

APPENDIX FORECAST ACCURACY

The Federal Aviation Administration (FAA) has developed econometric forecast models and established a forecast process that attempts to anticipate changes that may affect the future direction of the aviation industry. Using this forecast process, the FAA annually provides 12-year forecasts of aviation demand and activity measures that are used for aviation-related personnel and facility planning. The FAA occasionally sponsors workshops to critique techniques and practices currently used by the FAA and other aviation forecasters, and to examine the outlook for the aviation industry and its prospects for future growth. The workshops focus on the forecasting process and ways to improve the reliability and utility of forecasting results.

Tables A-1 and A-2 provide a measure of the accuracy of FAA projections of aviation demand and workloads at FAA facilities for forecasts published one and ten years prior to the year being forecast. The tables compare forecasts for both short- and long-term periods. The short-term period, 1 to 5 years, is the critical period for personnel planning; the long-term period, 10 years out, is important for facility planning.

For short-term trends, forecast errors normally tend to be modest. Table A-1 provides a summary of forecast errors for forecasts published one year earlier. Between 1995 and 2005, the average errors for forecasts published one year earlier for commercial carrier domestic RPMs, commercial carrier domestic enplanements, and en-route aircraft handled were 1.3, 0.1, and 0.6 percent, respectively. Using an alternative measure of forecast accuracy, the mean absolute error, the errors were 2.4, 2.1, and 1.6 percent, respectively. However, since the events of 9/11, the increased instability of the industry has resulted in larger forecast errors. Between 1995 and 2001, the mean absolute error for forecasts published one year earlier for commercial carrier domestic RPMs, commercial carrier domestic enplanements, and en-route aircraft handled were 1.9, 2.0, and 1.7 percent, respectively. For the period between 2002 and 2005, the mean absolute errors for the measures examined were 3.3, 2.2, and 1.3 percent, respectively.

TABLE A-1

**Forecast Evaluation for Selected Measures
Percent Variance: Actual vs Forecast
Forecast Published One Year Earlier**

Year Being Forecast	Domestic Commercial Carrier RPMs	Domestic Commercial Carrier Enplanements	En-Route Center Aircraft Handled
1995	(0.1)	(2.2)	0.8
1996	3.0	1.8	(1.7)
1997	0.0	(1.4)	1.2
1998	(2.0)	(1.7)	2.9
1999	1.8	1.3	1.1
2000	2.1	1.4	0.7
2001	(4.3)	(4.6)	(3.8)
2002	7.6	4.4	1.2
2003	0.7	(0.9)	0.4
2004	2.8	0.2	2.4
2005	2.1	3.2	1.2
Mean Error	1.3	0.1	0.6
Mean Absolute Error	2.4	2.1	1.6

The forecast errors for forecasts published ten years earlier tend to be larger because of unanticipated external events that have long-term impacts on the aviation system. Contributing external factors impacting the long-term forecasting accuracy of RPMs and aircraft handled include the 1991 Gulf War and the concomitant rise in fuel prices; the outbreaks of terrorism in 1986, 1991, and 2001; the Southeast Asian financial crisis in 1997-98; the War in Iraq along with the outbreak of SARS in 2003; and the rapid rise of oil prices in 2004-05. Since the FAA does not use cyclical economic projections in preparing its long-term forecasts, the 2001 economic recession was not considered in any of the forecasts prepared prior to 2001. Table A-2 provides a summary of the forecast errors for forecasts published ten years earlier.

For the period 1995 through 2005, the mean errors for forecasts published ten years earlier for commer-

TABLE A-2

**Forecast Evaluation for Selected Measures
Percent Variance: Actual vs Forecast
Forecast Published Ten Years Earlier**

Year Being Forecast	Domestic Commercial Carrier RPMs	Domestic Commercial Carrier Enplanements	En-Route Center Aircraft Handled
1995	(10.3)	(11.4)	(8.0)
1996	(10.9)	(12.2)	(8.2)
1997	(14.2)	(17.4)	(10.0)
1998	(12.6)	(14.9)	(6.3)
1999	(6.9)	(9.9)	(2.8)
2000	(1.1)	(5.5)	(2.3)
2001	(1.0)	(4.7)	(2.9)
2002	(10.3)	(14.5)	(3.0)
2003	(5.0)	(12.5)	(2.8)
2004	(6.5)	(20.0)	(2.3)
2005	(2.4)	(13.9)	(3.7)
Mean Error	(7.4)	(12.5)	(4.8)
Mean Absolute Error	7.4	12.5	4.8

cial carrier domestic RPMs, commercial carrier domestic enplanement, and en-route center aircraft handled were -7.4, -12.5, and -4.8 percent, respectively. Using the mean absolute error, the errors were 7.4, 12.5, and 4.8 percent, respectively. Some of the error is due to unanticipated exogenous events (e.g. the Gulf War in 1991, the shutdowns of Pan Am and Eastern, and the events of 9/11) and their impact on activity. Some of the error is due to errors in the assumptions (e.g. passenger trip length, seats per aircraft, economic growth) behind the forecasts. The evaluation of forecasts published in 1995 (for 2004) and 1996 (for 2005) indicate that the forecast error for domestic RPMs was 6.5 and 2.4 percent, respectively. For aircraft handled, the error for the forecasts published in 1995 and 1996 was 2.3 and 3.7 percent, respectively. There is also clear evidence that FAA’s long run forecasts have been too high. For each of the variables chosen, every comparison between actual values and forecasts of the variables done ten years prior show the actual values were less than the forecast values. This suggests that there is a bias in the FAA’s long run forecast process and FAA is exploring ways to eliminate the bias. This statistical comparison highlights the significant impact that unanticipated exogenous events, or the lack thereof, can have on the long-term accuracy of the forecasts.