CAPACITY
Aviation Fuel Efficiency

Federal Aviation Administration

FY 2009 Performance Target

"*Improve aviation fuel efficiency per revenue plane-mile by 7 percent, as measured by a three-year moving average, from 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: Improve aviation fuel efficiency by another 1 percent over the FY 2008 level (for a total of 7 percent) through FY 2009, and 1 percent each subsequent year through FY 2013 to 11 percent, as measured by a three-year moving average of the fuel burned per revenue mile flown, from the three-year average for calendar years 2000-2002.

	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Target	- 2.00%	- 5.00%	- 5.00%	- 6.00%[2]	- 7.00%
Actual	- 5.84%	- 8.23%	- 9.52%[1]	- 10.17%	

[1] Result revised in FY 2008 from original result of -10.82% to align data analysis methodology for the whole time series.

[2] Target revised in FY 2008 from -5.00%.

Definition of Measure

Unit of Measure: Cumulative reduction in fuel burned per mile flown.

Computation: Measuring and tracking fuel efficiency from commercial aircraft operations allows FAA to monitor improvements in aircraft/engine technology and operational procedures, as well as enhancements in the airspace transportation system. The FAA measures performance against this target using the Aviation Environmental Design Tool (AEDT)/System for assessing Aviation Global Emissions (SAGE). AEDT/SAGE is a FAA-developed computer model that estimates aircraft fuel burn and emissions for variable year emissions inventories and for operational, policy, and technology-related scenarios. For this target, AEDT/SAGE is used to generate annual fuel burn and total distance flown data for all U.S. commercial operations.

FY 2008 performance was calculated based upon full year operational data for the three calendar year period of 2005, 2006, and 2007, dividing average fuel burn by average total distance to determine the three year efficiency average of (73.03Tg/17.58Bk = 4.15 Tg/Bk). This efficiency average was compared against the baseline efficiency (from 2000, 2001, 2002) of 4.62 Tg/Bk. With the baseline considered to be 100%, the three-year efficiency average for each performance period is compared to determine the percentage improvement of aviation fuel efficiency.

Formula:

$$\frac{\text{Average Fuel Burn (Tg)}}{\text{Average Distance (billions of kilometers)}}$$

(Fuel Burn values in Tg where 1 Tg = 10^{12} g)

Scope of Measure: This measure focuses on all U.S. commercial operations.

Why the FAA Chooses this Measure

Although today's aircraft are up to 70% more efficient than early commercial jet aircraft, there is growing attention being given to aviation's impact on the environment. Aviation is currently viewed as a small contributor to those greenhouse gas emissions that have the potential to influence global climate. However the science involved with these emissions in the upper atmosphere is still evolving and many uncertainties

still exist. Carbon dioxide (CO_2) emissions are a primary greenhouse gas and are directly related to the fuel burned during the aircraft's operation.

Measuring and tracking fuel efficiency from aircraft operations allows FAA to monitor improvements in aircraft/engine technology and operational procedures, and enhancements in the airspace transportation system. This information provides an assessment of their influence on reducing aviation's emissions contribution.

Source of the Data

The AEDT/SAGE system uses radar-based data from the Enhanced Traffic Management System (ETMS) and Official Airline Guide (OAG) schedule information to generate annual inventories of fuel burn and total distance flown data for all U.S. commercial operations.

Statistical Issues

Potential seasonal variability and variability from year to year can be expected when analyzing air traffic data and commercial operations. Use of the statistical measure of a three-year moving average based upon analysis of annual operations should address this variability.

The extent to which enhancements are incorporated to improve model accuracy, via more robust aerodynamic performance modeling algorithms and database of aircraft/engine fuel burn information, will impact the overall results and thus the performance target. This could create some statistical variability from year to year if not properly taken into account. In cases where such enhancements have the potential to create a significant shift in baseline, annual inventories may need to be re-processed and/or adjusted to ensure consistency and accuracy of results.

The extent to which aircraft fleet improvements cannot be sufficiently modeled because of a lack of manufacturer proprietary data may also influence the performance target results. In this case, attempts will be made to characterize such aircraft with the best publicly available information, recognizing that newer aircraft types in the fleet will likely exist in significantly lesser numbers, thus minimizing the influence upon the results.

Completeness

Data used to measure performance against the target is assessed for quality control purposes. Input data for the AEDT/SAGE model are validated before proceeding with model runs. Radar data from the ETMS are assessed to remove any anomalies, check for completeness, and pre-processed for input to the AEDT/SAGE model. ETMS data are verified against the OAG information in order to avoid any duplication of flights in the annual inventory.

In some cases ETMS data lack appropriate fields to conduct quality control and in these cases the data is removed. Data from the AEDT/SAGE model is verified by comparing output from previous years and analyzing trends to ensure that they are consistent with expectations. In other cases monthly inventories may be analyzed to validate the results. Model output is subsequently post-processed through excel worksheets to perform the calculations for the performance target. Formulae and calculations are checked in order to ensure accuracy.

Full documentation of this target is determined when the annual inventories have been accomplished and the post-processing calculations have been completed, resulting in a percentage reduction in fuel efficiency relative to the baseline. The standard for this documentation is set by the FAA Office of Environment and Energy, which is separate from the organization (DOT Volpe National Transportation Systems Center) responsible for input and output associated with the AEDT/SAGE model runs and annual inventories.

Reliability

The measuring procedure used for this performance target is highly reliable. That is to say that the processing of data through the AEDT/SAGE model including the performance of algorithms is not subject to random factors that could influence the results. However, this performance target is potentially influenced by factors outside the control of the FAA. For example, a major sustained disruption or enhancement in air traffic and/or a significant shift in commercial operations amongst airlines, including changes in fleet composition and missions could have a profound impact upon achieving the performance target. The three-year moving average is intended to allow assessment of performance while minimizing to some extent the over-emphasis of any such anomaly in a given year.

We do not expect increases in fuel burn or decreases in distance traveled or both to degrade the fleet fuel

efficiency significantly. Further, we do not expect this to prevent us from meeting the FY 2009 target. However, we do expect that in the coming years aircraft and engine technology improvements or air traffic management improvements or both may not be enough to offset traffic growth, congestion and delays. The metric for measuring and tracking fuel efficiency may not adequately capture performance to the degree that would allow future decisions on technological and operational considerations. Thus, we are continuing to review the impact of improvements on air traffic management and changes in operational trends to assess whether we should use a revised performance metric for future targets.