CAPACITY
Noise Exposure

Federal Aviation Administration

FY 2008 Performance Target

"Reduce the number of people exposed to significant noise, as measured by a three-year moving average, to 12% below the three-year average for calendar years 2000-2002."

Flight Plan Objective and Performance Target

Objective 3: Address environmental issues associated with capacity enhancements.

Performance Target: Reduce the number of people exposed to significant noise by 4 percent each year through FY 2012, as measured by a three-year moving average, from the three-year average for calendar years 2000-2002.

	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Target	- 2.00%	- 3.00%	-4.00%	-8.00%[4]	-12.00%
Actual	- 28.00%[1]	- 29.00%[2]	-28.00%[3]	-27.00%[5]	

[1] Revised from original result of -23.00% in FY 2005 due to improvement in noise exposure model.
[2] Revised from projection of -27.00% in FY 2006.
[3] Revised from projection of -27.00% in FY 2007.
[4] The target was revised in FY 2007 from a 1% annual decrease from the baseline to a 4% decrease, lowering the cumulative target for FY 2007 from 5% to 8.00%.
[5] Projection from trends, to be revised in May 2008.

Definition of Measure

Unit of Measure: Percent reduction in the number of people in the U.S. exposed to significant aircraft noise levels as measured by a three-year moving average from the base year average of 2000 to 2002. In FY 2007, the noise exposure target was revised from a 1% to a 4% cumulative reduction per year in the number of people exposed to significant aircraft noise.

Computation: The estimates of the number of people exposed to significant noise are calculated from the Model for Assessing Global Exposure to the Noise of Transport Aircraft (MAGENTA). The computational core of MAGENTA is FAA's Integrated Noise Model (INM), the most widely used computer program for the calculation of aircraft noise around airports. Major assumptions on local traffic utilization come from obtaining INM datasets that were developed for an airport.

The MAGENTA model calculates individual DNL contours for the top 96 US airports using INM. The contours are superimposed on census data to calculate the number of people within the DNL 65 dB contour at each airport. For smaller airports, a procedure is used where contour area is calculated from airport operations data using a statistical relationship. The contours areas are then used to calculate people exposed using census population densities. The individual airport exposure data is then summed to the national level. Finally, the number of people relocated through the Airport Improvement Program is subtracted from the total number of people exposed.

Formula: The number of people exposed to significant aircraft noise is calculated as follows:

$$\sum_{i=1}^{261} POP65_i - \sum_{j=1}^{9} POPREL_j$$

Where, $POP65_i$ is the number of people residing in the DNL 65 dB contour at the i^{th} MAGENTA airport as of the 2000 Census. $POPREL_j$ is the number of people relocated from the DNL 65 dB contour in the j^{th} FAA region since the year 2000.

Scope of Measure: The measure tracks the residential population exposed to significant aircraft noise around U.S. airports. Significant aircraft noise is defined as aircraft noise above a

Day-Night Sound Level (DNL) of 65 decibels. Exposure in a given year is reported as a three-year historical average. For example, exposure in 2003 is reported as the three-year average of 2001 to 2003. In 1981, the FAA issued 14 CFR Part 150, Airport Noise Compatibility Planning, and as part of that regulation, formally adopted Day Night Sound Level. Day Night Sound level, abbreviated as DNL and symbolized as Ldn, is the 24-hour average sound level, in decibels (dB), obtained from the accumulation of all events with the addition of 10 decibels to sound levels in the night from 10 PM to 7 AM. The weighting of the nighttime events accounts for the increased interfering effects of noise during the night when ambient levels are lower and people are trying to sleep. In the promulgation of 14 CFR Part 150, the FAA also published a table of land uses that are compatible or incompatible with various levels of airport noise exposure in DNL. This table established that levels below DNL 65 dB are considered compatible for all indicated land uses and related structures without restriction.

Why the FAA Chooses this Measure

Mitigating noise directly impacts our ability to increase capacity. Although building new runways is the best way to increase capacity, communities and local government are reluctant to build them if they impose increased aircraft noise exposure. By mitigating and reducing exposure to excessive noise, FAA can help communities accept more runways in their areas.

The number of people exposed to significant noise levels was reduced by about 90 percent between 1975 and 2000. This is due primarily to the legislatively mandated transition of airplane fleets to newer generation aircraft that produce less noise. Most of the gains from quieter aircraft were achieved by FY 2000. The remaining problem must be addressed primarily through airport-specific noise compatibility programs. The FAA pursues a program of aircraft noise control in cooperation with the aviation community. Noise control measures include noise reduction at the source, i.e., development and adoption of quieter aircraft, soundproofing and buyouts of buildings near airports, operational flight control measures, and land use planning strategies. The FAA is authorized to provide funds for soundproofing and residential relocation, but each project must be locally sponsored and be part of a noise compatibility program prepared by the airport sponsor and approved by the FAA.

The FAA increased the noise exposure target in 2007 to a 4% cumulative reduction per year. The target is still calculated using a three year moving average from the 2000 to 2002 base average years. The FAA increased the noise exposure target after reviewing historical reductions and taking into account recent trends that remain well below the previous noise target. The significant reduction in noise exposure since the 2000 to 2002 base year average has been driven by air carrier fleet and operational changes that took place in the aftermath of September 11, 2001. It was expected that a return to more typical fleet compositions and a return to air traffic growth would narrow the “positive gap”. However, the return of fleet composition and air traffic to pre 9/11 levels has not occurred at the pace expected. In addition to noise trends, the new noise target reflects the relocation of people away from areas of significant noise exposure through grant funding. The target is also influenced by market forces that drive changes in commercial aircraft fleets and operations.

Environmental trends based on expansion of the U.S. air transportation system show that noise exposure is likely to move upwards as traffic growth continues – even taking into account forecasted fleet changes and implementation of beneficial new air traffic procedures. The agency’s ability to develop next generation technologies and have the broadest possible array of available noise mitigation approaches at its disposal will affect FAA’s ability to continue making significant improvements in aviation noise exposure. The FAA has proposed to Congress in its reauthorization legislation, provisions to create a research consortium whose purpose would be to accelerate the development of lower noise and emissions technologies for airframes and aircraft engines and to provide additional support for noise abatement flight procedures and land use planning and projects. It will be important for state and local land use planning to include appropriate consideration of noise-compatible land uses near airports.

Source of the Data

In 1997, the FAA initiated a project to collect airport noise analysis databases for a large number of the world's airports. This sample database of airports would be the basis for assessing worldwide trends that would occur as the result of stringency, different land-use planning initiatives and operational procedures. The objective was to develop a tool that could be used by the Committee on Aviation Environmental Protection (CAEP) under the International Civil Aviation Organization (ICAO). Previous attempts by CAEP to globally assess aircraft noise exposure had limited success. The proposed FAA methodology had much more promise, as the number of sample databases was large and has since grown to around 200. Furthermore, a generalized methodology was included to account for airports for which noise databases did not exist. Based on the initial success of the FAA activity, the fourth meeting of CAEP (CAEP4) recommended that a task group be formed to complete the development of this tool for CAEP analysis.

This group and subsequently the model became known as MAGENTA (Model for Assessing Global Exposure form Noise of Transport Airplanes). The MAGENTA population exposure methodology has been thoroughly reviewed by this ICAO task group and was validated for several airport specific cases. MAGENTA played an important role in the setting of new international aircraft noise standards by CAEP in 2001. CAEP used MAGENTA to assess the benefits (reduction in number of people exposed to aircraft noise) of several noise stringency proposals. FY 2000 was the first year MAGENTA was used to track the aircraft noise exposure goal in the DOT Performance Plan.

A U.S. version of the global MAGENTA model, which used input data to determine the noise exposure in the U.S. on aircraft and operations specific to U.S. airports, was developed in 2002. This version of the MAGENTA model uses updated population data from the 2000 Census. It has evolved over time as more comprehensive databases were incorporated to improve the accuracy of the model. The data source for airport traffic changed from the Official Airline Guide (OAG) to the FAA Enhanced Traffic Management System (ETMS). Unlike OAG, the ETMS database includes unscheduled air traffic, which allows for more accurate modeling of freight, general aviation, and military operations. The ETMS also provides more details on aircraft type for a more accurate distribution of aircraft fleet mix. Under the old model, unscheduled traffic was estimated and adjustments in the number of people exposed were made at the national level.

The general, regional FESG forecast used in the CAEP version of MAGENTA was also replaced in the new version by the FAA Terminal Area Forecast (TAF), which provides current and accurate information on how operations will increase on an airport specific basis. Since ETMS does not provide current data, FAA uses TAF to project flight operations. Therefore, the current year's result is classified as preliminary until the following year when projected data is finalized.

Data on the number of people relocated through the Airport Improvement Program are collected from FAA regional offices. Local traffic utilization data are collected from individual airports and updated periodically.

Statistical Issues

This measure is derived from model estimates that are subject to errors in model specification. The FAA has replaced the actual number of people exposed to significant noise with the percent decrease in the number of people exposed, measured from the three-year average for calendar year 2000-2002. Moving to the 3-year average stabilizes noise trends, which can fluctuate from year to year and are affected by unusual events such as the 9/11 attacks and the subsequent economic downturn. The 2000–2002 base time periods includes these events and is the same 3-year period used for the emissions goal.

The move from actual numbers to percent helps avoid confusion over U.S. noise exposure trends caused by annual improvements to the noise exposure model. A major change to MAGENTA (Model for Assessing the Global Exposure of Noise because of Transport Airplanes) resulted in a significant improvement in the estimate of the number of people exposed to significant noise levels around US airports. Until now, the scope of the measure included scheduled commercial jet transport airplane traffic at major U.S. airports. With access to better operational data sources, the scope of the MAGENTA calculation has expanded to include unscheduled freight, general aviation, and military traffic. The expanded scope of operations results in an increase in the estimate of the number of people exposed to significant noise.

The growth in the number of people exposed to significant noise results from improvements in measurement, not a worsening in aviation noise trends. Planned improvements to MAGENTA will continue to increase the estimate of the number of people exposed to aircraft noise, giving the false impression that aircraft noise exposure is increasing. Changing the noise performance goal to an annual percent change in aircraft noise exposure will better show the trend in aircraft noise exposure. The change will also make the

Government Performance Review Act (GPRA) goal consistent with FAA's *Flight Plan* goal.

Completeness

No actual count is made of the number of people exposed to aircraft noise. Aircraft type and event level are current. However, some of the databases used to establish route and runway utilization were developed from 1990 to 1997, with many of them now over seven years old. Changes in airport layout including expansions may not be reflected. The FAA continues to update these databases as they become available. The benefits of federally funded mitigation, such as buyout, are accounted for.

The noise studies obtained from U.S. airports have gone through a thorough public review process; either under the National Environmental Policy Act (NEPA) requirements or as part of a land use compatibility program.

Performance measure data for the current year (forecasted data) are calculated and reported during the period of July and August, and the data are finalized by May of the following reporting year.

Reliability

The Integrated Noise Model (the core of the MAGENTA model) has been validated with actual acoustic measurements at both airports and other environments such as areas under aircraft at altitude. External forecast data are from primary sources. The MAGENTA population exposure methodology has been thoroughly reviewed by an ICAO task group and was most recently validated for a sample of airport-specific cases.