AEM

Developed by EUROCONTROL

The EUROCONTROL **A**dvanced **E**mission **M**odel (AEM) is a stand-alone system used to estimate aviation emissions (CO_2, H_2O, SOx, NOx, HC, CO, PM, VOC, TOG) and fuel burn. It analyzes flight profile data, on a flight-by-flight base, for air traffic scenarios of almost any scope (from local studies around airports to global emissions from air traffic).

AEM uses several underlying system databases (aircraft, aircraft engines, fuel burn rates and emission indices) provided by external data agencies in order to assure the quality of the information provided. This system information is combined with dynamic input data, represented by air traffic flight profiles.

Below 3000 ft fuel burn calculation is based on the Landing and Take-Off Cycle (LTO) defined by the ICAO Engine Certification specifications. ICAO LTO covers four engine operation modes [idle, take-off, climb-out and approach], which are used in AEM to model the six following phases of operation: taxi-out (modeled by ICAO idle), taxi-in (modeled by ICAO idle), take-off, climb-out, approach and landing (modeled by ICAO approach). The ICAO Engine Exhaust Emissions Data Bank includes emission indices and fuel flow for a very large number of aircraft engines. AEM links each aircraft appearing in the input traffic sample to one of the engines in the ICAO Engine Exhaust Emissions Data Bank, unless the actual engine is provided.

Above 3000 ft fuel burn calculation is based on the —Base of Aircraft Data— (BADA). This database provides altitude and flight phase (i.e. Climb, Cruise or Descent) dependent performance and fuel burn data for more than 310 aircraft types. Emission calculations are based on the ICAO Engine Exhaust Emissions Data Bank, but emission factors and fuel flow are adapted to the atmospheric conditions at altitude by using a method developed by the Boeing Company: the Boeing Fuel Flow Method 2 (BFFM2). BFFM2 estimates emissions of the pollutants NOx, HC, CO.

The emissions of the pollutants H_2O and CO_2 are produced by the oxidation process of carbon and hydrogen contained in the fuel with the oxygen contained in the atmosphere. The SOx emissions depend on the sulphur content of the fuel. All three are proportional to the fuel burn. Benzene emissions, as well as VOC, TOG and all pollutants derived from VOC-TOG, are proportional to the HC emissions. PM emissions result from the incomplete combustion of fuel.

Official website:
http://www.eurocontrol.int/environment/public/standard_page/AEM.html

AEM is subject to a license. More information is available here:
http://aem.envtool.eurocontrol.fr