INTERNAL COMBUSTION ENGINE OF AN AIRCRAFT

Carleton University

Recipients:

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By:

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Group members for team #3:

Abdul Rehman

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1. **Introduction:**

As a response to the Call for Proposals received on September 25, 2018. The main purpose of this is to achieve an approval for the team's research. This proposal presents a plan to develop a report that details the importance of evaluating the adverse effects of fuel consumption by internal combustion engines used in aircraft on humans and the environment. This proposal describes the contents of this research project; the contents to be described are based on the internal combustion engine of the aircraft. This proposal also indicates that this project deals with specific concepts related to *mechanism, combustion, efficiency,* noise. This proposal will address the team's project description, project timeline, team contract to be signed by each member. There may be some concerns that the language used in this report will be too technical for clients to understand. The technical terms in this proposal are italicized and appear in the glossary, which is listed before the appendix section. The project timeline and team contract are included in the appendix section.

2. **Background:**

The CCDP 2100L 2018 winter class is working on cutting edge technologies for a rapidly changing world. The project that my team and I were assigned to conduct research upon was the internal *combustion* engine of an aircraft. The internal *combustion* engine is a very important source of power generation in aircrafts. There is an increasing demand in the global market for innovation in the operation of these engines to reduce their fuel consumption, *noise pollution*

levels, and improve the aircraft's overall performance [1]. Noise is produced by several processes that take place both within and outside the engine [2]. This project will provide insight

to any client on the *mechanism* and *efficiency* of the internal *combustion* engines present today with the purpose of pursuing innovation in the fuel consumption of the engine. This can be achieved through possible modifications to the current engine design. This project will also offer any client acumen on the current *noise pollution* levels of the engine and the designs of other aspects of an aircraft that contribute to this type of pollution. This project, if approved, will be of great benefit to society for two main reasons: This project delivers a smarter, more cost-effective avenue for which *non-renewable fuels*, such as oil, can be utilized in the engines. The second benefit it brings is the identification of the major sources of *noise pollution* and carbon dioxide *emissions* from both the engine and aircraft. As such, the objective is to eliminate the threat of nausea to individuals onboard the aircraft whilst simultaneously reducing the contribution of air traffic to *greenhouse pollution*.

3. **Project Description:**

Today, the public is accustomed to travelling in an aircraft since it has become the safest and the most efficient mode of transportation. The team's project is based on the Internal Combustion Engine of the aircraft dealing with specific concepts related to *mechanism*, *combustion*, *efficiency*, and noise. These factors constitute the working of an engine. The team's research is based in the engineering principles governing the system to find ways to improve the fuel *efficiency* of the machine, reduce pollution of any kind from an aircraft, and safeguard the health of all individual on all aircraft.

Table 1: What each team member will oversee.

Group member Name:	Research Questions	Engineering Principle	Role of Principle
Reuben Ghosh	1. How does mechanical operation work in internal combustion engine of an aircraft? 2. How does crank mechanism in an internal combustion engine work?	3. Propeller. 4. Torque.	5. The role of the propeller is to provide thrust to the engine to facilitate the flow of the aircraft in air. Essentially, a gas or a fluid is accelerated through the engine and the reaction produces a force on the engine. 6. The role of torque is to explain the fact that how the gas force acting on the piston is to be converted to the crankshaft depending on the crank position to turn the propellers and make the aircraft move.
Alex Dinh	1. What is combustion and what are its products?	3. Chemical Reaction.	5. A combustion reaction is a chemical

	2. Which pollutants are produced and does an engine reduce their emissions?	4. Catalytic Converters	reaction between fuel and oxygen which produces a small explosion. 6. Catalytic converters filter out a good part of the toxic particles before the gas is released through the exhaust pipe.
Abdul Rehman	1. How to improve fuel efficiency? 2. What are the factors affecting the efficiency of an internal combustion engine?	Thermodynamics. Conservation of energy.	5. Through Thermodynamics, engine produces work and power. Also, engine parts are rotated in an Otto cycle that improves the fuel efficiency. 6. The role of conservation of energy is when the energy gets converted from one form to another in an internal combustion engine during the takeoff and landing of an aircraft; some energy loses while in this process.
Bomi Garuba	What are the ways to reduce ise pollution by ICE? What is the sonic boom enomenon and its effects of the	Frequency Pressure	5. One of the most efficient ways to reduce the operation of the landing gears and the high lift device (flaps and slats), which are

	craft pilot and passengers (if it's ommercial aircraft)?		deployed during takeoff and landing as their current mode of operation unsteadies the aircraft frame tremendously and thus gives off noise pollution. 6. When an aircraft passes through the air it creates a series of pressure waves in front of the aircraft that eventually merge into one single shockwave traveling at the speed of light, that is a sonic boom.

4. **Project Timeline:**

The project timeline and deliverables can be found in appendix A of this document.

5. **Team Contract:**

The team contract can be found in appendix B of this document.

6**. Conclusion:**

In conclusion, the research project that my team and I are currently working one will be of great benefit to the society as it will explore the way an internal combustion engine operates mechanically and how such an operation influences the fuel consumption, fuel efficiency and noise pollution generation from the engine.

Appendix A

Table 2: Project deliverables.

Major Project Deliverables	Due Date	Stages in completing those deliverables
Presentation of preliminary findings	October 16, 2018	- Conduct personal research on subtopics. - Check-up meeting to prepare presentation (rehearsal) and gather the information to write the handout.
Preliminary Report	October 30, 2018	- Group meeting to prepare for in-class write-up.
Presentation of team findings	November 13, 2018	- Create a PowerPoint presentation. - Create common document.
Report of individual findings	November 20, 2018	-Research on individual subtopics and extracting data for presentation.
Report of team findings	December 04, 2018	-Writing an abstract. -Combining team report and conclusion.
Letter of Transmittal	December 05, 2018	-Providing a brief introduction of the document that mainly explains the purpose of the project.

Table 3: Team meeting schedule:

Team Meeting Date	Team Meeting Focus
September 17, 2018	Meeting Peer mentor and proposing our individual second research questions and Engineering principles linked to them.
September 25, 2018	Working on presentation and rehearsing it. Figuring out what individuals could add to their research and work on referencing in IEEE format. Abdul Rehman recorded team meeting minutes
September 28, 2018	Giving the team members a brief introduction about their topic Reuben Ghosh recorded team meeting minutes
October 5, 2018	Visiting the Elsie McGill Learning Centre or Writing Tutorial Services to get the project proposal review and receive feedback.
October 14, 2018	Presenting your preliminary findings to your team and rehearsing the presentation. Alexandre Dinh will be recording team meeting minutes.
November 18, 2018	Working on final presentation and rehearsing it in a team. The rest of team members are supposed to give feedbacks. Bomi Garuba will be recording team meeting minutes.
November 30, 2018	Make a full report that include both team and individual components

Appendix B

Team contract:

Team 3 Group members:

Reuben Ghosh, Alexandre Dinh, Abdul Rehman, and Bomi Garuba.

Team Goal:

- The team's main goal for this project is the development of written and oral communication skills.
- It will also be very important to finish the project within the set deadline and avoid procrastination.
- The combination of our different talents and interests will be key to our success. An essential team goal is to finish the project before it is due and not to wait until the last minute to begin working.
- The key should be to learn from this term project and use the developed concepts in the future.
- Focus on each team member individual talents that can greatly help on the project.
- Motivate one another and treat each other professionally and generate more and better ideas as a team.
- Develop our team quirk: One for all and all for one.

Role of team leader:

- Improvising on organizational and management skills.
- Develop a strategy that will help the team to reach its goal.
- Making sure that everyone in the group is following the instructions and meeting the team deadline.
- Monitor the participation of each team member.
- Make sure that everything is handed in on time.
- Post due date reminders.
- Maintain an interactive environment.
- Work on establishing common ground since the project is based on team work.

Active participation & behavior that encourages active participation:

- Encourage each other to arrive on time for the team meeting.
- Work collaboratively and help each other.
- Keep in touch through messaging and video conference.

Attendance expectations:

- Timely and regular attendance of every team meeting which is scheduled between September 17th, 2018, September 25th, 2018, September 28th, 2018, October 5th, 2018, October 19th, 2018, November 15th, 2018, and December 4th, 2018.
- If a team member is unable to attend the team meeting, he is expected to notify the team leader at least 24 hours prior to the team meeting.
- If people are not able to adjust schedules for certain days team members should interact over social media or video conference.

Roles and Responsibilities of each team member:

Reuben Ghosh: Reuben's role in this team is to provide a detailed explanation of the overall operation of the internal combustion engine to the audience; he provides the important framework that will provide clarity in understanding how the mechanism of the engine works and the principles related to his subtopics and research questions. His role is also to lay the base foundation and introduce the cabinet to every team member's work and facilitate smooth transition

Alexandre Dinh: Alex's role in this team is to take over from where Reuben left and explain the key concepts behind his subtopic which includes phenomenon of chemical combustion which is a prerequisite for any mechanical operation in an engine. His main responsibility is the combustion sub topic of our project; his will list the product/pollutants that are created as a result of these chemical combustions.

Abdul Rehman: Abdul's role in this team is follow up from Alex and explain to the class how well or bad these combustion reactions that involve fuel then to go. He will provide the audience with possible methods to improve on the current fuel efficiency rates. His main responsibility is the fuel efficiency sub topic of our project; he will identify the factors that determine the fuel efficiency of an internal combustion engine present in an aircraft.

Bomi Garuba: Bomi's role in this team is to take over from where Abdul left and explain different ways of reducing noise pollution in an internal combustion engine. He will also describe audience that what is sonic boom and how does it affect an aircraft with the help of using pressure as an engineering principle. His main responsibility is noise as a subtopic of our project. During presentations, his role is to finish it effectively.

How will you communicate (by email, Facebook, phone, etc.)

- Throughout the project, the team members will be communicating through Facebook messages.

Back-up communication (alternative ways to reach team members)

- Each team member will have an email address of every other member, so that they can interact via email, provide feedback on Google Docs or catch up with the group members after class.

How will we make decisions as a group?

- We will make decisions on consensus as a group in person.

Use of log books/discussion groups for meeting agendas and minutes (action items/follow-up):

- Make a google document and sharing it with everyone so each team member has access to it.
- Each person in the team must submit their research notes on Culearn before the due date.
- Questions regarding the project should always be posted on Facebook group chat.

Guidelines for sharing research resources, and research notes:

Research notes must follow the following order:

- Title for research notes
- The research question 1
- Engineering principle for question 1
- Point form notes to answer the question
- Source in IEEE format
- The research question 2
- Engineering principle for question 2
- Point form notes to answer the question
- Source in IEEE format

The CCDP 2100 Style Guide should be used for formatting.

Problem solving approaches/ensuring equal opportunities for team participation:

- Firstly, the team must be resolved in the Facebook group chat.
- If the solution of the problem not found, then it would be discussed during a team meeting.
- Each team member will be given equal amount of work that should get finish on time.

Conflict resolution:

- Find the source of the conflict.
- Give an opportunity to everyone who was involved in the conflict to express his perception.
- Coming up with a contingency plan that will bring a fair and balanced result i.e Should two or more members be involved in a conflict about workload share, the contingency plan for said situation shall be taken to Professor Luke Russell.

Consequences:

- If a team member is not able to attend a meeting, a grid is designed to keep track of total number of absences of each team member:

Table 4: Keep track of absences of each team member.

Meeting No:	Name of Group Member:	Date of Team Meeting:	Discipline Step and Action:

- If a person misses more than two team meetings, two shots for every group member at Olivers.
- A team member who is late at the meeting but for only under 5 minutes will not face any consequences. But after that, for every 10 minutes someone is late, coffee for every group member at second cup.
- The final consequence of not working in accordance with the members is being fired from the team.

Signature(s): _____

GLOSSARY

Combustion is a usually rapid chemical process (such as oxidation) that produces heat and usually light.

Efficiency is the quality or degree to which an operation is measured regarding costs of energy, time, and money.

Greenhouse pollution is the release of certain gases into the atmosphere that absorb the light energy rays from the sun and trap the energy absorbed within the atmosphere without proper dispersal; These processes lead to the unsafe increases in the earth's average temperature annually.

Mechanism is a process, technique, or system conceived with the aim of achieving a certain result or set of results.

Noise pollution is propagation of irritating or harmful sounds, such as those sounds from automobiles and aircraft engines, from the operation of mechanical systems and the release of these sounds in to the environment.

Non-renewable fuel is a mineral resource, such as coal, oil, or natural gas, that is finite in its supply; A non-renewable fuel is also called a fossil fuel because it is formed from the bio-degradation of plant and animal remains in the earth's crust over thousands of years.

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