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## APPENDIX B

# Capacity Analysis Calculation Details

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This appendix describes detailed calculations for the airfield capacity analysis described in Chapter C of this Master Plan.

Weighted hourly capacity,  $C_w$ , was calculated in accordance with AC 150/5060-5. In calculating  $C_w$ , ceiling and visibility (VFR/IFR) data is needed. Weather conditions can impact an airport's capacity by causing conditions that require the facility to close or greatly stagger aircraft operations. There are two categories for weather conditions related to operating aircraft, instrument flight rules (IFR) and visual flight rules (VFR). VFR weather conditions exist when the cloud ceiling is greater than or equal to 1,000 feet above ground level (AGL), and visibility is greater than or equal to three miles. IFR conditions are those below the stated VFR minimums.

It is important to differentiate IFR and VFR conditions because greater separation distances (which reduce capacity) are required under IFR conditions. According to the most recent weather data available through the National Climatic Data Center (NCDC) that is compatible with existing FAA wind analysis software, the Automated Weather Observing System (AWOS) unit located on the Airport observed the following weather conditions for the period from 2005 to 2014:

- **94.1% of the total hourly observations reported VFR weather conditions, of which 90.8% occurred during calm wind conditions (<10.5 knots).**
- **5.9% of the total hourly observations reported IFR weather conditions, of which 97.2% occurred during calm wind conditions (<10.5 knots). (Note: this is all IFR weather, or anything observed with the visibility below 3 SM)**
- **Airport Closed, weather below Category A, B, or C visibility requirements:**
  - Category A – 2.3% of the total hourly observations reported, weather conditions below SUN's existing instrument approach minimums (below 1 ¼ mile visibility), of which 97.8% occurred during calm wind conditions (<10.5 knots)
  - Category B – 2.8% of the total hourly observations reported, weather conditions below SUN's existing instrument approach minimums (below 1 ½ mile visibility), of which 97.7% occurred during calm wind conditions (<10.5 knots)
  - Category C – 5.9% of the total hourly observation reported, weather conditions below SUN's existing instrument approach minimums (below 3 miles visibility), of which 97.2% occurred during calm wind conditions (<10.5 knots)

Based on capacity charts contained in AC 150/5060-5 for single runway airport configurations with bi-directional (i.e. not head-to-head) operational patterns, the theoretical VFR hourly capacity for Runway 13/31 is 73 operations, and the IFR hourly capacity is 54 operations. There are not capacity charts in the AC for opposite direction operational patterns, as this type of pattern is generally undesirable according to FAA procedure. The head-to-head procedures at SUN significantly reduce the runway's operational capacity. Airport and Tower personnel estimate that the head-to-head pattern reduces VFR capacity by 25% and reduces IFR capacity by 50% when compared to a typical bi-directional pattern. This results in an estimated

VFR hourly capacity of 55 operations and an IFR hourly capacity of 27 operations for opposite direction operations. Because the head-to-head pattern is the predominant operational procedure at SUN, these estimates of hourly capacity were used for this analysis. However, it is important to recognize that this analysis does not take into account required air traffic control procedures and clearances needed at SUN given the challenging terrain. The ATCT must obtain clearances for arrival and departures from Salt Lake Center, which further lowers capacity. Thus, the actual runway capacity is likely more limited than these figures indicate.

**Table C2** summarizes the hourly capacity for the airfield’s operating configuration. Based on formulas contained in AC 150/5060-5, weighted hourly capacity of the airfield at SUN is 32.1 operations.

Table C2 **WEIGHTED HOURLY CAPACITY (C<sub>w</sub>)**

Configuration	Description	Occurrence Rate	Hourly Capacity	Weighting Factor
VFR 1	VFR Conditions	95.1%	55	1
IFR 1	IFR Conditions	2.6%	27	25
IFR 2	Below IFR Minimums	2.3%	0	25
<b>Weighted Hourly Capacity (C<sub>w</sub>)</b>				<b>32.1</b>

SOURCE: FAA Advisory Circular 150/5060-5, Airport and ATCT personnel, Mead & Hunt.

The Daily Demand Ratio (D) is the ratio of annual demand to average daily demand in the peak month. Annual demand for the year 2014 was drawn from the estimate presented in Chapter B of 28,480 operations. Average daily demand in the peak month was determined by dividing the estimated peak month (July) 2014 operations of 4,557 that was also presented in Chapter B by 31 days, which is equivalent to 147 average daily operations. The Daily Demand Ratio (D) for 2014 was calculated as follows:

$$D = \text{Annual Demand} / \text{Peak Month Average Daily Demand}$$

$$D = 28,480 / 147$$

$$D = 193.7$$

The Hourly Demand Ratio (H) is the ratio of average daily demand to average peak hour demand during the peak month. In the Peak Period Operations Forecast presented in Chapter B, it was estimated that peak hour operations are 10.0% percent of the peak day of the peak month. Therefore, average peak hour demand during the peak month was calculated by multiplying the average daily demand (147) times 0.1, which is equivalent to 14.7 operations. The Hourly Demand Ratio (H) was calculated as follows:

$$H = \text{Peak Month Average Day Demand} / \text{Peak Hour Demand}$$

$$H = 147 / 14.7$$

$$H = 10.0$$

Finally, the theoretical Annual Service Volume (ASV) for 2014 is calculated as follows:

$$ASV = C_w * D * H$$

$$ASV = 32.1 * 193.7 * 10.0$$

$$ASV = 62,200 \text{ operations}$$