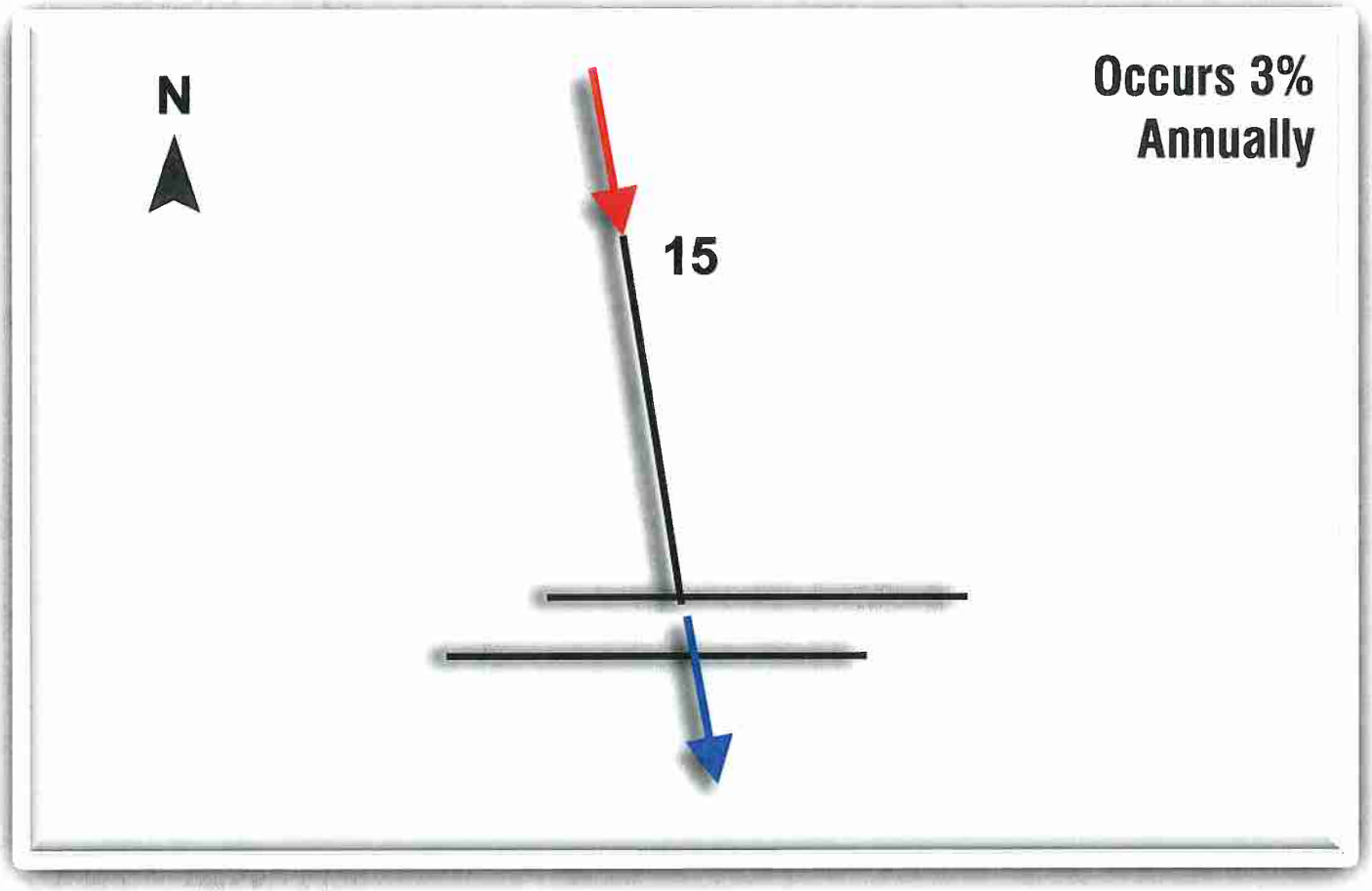


Legend:

15	Runway Number (Typical)
→	Departure
→	Arrival

Figure 3.10

Anchorage International Airport
Configuration 4 Diagram
VFR



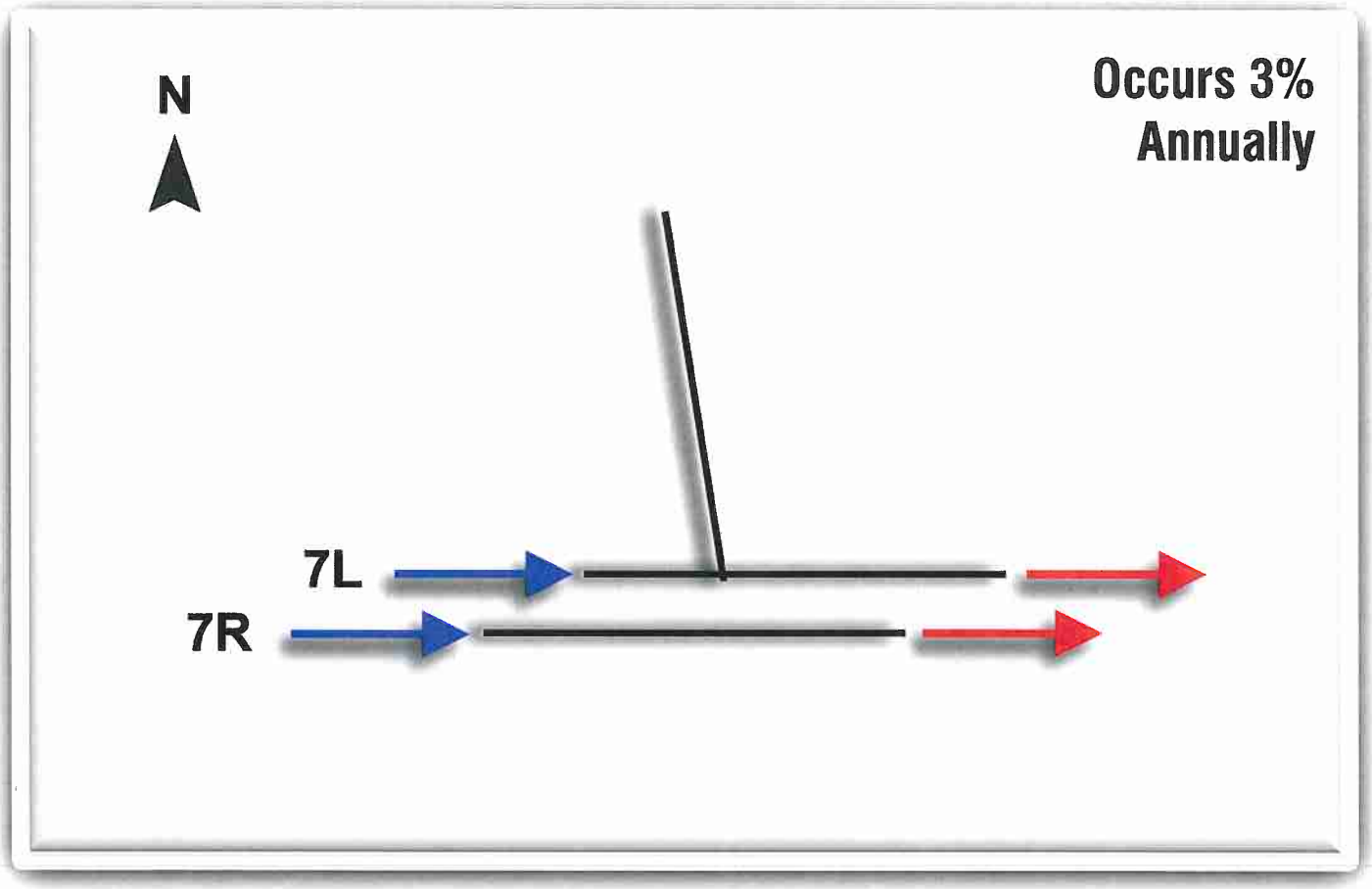
Legend:

15	Runway Number (Typical)
→	Departure
→	Arrival

Figure 3.11

Anchorage International Airport
Configuration 3 Diagram
VFR

(This configuration was not modeled in SIMMOD for this analysis)



Legend:

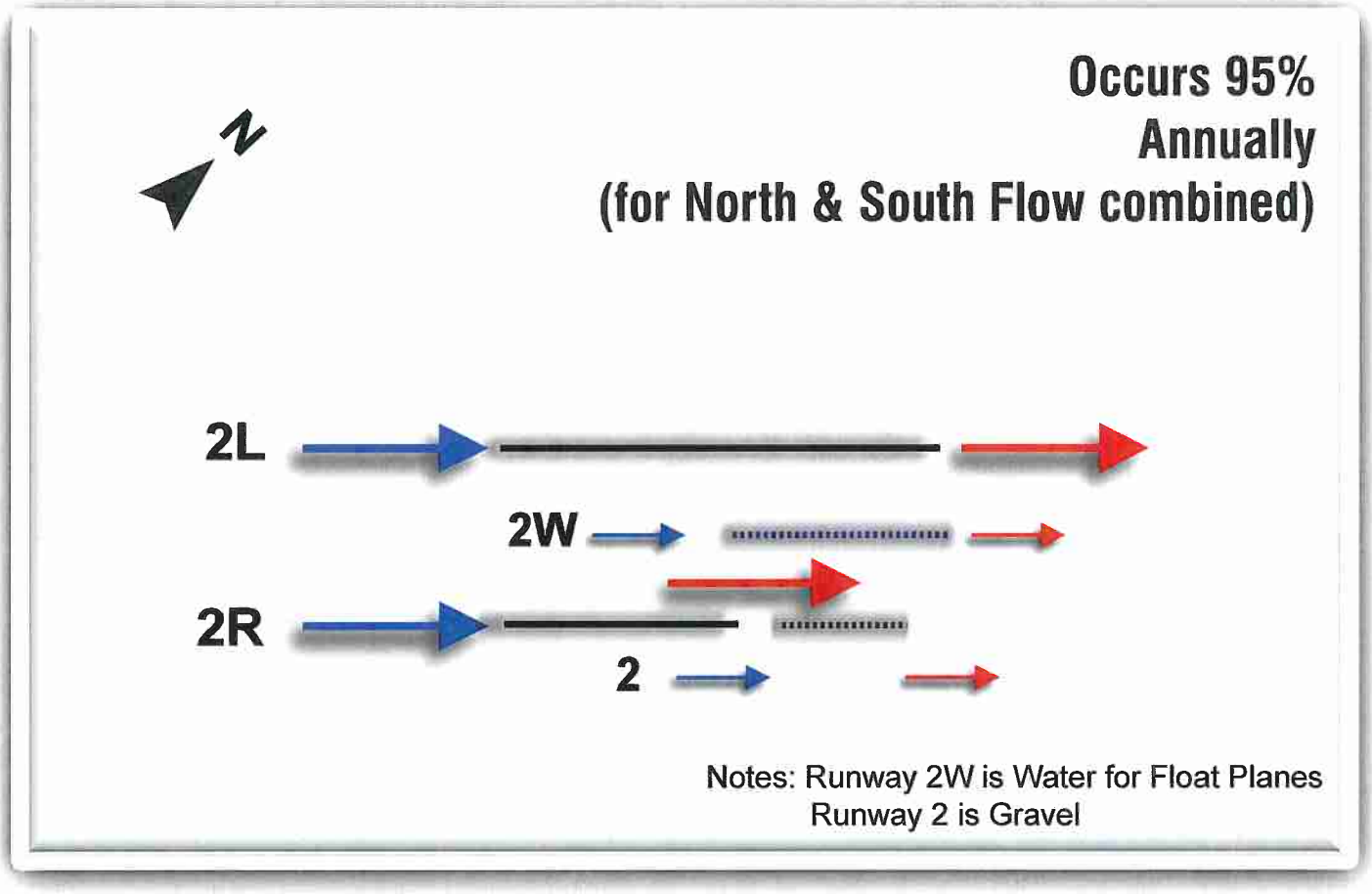
7L Runway Number (Typical)

Departure

Arrival

Figure 3.12

Fairbanks International Airport
Configuration 1 Diagram
VFR (North Flow)



Legend:

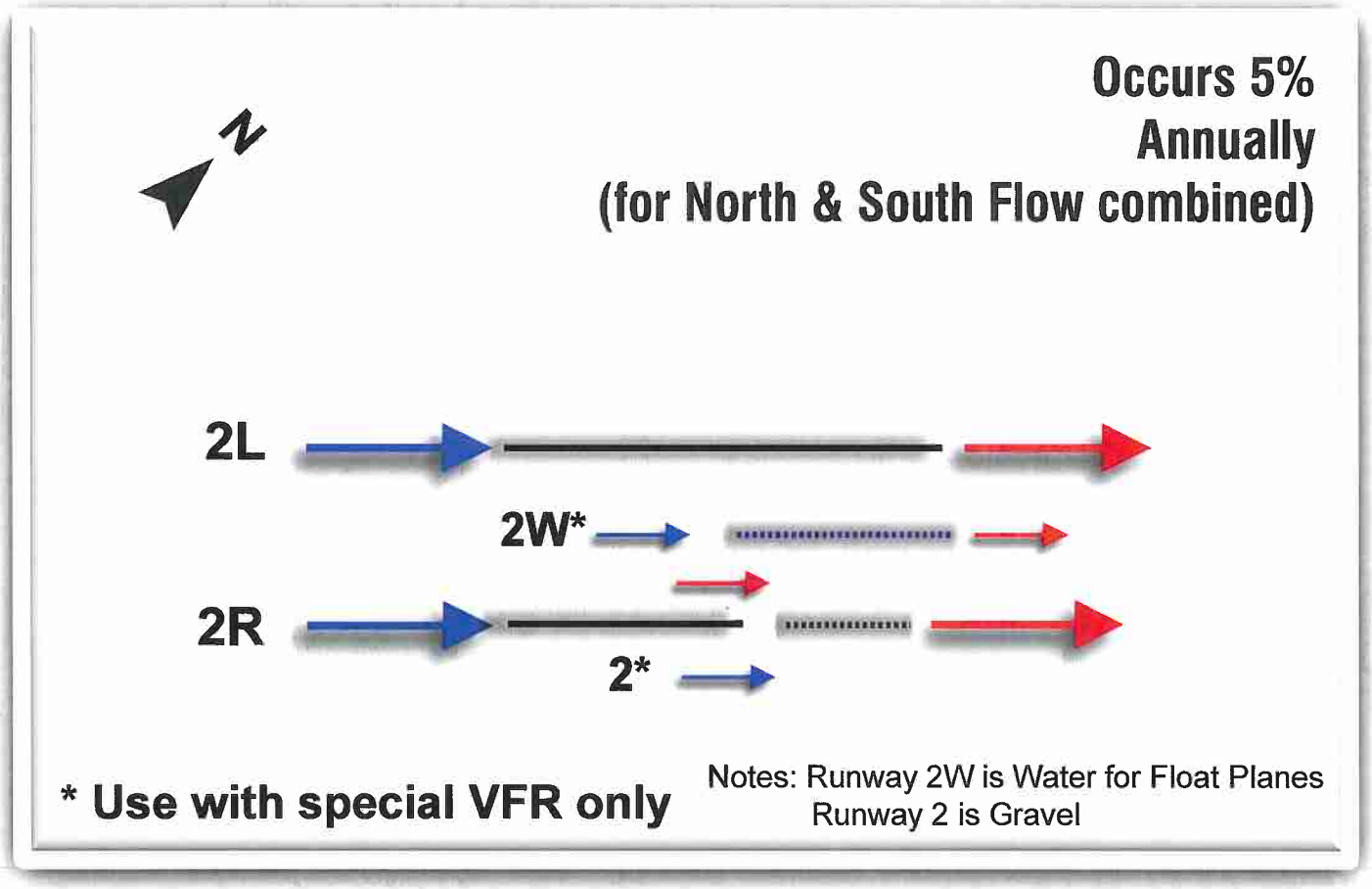
2L Runway Number (Typical)

Departure

Arrival

Figure 3.13

Fairbanks International Airport
Configuration 1 Diagram
IFR (North Flow)



Legend:

2L Runway Number (Typical)

Departure

Arrival

3.1.2 Airfield Capacity

Airfield capacity is a complicated subject. A brief discussion of the complexities of the subject is provided here. For the purposes of this study, a distinction is made between theoretical capacity and practical capacity. Theoretical capacity assumes a constant demand is present to consistently supply an aircraft to the airfield system as soon as the system has an opening. However, in real life that seldom happens. Typically, aircraft arrive and depart in clusters. An airfield can have a theoretical capacity of 60 arrivals per hour for example. However, if 60 arrivals come in an hour, but 40 of those arrivals come in the last 20 minutes, the airport will not accommodate 60 arrivals during that hour.

Practical Capacity measures the throughput that can actually be accomplished over a given time period based upon the nature of the traffic that is supplying the demand to the system. This study looks at the practical capacity of the AIAS by using gated flight schedules and SIMMOD modeling developed from existing arrival and departure statistics.

Capacity, both theoretical and practical, varies according to the operating mode in use at any given time. The number of runways in use and the runways' interactions with each other and the airspace has a direct impact on the capacity.

Even for a given operating mode, the capacity varies according to the mix of arrivals and departures, and also according to the type of aircraft using the airport. One of the biggest impacts upon capacity is the amount of wake turbulence generated by the aircraft using the airfield and adjacent airspace. Aircraft designated as "heavy" (capable of takeoff weights of 300,000 pounds or more) and B-757 aircraft, need especially large separation from other aircraft for safety reasons associated with wake turbulence. Aircraft speed and the amount of time they occupy on the runway also impact capacity. SIMMOD takes all of these parameters and more into account when determining capacity. For example, Exhibit 3.14 shows how the hourly capacity for ANC Configuration 4-VFR changes slightly as the departures-to-arrivals ratio changes and as the "fleet mix" also changes. For simplicity, a "representative practical capacity" is determined for each operating mode. The representative practical capacity for this study is the peak throughput (number of operations) achieved for a given operating mode even though that number cannot necessarily be maintained throughout the period of peak demand.

Figure 3.14

Hourly Capacity
Anchorage International Airport
Configuration 4
VFR

Hour	Capacity	Arrival/ Departure Mix (%)
9-10 a.m.	42	50/50
10-11	41	49/51
11-12	43	48/52
12-1 p.m.	42.5	48/52
1-2	44	49/51
2-3	43.5	48/52
3-4	43.5	48/52
4-5	42	49/51