1.1 Background:

Since the beginning of turbojet engine, noise emitted by commercial aircraft has been one of the most critical environmental problems, such as large number of people affected by aviation noise. The environmentalists and local communities faced this problem. Aviation is a critical part of our national economy, providing for the movement of people and goods throughout the world, enabling our economic growth. Because of these reasons and the rising value placed on environmental quality, airport expansion plans have been delayed and cancelled due to local air quality, and community noise impacts

The NASA and the Advisory Council for Aeronautical Research in Europe (ACARE) Strategic Research Agenda 2002 set the environmental requirement objectives relative to 2000 level by the year 2020 as:

- Reduction of carbon dioxide (Co_2) by 50%
- Reduce nitrogen oxides mixture ( ) by 80%
- Reduce aircraft noise by 50%

The ACARE findings state, quote: “The objectives are not achievable without important breakthrough, both in technology & in concepts of operation”.

The ICAO regulations:

The International body ICAO sets the common rules for the level of noise & engine emission through Annex 16 to the Chicago Convention 1944. It classified the aircraft in chapter:

- Non-compliance airplanes (707, DC-8,…) already banned from flying
- Chapter II (B737-200, B747-200, ..) already banned from flying
- Chapter III (B737-500, A320, A330, B777, …) still in operation

 Chapter IV adopted in 2000 requires:-All airplanes manufactured from Jan 2006, with tighter lower level to Chapter III. (Some chapter III current aircraft meet chapter IV level)

Traditionally aircraft developed to meet performance and cost, environmental issues are considered secondary ,but now the aviation project goal is not produce marketable aircraft, the goal was to find out what technologies what be required ,and what an aircraft would look like if a step change in noise reduction was one of key drivers for design .
The 110€ millions, four years project involve some 50 European companies , Universities ,and research institutes in a concerted effort to reduce jet engine noise, and More than 40 researcher from MIT and Cambridge as well as engineers from 30 companies have been collaborating on the design . A wide range of engine technologies are being tested from low noise fans to nozzle jet noise suppressor.[1]

1.2 Objectives of the project:

 The objective of this project firstly to show the environmental impacts of the aviation, with the role of international organisations, authorities and local communities for reduction this impact.

 Review of the suggested technologies that can achieve the concept of silent aircraft

 Since the Most of aircraft noise is emitted by propulsion system, the major objective of this project is to review, study and optimisation of the recently techniques of the design that can achieve the concept of silent propulsion system (30 dB noise reduction).

1.3 Methodology:

 Data was collected , firstly the environmental impacts of the aviation, with the role of the international organisations, the authorities and the local communities for reduction this impact was showed in chapter one.

 Chapter two was contained sources of noise in the aircraft and technologies of reduction the noise early.

 The silent aircraft concept with the potential technologies of it enable functionally silent aircraft were reviewed in chapter three.

 The concept of ultra high bypass ratio engines with the influence of fan pressure ratio on engine noise emission with concept of variable area nozzle, in addition to the concept of distributed propulsion system with high aspect ratio nozzle were reviewed in chapter four.

 A300-600 powered by trent 500 was taken as case study for optimization the effet of fan pressure ratio on jet velocity as well as on jet noise emissions under normal takeoff flight conditions ,jet noise was calculated by using lighthill equations under certain assumptions.

Another case study carried out for optimization Influence of high aspect ratio nozzle on jet noise emissions by using stone model equations, under certain assumptions , and the optimum jet area which can achieve silent takeoff was estimiated , results and findings were discussed and finally graphs between the jet temperatures, the jet areas and the jet velocities were drawn.
 Chapter six was contained summrized results , conculsion, suggestions and recommendations.

1.4 Project outlines:

- Inroduction
- Objective
- Methodology
- litertureview
- The silent aircraft concept
- Review of the technologies for silent propulsion system
- Technologies optimisation(silent takeoff optimisation)
- Conculsion
- Suggestions and recommendations