BACKGROUND

As the world of energy systems becomes increasingly 'more electric', what does this mean for transport industry. The International Energy Authority estimates that by 2040, 25 per cent of cars on the roads will be electrically powered. New ways of distributing electricity on national grids and the significant ramp-up of wind energy are set to be markets worth hundreds of billions of dollars each year. All of these trends are creating technologies which are already impacting companies like Rolls-Royce and this is just the start.

In Power Systems, Rolls-Royce is developing hybrid train packs that combine electric motors, diesel engines, battery packs and management systems, generating significant energy savings and reducing noise pollution. In Marine there's huge demand from customers for quieter, more efficient, electrically driven propulsion. Estimates are, within ten years more than half of the ships Rolls-Royce power will have electrical drive.

But what about civil aerospace? The industry is facing ambitious environmental targets, as laid out in the European Commission's report, *Flightpath 2050 – Europe's vision for aviation*. These include:

- CO_2 reduced by 75 per cent.
- Nitrogen oxides reduced by 90 per cent.
- Noise reduced by 65 per cent.

It goes without saying that these targets will have to be met while also meeting power and cost demands.

Experts believe that civil aerospace industry can't achieve these targets by simply enhancing current aircraft features. Significant performance improvement requires a step-change in engine technology, system architecture and engine-airframe integration. Breakthrough technologies are required, and that's where hybrid electric flight is likely to play a role. Essentially, hybrid electric flight uses a gas turbine to power a generator, and the aircraft is then propelled by electrically driven fans or propellers.

PROBLEM STATEMENT

The team should come up with a preliminary design of a hybrid powered airliner. The airliner should use existing gas turbine engine to generate electricity, which will be used to power the electric motors. It should have passenger capacity of more than 100.

The design will be graded based on following parameters:

1. Use of system engineering approach in design phase. The design should include aircraft system architecture (placement of passengers, fuel and cargo), power system architecture (gas turbine, generator and electric motors) and engine-airframe integration.
2. Preliminary aircraft design calculations.
3. Case study for the aircraft size and improvement predictions.

LIMITATIONS: