Chapter 5 – AIRFIELD CAPACITY ANALYSIS

5.01 GENERAL

In this chapter, the existing airfield capacity at Dutchess County Airport is compared with the forecast levels of aviation activity. From this analysis, facility requirements for the planning period will be developed by converting any identified capacity deficiencies into detailed needs for new airport facilities. The background of airfield capacity is based on four areas. They are:

- Definition of airfield capacity;
- Methodology used;
- Hourly capacity; and
- Annual Service Volume.

5.02 DEFINITION OF AIRFIELD CAPACITY

Airfield capacity, as it applies to Dutchess County Airport, is a measure of terminal area airspace and airfield saturation. It is defined as the maximum rate at which aircraft can arrive and depart an airfield with an acceptable level of delay. Measures of capacity include the following:

- Hourly Capacity of Runways: The maximum number of aircraft operations that can take place on the runway system in one hour.
- Annual Service Volume: The annual capacity or a maximum level of annual aircraft operations that can be accommodated on the runway system with an acceptable level of delay.

5.03 METHODOLOGY USED

Various techniques have been developed for the analysis of airfield capacity. The current technique accepted by the FAA is described in the FAA Advisory Circular 150/5060-5 *Airport Capacity and Delay*. The Airport Capacity and Delay Model (ACDM) uses the following inputs to derive an estimated airport capacity:

- Airfield layout and runway use;
- Meteorological conditions;
- Navigational aids;
- Aircraft operational fleet mix; and
- Touch–And–Go operations.

Each of the inputs used in a calculation of airfield capacity is described in the following sections.

AIRFIELD LAYOUT AND RUNWAY USE

The airport layout refers to the location and orientation of runways, taxiways, and other facilities. Currently, Dutchess County Airport has two runways with full parallels accessed at each runway end and mid-field. Additional taxiways connect the runways to the fueling apron and terminal building.

METEORLOGICAL CONDITIONS

Wind conditions are of prime importance in determining runway use and orientation. The prevailing wind and visibility conditions determine the directions in which takeoffs and landings may be conducted and the frequency of use for each available runway.

For the purposes of this study, the terms visual flight rules (VFR) and instrument flight rules (IFR) are used as measures of ceiling and visibility. VFR conditions occur when the ceiling is at least 1,000 feet and visibility is three miles or greater. During these conditions, pilots fly on a see-and-be-seen basis. IFR conditions occur when the ceiling is less than 1,000 feet or visibility drops below three miles. In IFR weather, the FAA air traffic control system assumes responsibility for safe separation between aircraft.

NAVIGATIONAL AIDS

FAA's ACDM uses information concerning instrument flight rule (IFR) capability in the capacity calculation. Airports with instrument capabilities are able to operate during IFR conditions and thus are open a greater percentage of the year than similar VFR-only airports.

The navigational aids available at Dutchess County Airport have been described in Section 3.09-4 NAVIGATION AIDS/VISUAL LANDING AIDS.

AIRCRAFT OPERATIONAL FLEET MIX

The FAA's Airport Capacity Demand Model also requires that total annual operations be converted to operations by specific aircraft classification category. The capacity model identifies an airport's aircraft fleet mix in terms of four classifications ranging from A (small, single engine with gross weight 12,500 lbs. or less) to D (large aircraft with gross weights over 300,000 lbs.). The applicable classifications and examples of each are identified in Table 5-1. The classifications that apply to Dutchess County Airport fleet mix are Classes A, B, and C.

TABLE 5-1
ACDM Aircraft Classification System

Class A: Small single-engine, gross weight 12,500 lbs. or less

Examples:	Cessna 172/182	Mooney 201
	Beech Bonanza	Piper Cherokee/Warrior

Class B: Twin-engine, gross weight 12,500 lbs. or less

Examples:	Beech Baron	Mitsubishi Mu-2
	Citation I	Piper Navajo

Class C: Large aircraft, gross weight 12,500 lbs. to 300,000 lbs.

Examples:	Boeing 727/73757	Douglas DC-9
	Gulfstream III	Lear 35/55

Class D: Large aircraft, gross weight more than 300,000

Examples:	Boeing 747	Airbus A-300/310
	Lockeed	Douglas DC-8-60/70

SOURCE: C&S Engineers

TOUCH – AND – GO OPERATIONS

A touch–and–go operation occurs when an aircraft lands and then makes an immediate take off without coming to a full stop. The primary purpose of touch–and–go operations is for the training of student pilots. Typically, touch–and–go operations occur in greater numbers at smaller airports or airports with large flight schools.

5.04 HOURLY CAPACITY

The capacity of the landing area is a primary determinant of the level of activity that can take place at the airport. An airport is assumed to reach capacity when the average delay to an arrival or departure exceeds a certain level. This level is lower for a general aviation airport than for a large air carrier facility based on the assumption that the general aviation user can less afford the costs of delays.

Airport capacity will vary over time as the mix of aircraft operating from the airport changes and as the operating configurations on the airport change. Capacity will be reduced as the aircraft mix contains a higher percentage of high performance aircraft and varied operational characteristics are mixed into the traffic. A more diverse mix of aircraft will generally lead to a reduction in the level of training activity, which will tend to reduce capacity.

The basis for determining airport capacity is the delay experienced by individual aircraft. It should be noted that capacity could be exceeded; however, this condition will result in increased and unacceptable levels of delay. The Federal Aviation Administration recommends that airport design related to capacity be based upon hourly demand. Therefore, hourly capacity on an annual basis is also estimated. Capacity improvements to the runway/taxiway system should be planned after 60% of capacity is reached and implemented when the system reaches 80% capacity.

The FAA's Airport Capacity Delay Model (ACDM) combines information concerning runway configuration, runway usage, meteorology, operational fleet mix, and touch–and–go operations to produce an hourly capacity of the airfield. A weighted hourly capacity combines the input data to determine the weighted hourly capacity of the entire airfield.

The VFR and IFR hourly capacities for Dutchess County Airport were determined using information contained in the FAA AC 150/5060-5. The hourly capacities are 98 and 59 operations per hour, respectively. Design hour operations ranged from 46 in 2005 to 53 in 2020. As shown in Table 5-2, the airfield will have sufficient VFR and IFR hourly capacity to meet design hour and peak period demand for the 20-year planning period.

TABLE 5-2
Hourly Capacity Summary

Year	Design Hour Operations	VFR Capacity [1]	IFR Capacity [1]	VFR/IFR Capacity Ratio
2005	46	98	59	45/75%
2010	48	98	59	47/78%
2020	53	98	59	52/86%

[1] SOURCE: FAA AC 150/5060-5
SOURCE: C&S Engineers, Inc.

5.05 ANNUAL SERVICE VOLUME

An airport's Annual Service Volume (ASV) has been defined by the FAA as "a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time." Therefore, ASV is a function of the hourly capacity of the airfield and the annual, daily, and hourly demands placed upon it. ASV is estimated by multiplying the daily and hourly operation ratios by a weighted hourly capacity.

Regarding the projection of 166,750 operations by the year 2020, FAA recommends that planning for additional airfield capacity should begin when actual annual operations reach 60 percent of ASV. Table 5-3 summarizes the ASV relationships developed in this chapter.

TABLE 5-3
Annual Service Volume Summary

Year	Annual Operations	Annual Service Volume [1]	Capacity Ratio
2005	144,275	230,000	63%
2010	158,775	230,000	69%
2020	166,750	230,000	73%

[1] SOURCE: FAA AC 150/5060-5
SOURCE: C&S Engineers, Inc.