

46ESS-44: Aero Engine Low Emission Combustion System

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Aircraft emit gases and aerosol that change the composition of the atmosphere, cause increases in cloudiness through contrail formation and spreading, and modify natural clouds. At present, these changes together are estimated to cause a net positive forcing of Earth's climate system, which contributes to surface warming and other responses.

The principal greenhouse gases (GHGs) emitted are carbon dioxide (CO₂) and water vapor (H₂O). Emissions of nitrogen oxides (NO_x) impact the concentrations of other GHGs, mainly ozone (O₃) and methane (CH₄). Black carbon (soot) is a directly emitted aerosol, and sulphur oxides (SO_x), NO_x, and hydrocarbons (HC) lead to aerosol production after emission. This has led to a re-evaluation of aircraft combustor design techniques.

A brief review of the aircraft emission regulations and emission goals to minimize the environmental issues in growth of air transportation is given. Emissions formation mechanisms in a hydrocarbon fuels burning aircraft gas turbine combustion system are described. Conflicting requirements for producing low emission levels of nitrogen oxides while at the same time controlling carbon monoxide and hydrocarbon levels are explained.

Current and future research projects into advanced low emission aircraft combustor technology have been identified.