

NO_x Emissions of the 50 Most Used Engines for Passenger Aircraft

Task for a *Master Project*

Background

Nitrogen oxide is produced when nitrogen (N) and oxygen (O) are heated. NO_x stands for any combination of N and O as explained [here](#) in detail. Inhalation of the pure NO and NO₂ is rapidly fatal. Nitrogen oxides form by natural and technical combustion processes. Chemically bound nitrogen from fuels (such as kerosene) also reacts with oxygen during combustion to NO_x. Elevated levels of nitrogen dioxide can cause [damage](#) to the human respiratory tract and can lead to asthma. NO_x forms acid rain, [smog](#) (haze) and contributes to particulate matter and ozone. At higher altitudes NO_x is a potent greenhouse gas. As such, NO_x from aircraft lead to local air pollution near airports. NO_x emitted at altitude in cruise flight contributes to global warming.

Task

The task of this project is to determine, list and compare the NO_x emissions of the 50 most used engines in commercial passenger aircraft. The subtasks are:

- Provide background information to the task: What are NO_x? How do aircraft produce NO_x? How do NO_x cause damage? How can NO_x be reduced? What are the trade-offs in NO_x reduction? What are legal NO_x limits for aviation?
- Determine the 50 most used engines for passenger aircraft.
- Determine the NO_x emissions from the selected aircraft engines: Landing and Take Off Cycle; Cruise.
- Produce statistics: How do NO_x emissions compare to legal limits? How do NO_x emission depend on other aircraft parameters? Estimate the relationships between parameters with regression analysis.
- Discuss your findings and draw conclusions.

The report has to be written in English based on German or international standards on report writing.