INTERNAL COMBUSTION ENGINE OF AN AIRCRAFT

Team 3's project is based on the Internal Combustion Engine of an Aircraft dealing with specific concepts related to mechanism, combustion, efficiency and noise. The entire research is based on the engineering principles governing the system to find ways to improve the working and efficiency of the machine, reduce waste emissions, and most importantly make it more cost effective.

Presentation Flow:

Introduction and Transition to subtopic of Mechanism: Reuben Ghosh

Combustion:Alexandre Dinh

Efficiency: Abdul Rehman

Noise: Garuba Bomi

Conclusion with closing statements: Reuben Ghosh

Name: Reuben Ghosh

Subtopic: Mechanism

Propellers: Thrust is a force that moves the aircraft through the air. Thrust is generated by the propulsion system of the aircraft. In the working of the mechanism of the aircraft, a working fluid accelerated by the system and the reaction to this acceleration produces a force on the system. A propeller is in shape of a wing which produces higher air pressure on one surface and lower air pressure on the other surface. Getting aloft takes more than lift, it needs thrust. Thrust provides forward motion needed to sustain lift and counter drag, it is also used to accelerate and maneuver the aircraft [1]. Engines that work with pistons usually need a way of converting back-and-forth motion to round-and-round motion. A crank is in off-centre connection that provides energy to a

rotating wheel or a turbine. As the crank pushes back and forth, the wheel rotates. The torque depends on the gas force obtained by burning of gas and the distance from the crankshaft's axis of rotation. In the crank slider mechanism, the conversion of the linear force to rotational force takes place. Periodically variable torsional frequencies make the propellers work and generate thrust and float in air [2].

Name: Alexandre Dinh

Subtopic: Combustion

Various chemical reactions that occur, apart from the main combustion reaction generating the energy in the ICE, that affect the efficiency. All chemical reactions happen in exact stoichiometric proportions, which means, in most cases, there will be excess fuel left in the engine alongside the products of the main combustion reaction [3]. The excess elements react with each other and creates the pollutants such as carbon monoxide, hydrocarbons and NOx molecules [4]. Aircrafts are responsible for 2% of total greenhouse gas emissions and this number is expected to rise by 3 to 4 % every year [5]. Team #3's research will highlight the importance of optimizing the combustion reaction for a better engine efficiency as well as improving the longevity of catalytic-converters'-efficiency.

Name: Abdul Rehman

Subtopic: Efficiency

Nowadays, greenhouse gases have a major impact on climate change which can have serious outcomes for humans and the environment [6]. One of the solutions to this problem is improving the fuel efficiency of internal combustion engine of an aircraft. Fuel efficiency can be

improved through compression ratio. Compression ratio is the ratio of the volume inside a cylinder at the beginning and ending of a stroke of an engine and it has a major impact on the fuel efficiency. Making engine with high compression ratio to produce more power output can improve both the fuel economy and fuel efficiency of a combustion engine [7]. However, there is a limitation in increasing of the compression ratio. A research project was conducted in 2005 on the effect of higher compression ratio in engines. The results show that the fuel consumption was improved by 1-3% [8]. Improving the fuel efficiency will decrease the greenhouse gas emissions which is a major concern in today's world.

Name: Bomi Garuba

Subtopic: Noise

Today, the public is accustomed to travelling in an aircraft since it has become the safest and the most efficient mode of transportation. It is therefore of great importance that health and safety of the pilots, passengers, and any individuals that utilise this mode of transportation are not affected by the current levels noise pollution which the internal combustion engines produces. As such, the objective is to identify the sources of noise pollution in the internal combustion engine and the aircraft as a whole; Identifying the sources of noise pollution will help in formulating possible modifications to both the engine and the aircraft. The first source of noise pollution is when an internal combustion engine creates a high-pitched whine as the fan pulls air into the engine [9]. This usually occurs during the landing phrase of a commercial airline flight. An effective way of reducing noise levels originating from this source is to rework the current design of an internal combustion engine by implementing larger fans [9]. This is a situation that primarily involves the engine alone. There is, however, a situation that involves the entire aircraft; The source is an

aircraft flying at supersonic speed and releasing pressurized energy sound waves called shockwaves that affect the individuals on the aircraft and anyone in close proximity [10]. To counteract this, a protocol named Active Noise Control (ANC) is in existence. ANC involves producing a sound field is the mirror image of the offending sound [9]. This active noise cancels out the disturbance, with the net result that the sound is significantly reduced. It is very likely that both sources cause damage to the human nervous system. The team's research will highlight the importance of noise pollution control during air travel.

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