Chapter 3. Demand/Capacity & Facility Requirements

Chapter 3. DEMAND/CAPACITY & FACILITY REQUIREMENTS

This chapter provides an assessment of future airport development requirements based upon the forecasts of aviation demand presented in Chapter 2, and an examination of existing airport facilities presented in Chapter 1. The demand/capacity analysis provides a basis to assess the capability of the existing airport facilities to accommodate current and future levels of activity.

This analysis assumes that a method can be found to develop the facilities to serve future demand. These requirements therefore do not reflect actual site constraints of Dayton International Airport (DAY) or possible monetary constraints that may exist at the time of need. The investigations of the airport's ability to meet the forecast demand are presented in Chapter 4.

Anticipated timing of the need for identified improvements is based on projections of future aviation activity. Future airport conditions, in relationship to forecasts of aviation demand, should be continually monitored. The Master Plan should also be revisited on a yearly basis to confirm the timing and need of proposed facilities.

1. AIRFIELD

This section contains the demand/capacity analysis of the existing airfield, future airfield capacity requirements, and the requirements for navigational aids, runway visibility zones, runway safety areas, and runway length.

(1) Existing Airfield

The existing airfield is shown on ***Exhibit 3-1***. Oriented in a Northeast-Southwest direction, DAY has two parallel runways (Runway 6R/24L at 7,000 feet in length and Runway 6L/24R at 10,900 feet in length), and one crosswind Runway 18/36 at 8,500 feet in length. Runway 18/36 intersects Runway 6R/24L 1,066 feet from the 36 threshold end.

(2) Airfield Capacity

The detailed airfield capacity analysis is presented in a separately published report, Draft SIMMOD Simulation Study, October 6, 1999. This section summarizes the assumptions and findings of this report:

- Runway Operating Plans
- Aircraft Demand Profiles
- Existing Airfield Demand/Capacity
- Future Airfield Requirements

1. Runway Operating Plans

Wind and weather conditions play a significant role in dictating the choice of runway operating plans and specifically influence the use of various air traffic control procedures. Twenty years of hourly weather data, collected by the National Oceanic and Atmospheric Administration between the years 1971 and 1991 (latest data available from NOAA) at DAY, were analyzed to assess the nature, frequency, and duration of weather conditions that influence runway use and operating procedures at the airport.

As shown in **Table 3-1**, the ceiling and visibility weather conditions are grouped into two air traffic control categories: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). VFR conditions, which permit visual approaches, occur over 87 percent of the time during nighttime hours and over 86 percent of the time during daytime hours.

Table 3-1 – ATC Procedures Weather Criteria

Weather Condition	Maximum Ceiling and Visibility	Minimum Ceiling and Visibility	Nighttime Percent Occurrence	Daytime Percent Occurrence
VFR	Unlimited	1,000 feet, 3 miles	87.43%	86.11%
IFR	1,000 feet, 3 miles	0	12.57%	13.89%
Total			100.00%	100.00%

Source: Landrum & Brown and NOAA Weather Data (1971-1991). Assumes maximum 3 knot tailwind and 15 knot crosswind.

The orientation of the runways and the direction and speed of the wind and other operational criteria (airspace, construction, noise abatement, pilot preference, etc.) determine the direction in which an airport operates. In addition, runway length and taxi distances dictate specific runway use throughout the day. For example, the runways are used differently during the nighttime cargo operations than they are during the day, when most passenger carrier operations occur. The runway operating plans during the daytime and nighttime are shown in ***Exhibit 3-2*** and discussed in the following sections.

Nighttime Runway Operating Plans

The majority of cargo operations occur during the nighttime hours at DAY. Emery Worldwide has the majority of the cargo operations, which consist mainly of arrivals and departures on Runway 6L/24R. Emery will use Runway 6R/24L on a limited basis for B-727 aircraft operations. The Runway 6R/24L length (7,000 feet) is too short for DC-8 and DC-10 aircraft, which amount to 62 percent of the Emery fleet. The other cargo carriers, such as FedEx, will occasionally use Runway 6R/24L and

18/36 when wind and weather dictate. Airport policy maximizes the availability of Runway 6L/24R for night operations by scheduling construction and maintenance for off-peak hours.

Based on records and data from the DAY Air Traffic Control Tower, under calm winds the preferred operating direction during nighttime hours is Southwest flow, which occurs over 79 percent of the time. This Southwest flow consists of primary operations on Runway 24R, with secondary operations on Runways 24L and 18. Northeast flow, which consists of primary operations on Runway 6L and secondary operations on 6R, provides an additional 19 percent coverage. The DC-8 aircraft has a 28 knot crosswind limitation. When winds exceed this velocity, it becomes necessary to use Runway 18/36. North and South flows, which consist exclusively of operations on Runway ends 36 and 18 respectively, occur less than one percent of the time due to wind and weather, and noise abatement procedures which protect the City of Vandalia.

Daytime Runway Operating Plans

Currently, daytime operations consist mainly of passenger activity with some cargo activity. Southwest flow is the preferred mode of operation and consists of arrivals on Runway 24L, with occasional use of Runways 24R and 18. Runway 24R is the main departure runway with occasional use of Runways 24L and 18. Daytime cargo operations typically use Runway 24R for arrivals and departures due to its longer length. Based on ATC preference and wind conditions, Southwest flow occurs 77 percent of the time.

Northeast flow mainly consists of arrivals on Runway 6L, with some use of Runway 6R. The majority of passenger air carrier and commuter departures use Runway 6R. Runways 6L and 36 are used occasionally for departures. Most daytime cargo operations use Runway 6L, again due to its longer length. Northeast flow provides an additional 22 percent coverage. Wind and weather dictate that north and south flows on Runway 18/36 must occur less than one percent of the time. However, there has been a continued increase in use of Runway 18/36 for arrivals and departures, mainly due to wind and weather, but also due to periodic closures of other runways for routine maintenance.

Runway 18/36 does not only provide runway operating coverage for South and North flow, but also provides needed arrival and departure capacity. According to data records from DAY Air Traffic Control Tower, the annual usage of Runway 18/36 typically is 30 percent of days with increased usage up to 50 percent of days (4,500 hours annual) due to airfield construction, maintenance, and other operating reasons.

2. Aircraft Demand Profiles

To determine the ultimate capacity of the existing airfield system, aircraft activity profiles of 24-hour scheduled and unscheduled operations were developed to represent baseline year 1998 and future year 2003, 2008, and 2018 activity levels.

The profile of aircraft operations were used to prepare daily flight schedules that reflect the characteristics (demand level, fleet mix, etc.) of existing as well as the future aircraft activity levels.

Emery Worldwide schedule data from July and November 1998, the Automated Radar Terminal System (ARTS), the June 1998 Official Airline Guide (OAG), and Forecasts of Aviation Demand (Chapter 2), were used to construct the baseline 1998 demand profile. The future design day flight schedules were developed from information provided by the Forecasts of Aviation Demand. The resulting total number of design day operations for the baseline 1998 schedule is 478, increasing to 524 operations for 2003, 647 for 2008, and 790 operations for the 2018 activity level. **Table 3-2** presents aircraft operations by user group: Emery Worldwide, Passenger Airlines, Other Cargo, and General Aviation (GA)/Military.

The hourly distribution of operations is graphically shown on **Exhibits 3-3** and **Exhibit 3-4**. Hourly operations in the future schedules were based on the hourly distribution from the 1998 schedule. In 1998, the peak nighttime arrival hour is 24:00 (00:00) with 32 arrivals and the peak daytime arrival hour is 11:00 with 19 arrivals. Peak nighttime and daytime departure hours are 05:00 and 15:00, with 39 and 18 departures, respectively. In 2018, there are 43 arrivals in the peak nighttime hour and 75 in the peak daytime hour. In 2018, there are 67 departures in the peak nighttime hour and 47 in the peak daytime hour. The peak hours remain the same in all future schedules.

The design day flight schedules were created using the baseline forecasts. Therefore the airfield demand/capacity analysis does not reflect the potential for an airline mini-hub operation at DAY. If passenger service increases faster than forecast, it will most likely trigger a change in the timing of new facilities rather than a change in the actual facilities required.

3. Existing Airfield Demand/Capacity

Simulation modeling was used to determine the capacity of the existing airfield system at DAY. The four demand levels discussed previously were simulated with the existing airfield. Detailed airspace procedures, primary taxi routings, and generalized gate apron area movements were simulated on the existing airfield layout using the FAA's airport and airspace simulation model, SIMMOD Version 2.2. The model was calibrated to reflect the actual airspace and airfield operations at DAY.

The simulation modeling was used to determine the time at which the existing airfield will no longer have the capacity to serve forecast demand. Interviews with Emery personnel indicated that air cargo must be delivered at a required time, or the company risks losing all revenue for the shipment. In addition, Emery also incurs a financial penalty if some shipments arrive late. While the airline is operated in a manner that minimizes this revenue risk, two factors increase this risk to a level where profitability will be threatened. The first factor is increasing aircraft travel times and delays, while the second factor is the timely dispatch of aircraft to and from the airport. Increasing travel times and delays reduce the timeliness of shipment arrivals. Late arriving and departing of aircraft reduce the amount of time

Table 3-2 (1 of 3)

Dayton International Airport
Strategic Master Plan and Air Cargo Capacity Enhancement Study
Arrival Operations by User Group

	Emery Worldwide				Passenger Airlines				Other Cargo				General Aviation				Total			
Hour	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018
0	29	30	32	37	1	1	1	2	1	2	2	3	1	1	1	1	32	34	36	43
1	22	25	30	37	0	0	0	0	0	0	0	0	0	0	0	0	22	25	30	37
2	9	11	16	19	0	0	0	0	0	0	0	0	0	0	0	0	9	11	16	19
3	2	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	2
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	1	1	3	4	0	0	0	0	1	1	3	4
6	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
7	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2
8	0	0	0	0	4	3	4	4	0	0	0	0	3	3	3	3	7	6	7	7
9	0	0	0	0	6	5	4	4	0	0	0	0	10	10	10	10	16	15	14	14
10	5	10	21	36	4	4	3	4	0	0	0	0	2	2	2	2	11	16	26	42
11	10	20	41	66	8	7	7	8	0	0	0	0	1	1	1	1	19	28	49	75
12	7	14	30	36	5	4	4	4	0	0	0	0	5	5	5	5	17	23	39	45
13	0	0	0	0	3	2	2	1	0	0	0	0	1	1	1	1	4	3	3	2
14	0	0	0	0	4	4	5	5	0	0	0	0	3	3	3	3	7	7	8	8
15	0	0	0	0	7	6	7	7	0	0	0	0	6	6	6	6	13	12	13	13
16	0	0	0	0	4	4	3	4	0	0	0	0	11	11	11	11	15	15	14	15
17	0	0	0	0	7	6	5	5	0	0	0	0	9	9	9	9	16	15	14	14
18	0	0	0	0	6	6	6	7	0	0	0	0	3	3	3	3	9	9	9	10
19	0	0	0	0	4	4	5	6	0	0	0	0	2	2	2	2	6	6	7	8
20	0	0	0	0	7	8	7	9	0	0	0	0	1	1	1	1	8	9	8	10
21	0	0	0	0	6	5	6	6	0	0	0	0	1	1	1	1	7	6	7	7
22	0	0	0	0	6	5	4	4	0	0	0	0	2	2	2	2	8	7	6	6
23	4	4	3	6	6	7	7	8	0	0	0	0	0	0	0	0	10	11	10	14
Total	88	117	178	239	88	81	80	88	2	3	5	7	64	64	64	64	242	265	327	398

Prepared by Landrum & Brown
Draft: 01/13/2000
H:\DAY\simmod\ddfs\98ddfs\98EWW\[dayopsgraph.xls]Arr Table User 3-2 (1 of 3)

Table 3-2 (2 of 3)

Dayton International Airport
Strategic Master Plan and Air Cargo Capacity Enhancement Study
Departure Operations by User Group

	Emery Worldwide				Passenger Airlines				Other Cargo				General Aviation				Total			
Hour	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018
0	0	0	0	0	0	0	0	0	1	2	2	4	0	0	0	0	1	2	2	4
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	3	18	20	23	0	0	0	0	0	0	0	0	0	0	0	0	3	18	20	23
5	39	43	56	67	0	0	0	0	0	0	0	0	0	0	0	0	39	43	56	67
6	24	12	10	11	9	8	9	10	2	2	3	4	2	2	2	2	37	24	24	27
7	0	0	0	0	11	11	9	11	0	0	0	0	4	4	4	4	15	15	13	15
8	1	2	5	6	5	4	4	4	0	0	0	0	2	2	2	2	8	8	11	12
9	0	0	0	0	5	4	5	5	0	0	0	0	7	7	7	7	12	11	12	12
10	0	0	0	0	7	6	7	7	0	0	0	0	5	5	5	5	12	11	12	12
11	0	0	0	0	5	5	4	3	0	0	0	0	3	3	3	3	8	8	7	6
12	0	0	0	0	2	2	2	3	0	0	0	0	2	2	2	2	4	4	4	5
13	2	5	10	12	9	8	6	9	0	0	0	0	3	3	3	3	14	16	19	24
14	7	14	29	39	2	2	2	2	0	0	0	0	1	1	1	1	10	17	32	42
15	6	11	21	35	6	5	6	6	0	0	0	0	6	6	6	6	18	22	33	47
16	2	5	9	20	4	4	5	5	0	0	0	0	6	6	6	6	12	15	20	31
17	2	4	10	12	7	6	5	5	0	0	0	0	5	5	5	5	14	15	20	22
18	0	0	0	0	6	6	6	6	0	0	0	0	7	7	7	7	13	13	13	13
19	1	1	3	8	7	7	8	8	0	0	0	0	0	0	0	0	8	8	11	16
20	0	0	0	0	2	2	1	2	0	0	0	0	2	2	2	2	4	4	3	4
21	1	2	5	6	1	1	1	2	0	0	0	0	1	1	1	1	3	4	7	9
22	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	88	117	178	239	88	81	80	88	3	4	5	8	57	57	57	57	236	259	320	392

Source: Landrum & Brown

Draft: 01/13/2000

H:\DAY\simmod\ddfs\98ddfs\98EWW\[dayopsgraph.xls]Dep Table User 3-2 (2 of 3)

Table 3-2 (3 of 3)

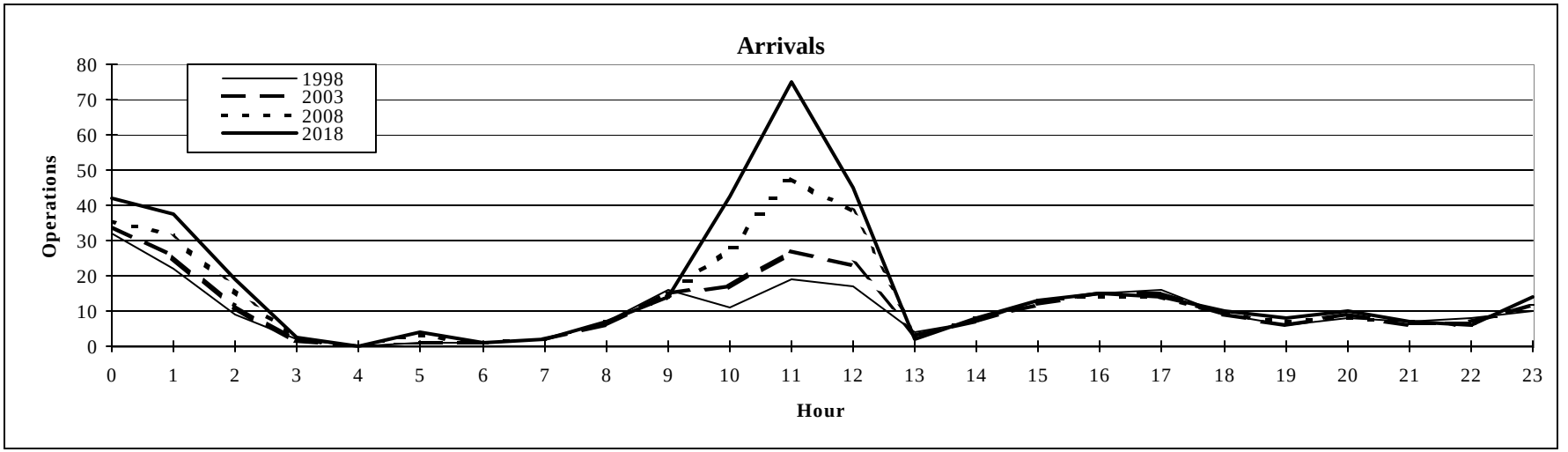
Dayton International Airport
Strategic Master Plan and Air Cargo Capacity Enhancement Study
Total Operations by User Group

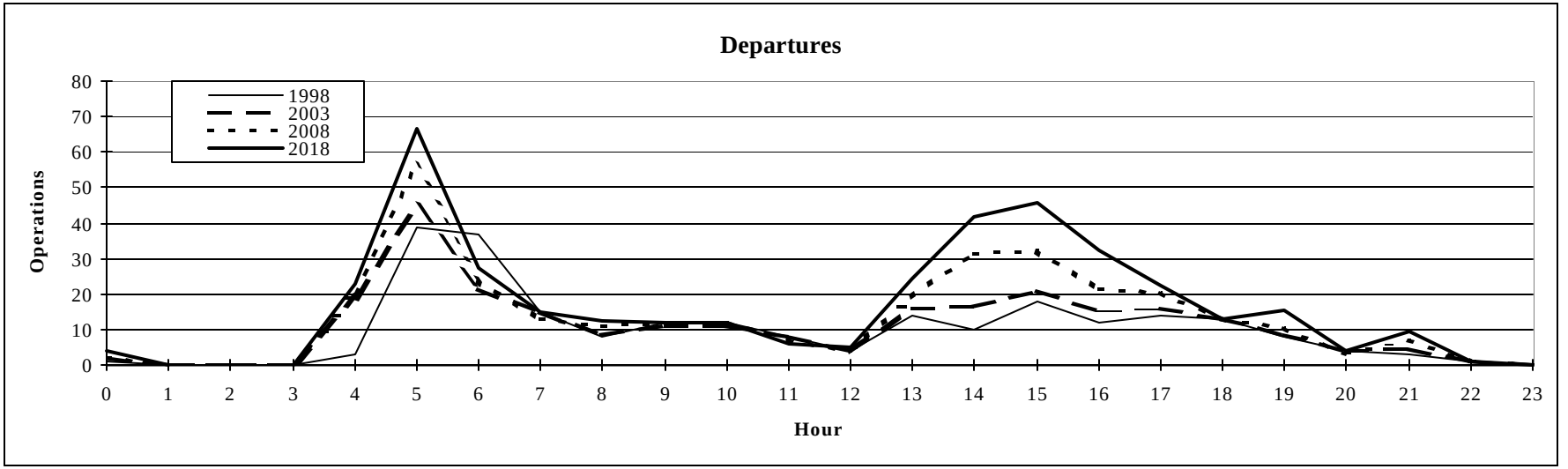
	Emery Worldwide				Passenger Airlines				Other Cargo				General Aviation				Total			
Hour	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018	1998	2003	2008	2018
0	29	30	32	37	1	1	1	2	2	4	4	7	1	1	1	1	33	36	38	47
1	22	25	30	37	0	0	0	0	0	0	0	0	0	0	0	0	22	25	30	37
2	9	11	16	19	0	0	0	0	0	0	0	0	0	0	0	0	9	11	16	19
3	2	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	2
4	3	18	20	23	0	0	0	0	0	0	0	0	0	0	0	0	3	18	20	23
5	39	43	56	67	0	0	0	0	1	1	3	4	0	0	0	0	40	44	59	71
6	24	12	10	11	9	8	9	10	2	2	3	4	3	3	3	3	38	25	25	28
7	0	0	0	0	11	11	9	11	0	0	0	0	6	6	6	6	17	17	15	17
8	1	2	5	6	9	7	8	8	0	0	0	0	5	5	5	5	15	14	18	19
9	0	0	0	0	11	9	9	9	0	0	0	0	17	17	17	17	28	26	26	26
10	5	10	21	36	11	10	10	11	0	0	0	0	7	7	7	7	23	27	38	54
11	10	20	41	66	13	12	11	11	0	0	0	0	4	4	4	4	27	36	56	81
12	7	14	30	36	7	6	6	7	0	0	0	0	7	7	7	7	21	27	43	50
13	2	5	10	12	12	10	8	10	0	0	0	0	4	4	4	4	18	19	22	26
14	7	14	29	39	6	6	7	7	0	0	0	0	4	4	4	4	17	24	40	50
15	6	11	21	35	13	11	13	13	0	0	0	0	12	12	12	12	31	34	46	60
16	2	5	9	20	8	8	8	9	0	0	0	0	17	17	17	17	27	30	34	46
17	2	4	10	12	14	12	10	10	0	0	0	0	14	14	14	14	30	30	34	36
18	0	0	0	0	12	12	12	13	0	0	0	0	10	10	10	10	22	22	22	23
19	1	1	3	8	11	11	13	14	0	0	0	0	2	2	2	2	14	14	18	24
20	0	0	0	0	9	10	8	11	0	0	0	0	3	3	3	3	12	13	11	14
21	1	2	5	6	7	6	7	8	0	0	0	0	2	2	2	2	10	10	14	16
22	0	0	0	0	6	5	4	4	0	0	0	0	3	3	3	3	9	8	7	7
23	4	4	3	6	6	7	7	8	0	0	0	0	0	0	0	0	10	11	10	14
Total	176	234	356	478	176	162	160	176	5	7	10	15	121	121	121	121	478	524	647	790

Prepared by Landrum & Brown

Draft: 01/13/2000

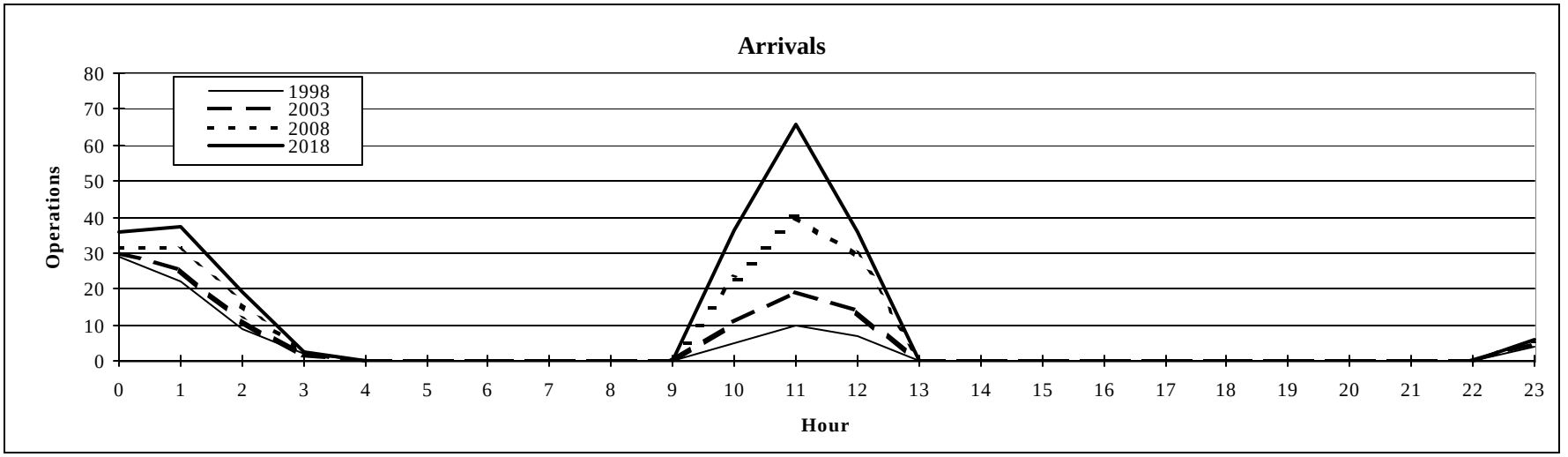
H:\DAY\simmod\ddfs\98ddfs\98EWW\[dayopsgraph.xls]Total Ops Table 3-2 (3 of 3)

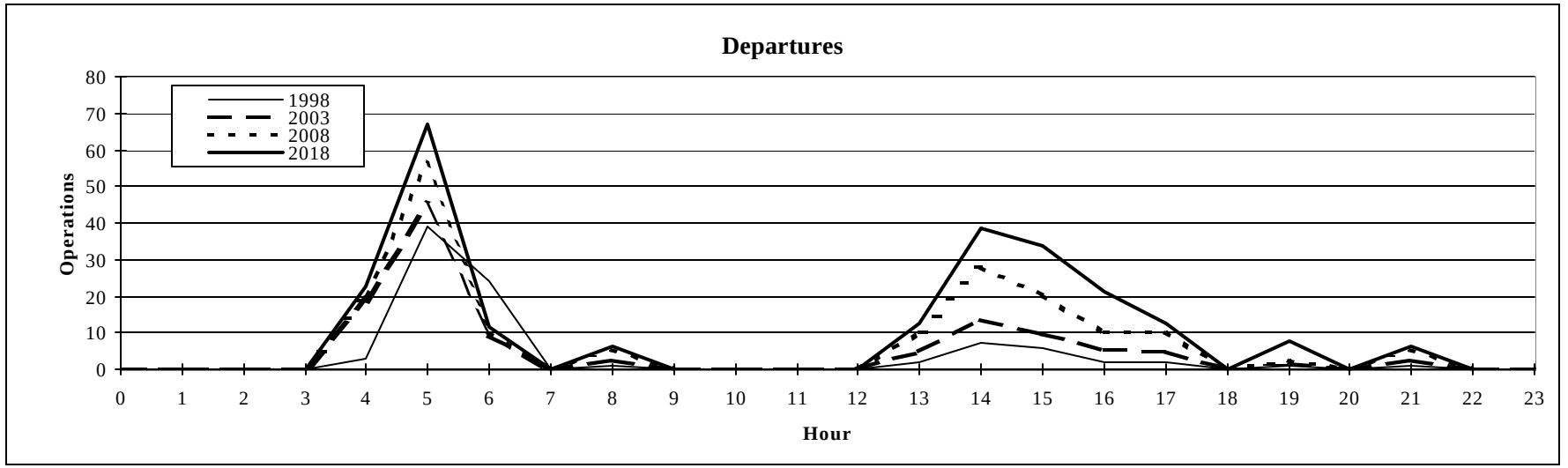




Source: Forecasts of Aviation Activity and ARTS data for November 1998.
Prepared by: Landrum & Brown
Draft: 01/14/2000
H:\DAY\simmod\ddfs\98ddfs\98EWW\[dayopsgraph.xls]Chart all smp ch3

Dayton International Airport Master Plan Study	All Operations Hourly Design Day Operations	EXHIBIT 3-3





Source: Forecasts of Aviation Activity and ARTS data for November 1998.
Prepared by: Landrum & Brown
Draft: 01/14/2000
H:\DAY\simmod\ddfs\98ddfs\98EWW\[dayopsgraph.xls]Chart EWW smp ch3

Dayton International Airport Master Plan Study	Emery Worldwide Operations Hourly Design Day Operations	EXHIBIT 3-4

available to sort freight and reduce the timeliness of shipment arrivals. Two performance measures from the simulation modeling were used to evaluate airfield capacity against these two performance risk factors:

- The number of Emery aircraft that operate outside of desired time windows – aircraft that operate outside of the required time windows will not provide timely shipments, and will also reduce the amount of time available to sort freight. All flights must operate within the desired time windows to assure profitability.

- Average aircraft travel times and operating delays – increased travel time and operating delays reduce the timeliness of shipments and also reduce the amount of time available to sort freight. Average aircraft delays in excess of ten to twelve minutes per flight generally indicate serious on-time performance and service reliability problems for both cargo and passenger airline services.

Table 3-3 shows the expected performance of the existing airfield for each of these two measures of airfield capacity need. This analysis shows that prior to year 2003 the existing airfield geometry will not meet Emery's operating window requirements. In addition, this table shows that shortly after year 2003 aircraft delay problems will rise to a level where they indicate serious on-time performance and service reliability problems.

Table 3-3 – Existing Conditions All Weather Average Performance Summary

Year	Number of Emery Flights Outside Window	Average Taxi Time & Delay (min./op.)
1998	0	6.24
2003	4	7.30
2008	31	15.35
2018	82	27.18

Note: Average time and delay includes all airport operations. Flights outside the operating window represent only Emery Worldwide flights.
Source: Simulation modeling output.

4. Future Airfield Requirements

Based on the demand/capacity analysis of the existing airfield, it was determined that additional airfield capacity will be needed by year 2003 or sooner. A review of existing operations showed that heavy cargo aircraft rarely use Runway 6R/24L due to its length, even when Runway 6L/24R is closed. When Runway 6L/24R is closed, Runway 18/36 becomes the primary air cargo runway. In general, these aircraft refuse Runway 6R/24L because they are operating at a landing or departure weight that exceeds the aircraft performance limitations imposed by a 7,000 foot runway length. In addition, many pilots (both passenger and cargo airlines) will refuse a shorter parallel runway when a longer runway is open. This refusal can be based on specific airline procedures that require use of the longest available runway, or by individual pilot preference. Thus, the primary constraint to serving an

increased number of cargo operations is the lack of additional parallel runways that have sufficient length to accommodate heavy cargo aircraft (DC-8, DC-10, B-747, etc.).

While it is theoretically possible to use both Runways 6R/24L and Runway 18/36 simultaneously for air cargo operations, many weather conditions limit the capacity of this operation. For example, north wind conditions require the full coordination of departing aircraft from these runways, effectively reducing capacity to that of a single runway. In addition, current air traffic control rules prohibit simultaneous arrivals to converging runways during IFR weather conditions. In addition, during south and west wind conditions, arriving aircraft for these two runways must be fully coordinated, thus reducing capacity to that of a single runway.

Increasing the number of full-length parallel runways is the most effective means of increasing airfield capacity. Relocating Runway 18/36 to the north can remove many of the air traffic control coordination requirements imposed by its intersection with Runway 6R/24L, while providing additional airfield capacity.

Three types of runway improvements were evaluated using simulation modeling:

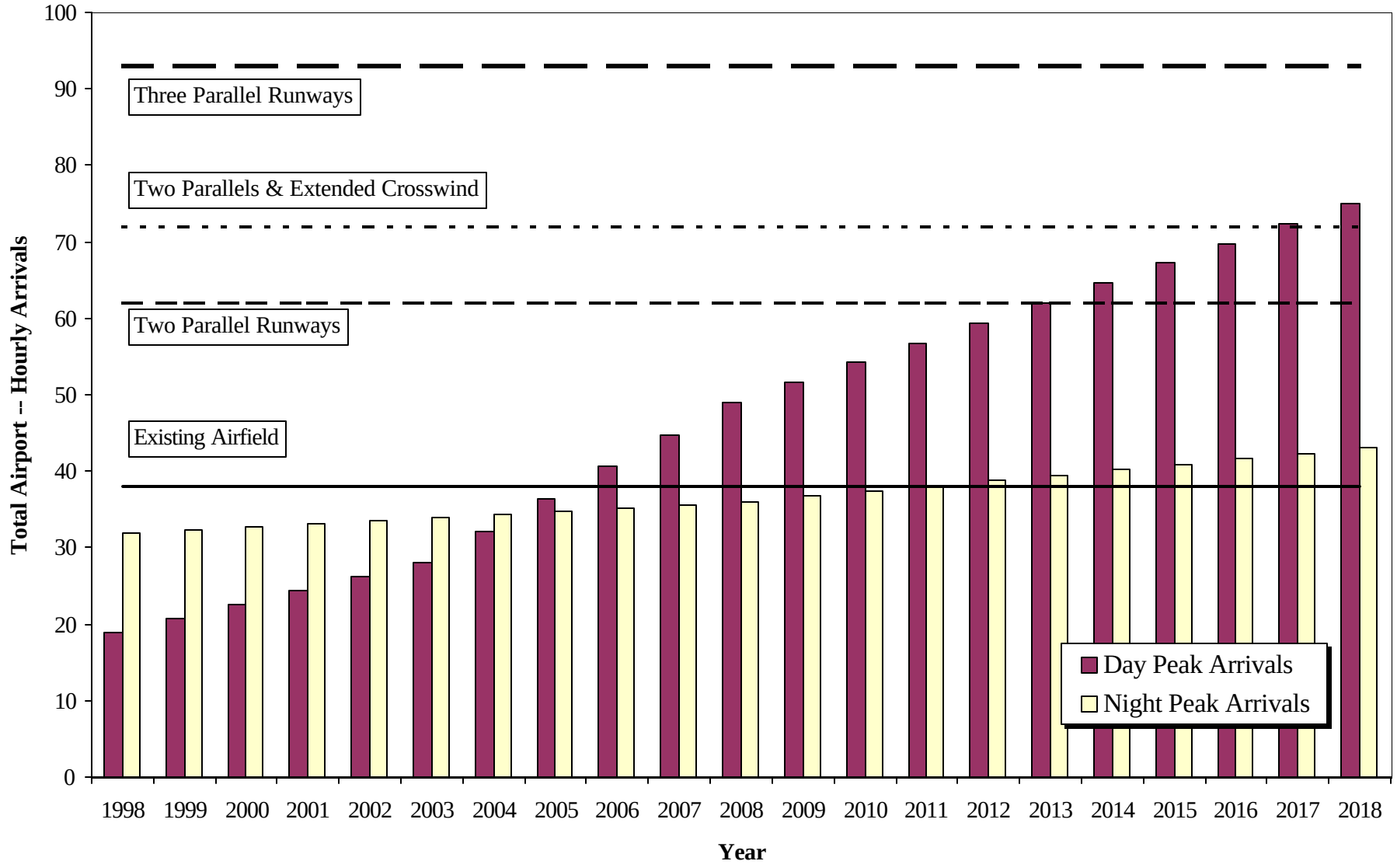
- Two parallel runways with sufficient length to accommodate heavy jet aircraft
- Two parallel runways and a non-intersecting crosswind runway with sufficient length to accommodate heavy jet aircraft.
- Three parallel runways with sufficient length to accommodate heavy jet aircraft.

While the modeling assumed a specific geometry, the results of the modeling can be used to determine the amount of runway capacity that supports future demand.

Three specific measures of runway need were used. The first measure was hourly capacity for arrivals and departures. The second measure was the ability of the runway system to process an arrival or departure bank of flights in a specified amount of time. The third measure was the ability to continue supporting the cargo hub with one of the main parallel runways closed.

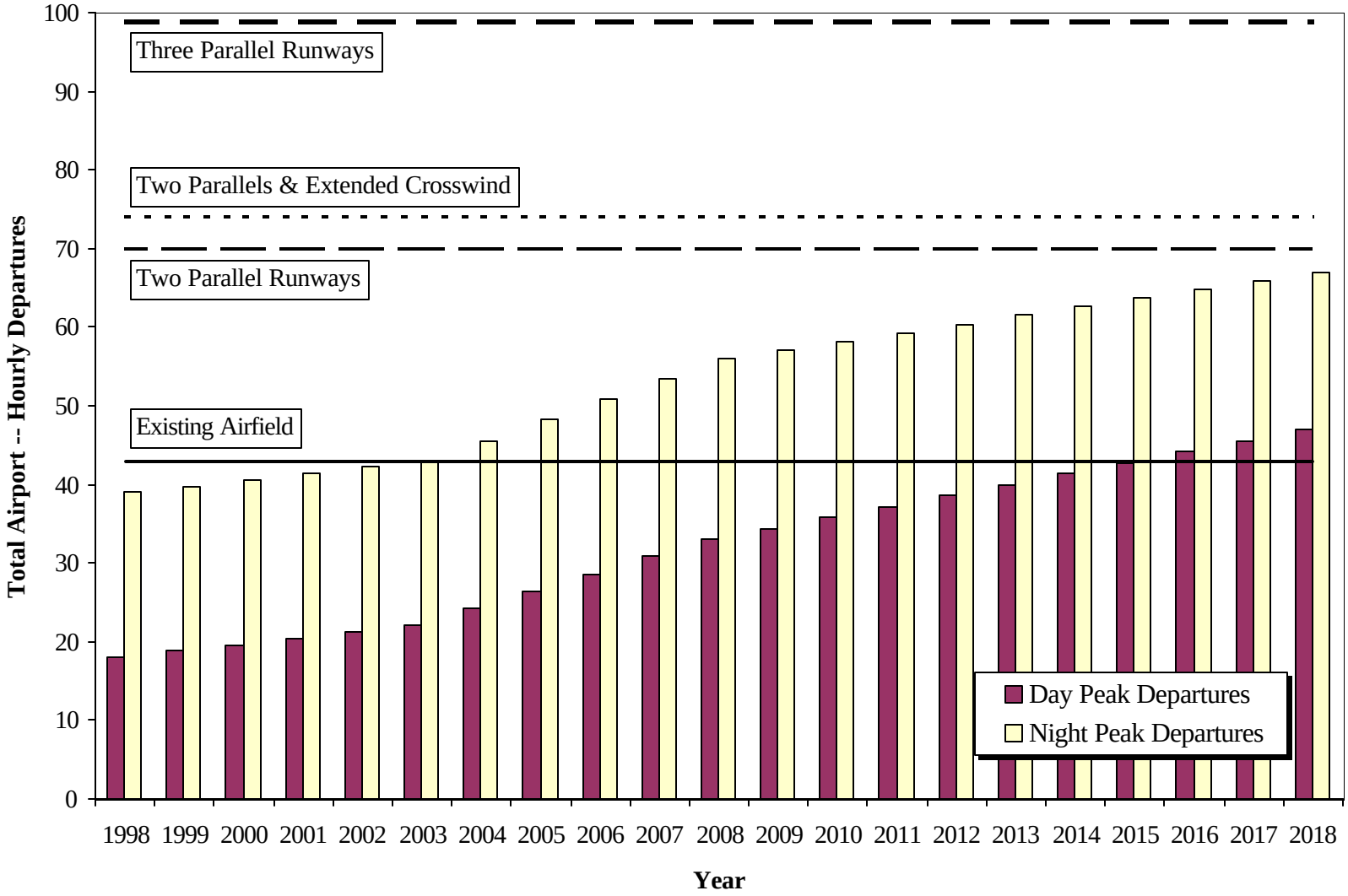
Exhibit 3-5 shows that daytime peak hour arrivals (total airport arrivals) will exceed the capacity of the existing airfield by year 2006. By year 2014, peak hour arrivals will exceed the capacity of two full-length parallel runways. By year 2018, peak hour arrivals will exceed the capacity of two full-length parallel arrival runways and an extended crosswind runway. This analysis also shows that arrival runway capacity is the critical deciding factor for the ultimate size of the daytime cargo sort facility.

Exhibit 3-6 shows that nighttime peak hour departures (total airport departures) will exceed the capacity of the existing airfield by year 2003. Two full-length parallel



Prepared by: Landrum & Brown
Draft, 01/14/2000
H:\DAY\[Day Runway 18-36 Ext.xls]Chart 2 3-5

Dayton International Airport Master Plan Study	Arrival Runway Capacity Required	EXHIBIT 3-5



Prepared by: Landrum & Brown
Draft, ########
H:\DAY\[Day Runway 18-36 Ext.xls]Chart 3 3-6

Dayton International Airport Master Plan Study	**Departure Runway Capacity Required**	**EXHIBIT 3-6**

runways provide sufficient capacity through the year 2018. Extending and relocating the crosswind runway to the north increases peak hour departure capacity by six percent over two full-length parallel runways and provides sufficient capacity for the 20-year planning period. This analysis also shows that departure runway capacity is the critical deciding factor for the ultimate size of the nighttime cargo sort facility. Three full-length parallel runways provide sufficient arrival and departure runway capacity beyond the twenty-year planning period.

Cargo has different airport capacity goals than passenger transportation. These goals differ because of the differing economic models that underlie passenger and cargo transportation. Very simply put, if freight is not delivered by a certain guaranteed time, the carrier does not get paid. Passenger airlines do not have a direct economic incentive for on-time performance since they have already received payment from the passenger.

Within this economic context, demand/capacity factors that are usually not considered in the evaluation of passenger oriented airfield improvements have much more significance at a cargo oriented airport such as Dayton. Most important of these factors are unscheduled runway closures for maintenance, snow removal and accidents.

The capacity analysis has demonstrated that as demand grows, the need for dual full-length parallel runways will become critical. The need for Runway 18/36 as a back-up runway for either of the two main parallel runways will become more acute. This back-up capability for the main parallel runways would only be available during VFR weather conditions, which occur 87 percent of the time. While the Dayton Airport staff strives to keep Runway 6L/24R available during peak arrival and departure periods, a review of airport operations at DAY indicates that Runway 6L/24R was closed during peak periods, approximately one percent of the time for unscheduled events. Because of its length, this runway is the only runway that provides unrestricted arrival and departure capability. With the existing airfield, Runway 18/36 is the back-up runway for Runway 6L/24R. However, it can accommodate only 75 percent of all departures due to its limited length. ***Exhibit 3-7*** shows how runway operations would occur with existing Runway 6L/24R closed under the existing airfield configuration and also under the three future airfield expansion levels described in the runway capacity requirements analysis.

The SIMMOD analysis also evaluated possible closed runway conditions. The results of this analysis are summarized in **Table 3-4**. This analysis demonstrates that in order to improve upon existing levels of performance, two full-length parallel runways should be in place by approximately year 2003 and that the crosswind runway should be relocated and extended to the north prior to year 2008.

Table 3-4 – Number of Emery Worldwide Flights Outside of the Required Operating Window One Parallel Runway Closed

Year	Existing Airfield	Two Full-Length Parallel Runways	Two Full-Length Parallels and One Extended Crosswind Runway	Three Full-Length Parallel Runways
1998	17	0	0	0
2003	24	4	1	0
2008	57	31	4	0
2018	118	82	16	6

(3) Instrumentation and Lighting

Instrumentation, lighting, and other navigational aids (NAVAIDS) assist pilots in maneuvering their aircraft with high levels of safety and efficiency under various weather conditions. The following sections review the existing lighting and approach instrumentation aids at DAY and identify requirements for future facilities.

1. Runway Approach and Instrumentation

Runway instrumentation permits landings in IFR conditions which occur when the ceiling is less than 1,000 feet and the visibility is less than three miles. Basic IFR weather conditions occur 13.4 percent of the time at DAY. There are three IFR Approach Categories (I, II, and III) with different ceiling and visibility minimums. The annual occurrence of these categories is shown in **Table 3-5**. CAT I occurs the majority of the time (11.99 percent) during IFR. CAT II and III each occur less than one percent of the time.

Table 3-5 – IFR Conditions by Category

IFR Category	Ceiling (in feet)	Visibility (in miles)	Annual Occurrence
CAT I	> = 200 & <1,000	> = 1/2 & <4	11.99%
CAT II	> = 100 & <200	> =1/4 & <1/2	0.50%
CAT IIIa	<100	> = 700 feet & <1/4	0.00%
CAT IIIb	<100	> = 150 feet & <700 feet	0.91%
CAT IIIc	<100	<150 feet	0.00%
Total			13.40%

Source: Landrum & Brown and NOAA Weather Data (1971-1991).

The type of instrumentation on a runway determines the minimum ceiling and visibility, or minimums, under which landings can occur. The most widely used precision approach system is the Instrument Landing System (ILS). Currently, Runways 6L, 24R, 24L, and 18 are equipped with an ILS. The ILS's electronic components consist of radio transmitters which guide the aircraft's alignment with the runway (localizer), descent to the runway (glide slope), and distance from the runway (marker beacon).

As shown in **Table 3-6**, Runways 24R, 24L, and 18 are equipped for precision instrument approaches under IFR, CAT I conditions. Runway 6L, the primary arrival runway in northeast flow, can accommodate arrivals under IFR, CAT III conditions. Runways 6R and 36 are not equipped with precision approach instrumentation.

The lack of an ILS on Runway 6R, a primary arrival runway, results in a capacity constraint during IFR conditions. However, this runway is proposed to be extended in the near future and equipped with CAT III instrumentation.

Table 3-6 – Existing Landing Aids by Runway End

Runway	IFR Approach Category	Landing Aids
Northeast Flow		
6R	-	NDB, AVASI-L
6L	III	ILS (CAT III), NDB
Southwest Flow		
24R	I	ILS (CAT I), VASI-L
24L	I	ILS (CAT I), VASI-R
Crosswind		
18	I	ILS (CAT I)
36	-	VASI-L

Source: Jeppesen Sanderson, Inc., 1997

All parallel runways should have equal ILS approach capability in order to maintain airport capacity during IFR weather conditions. In the future, DAY is proposed to provide CAT III instrumentation to all Runway 6, 24 and 18 ends to ensure that the airport remains in operation during all weather conditions.Runway 36 is proposed to provide CAT I approach capability. These parallel CAT III approaches will become increasingly important as the nighttime cargo operation begins to depend on having more than one runway available to meet demand during all weather conditions. Equipping more than one primary runway with a CAT III approach capability is also necessary in the event that one runway is taken out of service for equipment maintenance or snow removal.

2. Visual Lighting Systems

An approach lighting system is a necessary component of any airport's runway system. The most critical point of a landing occurs when the pilot must change from instrument to visual flight conditions. The approach lighting system aids in this transition. The existing approach lighting systems for the arrival runways are shown in **Table 3-7**. The approach lighting system on Runway 6L, the principal arrival runway in northeast flow, is an ALSF-II, which is a more advanced lighting system. All runways are equipped with high intensity edge lighting systems.

Table 3-7 – Existing Lighting Systems by Runway

Runway	Edge Lighting Intensity	Approach Lighting Systems
Northeast Flow		
6R	High	REILS
6L	High	ALSF-II, Centerline, Touch Down Zone Lights
Southwest Flow		
24R	High	Centerline, MALSR
24L	High	MALSR
Crosswind		
18	High	MALSR
36	High	None

Source: Jeppesen Sanderson, Inc., 1996

In the future, DAY is proposed to have ALSF-II approach lighting systems on all primary arrival runways in order to maintain maximum airfield capacity under all weather conditions.

(4) Runway Visibility Zone

FAA Advisory Circular 150/5300-13, "Airport Design", recommends that a clear runway visibility zone be maintained where two runways intersect. "Terrain needs to be graded and permanent objects need to be designed or sited so that there will be an unobstructed line of sight from any point five feet above one runway centerline to any point five feet above an intersecting centerline, within the runway visibility zone. The runway visibility zone is an area formed by imaginary lines connecting the two runways' visibility points."

Runway 18/36 intersects with Runway 6R/24L and the visibility zone of these runways is shown on ***Exhibit 3-8***. Currently, DAY does not provide a clear line of sight associated with these two runways because a single FBO hangar (No. 53) is within the runway visibility zone. The future airfield geometry should provide an unobstructed runway visibility zone.

(5) Runway Safety Areas

As stated in AC 150/5300-13, the FAA requires a runway safety area (RSA) that is 1,000 feet beyond the runway end and a width of 500 feet for aircraft approach Categories C and D. The RSA is a "defined surface surrounding a runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or other excursion from the runway." RSAs enhance the safety of airports and provide pilots with a suitable surface area that will minimize the potential for aircraft damage. Furthermore, RSAs provide greater ground accessibility for firefighting and rescue equipment during such incidents.

Runway ends 24L, 6R, and 36 do not have standard clear RSAs. The current RSA for Runway 24L extends only 752 feet on its south side from the runway end to North Dixie Drive. The Runway 6R and Runway 36 RSA surfaces are obstructed by the Amateur Trapshooters Association facilities. The Runway 6R RSA extends only 328 feet from the runway end, while the Runway 36 RSA extends only 926 feet from the runway end. Future runway alternatives must meet FAA design criteria by providing a full RSA to enhance airport and aircraft safety.

(6) Runway Length

This section summarizes the existing and future runway length requirements at DAY.

1. Existing Runway Lengths

Runway 6L/24R is the primary arrival and departure runway for cargo operations, and is also used for air carrier/commuter operations. It has a total length of 10,900 feet with no displaced thresholds. Runway 6R/24L serves as the primary runway for air carrier, commuter, and GA aircraft operations and has a length of 7,000 feet with no displaced thresholds. Runway 18/36 is 8,500 feet long and is used primarily for passenger arrivals and departures with no displaced thresholds.

2. Air Cargo Fleet Mix

Table 3-8 shows Emery's existing aircraft fleet, which consists mainly of Boeing 727 and DC-8 aircraft.

Table 3-8 – Existing Emery Worldwide Aircraft Fleet Mix

Aircraft Type	Total Number of Aircraft	Percent of Total
DC-9-15F	1	1.2%
B-727F	36	43.4%
DC-8F-54	2	2.4%
DC-8-62F	7	8.5%
DC-8-63F	9	10.8%
DC-8-71F	10	12.0%
DC-8-73F	13	15.7%
DC-10-10	5	6.0%
Total	**83**	**100%**

Source: JP Fleets, 1998

Emery's daily departures at DAY by aircraft type are shown in **Table 3-9**. The existing Emery fleet at DAY consists mainly of DC-8 and B-727 aircraft, in addition to one DC-10 and one MD-11 daily departure. The 2003 fleet mix is similar to the 1999 fleet, however, additional DC-10 and B-767 aircraft have been added. By 2008 there will be no DC-8 aircraft in the Emery fleet. The 2008 and 2018 fleet mixes will consist mainly of B-767 aircraft (around 70 percent of the fleet in 2008 and 60

percent in 2018). B-727 and DC-10 aircraft will make up 30 to 40 percent of the future fleet mix and the MD-11 will be less than five percent of the total Emery fleet at DAY.

The DC-8 is being phased out by Emery and replaced with DC-10 and 767 aircraft for a number of reasons. They are older aircraft which are more costly to operate and maintain. They do not meet Stage 3 requirements. Also, the DC-8 has less cargo capacity and range than the DC-10 aircraft.

Table 3-9 – Emery Worldwide Daily Departures

Aircraft Type	1999	2003	2008	2018
B-727F	29	30	30	60
DC-8F-54	1	1	0	0
DC-8F-61	1	1	0	0
DC-8-62F	6	6	0	0
DC-8-63F	14	14	0	0
DC-8-71F	16	16	0	0
DC-8-73F	19	19	0	0
DC-10	1	17	22	34
MD-11	1	1	6	6
B-767	0	12	120	139
Total	**88**	**117**	**178**	**239**

Source: Emery Worldwide February 15, 1999 flight schedule, current fleet information, and the Master Plan Forecast of Aviation Demand.

The runway length analysis will be based on the aircraft fleet mix shown in the previous table. Additionally, the B-747-100F, -200, and -400, and the Airbus 300-600 will also be considered since these aircraft have recently been added to the Emery fleet and may also be used by other carriers. Emery Worldwide is also considering leasing the Airbus 300B4F as replacements for their DC-8-63F aircraft.

3. Runway Length Requirements

Based on the demand/capacity analysis of the existing airfield, two parallel runways of sufficient length for cargo operations will be needed by 2003. A third parallel runway will be needed around 2018 to meet additional demand. Length requirements for these future runways were calculated using the individual Aircraft Manufacturers Characteristics Manuals.

Takeoff Requirements

Takeoff runway length requirements can be determined for the "Standard Day" (59 degrees Fahrenheit) or "Hot Day" (Standard Day plus 25 to 36 degrees Fahrenheit). Evaluating runway length requirements for a hot day results in longer takeoff distances. This occurs because the relative density of the altitude increases at higher temperatures, thereby decreasing an aircraft's operational performance.

For this analysis, the Hot Day performance data will be used. The cargo day sort operations, resulting from Emery's potential contracts with the United States Postal Service (USPS), is projected to be larger than the night sort

operations around year 2008. Summer daytime temperatures at DAY typically reach the Hot Day temperatures of 87.6 to 98.6 degrees Fahrenheit and will result in the longest runway length requirements.

Table 3-10 and ***Exhibit 3-9*** show the takeoff runway length requirements for each aircraft type. Takeoff runway length requirements were calculated for each aircraft at 100, 95, 90, 85, 80, 75, and 70 percent of maximum takeoff weight. The weight of the aircraft affects the amount of runway length required for takeoff. Aircraft at 100 percent of maximum takeoff weight require significantly more runway length than aircraft at reduced takeoff weight.

Projections have been made on typical cargo aircraft takeoff weights. These weights and the associated takeoff runway length requirement are shown in **Table 3-11**.

Table 3-11 – Cargo Aircraft Takeoff Weights and Runway Length Requirements

Aircraft Type	Percent of Existing Fleet	Percent of 2003 Fleet	Percent of 2018 Fleet	Takeoff Weight	Runway Takeoff Length Required (feet)
B-727F 1/	33%	25%	25%	175,560	9,200
DC-8-62	8%	7%	0%	271,300	7,300
DC-8-63	17%	12%	0%	328,500	10,100
DC-8-71	18%	14%	0%	303,900	8,600
DC-8-73	22%	16%	0%	325,000	9,200
DC-10-10F 2/	1%	15%	14%	440,000	10,900
B-767 1/	0%	10%	58%	386,650	8,600
MD-11 1/	1%	1%	3%	587,100	10,300

Source: Landrum & Brown and Aircraft Manufacturers Manuals (Hot Day).
1/ - Actual takeoff weight assumed to be 95 percent of maximum takeoff weight.
2/ - Standard day takeoff requirement used. Hot Day requirement is 14,000 feet.

The DC-10-10F, which is expected to increase to 15 percent of Emery's fleet by 2003, requires the longest length of 10,900 feet for takeoff. This length was calculated using standard day takeoff requirements. The hot day requirement for this aircraft is 14,000 feet. The MD-11 (three percent of the fleet in 2018) requires 10,300 feet, and the DC-8-63 (17 percent of the current fleet) requires 10,100 feet for departure. Runway 6L/24R (the main cargo runway) is 10,900 feet and can accommodate the entire anticipated cargo fleet. However, additional runways will be needed in the future to serve increased demand. In order to maximize the capacity of the future airfield system, any runways that will be used primarily by cargo aircraft should be a minimum of 10,900 feet long in order to serve 100 percent of the anticipated cargo fleet. FAA Advisory Circular 150/5325-4A (January 29, 1990) recommends that parallel runways should be approximately equal in length.

Based on the above analysis, any future primary runways should be a minimum of 10,900 feet long, equal to Runway 6L/24R. This length has been rounded up to 11,000 and is the minimum recommended length for all future primary departure runways. Any future secondary runways should be a minimum of 9,500 feet long to accommodate the B-727 and B-767 aircraft for departures.

Table 3-10 (1 of 4)
Dayton International Airport
Strategic Master Plan Update Study

Runway Takeoff Length Requirements
Aircraft Manufacturers Characteristics Method

100% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	169,500	9,400
B-727-100	JT8D-9	169,500	8,700
B-727-200 1/	JT8D-7	172,000	9,100
B-727-200 1/	JT8D-9	184,800	10,400
MD-11	CF6-80C2D1F	618,000	11,300
MD-11	PW4460	618,000	11,700
DC-10-10F (CF)	All	440,000	14,000
DC-8-62F (AF)	JT3D-3B	350,000	13,100
DC-8-63F (AF)	JT3D-7	355,000	12,100
DC-8-71F (AF)	CFM56-2	328,000	9,800
DC-8-73F (AF)	CFM56-2	355,000	11,100
747-200F	JT9D-7Q	833,000	11,500
747-400F	CF6-80C2B1	875,000	11,800
767-300ER	All	407,000	10,100
A300-600	All	363,760	8,300

Notes:
B-727-100 - Standard Day + 25F (13.9C)
B-727-200 - Standard Day + 25F (13.9C)
MD-11 - Standard Day + 27F (15C)
DC-10 - Standard Day + 36F (20C)
DC-8 - Standard Day + 27F (15C)
747-200 - Standard Day + 21F (11.7C)
747-400 - Standard Day + 31F (17.2C)
767-300ER - Standard Day + 27F (15C)
A300-600 - Standard Day + 27F (15C)
1/ - Passenger version (freighter version information is unavailable).

Draft: 01/13/00
H:\DAY\MP Facility Req\[LENGTH.XLS]Takeoff %mtw

Table 3-10 (2 of 4)
Dayton International Airport
Strategic Master Plan Update Study

Runway Takeoff Length Requirements
Aircraft Manufacturers Characteristics Method

95% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	161,025	8,500
B-727-100	JT8D-9	161,025	7,500
B-727-200 1/	JT8D-7	163,400	8,100
B-727-200 1/	JT8D-9	175,560	9,200
MD-11	CF6-80C2D1F	587,100	10,200
MD-11	PW4460	587,100	10,300
DC-10-10F (CF)	All	418,000	10,700
DC-8-62F (AF)	JT3D-3B	332,500	11,200
DC-8-63F (AF)	JT3D-7	337,250	10,300
DC-8-71F (AF)	CFM56-2	311,600	8,900
DC-8-73F (AF)	CFM56-2	337,250	9,800
747-200F	JT9D-7Q	791,350	10,200
747-400F	CF6-80C2B1	831,250	10,600
767-300ER	All	386,650	8,600
A300-600	All	345,572	7,000

90% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	152,550	7,250
B-727-100	JT8D-9	152,550	6,400
B-727-200 1/	JT8D-7	154,800	7,200
B-727-200 1/	JT8D-9	166,320	7,800
MD-11	CF6-80C2D1F	556,200	9,200
MD-11	PW4460	556,200	9,300
DC-10-10F (CF)	All	396,000	8,500
DC-8-62F (AF)	JT3D-3B	315,000	9,500
DC-8-63F (AF)	JT3D-7	319,500	9,500
DC-8-71F (AF)	CFM56-2	295,200	8,100
DC-8-73F (AF)	CFM56-2	319,500	8,800
747-200F	JT9D-7Q	749,700	9,000
747-400F	CF6-80C2B1	787,500	9,400
767-300ER	All	366,300	7,500
A300-600	All	327,384	6,100

Notes:

B-727-100 - Standard Day + 25F (13.9C)
B-727-200 - Standard Day + 25F (13.9C)
MD-11 - Standard Day + 27F (15C)
DC-10 - Standard Day + 36F (20C)
DC-8 - Standard Day + 27F (15C)
747-200 - Standard Day + 21F (11.7C)
747-400 - Standard Day + 31F (17.2C)
767-300ER - Standard Day + 27F (15C)
A300-600 - Standard Day + 27F (15C)

1/ - Passenger version (freighter version information is unavailable).

Draft: 01/13/00

H:\DAY\MP Facility Req\[LENGTH.XLS]Takeoff %mtw

Table 3-10 (3 of 4)
Dayton International Airport
Strategic Master Plan Update Study

Runway Takeoff Length Requirements
Aircraft Manufacturers Characteristics Method

85% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	144,075	6,100
B-727-100	JT8D-9	144,075	5,500
B-727-200 1/	JT8D-7	146,200	6,100
B-727-200 1/	JT8D-9	157,080	6,800
MD-11	CF6-80C2D1	525,300	8,500
MD-11	PW4460	525,300	8,200
DC-10-10F (CF	All	374,000	7,200
DC-8-62F (AF)	JT3D-3B	297,500	8,700
DC-8-63F (AF)	JT3D-7	301,750	8,500
DC-8-71F (AF)	CFM56-2	278,800	7,100
DC-8-73F (AF)	CFM56-2	301,750	7,900
747-200F	JT9D-7Q	708,050	7,800
747-400F	CF6-80C2B1	743,750	8,200
767-300ER	All	345,950	6,700
A300-600	All	309,196	5,500

80% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	135,600	5,350
B-727-100	JT8D-9	135,600	4,900
B-727-200 1/	JT8D-7	137,600	5,300
B-727-200 1/	JT8D-9	147,840	5,900
MD-11	CF6-80C2D1	494,400	7,800
MD-11	PW4460	494,400	7,600
DC-10-10F (CF	All	352,000	6,200
DC-8-62F (AF)	JT3D-3B	280,000	7,700
DC-8-63F (AF)	JT3D-7	284,000	7,500
DC-8-71F (AF)	CFM56-2	262,400	6,400
DC-8-73F (AF)	CFM56-2	284,000	7,100
747-200F	JT9D-7Q	666,400	6,700
747-400F	CF6-80C2B1	700,000	7,200
767-300ER	All	325,600	5,900
A300-600	All	291,008	4,800

Notes:

B-727-100 - Standard Day + 25F (13.9C)
B-727-200 - Standard Day + 25F (13.9C)
MD-11 - Standard Day + 27F (15C)
DC-10 - Standard Day + 36F (20C)
DC-8 - Standard Day + 27F (15C)
747-200 - Standard Day + 21F (11.7C)
747-400 - Standard Day + 31F (17.2C)
767-300ER - Standard Day + 27F (15C)
A300-600 - Standard Day + 27F (15C)

1/ - Passenger version (freighter version information is unavailable).

Draft: 01/13/00

H:\DAY\MP Facility Req\[LENGTH.XLS]Takeoff %mtw

Table 3-10 (4 of 4)
Dayton International Airport
Strategic Master Plan Update Study

Runway Takeoff Length Requirements
Aircraft Manufacturers Characteristics Method

75% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	127,125	4,600
B-727-100	JT8D-9	127,125	4,300
B-727-200 1/	JT8D-7	129,000	no data
B-727-200 1/	JT8D-9	138,600	5,100
MD-11	CF6-80C2D1	463,500	7,200
MD-11	PW4460	463,500	7,200
DC-10-10F (CF	All	330,000	5,500
DC-8-62F (AF)	JT3D-3B	262,500	6,800
DC-8-63F (AF)	JT3D-7	266,250	6,700
DC-8-71F (AF)	CFM56-2	246,000	5,600
DC-8-73F (AF)	CFM56-2	266,250	6,300
747-200F	JT9D-7Q	624,750	6,400
747-400F	CF6-80C2B1	656,250	7,300
767-300ER	All	305,250	5,200
A300-600	All	272,820	4,300

70% of Maximum Takeoff Weight

Aircraft	Engine	Takeoff Weight	Runway Length (ft.)
B-727-100	JT8D-7	118,650	4,000
B-727-100	JT8D-9	118,650	3,800
B-727-200 1/	JT8D-7	120,400	no data
B-727-200 1/	JT8D-9	129,360	4,400
MD-11	CF6-80C2D1	432,600	7,200
MD-11	PW4460	432,600	7,200
DC-10-10F (CF	All	308,000	5,000
DC-8-62F (AF)	JT3D-3B	245,000	6,100
DC-8-63F (AF)	JT3D-7	248,500	5,900
DC-8-71F (AF)	CFM56-2	229,600	no data
DC-8-73F (AF)	CFM56-2	248,500	no data
747-200F	JT9D-7Q	583,100	6,200
747-400F	CF6-80C2B1	612,500	5,900
767-300ER	All	284,900	4,700
A300-600	All	254,632	3,700

Notes:

B-727-100 - Standard Day + 25F (13.9C)
B-727-200 - Standard Day + 25F (13.9C)
MD-11 - Standard Day + 27F (15C)
DC-10 - Standard Day + 36F (20C)
DC-8 - Standard Day + 27F (15C)
747-200 - Standard Day + 21F (11.7C)
747-400 - Standard Day + 31F (17.2C)
767-300ER - Standard Day + 27F (15C)
A300-600 - Standard Day + 27F (15C)

1/ - Passenger version (freighter version information is unavailable).

Draft: 01/13/00

H:\DAY\MP Facility Req\[LENGTH.XLS]Takeoff %mtw

Landing Requirements

Landing length requirements were also assessed for the same aircraft types discussed in the previous section. **Table 3-12** and ***Exhibit 3-10*** depicts the landing lengths necessary for maximum aircraft landing weight and various flap degree settings for wet and dry pavement. Approximately 60 percent of the future fleet (year 2018) is expected to consist of B-767 aircraft which will require 6,800 feet for landing in wet conditions. The MD-11 requires the longest length of 9,600 feet for wet runway conditions. Therefore, any future primary runways should have a minimum arrival length of approximately 9,600 feet.

(7) Summary of Airfield Requirements

The above analysis identified the following airfield development needs:

- Increase airfield capacity for cargo operations by providing a second parallel runway at 11,000 feet in length by 2003, and a third parallel runway of equal length around year 2018.
- Relocate and extend Runway 18/36 to the north at a total length of 9,500 feet by year 2008.
- Upgrade existing and future Runway 6, 24 and 18 ends to CAT III approach capability to maximize capacity during IFR conditions and Runway 36 end to CAT I approach capability.
- Provide a clear line of sight within the runway visibility zone for Runways 6R/24L and 18/36. Eliminating the runway intersection would decrease the complexity of the runway system, reduce controller workload, minimize possible runway incursions, reduce noise impacts south of the airport, and increase airport capacity.
- Upgrade the runway safety areas for Runways 24L, 6R, and 36 to be in compliance with current FAA design standards.

2. TERMINAL REQUIREMENTS

The land area for the passenger terminal has sufficient size to handle forecast growth in enplaned passenger and aircraft operations. DAY has initiated a separate detailed Passenger Terminal Area Study that will examine the specific configuration of expanded facilities that will accommodate both forecast growth and long-term needs.

Table 3-12

Dayton International Airport

Strategic Master Plan Update Study

Runway Landing Length Requirements

Aircraft Manufacturers Characteristics Method

Aircraft	Max. Landing Wt. (lbs)	Flap Degree Setting	Dry Runway Length (ft)	Wet Runway Length (ft)
B-727-100	142,500	30	5,500	5,900
B-727-100	137,500	40	4,900	5,300
B-727-200 1/	154,400	30	5,400	6,100
B-727-200 1/	142,500	40	4,700	5,200
MD-11	471,500	35	8,300	9,600
MD-11	471,500	50	7,600	8,800
DC-10-10F (CF)	363,500	50	6,000	no data
DC-8-62F (AF)	250,000	full down	6,300	7,100
DC-8-63F (AF)	275,000	full down	6,600	7,700
DC-8-71F (AF)	250,000	full down	6,900	8,000
DC-8-73F (AF)	275,000	full down	7,200	8,200
747-200F	630,000	25	7,600	8,700
747-200F	630,000	30	7,100	8,100
747-400F	666,000	25	7,800	9,100
747-400F	666,000	30	7,200	8,400
B-767-300ER	320,000	25	5,600	6,800
B-767-300ER	320,000	30	5,300	6,200
A300-600	304,230	40	5,400	no data

Assumptions:

1. Zero wind
2. Zero runway gradient
3. Maximum landing weight used
4. Runway elevation 1,009 MSL
5. Aircraft manufacturers data
6. No reverse engine thrust
7. Standard day temperature
8. Antiskid operative
9. Air conditioning on

1/ - Passenger version (freighter version information is unavailable).
Source: Aircraft Manufacturers Characteristics Manuals

Prepared by Landrum & Brown
Draft: 01/13/2000
H:\DAY\MP Facility Req\[LENGTH.XLS]Landing

3. SURFACE TRANSPORTATION

This section describes the demand/capacity relationships for the surface transportation facilities at DAY. The purpose of the analysis is to determine the maximum level of activity, as defined by annual or hourly activity, which can be accommodated on the existing airport surface transportation system. The following are the main airport surface transportation facilities analyzed in this section:

- Perimeter Roadways
- Auto Parking

(1) Perimeter Roadways

To eliminate vehicle runway crossings, the FAA recommends that airside perimeter roadways be constructed around all runway ends. Currently, there is no dedicated airside service road between the passenger terminal area and the east side of the airport that does not cross an active runway. Airline maintenance facilities, the airport maintenance complex, fuel farms and other support facilities are located on the opposite side of Runway 18/36 from the passenger terminal and Emery Cargo complex. This location results in a substantial volume of vehicle traffic (up to 250 per day) crossing Runway 18/36. Each of these crossings requires coordination with air traffic control, which substantially increases air traffic control workload and diverts attention away f`rom controlling aircraft. Rerouting vehicle traffic to avoid crossing Runway 18/36 adds approximately three to five miles to each vehicle trip. In addition, some of these vehicles (such as baggage tugs and cargo loaders) may not be appropriate for use on the public roads that would provide the only alternate route. Relocating Runway 18/36 northward allows space for developing a dedicated airside service road between the east and west sides of the airport without crossing an active runway. This service road would accommodate all vehicle traffic that currently crosses Runway 18/36. This in turn increases airport safety and reduces air traffic controller workload.

(2) Auto Parking

This section describes the existing public, employee, and rental car facilities and their future requirements.

1. Public Parking

The existing public parking system at DAY is shown on ***Exhibit 3-11*** and includes valet, short-term, long-term, and economy parking. The Airport's existing public

parking facilities provide a total capacity of 4,417 spaces. Except for the economy lot which has a shuttle service, all of the airport's public parking facilities are located in the terminal core within walking distance to the terminal building. Valet parking is located on Valet Drive next to the rental car storage areas and consists of 100 spaces with pick-up/drop-off provided at the terminal curbfront. The short-term lots are located on the west and south sides of the terminal building and contain 973 total spaces. The short-term lot west of the terminal building consists of 585 spaces, while the lot south of the terminal building is used as a business class/frequent user lot and consists of 388 spaces. Long-term parking is located west of short-term parking in front of the terminal building and consists of 1,512 spaces. The economy lot is located south of the terminal building and consists of 1,832 spaces. The economy lot provides a shuttle service to the terminal that operates on 15 minute intervals.

Table 3-13 contains the demand/capacity analysis for the public parking facilities, and is described in the following paragraphs. The existing parking demand levels were determined based on utilization rates for a peak month average day provided by airport parking personnel. Future parking demand levels were determined based on the forecast of domestic originating passengers. The required public parking capacity necessary to accommodate the PMAD described in the previous paragraph was calculated by applying a 15 percent contingency factor to the PMAD demand. The FAA's Advisory Circular 150/5360-13, "Planning and Design Guidelines for Airport Terminal Facilities", has a "rule-of-thumb" that suggests an increase of 15 percent in the number of estimated parking spaces to minimize the amount of time required to find a parking space. The PMAD utilization was then determined by comparing the required capacity to the available capacity. A utilization rate of 100 percent or higher indicates there is not sufficient capacity to accommodate demand.

Short-term parking begins to show a deficit of 110 spaces in 2008, increasing to 270 by 2018. There is currently a deficit in long-term parking of 53 spaces which increases to 280 spaces in 2003 and 730 spaces by 2018. The economy parking maintains a surplus in spaces throughout the planning period.

A 3,000 stall parking garage has also been planned for DAY. However, the layout and siting of this garage will be determined in a separate study.

2. Employee Parking

Employee parking consists of two separate lots. The general employee lot is located northwest of the terminal building and has 1,321 spaces. This lot has two sections, one consisting of 500 spaces that is used by US Airways Express (PSA) and one that has 821 spaces for airport employee use. During the months of October through March, a shuttle service is provided to the terminal that operates every 15 minutes. The executive lot is located adjacent to the north side of the terminal building and has 80 spaces.

Airport parking personnel indicate that the employee lot is currently 50 percent utilized and the executive lot is currently 70 percent utilized. These numbers were increased at the same rate as forecast enplanements over the 20-year planning period to determine future demand. The employee parking requirements are shown in

Table 3-13
Dayton International Airport
Strategic Master Plan Update Study
Public Auto Parking Requirements Summary

	Number of Parking Spaces Available				Required Parking Capacity (spaces)				Surplus/(Deficit)				Utilization Rates			
Year	Short-Term	Long-Term	Economy	Total	Short-Term	Long-Term	Economy	Total	Short-Term	Long-Term	Economy	Total	Short-Term	Long-Term	Economy	Total
Actual																
1999	1,073	1,512	1,832	4,417	935	1,565	1,053	3,554	138	(53)	779	863	87%	104%	58%	80%
Forecast																
2003	1,073	1,512	3,132	5,717	1,074	1,797	1,209	4,080	-	(280)	1,920	1,640	100%	119%	39%	71%
2008	1,073	1,512	3,132	5,717	1,180	1,974	1,290	4,444	(110)	(460)	1,840	1,270	110%	131%	41%	78%
2013	1,073	1,512	3,132	5,717	1,258	2,106	1,376	4,740	(190)	(590)	1,760	980	117%	139%	44%	83%
2018	1,073	1,512	3,132	5,717	1,342	2,246	1,468	5,056	(270)	(730)	1,660	660	125%	149%	47%	88%

Note: Short-term includes valet (100 spaces), short-term lot (585 spaces) and business class/frequent user lot (388 spaces).

Source: Airport and Landrum & Brown
01/13/00
H:\DAY\MP Facility Req\[parking.xls]public

Table 3-14. It is anticipated that the employee and executive lots will maintain a surplus of parking spaces throughout the planning period.

3. Rental Car Parking

Rental car parking at DAY consists of storage spaces and ready and return spaces. The storage areas are located on Valet Drive and consist of six lots operated by independent rental car companies. The total rental car storage area consists of 1,585 spaces. The ready and return spaces are located in front of the terminal building, adjacent to short-term parking. There are 386 ready and return spaces available.

The requirements for rental car parking are shown in **Table 3-15**. Based on information provided by airport personnel, the rental car storage facilities are, on average, 50 percent utilized. The ready and return lot is 60 percent utilized based on counts from a November 1998 aerial photo. In 1999, the addition of Thrifty increased the ready and return lot utilization to 63 percent. The storage facilities remain at an average of 50 percent utilization. These utilization rates were increased at the same rate as forecast enplanements. As shown, the storage areas are anticipated to maintain a surplus throughout the planning period. This surplus will decrease from 702 spaces in 2003 to 481 spaces in 2018. The ready and return lot currently utilizes 244 spaces, with a surplus of 142 spaces. This surplus will decrease to 114 in 2003 and 45 in 2018.

4. CARGO FACILITIES

The term "cargo" encompasses two separate entities, air freight and air mail. Air freight is made up of "express" and "traditional" freight. Express consists of the small packages shipped by the integrated overnight carriers. Traditional freight refers to shipments handled by passenger and/or all-cargo airlines, generally consolidated by an independent freight forwarder. Air mail includes all U.S. Mail that is transported aboard an aircraft.

Air freight and air mail can be further segregated into belly air mail/freight and all-cargo air mail/freight. Belly air mail/freight is transported in the underside compartments or bellies of commercial passenger aircraft operated by the commercial airlines. All-cargo air mail/freight is transported on aircraft that carry only cargo.

This section contains a description of the existing cargo facilities and an evaluation of future facility requirements. For this study, future air cargo facility requirements were derived principally from the unconstrained air cargo forecast. It was assumed that each unit of cargo requires handling and storage area to move it from the aircraft or truck through a facility and eventually off the airport.

Table 3-14
Dayton International Airport
Strategic Master Plan Update Study
Employee Parking Requirements

Year	Employee Parking			Executive Parking		
	Utilization Rate	Demand (spaces)	Surplus/(Deficit) (spaces)	Utilization Rate	Demand (spaces)	Surplus/(Deficit) (spaces)
Actual						
1998	50%	660	661	70%	56	24
Forecast						
2003	58%	761	560	81%	65	15
2008	63%	837	484	89%	71	9
2013	68%	892	429	95%	76	4
2018	72%	952	369	100%	80	-

1998 Employee Spaces Available:	1,321
1998 Executive Spaces Available:	80
Total Spaces Available:	1,401

Note: Employee parking spaces are increased at the same rate as forecast enplanements.
Source: Airport and Landrum & Brown
01/13/00
H:\DAY\MP Facility Req\[parking.xls]employee

Table 3-15
Dayton International Airport
Strategic Master Plan Update Study
Rental Car Parking Requirements

	Storage			Ready & Return		
Year	Utilization Rate	Demand (spaces) [1/]	Surplus/ (Deficit)	Utilization Rate [2/]	Demand (spaces) [1/]	Surplus/ (Deficit)
Actual						
1998	50%	716	719	60%	232	154
1999 [3/]	50%	791	794	63%	244	142
Forecast						
2003	56%	883	702	71%	272	114
2008	61%	970	615	78%	299	87
2013	65%	1,035	550	83%	319	67
2018	70%	1,104	481	88%	341	45

	1998	1999 [5/]
Ready & Return Spaces Available:	386	386
Storage Spaces Available [4/]:	1,435	1,585
Total Spaces Available:	1,821	1,971

Notes:
1/ Rental car parking spaces are increased at the same rate as forecast enplanements.
2/ 1998 Ready & return utilization calculated from aerial photo, dated 11-14-98.
3/ Updated to include Thrifty in 1999.
4/ Budget storage spaces calculated using 350 square feet per parking space, other storage spaces provided by rental car companies.
5/ Thrifty lot of 150 spaces added to storage spaces available in 1999.
Source: Airport and Landrum & Brown
01/13/00
H:\DAY\MP Facility Req\[parking.xls]rental car

(1) Existing Cargo Facilities

The existing airport air cargo facilities are in two locations. Emery Worldwide operates out of Emery Plaza, a complex on the north side of the airport, with access from Old Springfield Road, as shown on ***Exhibit 3-12***. The other cargo facilities are located north of Terminal Drive in the terminal area, as shown on ***Exhibit 3-13***. Access to these facilities is via Cargo Road and Freight Drive.

The 166 acre Emery Plaza consists of a 5,275,000 square foot ramp, a 1,000,000 square foot sort facility, a four million gallon fuel farm, employee parking, offices, and maintenance support buildings. In addition, Emery conducts heavy maintenance in the Ryan Air Hangar A located near the Wright Brothers FBO hangar (GA Center 1). They also have an office/truck facility southeast of the Federal Express Building on Cargo Road. The other non-Emery cargo facilities consist of five cargo buildings:

- The United States Postal Service (USPS) building is located to the far western side and has approximately 42,500 square feet.
- The building east of the USPS houses multiple tenants, including U.S. Customs.
- Federal Express is located in two buildings east of the multi-tenant/U.S. Customs building.
- The other building in the cargo complex is a multi-tenant cargo building, including air carriers and Wright Bros. Aero.

(2) Emery Worldwide Facility Requirements

Short-term and long-term facility requirements have been developed for the Emery Worldwide cargo hub complex at DAY. As part of this analysis, various planning standards and assumptions were made and are listed on **Table 3-16**. These were used in conjunction with the other airport planning standards to develop and evaluate facility requirements for the Emery Worldwide cargo complex. An evaluation of proposed facility requirements were conducted for years 2003, 2008, and 2018. This evaluation is summarized on **Table 3-17** with specific areas presented below.

- Aircraft Parking Positions - The total number of cargo aircraft parking positions is projected to increase from 81 in 1999, to 89 in 2003 and 152 in 2018. Apron parking requirements are based on power in/out for all aircraft, taxilane clearances, and includes spare aircraft. The proposed Emery Worldwide aircraft fleet mix is presented in **Table 3-18**.

Table 3-16
Dayton International Airport
Strategic Master Plan Update Study
Emery Worldwide Facility Standards and Assumptions

Total Number of Containers on Aircraft	See Table 3-19
Number of Container Reload Positions	50% of total containers
Area for Container Reload Positions	1000 sf/container
Support Space in Sort Building	15% of container reload area
Container Off-Load Area	Add 1 off-load for each planning horizon
Area for Container Off-Loads	50,000 sf/area
Truck Dock	Increase area 25% for 2008 and 2018
Container Staging	Based on maximum area in 2018--sized in relation to total containers for other years
Containers to be Staged	60% of total containers
Area for Container Staging	750 sf/container
Number of Container Transfer Docks	Based on maximum of 20 in 2018--sized in relation to total containers for other years-4,560 sf/dock
Ground Equipment Staging & Circulation	Perimeter area around Sort Building and distributed among aircraft parking areas equal to 70% of the Sort Building Area
Number of Employee Parking Spaces	Based on maximum of 6,530 for 2018--sized in relation to total containers for other years
Number of Trailer Staging Positions	Based on minimum requirement of 108 in 2003--sized in relation to total containers for other years
Area for Truck Trailer Staging	2,840 sf/trailer staging position
Conway Building	Plan for 2018. Assumed to be in trailers next to transfer dock in 2003 and 2008
Employee & Visitors Entry & Parking	339 sf/space + .5 acres for the entry
Visitor's Parking & Shuttle Pick-up & Drop-off Area	Allowance of 175,000 sf in 2008 and 2018--includes the site for the new Human Resources Building
Human Resources Building	Allowance of 15,000 sf/ floor with 2 floors
Pedestrian Bridge from HR Building to the Hub	Wide bridge with a moving walk for employees and visitors to access the Hub
Truck Entry	Allowance for 4 lane entry=4.0 acres
Total Ramp Area for Aircraft Parking & Taxilanes	Requirements based on power-in/out for all aircraft
Crossfield Taxiways	Right-of-Way required to accommodate Group V aircraft Length based on aircraft parking layout
Apron Ground Equipment Connector	Bridge structure over Mill Creek in 2003 to allow ground equip. to move to Maint. Base & Spare Aircraft Parking Area
Maintenance Building	Based on maximum of 62,000 sf in 2018--sized in relation to total aircraft for other years
Maintenance Apron	Based on maximum of 62,000 sf in 2018--sized in relation to total aircraft for other years
Aircraft Maintenance Base	Area for hangars, offices, apron, and parking
Fuel Farm	A minimum of a 30% increase in capacity from 4 million gallons to 5.2 million gallons by 2008
Roadways	Ultimate 4 lane access road
Glycol Ponds	Increase in proportion to increase in dedicated deicing areas
Deicing Fill Stations	Provide 1 at east and west end of site for 2008 & 2018 at 5,000 sf each
Apron Area for Dedicated Deicing	Proportional to aircraft operational needs
Detention Ponds	Portions of Mill Creek will be rerouted to the west and then south by 2008

Table 3-17
Dayton International Airport
Strategic Master Plan Update Study
Emery Worldwide Cargo Complex Facility Requirements

	1998		2003		2008		2018	
Summary of Operational Requirements								
Number of Aircraft Parking Positions (including spares)	81		89		101		152	
Total Number of Containers on Aircraft	1,265		1,615		2,766		3,936	
% Growth in Containers			28%		71%		42%	
Number of Container Reload Positions	600		855		1,125		1,400	
Number of Containers to be Staged	759		969		1,660		2,362	
Number of Employee Parking Spaces	1,840		2,680		4,590		6,530	
Number of Trailer Staging Positions			108		185		263	
Number of Container Transfer Docks			8		14		20	
	Site Area		**Actual Site Area***		**Actual Site Area**		**Actual Site Area**	
Building & Site Area Requirements	**SF**	**Acres**	**SF**	**Acres**	**SF**	**Acres**	**SF**	**Acres**
Employee & Visitors Entry & Parking			814,084	18.7	1,639,204	37.6	2,178,000	50.0
Visitor Parking & Shuttle Pick-up/Drop-off Area	479,160	11.0			175,625	4.0	175,625	4.0
Human Resources Building			included in sort bldg.		included in visitor's prkg.		included in visitor's prkg.	
Pedestrian Bridge from HR Building to Hub					4,500	0.1		
Truck Entry	126,324	2.9	173,036	4.0	383,287	8.8	161,519	3.7
Cross-field Taxiways			456,033	10.5	1,384,633	31.8	2,132,402	49.0
Apron Ground Equipment Connector			271,178	6.2		NA		NA
Total Ramp Area for Aircraft Parking & Taxilanes	5,275,116	121.1	5,943,402	136.4	9,963,497	228.7	13,488,515	309.7
Sort Building Area w/Truck Dock	1,000,000	23.0	1,277,984	29.3	1,364,821	31.3	1,959,025	45.0
Maintenance Building & Apron	33,000	6.5	169,479	3.9	235,661	5.4	309,296	7.1
Fuel Farm	239,580	5.5	455,132	10.4	322,810	7.4	360,210	8.3
Miscellaneous Support Areas			213,444	4.9	365,904	8.4	615,196	14.1
Container Staging			725,912	16.7	1,542,600	35.4	1,774,773	40.7
Ground Equipment Staging & Circulation			797,131	18.3	1,345,212	30.9	1,360,456	31.2
Container Transfer Dock & Truck Trailer Staging			511,303	11.7	466,438	10.7	936,945	21.5
Conway Building			included with dock		included with dock		included with dock	
Container Pick-up & Repair Station			365,846	8.4	663,952	15.2	508,406	11.7
Hangar Aircraft Parking			1,261,886	29.0	1,261,886	29.0	1,261,886	29.0
Maintnenance Base			433,025	9.9	492,511	11.3	492,511	11.3
Deicing Fill Stations	5,000	0.1			10,000	0.2	10,000	0.2
Total Building & Site Area Requirements	**7,158,180**	**170.1**	**13,868,874**	**318.4**	**21,622,541**	**496.4**	**27,724,765**	**636.5**
Emery Access Road	100,188	2.3	1,374,508	31.6	1,623,929	37.3	1,623,929	37.3
Hangar Road					773,281	17.8	773,281	17.8
Glycol Ponds	152,460	3.5	165,528	3.8	642,463	14.7	642,463	14.7
Detention Ponds	675,180	15.5	207,816	4.8	425,447	9.8	425,447	10.0
Total Site Area Required		**191.4**	**15,616,726**	**358.5**	**25,087,661**	**576.0**	**31,189,885**	**716.3**
Apron Area for Dedicated Deicing		27.9		40.3		50.0		71.3

***** Actual site areas are taken from the conceptual site utilization plans

01/13/2000 15:25
H:\DAY\Emery Air Cargo\[SMP ch3-4.xls]Site Area

Table 3-18
Dayton International Airport
Strategic Master Plan Update Study

Emery Worldwide Fleet Mix and ULD Containers

SCHEDULED FLIGHTS

Aircraft Type	# of ULDs	1998		2003		2008		2018	
		Aircraft	ULD	Aircraft	ULD	Aircraft	ULD	Aircraft	ULD
727	12	25	300	22	264	15	180	45	540
DC-8	18	39	702	39	702	0	0	0	0
DC-10	47	1	47	5	235	12	470	18	846
Airbus 300 / 767	20	2	40	6	120	53	1,060	57	1,140
747-200	59	2	118	4	236	12	708	18	1,062
MD-11	58	1	58	1	58	0	348	0	348
Total Scheduled		70	1,265	77	1,615	92	2,766	138	3,936

01/13/2000 15:27
H:\DAY\Emery Air Cargo\[SMP ch3-4.xls]fleet mix-ULD

- Aircraft Cargo Containers - The total number of aircraft cargo containers is projected to increase from 1,265 in 1999, to 1,615 in 2003 and 3,963 in 2018. Table 3-18 presents the total number of containers based on the anticipated Emery Worldwide aircraft fleet mix. The number of container transfer docks is based on a maximum of 20 in 2018 and sized at 4,560 square feet per dock.

- Truck and Trailer Staging Area - The truck and trailer staging areas are currently located in a temporary area west and northeast of the aircraft apron. These areas are proposed to be moved to an area adjacent to the transfer dock in 2003, and ultimately relocated to the north side of the complex in 2018. The number of truck and trailer staging positions is projected to be 108 in 2003 and 263 in 2018. Each truck trailer staging position is anticipated to occupy 2,840 square feet. A Conway Trucking building is proposed for 2018. During the planning years 2003 and 2008, Conway is assumed to be located in trailers next to the transfer dock.

- Cargo Sort Hub Building - The cargo sort hub building and truck dock area currently occupies approximately 1 million square feet of ground floor space. It is proposed to be expanded to 1.27 million square feet in 2003, and increasing to 1.96 million square feet in 2018. The sort building area includes the container off-load and reload space, support space and truck dock area. One additional container off-load area is proposed for each planning horizon (2003, 2008, and 2018) at 50,000 square feet per area. Planning standards for the number of container reload area is equal to 50 percent of the total number of containers at 1,000 square feet per container.

- Container Staging and Ground Service Equipment Staging - The container staging area is proposed to be located along the outside perimeter of the sort building. The container staging area is planned at 750 square feet per container with sixty percent of the total containers being staged. This results in a total area of 16.7 acres in 2003, and increasing to 40.7 acres in 2018. The ground service equipment (GSE) staging area is also proposed to be located around the outside perimeter of the sort building and throughout the aircraft parking apron area. The GSE area is equal to seventy percent of the sort building floor area and amounts to 18.3 acres in 2003 and increases to 31.2 acres in 2018.

- Employee and Visitor Auto Parking - Currently there are approximately 1,340 employee and 25 visitor parking spaces located north of the cargo sort building. There are also 500 employee parking spaces in the gravel lot east of the sort building. The employee and visitor parking area, and shuttle pick-up/drop-off area occupy approximately 11 acres. The anticipated number of employee parking spaces is proposed to be 2,680 in 2003, and increasing to 6,530 spaces in 2018. Using a planning assumption of 339 square feet per space, this equates to an area of approximately 21 acres in 2003 and 51 acres in 2018. One half acre is also reserved for the entry to the employee parking lot. A new two story human resources/visitor center is proposed to be built in 2008 with 15,000 square feet per floor. This facility will be located on the north side of the main access roadway with parking located adjacent to the building and a shuttle service for visitors. A total area of 175,000 square feet is required for

the visitors parking, shuttle area and human resource building. A wide pedestrian bridge is proposed to be constructed in 2018 between the human resources building and cargo sort building with a moving walk for visitors and employees.

- Cargo/Fuel Truck Access - The cargo truck operation will have its own dedicated entrance/exit roadway system throughout the planning period. A four lane roadway will be provided for access to the cargo sort building. Separate truck entrance and exits will be provided for the two proposed fuel storage tank areas located adjacent to the aircraft maintenance base and container repair station. A long-term goal is to develop a fuel pipeline system into the cargo and commercial terminal areas in order to reduce the amount of truck traffic on the surrounding roadway system.

- Aircraft Maintenance Base - Currently all of Emery's aircraft maintenance is being performed on the east side of the airport in the Ryan Air Hangar "A". Aircraft and vehicular traffic transition between the cargo hub and hangar areas, resulting in significant ground traffic on the airport. In order to help reduce this traffic, an aircraft maintenance base is proposed to be constructed west of the cargo hub building to provide C and D maintenance checks for the large fleet of aircraft being use for daily cargo operations by Emery Worldwide at DAY. The aircraft maintenance base will consist of two hangars capable of accommodating B-747 aircraft, administrative office space, aircraft parking apron, and auto parking. There will be a total of approximately 115,925 square feet for each hangar, 164,025 square feet of office space, 29 acres of aircraft parking apron, 304 auto parking spaces, and a 30,000 square foot warehouse building. Adjacent to the maintenance base will be a small service building and day/night care center for employees. Also, a two lane bridge structure will be build over Mill Creek to provide vehicular access between the maintenance base and sort hub building.

- Ground Maintenance Building - The existing ground maintenance building and apron is proposed to be expanded from 33,000 square feet to 36,300 square feet in 2003 and 62,000 square feet in 2018. Future requirements for this building and apron area were based on the existing ratio of building area and number of aircraft parking positions, and increased proportionately for the planning years.

- Taxiways/Taxilanes - Two cross-field taxiways with Design Group V clearances will be required in 2018 to connect the existing airfield with the new parallel Runway 6/24. Portions of these cross-field taxiways will be developed in conjunction with expansion of the aircraft apron and maintenance base over the planning period.

- Access Roads - Local access roads will be relocated and upgraded to provide continuous access flow for the Emery complex for truck and employee traffic. A temporary two lane Cargo Access Road will be necessary to support the proposed 2003 expansion program. This road will be a replacement for the

section of Old Springfield Road between Dog Leg Road and Peters Pike. In 2008, a new four lane road will be required north of the temporary road to accommodate further expansion.

- Fuel Farm - The existing fuel farm is located northwest of the sort building and consists of four tanks with a total capacity of 4 million gallons. Future storage capacity is based on a minimum 30 percent increase in capacity by 2008 and will remain constant through 2018. It is proposed to split the fuel storage into two new facilities in order to minimize the amount of travel distance and congestion on the aircraft apron area. One fuel farm will be located immediately west of the aircraft maintenance base, while the second fuel farm will be located west of the future container repair station. Total fuel storage capacity will be 5.2 million gallons.

- Glycol Station and Deicing Ponds - The existing Emery apron area has two designated aircraft deicing areas located at each end of the sort hub building. Adjacent to the deicing aprons are two glycol ponds and pump stations which accommodate apron run-off. There is also a deicing station located east of the sort hub building for storage and dispensing of the aircraft deicing fluid. These facilities will need to be relocated and expanded over the planning period to accommodate future demand. Currently 23 percent of the Emery cargo apron area is allocated for aircraft deicing. The increased aircraft parking apron may maintain this same ratio for future aircraft deicing. However, this will depend on Emery's future operational needs and requires further study. New glycol ponds and deicing stations will be needed adjacent to the north and south apron areas. Each deicing fill station will occupy 5,000 square feet of area.

- Mill Creek - Due to the extensive expansion of the Emery cargo complex, it is proposed to relocate and/or enclose Mill Creek around these facilities prior to construction in order to minimize construction costs and provide easy access to the tributary. Future detailed study of Mill Creek and the airport stormwater system is necessary to determine the ultimate re-alignment of the creek.

(3) Cargo Access Road Requirements

Cargo trucks currently travel on various local roadway segments surrounding the airport as shown on ***Exhibit 3-14***. Currently, most truck traffic occurs during the nighttime hours and has resulted in some noise complaints from the adjacent communities. In an effort to provide relief from truck noise to the neighborhoods surrounding DAY, a new access road is proposed to accommodate the anticipated increased cargo truck traffic over the 20 year planning period. Where possible the proposed access roads will minimize the number of at grade interchanges to help reduce truck noise due to the stop and starting process. Various roadway routing alternatives will be presented and analyzed in Chapter 4. In order to

provide immediate relief from truck noise, an interim relocation of Old Springfield Road will also be evaluated. This interim measure may require land acquisition and road rerouting around residential housing.

(4) Other Cargo Facility Requirements

1. Cargo Building Area

An analysis of building space for the other non-Emery cargo carriers at DAY was conducted as part of this study. To conduct the building analysis for the air freight facilities, some measure of operational efficiency was needed. For the purposes of this task, the total tons of freight passing through the facility per year was used in conjunction with the area over which it passes. An actual tonnage per area ratio (TAR), defined in units of total (enplaned plus deplaned) annual tons of cargo per square foot of cargo floor space, was determined using forecast cargo tonnage and a total building area of 198,582 square feet. The 1998 TAR value for DAY air mail and freight facilities is 0.1.

TAR ratios typically range from 0.5 tons/square foot to 2.0 tons/square foot. The 2.0 tons/square foot ratio is representative of a highly efficient, large domestic operation. The achievement of the higher value is dependent upon the degree of mechanization, amount of containerization, percent of international cargo, and building layout.

A maximum TAR value was chosen to determine the facilities needed in the future. The determination of this value for the air cargo facilities involved a comparison of recommended planning ratios and the existing operational environment. The 1998 TAR value for the DAY facilities is lower than the typical operating range. A maximum TAR value of 0.5 was chosen because it represents a lower than average value, while assuming that the facilities become more efficient with time. This value may be high for some facilities and low for others, but as an average this value is assumed to be adequate for the purposes of this analysis.

Table 3-19 shows the future building requirements for air mail and air freight based on the maximum TAR value discussed previously. Based on TAR value analysis, there will be a surplus of cargo facilities through year 2018. However, TAR value analysis is based on tons of air cargo and does not take into consideration high volumes of truck-to-truck traffic.

Although the TAR value analysis shows no need for expansion, interviews with FedEx personnel indicate a requirement to expand the FedEx facilities at DAY to accommodate increased truck to truck cargo traffic. FedEx has requested 20 percent more building and truck parking space in the 3 to 5 year timeframe, which will amount to approximately 17,200 square feet of building space and 4 to 6 additional truck parking spaces. This increases to 50 percent more space needed in the 5 to 10 year timeframe. Alternatives for accommodating this requirement and any unforeseen increases in cargo demand will be evaluated in Chapter 4.

Table 3-19
Dayton International Airport
Strategic Master Plan Update Study
Building Area Requirements - Other Air Cargo Facilities

Year	Tons of Air Cargo	Existing Facility Tar Value 1/	Maximum Tar Value 2/	Building Area (square feet) Required with Max Tar Value	Surplus/ (Deficit)
Actual					
1998	16,814	0.1	0.5	33,628	164,954
Forecast					
2003	20,400	0.1	0.5	40,800	157,800
2008	24,900	0.1	0.5	49,800	148,800
2013	30,600	0.2	0.5	61,200	137,382
2018	37,800	0.2	0.5	75,600	123,000

	Square Feet
1998 Building Area Available:	198,582

1/ - Tons of cargo divided by the available building area.
2/ - Maximum TAR value based on industry standards which blends belly, freight, and express cargo.
Source: Landrum & Brown
01/14/2000
H:\DAY\MP Facility Req\[CARGOREQ.XLS]cargo building

2. Cargo Aircraft Apron Area

The aircraft apron parking area currently available for freighter aircraft encompasses approximately 387,830 square feet. Current flight schedules show a maximum of two daily cargo departures on the ground at one time in this area. This number is forecast to increase to three aircraft in 2003 and five aircraft in 2013, based on forecast cargo flight schedules and FedEx projections. PSA, a commuter carrier owned by US Airways, also uses this ramp to park aircraft overnight. They currently park 4 Dornier 328 aircraft for maintenance work, and 1 Saab 340 because of lack of gate space at the terminal. Using a weighted average of space requirements for the 727-200 (used by cargo carriers), Dornier 328, and Saab 340, the existing cargo ramp has a surplus of 272,565 square feet in 2003, decreasing to 225,164 in 2018. As shown in **Table 3-20**, the cargo ramp area is anticipated to be adequate through the planning period. However, additional cargo building and apron space will be allocated for future expansion in case of unforeseen increase in activity.

5. SUPPORT FACILITIES

Support or ancillary facilities play a vital role in the operations and maintenance of DAY. The sizing, location and phasing of these facilities must provide flexibility to accommodate the dynamic aviation industry and more specifically the DAY Metropolitan Area. The recommended development must have planning options which optimize the operational efficiency, effectiveness and safety of the airport. Short-term actions and recommendations should not preclude long-range planning options.

Support facilities at DAY are shown in ***Exhibit 3-15***, and include the following:

- Airline Maintenance Facilities
- Commercial Aviation Fuel Storage
- Flight Kitchen
- Airport Maintenance Facilities
- ARFF Facilities & Equipment
- General Aviation Facilities
- Air Traffic Control Tower/FAA Offices
- Air Show Facilities

Support facility requirements were prepared based on the forecast of aviation demand contained in this Master Plan Study. Overall forecast and peak period demands were considered in the formulation of the facility requirements. Requirements contained herein provide general planning parameters and are based on existing and anticipated conditions at DAY.

Table 3-20
Dayton International Airport
Strategic Master Plan Update Study
Aircraft Parking Requirements - Other Air Cargo Facilities

Year	Number of Aircraft Expected to be on the Ground 1/	Average Area Per Aircraft 2/ (square feet)	Apron Area Required (square feet)	Apron Area Surplus/(Deficit) (square feet)
Actual				
1998	7	13,081	91,564	296,266
Forecast				
2003	8	14,408	115,265	272,565
2008	8	14,408	115,265	272,565
2013	10	16,267	162,666	225,164
2018	10	16,267	162,666	225,164

	Apron Area (square feet)
1998 Parking Area Available:	387,830

1/ - Based on Design Day flight schedule, FedEx projections, and PSA (a commuter carrier owned by US Airways) existing conditions.
2/ - Area requirements are for 727-200, Dornier 328, and Saab 340 aircraft. These aircraft are currently used by FedEx and PSA.

Source: Landrum & Brown
01/14/2000
H:\DAY\MP Facility Req\[CARGOREQ.XLS]cargo building

(1) Airline Maintenance Facilities

Airline maintenance facilities are typically utilized in one of two ways: to conduct scheduled maintenance overhauls, inspections, cleaning, etc.; and to conduct non-scheduled aircraft repairs that arise due to mechanical malfunctions. Typically, airlines will establish a primary maintenance facility at a location within their route system offering a minimal enroute distance from a majority of the cities they serve, or at an airport where a large portion of their activity occurs. These primary maintenance facilities are utilized mainly for major overhauls scheduled periodically throughout the operating life of an aircraft. In addition to primary maintenance facilities, airlines establish non-scheduled maintenance facilities throughout their route system. The non-scheduled maintenance facilities conduct necessary repairs on an as needed basis. Depending on the individual airline, these non-scheduled maintenance areas are hangar facilities either owned by the airline, facilities that can be leased on an as needed basis, or the airline contracts with a local company to perform the maintenance. The use and placement of the maintenance facilities are entirely dependent upon the individual airlines policies. The current airline maintenance facilities at DAY are used mainly for minor routine inspections and cleaning purposes.

There are two airline maintenance facilities located on the airfield, which are operated by US Airways Express (PSA Airlines) and Comair. These airline maintenance facilities currently occupy 74,400 square feet or 1.7 acres and consist of hangar and office space. The US Airways Express (PSA) facility is located in the area between the air cargo ramp and airport employee parking. The Comair facility is located in the east portion of the Wright Bros. Aero hangar in GA Center 1. There is also a joint use Ryan Air and Emery Worldwide hangar located in GA Center 1. This hangar is included in the analysis beginning in year 2008, assuming Emery builds a new hangar in this year.

It was assumed that existing facilities, as an aggregate, are adequate for existing demand loads and are operating at 100 percent capacity. Based on these assumptions, an annual aircraft operations to available maintenance area ratio was derived. This ratio is 0.8 and was then applied to the forecast of operations, as contained in Chapter 2, to determine future requirements. **Table 3-21** shows the calculation of future airline maintenance hangar requirements. Applying the existing ratio results in a deficit of 19,600 square feet in 2003. The addition of the Ryan Air hangar space in 2008 reduces this deficit to 100 square feet. This deficit increases to 35,100 square feet in 2018.

Table 3-21
Dayton International Airport
Strategic Master Plan Update Study
Airline Hangar/Maintenance Area Requirements

Year	Square Feet Per Operation	Commercial Operations [1/]	Area Required		Surplus/(Deficit)	
			Square Feet	Acres	Square Feet	Acres
Actual						
1998 [2/]	0.8	98,086	74,400	1.7	-	-
Forecast						
2003 [2/]	0.8	123,900	94,000	2.2	(19,600)	(0.5)
2008 [3/]	0.8	160,000	131,000	3.0	(100)	(0.0)
2013	0.8	180,500	147,700	3.4	(16,800)	(0.4)
2018	0.8	202,800	166,000	3.8	(35,100)	(0.8)

	Square Feet	Acres
1998 Area Available	74,400	1.7
2008 Area Available	130,950	3.0

Notes:
1/ Excludes general aviation and military operations.
2/ Includes Comair and US Airways Express (PSA) hangars in 1998 and 2003.
3/ Adds the joint use Ryan Air and Emery Worldwide hangar in GA Center 1 in year 2008, assuming Emery builds their own maintenance hangar in this y

Source: Airport and Landrum & Brown
01/14/2000
H:\DAY\MP Facility Req\[Supfac.xls]airport maintenance (2)

(2) Passenger Area Commercial Aviation Fuel Storage

There are currently 821,000 gallons of commercial fuel storage available at DAY. This does not include the Emery Worldwide fuel farm, which is discussed in a separate section. The fuel storage facilities are located in two areas. Approximately 741,000 gallons are stored in three above-ground tanks located in the cargo area on the corner of Freight Drive and Cargo Road. Fuel from these tanks runs through an underground line into two underground tanks located under the terminal apron area. These two tanks hold a total of 80,000 gallons and supply the terminal apron hydrant fueling system. All aviation fuel is delivered to the airport via truck and the two fuel farms are operated by Wright Bros. Aero.

To determine a PMAD fuel demand first requires developing a ratio of gallons of fuel used per PMAD commercial aircraft departures. This ratio is derived by dividing the number of gallons of "Jet A" demand in August 1998 (the peak month) by 31 (number of days in August), then dividing that amount by the number of 1998 PMAD commercial aircraft departures. The amount of "Jet A" demand was provided by Wright Bros. Aero personnel. This calculation results in a 1998 gallons per PMAD departure ratio of 500. The 1998 ratio was inflated from 2003 to 2018 to take into account the following factors:

- The replacement of a majority of the turboprops with regional jets, with greater fuel capacities, by the commuter carriers
- The use of larger aircraft, with greater fuel capacities, by the air carriers and cargo carriers
- The increase in aircraft load factors

These ratios are applied to the forecast PMAD commercial departures to determine PMAD fuel demand.

The airlines normally require a three to four day supply of fuel to provide the airport adequate reserves in the event the normal supply systems were disrupted. The airport currently has a ten day supply due to excess capacity. Future storage requirements are based on the airline requirement of a four day supply of fuel.

Future fuel storage requirements are shown in **Table 3-22** and are expected to grow from approximately 187,000 gallons in 2003 to 234,240 in 2018. These future storage requirements can be accommodated within the existing airport fuel storage system.

Table 3-22
Dayton International Airport
Strategic Master Plan Update Study
Airport Jet A Fuel Storage Requirements

Year	Gallons Per PMAD Departures (gallons)	PMAD Departures 1/	PMAD Demand (gallons)	Storage Requirements (4 Day Supply) (gallons)	Surplus/ (Deficit) (gallons)
Actual					
1998	500	91	45,500	182,000	639,000
Forecast					
2003	550	85	46,750	187,000	634,000
2008	600	85	51,000	204,000	617,000
2013	610	91	55,205	220,820	600,180
2018	610	96	58,560	234,240	586,760

1998 Storage Available (gallons):	821,000

1/ - PMAD departures include passenger airlines and other cargo. They do not include general aviation or Emery Worldwide departures.

Source: Airport and Landrum & Brown
01/13/2000
H:\DAY\MP Facility Req\[Supfac.xls]airport fuel storage

(3) Flight Kitchen

The sole flight kitchen building at DAY is Dobbs International Services, which currently occupies 16,492 square feet. It is located in the cargo area on Cargo Road between the Airport Properties office building and the Emery Worldwide office/truck facility. The Dobbs' auto parking area consists of 42,290 square feet.

Two planning factors were used to determine future flight kitchen facility requirements. First is the ratio of meals per passenger. This ratio was derived by dividing the number of daily meals produced by Dobbs by PMAD enplaned passengers. This ratio is 0.06 and is applied to forecast PMAD passengers to determine the total number of daily meals required in the forecast years. Second is the ratio of meals per total building square feet which is determined by dividing the number of annual meals, provided by Dobbs, by the square footage being utilized in the building. Personnel at Dobbs indicate that they are currently using only 50 percent of their facility. Taking the current facility utilization into account results in a ratio of meals per total building square foot of 0.03. This ratio is applied to the forecast total meals required to determine the square footage needed in the future.

The future flight kitchen requirements are presented in **Table 3-23**. It is determined that there will be a surplus of flight kitchen building space through year 2018. This analysis does not assume that an airline will initiate hub service at DAY. However, if this were to occur, there will be sufficient land to expand the flight kitchen facility as needed.

(4) Airport Maintenance

This section identifies the demand capacity relationship for DAY airport maintenance facilities. The goal of this analysis is to determine the future building and land area requirements for airfield maintenance operations, which includes snow removal, mowing, and general airport maintenance.

1. Existing Airport Maintenance Facilities

The existing airport maintenance facilities consist of 51,641 square feet of building space on 1.2 acres of land located in the GA Center 1. These facilities are comprised of four buildings; the city electrical shop, airport sand storage building, and two airport maintenance buildings. Co-located within the two airport maintenance buildings are airfield maintenance equipment storage and a garage which is used 5 days per week. The truck/auto parking areas total approximately 106,840 square

Table 3-23
Dayton International Airport
Strategic Master Plan Update Study
Flight Kitchen Requirements

Year	Meals Per Passenger	PMAD Enplaned Passengers	Daily Meals Required	Meals Per Total Square Feet 1/	Area Required		Surplus/(Deficit)	
					Square Feet	Acres	Square Feet	Acres
Actual								
1998	0.06	3,400	220	0.03	8,246	0.2	8,246	0.2
Forecast								
2003	0.06	3,700	220	0.03	8,200	0.2	8,300	0.2
2008	0.06	4,100	250	0.03	9,400	0.2	7,100	0.2
2013	0.06	4,400	260	0.03	9,700	0.2	6,800	0.2
2018	0.06	4,600	280	0.03	10,500	0.2	6,000	0.1

	Square Feet	Acres
1998 Area Available:	16,492	0.4

1/ - Meals per square feet based on daily meals divided by current facility utilization. Dobbs currently uses 50% of their facility.
Source: Dobbs and Landrum & Brown

01/14/2000
H:\DAY\MP Facility Req\[Supfac.xls]airport maintenance (2)

feet. This includes the airport ground vehicle fuel farm area, parking area, and an outdoor equipment storage area. A list of the existing airport maintenance equipment is shown in **Table 3-24**.

2. Airport Maintenance Requirements

Maintenance personnel have indicated that there is a deficiency in building area for equipment storage and in the associated parking area. Some of the airport's snow removal equipment, as listed in **Table 3-25**, is parked outside and exposed to the elements due to inadequate building storage space. Therefore, it is assumed that the current facilities are inadequate to meet existing or forecast demand.

Table 3-25 – Snow Removal Equipment Stored Outside

Oshkosh Dump Truck W/snowplow, spreader 4X4	GMC 3/4 Ton Pick-up
Oshkosh Dump Truck W/snow & spreader	GMC Pick-up
Snowblast Blower	Sweepster Broom
Oshkosh Dump Truck With plow and spreader	Chevy 3/4 pick-up 4X4 plow
Oshkosh Dump Truck With plow & spreader	4X4 Chevy 3/4/Pick-up
Oshkosh Dump Truck With plow/spreader	7740 Fort Tractor-with flail
Idaho-Norland R/W Broom	'97 Chev-Utility Truck
Oshkosh Blower	John Deere Dozer

A general planning area of 1,000 square feet of parking space per vehicle was used for the 10 snow removal vehicles that currently must be stored outside, and 3,600 square feet for the snow sweeper and pick-up snow plows, as recommended in AC 150/5220-18, "Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials." This results in a current deficit of 13,600 square feet of building area for the storage of this equipment. Also, aisle space, repair areas, and personnel facilities must be taken into consideration with the addition of this equipment in the maintenance building.

Airport maintenance facility requirements were determined based on the existing ratio of building space to the total airport property boundary area. As shown in **Table 3-26**, this analysis indicates that there is a current deficit of airport maintenance facilities as indicated by airport maintenance personnel. Based on this analysis, there will be a building deficit of 26,500 square feet in 2003, increasing to 69,800 square feet by 2018. The land area deficit will be 54,800 square feet in 2003, increasing to 144,400 square feet in 2018.

(5) Aircraft Rescue and Fire Fighting (ARFF)

The primary responsibility of the DAY Aircraft Rescue and Fire Fighting (ARFF) department is to provide emergency services to all individuals, aircraft, and facilities on the airport property. The existing ARFF facility is located east of the Terminal ramp and houses all fire fighting equipment, emergency vehicles, and provides living quarters for staff personnel. ARFF requirements, both equipment and response times, for airports serving air carrier operations are outlined in Federal Aviation Regulation (FAR) Part 139.

Table 3-24 – Airport Maintenance Equipment List (Page 1 of 2)

Stihl Chain Saw Mod. #08
GMC Truck-Deicer
Oshkosh Dump Trunk W/snowplow, spreader 4X4
Homelite 3" pump
Stihl Weed Eater
Stihl Weed Eater
Miller Tilt Top Trailer
P&H Welder (mobile arc)
Dungarvon 32" Snow Plow
Kellog-American Air Compressor (on homemade trailer #5178)
Detroit Diesel Engine
Oshkosh Dump Truck W/snow & spreader
Greenline Post Driver
Donuser Post Hole Auger
Hale Pump (firehouse)
John Deere Scarifier-scraper
Tait Pump 4" Sewage Pump
GMI ML710 Fork Lift
Niagara Portable Mod. #5621-0 Watts
Kuntz & Root Portable Alternating Plant-civil defense
Stihl Weed Eater
Stihl Weed Eater
Tait 3" Pump
Detroit Diesel Engine
Billy Goat Sweeper
Stihl Metal Trailer
Allis Chalmers, Blue Electric Power Electric Stacker
MTD Snowflite Snow Blower
Snowblast Blower
Oshkosh Dump Truck With plow and spreader
Pincor Alternator (portable)
Homemade trailer
Golf Cart
Oshkosh Crash Truck
Oshkosh Dump Truck With plow & spreader
New Idea Portable Tank
Oshkosh Dump Truck With plow/spreader
York Rake
Hudson Bros Trailer
Oshkosh Dump Truck With plow & spreader
8" Woods Mower, D-80
Idaho-Norland R/W Broom
Ford Tractor
Stihl 16" Chain Saw
Stihl Chain Saw
Oshkosh Blower
Oshkosh 6X6
Oshkosh 4X4
Oshkosh T-12
GMC 3/4 Ton Pick-up
Altek Ford Bucket Truck
Ford Van Paint Machine
John Deere 14" walk behind
Amkus Rescue Tool
Bomag Vibratory 120 Roller
Cronkhite Trailer
Wacker 3" Trash Pump
GMC Pick-up
Promack Turf Vacuum
Honda Generator 2250 W
Honda Generator 2250 W
Miller Welder-Bobcat
Kubota Eng. Generator 100W
Honda 5000 Watt Generator
Aplex Sweeper
John Deere 14" walk behind
John Deere Backhoe 310C
Case Int. Tractor 695
Chevy Caprice
Power Washer Clean System
Tar Kettle-Chaussee Mfe
Stihl FS81 Weed Eater
Stihl FS81 Weed-Eater
Woods Batwing Mower
Stihl Weed Eater
Stihl Weed Eater
Chev. Pick-up
Ford Pick-up
Ford Pick-up
Ford Van-ARFF
Partner Rescue Saw
Sweepster Broom
Concrete Saw
Chilton Trailer for Striper
Mormanco Trailer/5294 Saw
Toro Snow Blower
Toro Snow Blower
John Deere Mower
Custom 20 Ton Trailer
John Deere, 1145
John Deere, 1145
Sweepster Broom
Sweepster Broom
Ford Tractor
Mule
Stihl Chain Saw
'92 88 Oldsmobile
Befco Spreader
Bobcat
Chevy Blazer
6X6 Schmidt Snow Plow
6X6 Oshkosh Plow
Ford Truck

Table 3-24 – Airport Maintenance Equipment List (Page 2 of 2)

Rhino 15' Mower
4X4 Oshkosh Truck
Stihl Chain Saw
Shaver Post Driver
Stihl Weed Eater
Stihl Weed Eater
Stihl Weed Eater
John Deere 1145 Mower
John Deere 1145 Mower
Oshkosh Fire Truck RIV
Chevrolet Capricc
Chevy 3/4 pick-up 4X4 plow
Ford Van
Rescue Saw, Partner K12
Rhino 15' Mower Deck
John Deere 14" self-propelled
John Deere 14" self-propelled
4X4 Ford Ranger
SR 80 Mower
SR 80 Mower
4X4 Chevy 3/4/Pick-up
Stihl Weed Eater
Stihl Weed Eater
Cat Front End Loader
Auxiliary Vault Generator
Hyster Fork Lift
Stihl Leaf Blower
Stihl Leaf Blower

Snow Blowers, Terminal
Snow Blowers, Terminal
Volvo Front End Loader
Astro Van
Ground Pounder
Oshkosh Blower
Oshkosh Blower
John Deere Sprayer
Ford Truck/Stairs (Airforce)
Buick LaSabre
Aeroil-Hot Asphalt
Hyster Fork Lift
Coleman Generator
Champion Road Grader
AutoCar Tandom Truck
AutoCar Tandom Truck
Ford New Holland Tractor
John Deere 1145 Tractor
'97 Crown Victoria
'97 Chev-Utility Truck
1145 John Deere/plow

Ford Tractor
Cushman – police ATV
'94 S-10 Blazer
'94 S-10 Blazer
'94 S-10 Blazer
'95 Smeal Fire Truck
GMC Van
GMC Van
Gator-all Terrain
5640 Ford Tractor
5640 Ford Tractor
3930 Ford Tractor
3030 Ford Tractor
7740 Fort Tractor-with flail
Catepillar Man Lift
Chevy One Ton Dump
Paver
Chevy one ton dump
Chevy Crew Cab
'96 Ford Crown Victoria
'96 Ford Crown Victoria
Hotsy Power Washer
'94 S10 Chevy Blazer
Paint Striper
Woods 80" Rotary Mower
Woods 80" Rotary Mower
Bush Hob 20' Mower

John Deere Push Mower
John Deere Push Mower
John Deere Push Mower
John Deere Push Mower
Sullair Air Compressor
John Deere Dozer
White Tahoe
White Tahoe
Generator – Police
15' Ramp Snow Plow
Chevy Truck
Chevy Truck
Lighted "X"s
Lighted "X"s
Oshkosh Crash Truck
Sprayer
Partner Rescue Saw
RamFan Exhaust Fan
RamFan Exhaust Fan
Glencoe Plow
Disc

s:\99day\027901\mason_rev.doc

Table 3-26
Dayton International Airport
Strategic Master Plan Update Study
Airport Maintenance Area Requirements

Year	Building Sq. Feet Per Acre	Airport Property Acreage 1/	Land/ Building Ratio	Building				Land			
				Area Required		Surplus/(Deficit)		Area Required		Surplus/(Deficit)	
				Square Feet	Acres	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Actual											
1998	14.8	4,400	2.1	65,241	1.5	(13,600) 2/	(0.3)	134,978	3.1	(28,137)	(0.6)
Forecast											
2003	14.8	5,275	2.1	78,100	1.8	(26,500)	(0.6)	161,600	3.7	(54,800)	(1.3)
2008	14.8	5,390	2.1	79,800	1.8	(28,200)	(0.6)	165,100	3.8	(58,300)	(1.3)
2013	14.8	6,796	2.1	100,600	2.3	(49,000)	(1.1)	208,100	4.8	(101,300)	(2.3)
2018	14.8	8,201	2.1	121,400	2.8	(69,800)	(1.6)	251,200	5.8	(144,400)	(3.3)

	Square Feet	Acres
1998 Building Area Available	51,641	1.2
1998 Land Area Available	106,841	2.5
1998 Total Airport Land Area	191,304,348	4,400.0

1/ - Total airport acreage, forecast values based on future airport expansion requirements for all airport facilities.
2/ - Calculated using square footage measurements for equipment currently being stored outside.

Source: Airport and Landrum & Brown
01/13/2000
H:\DAY\MP Facility Req\[Supfac.xls]airport maintenance (2)

1. Equipment Requirements

The vehicles and equipment, as well as the required types of extinguishing agents are based upon the types of air carrier commercial aircraft operating at the airport. Five airport classes have been defined to specify the requirement. Each airport class, referred to as an "Index," and their corresponding ARFF equipment requirements are shown in **Table 3-27**.

Table 3-27
FAR Part 139.317 ARFF Equipment Requirement

		Vehicles		Extinguishing Agents [1]	
Airport Index	Length of Aircraft (ft) [3]	Light-Weight	Self-Propelled	Dry Chemicals [4]	Water [5]
A [2]	Under 90	1	0	500 or 450	0 or 100
B	90 to 126	1	1	500	1,500
C	**126 to 160**	**1**	**2**	**500**	**3,000**
D	160 to 200	1	2	500	4,000
E	Over 200	1	2	500	6,000

1/ The protein based agents may be substituted for AFFF and the quantities of water shown increased by a factor of 1.5. Dry chemicals in the ratio of 12.7 pounds per gallon of water may be substituted for up to 30 percent of the water specified For AFFF.
2/ These requirements are part of the total for Indexes B through E pertaining to the lightweight vehicle.
3/ Length of largest aircraft providing an average of five or more scheduled departures per day.
4/ 500 pounds of sodium-based dry chemical can be substituted with 450 pounds of potassium-based dry chemical with AFFF to total 100 gallons.
5/ Total quantity of water required for all vehicles for protein foam production.

The applicable airport Index is determined by the fuselage length of the longest aircraft operated by a commercial air carrier, with an average of five or more scheduled departures per day. The ARFF facility at DAY presently operates as an Index C. As shown in **Table 3-28**, the existing Dayton ARFF equipment meets Index C requirements.

Table 3-28
Existing ARFF Vehicular Capacities for Extinguishing Agent

Vehicle	Water (gallons)	AFFF [1] (gallons)	Dry Chemical (pounds)
1	3,000	410	450
2	1,500	275	450
3	3,000	410	0
4	3,000	410	0
Total	10,500	1,505	900
Index C Requirements [2]:	3,000	-	500

1/ Aqueous film forming foam.
2/ The largest air carrier aircraft in the scheduled forecast fleet mix with five or more scheduled departures per day is a 727 which falls in Index C.

Source: Airport, FAR 139.317, and Landrum & Brown

2. Response Time Requirements

In accordance with FAR Part 139, the first ARFF vehicle must be able to reach the mid-point of the furthest runway from its assigned post within three minutes. The existing ARFF facilities at DAY are in compliance with this FAR Part 139 requirement. The Master Plan recommendations include the extension of Runway 6R, the extension and relocation of Runway 18/36 and a new Runway 6/24 on the northwest side of the airfield. The response times of the existing ARFF were calculated to determine if an additional ARFF facility would be needed to reach the mid-point of these runways. The following assumptions were used in this analysis.

- Use the shortest travel route as shown in ***Exhibit 3-16***, which includes runways, taxiways and service roads.
- Twenty second response time from the sounding of the first alarm to the start of the first vehicle.
- Thirty seconds for a Class 2 ARFF vehicle to accelerate from a starting point to 50 miles per hour (as specified for Class 2 vehicles in AC 150/5220-10B, October 20, 1997).
- Average running speed of 50 miles per hour on straight pavement sections.
- Average running speed of 30 miles per hour on curved sections.
- Fifteen seconds for a Class 2 ARFF vehicle to decelerate from 50 miles per hour to a complete stop (as specified for Class 2 vehicles in AC 150/5220-10B, October 20, 1997).

The ARFF response times are summarized in **Table 3-29**. The description of the routes and response times to each runway are discussed in the sections that follow.

Table 3-29
ARFF Response Time Calculation

Runway	From Existing ARFF Station Distance (feet)	From Existing ARFF Station Time (seconds)	Maximum FAR Response Time (seconds)	Time Surplus/(Deficit) (seconds)
Existing Runway 6L/24R	4,700	149	180	31
Extended Runway 6R/24L	3,200	114	180	66
Extended Runway 18/36	4,920	146	180	34
New Runway 6/24	14,520	273	180	(93)

Source: Airport, FAR 139, and Landrum & Brown

Existing Runway 6L/24R

The ARFF vehicles will travel southwest from the existing Station using Taxiway "A" to the terminal ramp. Then travel northwest on Taxiway "M" to Taxiway "P" (westbound). From Taxiway "P" a right turn is made onto Taxiway "U". The vehicles travel northwest on Taxiway "U" and turn left onto Runway 6L/24R and go southwest to the runway midpoint.

The shortest route to the midpoint of Runway 6L/24R is approximately 4,700 feet and takes approximately 149 seconds. This response time is less than the maximum 180 seconds required under FAR Part 139. Therefore, the existing ARFF facility is adequate to serve Runway 6L/24R.

Extended Runway 6R/24L

The ARFF vehicles will travel southwest from the existing Station using Taxiway "A" to the terminal ramp. Then travel south on Taxiway "D" to Taxiway "E" (westbound) and then Taxiway "G" (southbound). The vehicles will then travel southwest down Runway 6R/24L to the midpoint.

The shortest route to the midpoint of Runway 6R/24L is approximately 3,200 feet and takes approximately 114 seconds or 1.9 minutes. This response time is less than the maximum time required under FAR Part 139 of three minutes. Therefore, the current ARFF facility location will be adequate to serve extended Runway 6R/24L.

Extended Runway 18/36

The ARFF vehicles will travel northeast from the existing Station onto Taxiway "A", then proceed east on Taxiway "Y", and then north down Runway 18/36 to the midpoint.

The shortest route to Runway 18/36 is approximately 4,920 feet and takes approximately 146 seconds or 2.43 minutes. This response time is less than the maximum time required under FAR Part 139 of three minutes. Therefore, the current ARFF facility location will be adequate to serve extended Runway 18/36.

New Runway 6/24

The ARFF vehicles will travel northeast from the existing Station on Taxiway "A", then proceed west on Taxiway "Z" across Runway 6L/24R and onto the new connector taxiway. From here the vehicles will travel southwest on the new parallel taxiway and use a connector service road to reach the runway midpoint.

The shortest route to the new Runway 6/24 is approximately 14,520 feet and takes approximately 273 seconds or 4.55 minutes. The existing ARFF response time exceeds the maximum time specified in FAR Part 139 of three minutes. Therefore, the current ARFF facility location will not adequately serve new Runway 6/24. An additional ARFF facility will be needed and alternative site locations will be analyzed in Chapter 4 of this report.

(6) General Aviation Requirements

The general aviation areas at DAY are located on the east side of the airfield in GA Centers 1 and 2. The total ramp area available for these two areas is approximately 1,403,830 square feet. The total auto parking area for the GA Centers is approximately 424,882 square feet. There are currently 56 based GA/corporate aircraft at DAY. This number is forecast to remain constant over the planning period. There appears to be no capacity problems today with the current general aviation facilities, and since based aircraft are forecast to remain constant, no additional general aviation facilities are recommended. However, expansion areas for general aviation facilities will be identified in the event demand increases unexpectedly in the future. Additional study and evaluation of future general aviation needs will be conducted under a separate study when need dictates.

6. AIR TRAFFIC CONTROL TOWER/FAA OFFICES

The existing Air Traffic Control Tower (ATCT) is located within the Dayton terminal building. It is a six-story structure containing FAA, airport administration, and airline offices; in addition, there is a TRACON facility and tower cab. The ATCT is classified as a Terminal Level IV facility based on total annual instrument operations. It has an eye-level elevation of 1,088.5 feet Mean Sea Level (MSL).

Additional FAA offices are located in the GA Center 1. There are two facilities at this location: the Flight Service Station (FSS) and the FAA Manufacturing Inspection District Office (MIDO). The FSS encompasses 14,568 square feet and the MIDO consists of 8,537 square feet. The FSS and MIDO offices are adequate and do not require future expansion.

The proposed airport expansion plan will require relocation of the existing ATCT due to inadequate line-of-sight to future runway and taxiway movement areas, and the need for increased controller workspace. A new ATCT siting analysis was conducted, and is provided in Chapter 4.

7. SUMMARY

The future airfield demand will exceed existing airfield capacity by 2003 and additional runway capacity will be needed. A third parallel is forecast to be necessary by 2018. The future airfield requirements are:

- Increase airfield capacity for cargo and commercial operations by providing a second parallel runway with sufficient length (11,000 feet) by 2003.
- Increase airfield capacity by providing an independent full-service crosswind runway (9,500 feet) by year 2008.
- To meet long-term airfield capacity requirements, a third full-length parallel runway (11,000 feet) will be needed by 2018.
- Provide airside service roadways around all runway ends.
- Provide an unobstructed runway visibility zone.
- Provide full-length Runway Safety Areas (RSA) for Runways 24L, 6R, and 36.
- Provide precision ILS approach capability to all runway ends.

A summary of the future Emery Worldwide and support facility requirements to meet the baseline demand forecast for DAY is shown in **Table 3-30**. There are a number of support facilities requiring immediate or future expansion. Public auto parking will require expansion immediately, and a parking garage is planned to accommodate this need. FedEx personnel indicate a need for additional building space and truck docks in three to five years. The airline maintenance facilities will require expansion in 2003. Airport maintenance facilities are in need of immediate expansion for equipment currently stored outside. The existing ATCT controller workspace is inadequate and should be replaced as soon as practical to provide adequate space. In addition, a new ATCT will become necessary by approximately year 2008 to accommodate a Runway 18/36 relocation to the north, and will also be necessary for the third parallel runway. Adequate public roadway systems will be necessary to support future expansion needs. The other support facilities; commercial fuel storage, flight kitchen, and general aviation facilities will be sufficient to accommodate demand through 2018.

S:\00DAY\027901\DAY_CH3.DOC

Table 3-30
Dayton International Airport
Strategic Master Plan Update Study
Summary of Emery Worldwide and Support Facility Requirements

Area	Existing Capacity	Future Requirements 2003	2008	2013	2018
Public Short-Term Parking Spaces	1,073	1,074	1,180	1,258	1,342
Public Long-Term Parking Spaces	1,512	1,797	1,974	2,106	2,246
Public Economy Parking Spaces	1,832	1,209	1,290	1,376	1,468
Rental Car Parking Spaces	1,971	1,157	1,271	1,355	1,446
Emery Wordwide Facilities (square feet)					
Sort Facility	1,000,000	1,277,984	1,364,821	-	1,364,821
Apron	5,275,116	5,943,402	9,963,497	-	13,488,515
Other Air Cargo Facilities (square feet)	198,582	40,800	49,800	61,200	75,600
Airline Maintenance (square feet)	74,400	94,000	131,000	147,700	166,000
Commercial Aviation Fuel Storage (gallons)	821,000	187,000	204,000	220,820	234,240
Flight Kitchen (square feet)	16,492	8,200	9,400	9,700	10,500
Airport Maintenance Buildings (square feet)	51,641	78,100	79,800	100,600	121,400
Airport Maintenance Land (square feet)	106,841	161,600	165,100	208,100	251,200
Air Traffic Control Tower (ATCT)					
Eye-Level Elevation (feet MSL)	1,089	1,089	1,094	1,094	1,102
Eye-level with Emery Worldwide hangar	1,089	N/A	N/A	N/A	1,271
Eye-level with Emery Worldwide tower	1,089	N/A	N/A	N/A	1,370

[ ] = year requirements exceed capacity.

Source: Airport and Landrum & Brown

#######

H:\DAY\MP Facility Req\[facility summary.xls]fac req sum