

MYP Personal Project – The Electric Aircraft Industry

Objective A: Planning

Introduction

I was extremely excited when I first heard about the personal project. I considered this project a very important experience as it will be beneficial for further complex projects in the diploma program and my future life. I have never conducted a long-term project which is why I have frugally used this opportunity to learn the most out of it. It was important for me to choose a topic that I was curious about and if possible, a topic that can be beneficial for my future carrier. I did not want to choose a demanding or impressive topic that I have no idea about.

Inspiration

I have always been extremely passionate about the aviation industry and its rapid growth. Throughout the years, I have watched many online documentaries and articles regarding the history of aviation, and I have also read several books that justified the mechanism of aircrafts. Therefore, I was able to build superior knowledge for the important aspects of aviation. A few years ago, me and my family became environmentalists to help the world with its global warming issue. We have reduced the use of unrecyclable products and started to reuse many items in our house. I have also participated in many beach clean-ups and recycling projects which has been very enjoyable and helpful to the environment. As an environmentalist and an aviation enthusiast, I got interested in the electric aircraft industry and its development. I wanted to know the reasons on why further sustainable flying methods are not possible. With the question in my mind, I have researched and investigated the electric aircraft industry deeply because I wanted to know and understand what obstacles are preventing this development and the probable benefits of future electric aircrafts. My interest for this topic and the enhanced prior knowledge that I have, inspired me to spread my knowledge and research to my product viewers by summarising and explaining the growth and problems of the electric aircraft industry using comprehensible words. My understanding for the mechanism of aircrafts has helped me understand why Kerosine aircrafts are detrimental to the environment. Although electric aircrafts are structured differently when compared to the current aircrafts, there are many mechanisms that are related to one another which will be beneficial for the research I am doing assuredly. It will also help me identify the differences between the two types of aircrafts.

My product

My interest for the aviation industry has inspired me to produce a detailed and educational YouTube video that has the capability to raise awareness of the revolutionary electric aircraft industry that most people are not familiar of. This product will help me promote further development of green electric vehicles by explaining why the use of battery is more environmentally beneficial than gas or fuel when it comes to vehicles. The video will give the viewers a brief idea of the mechanism of an electric aircraft which will also help them understand the positive environmental impacts that the existence of electric planes can have. It will also explain why the preferable aircraft cannot be used as commercial flights yet, but also state and clarify the inventions of small propeller planes that physicists are currently further developing with the intention of replacing most of the kerosine aircrafts today.

My Learning Goal

Considering my passion for the aviation industry, I am planning to study aeronautical engineering in the future. Therefore, my priority learning goal is to develop enhanced knowledge for aeronautics and the mechanism of both electric and kerosine aircrafts during the research I will be doing for my product. I will be able to find out if I genuinely enjoy the topic that I am planning to study in university and get further prior insight of the subject by building up knowledge of basic information for aeronautical engineering. Scientists believe that the electric aircraft industry will develop further in the future. My thorough investigation for the unevolved yet revolutionary industry will be beneficial for myself when electric aircrafts become prominently used. As an environmentalist, I am aware that ground vehicles and aircrafts emit many of the world's toxic gas emissions. This project will give me the opportunity to learn and understand why this is happening and find alternative methods of sustainable transportation. As a green environmentalist, I am willing to adopt further sustainable transportation methods when I can.

My main Global Context for my project is "Scientific and technical innovation". This is because electric aircrafts are new technical innovations that are designed to be more eco-friendly than gas-powered aircrafts. However, my project and product also correlate with "globalisation and sustainability" as the purpose of electric aircraft is to help preserve environmental sustainability which is the main reason why electric aircrafts were invented in the first place.

My Product Success Criteria

When planning my success criteria, I considered my questions that I had regarding the electric aircraft industry. The main product question was "why electric commercial flights do not exist". However, I have had to include other aspects for it to make more sense but also to entertain and educate the viewers with multiple facts in a short time. My criterions are mostly focused on the function of my product as it is a documentary. I am willing to inform people about my subject as much as I can with the time that I have from them. Therefore, I must focus on the information I am delivering. However, I find the visual of my product also critically important because many people rate a product by the presentation of a work piece. I have created 3 rows for my detailed success criteria. Bellow, meeting and exceeding expectation. This way, I can recognize what I have achieved and what I can improve on.

Product success criteria

Success criteria	Bellow expectation	Meeting expectation	Exceeding expectation
Product is complete on time.	Product is complete after the 10 th of January.	Product is complete between the 5 th and 9 th of January.	Product is complete in December.
Product is 10 – 12 minutes long.	. Product is longer than 12 minutes. . Product has many futile information and aspects that do not apply in the success criteria.	. Product is between 10 – 12 minutes. . Product has minor futile information . The product provides most of the required information with the given time.	Product is less than 10 minutes and achieves all requirements.

The product is comprehensible.	<ul style="list-style-type: none"> . The product utilizes complex / poor vocabulary. . The script sentences are too long. 	<ul style="list-style-type: none"> . The product can be easily understood by all teenagers. . The video is simply explained using comprehensible vocabulary. 	All product goals have been achieved and it is easily understandable by teenage school students and others.
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	<ul style="list-style-type: none"> . The video cannot be understood by many high school students. 		
Product is created with own words / script.	Some information's are copied from sources.	Most research information's in the script is rephrased in a comprehensible way.	All research information's in the script is paraphrases in an uncomplicated and comprehensible way.
All the research is factual / reliable.	The CRAAP evaluation is not applied to any source.	<ul style="list-style-type: none"> . Important sources are evaluated with CRAAP properly. . Important research questions are searched from 2 or more sources. 	<ul style="list-style-type: none"> . All sources are evaluated with CRAAP properly. . Every research question is investigated from 2 or more sources.
I understand my research and I can explain every part of it.	I am unable to explain some of my research freely.	I can explain important / key questions that I have done research about.	I can thoroughly explain every information in my product.
All research questions have been answered and explained in the product.	I have not explained / justified several research questions.	I have answered most of the research questions and have justified / explained complex questions.	I have thoroughly answered, justified, and explained all questions following all requirements.
Product is visually pleasing.	I have recorded the video of myself talking and it does not have any pictures / videos.	The video has a visually pleasing title clip, bibliography and a combination of photos, videos, interviews for the informative part.	Additionally: The video has many self-illustrated clips / pictures that suites every part.
Product uses selfdrawn or animated pictures to make certain aspects further understandable.	The video does not have any self-illustrated pictures.	The video consists of some drawn pictures that helps the justification / explanation of aspects.	Additionally: Creating self-animated clips that will be add on to the product which will help with the justification and explanation of research questions.

Product uses necessary online images / videos which are cited at the end.	Some online images are used and not cited at the end of the video.	Online images are used and cited at the end of the video.	Online images are used and cited at the end of the video.
Product includes clips of interviews.	No interviews have been done.	Interviews have been done with school and short important scenes have been included in the product.	Additionally: Interviews has been done with professionals outside the school to gather accurate information for the product.
Product is looked at by the supervisor.	Product is not shown to supervisor.	The pros and cons of the product is discussed with the supervisor and the product is improved.	The pros and cons of the product is discussed with the supervisor and the product is improved.

Plan for achieving the product

For my project I have created 2 plans. The first action plan was more general where I divided the work in the students guide into different parts and added further justified plans for each part. This has helped me finish my tasks on time while knowing the objectives. My second action plan was made for the process of creating my product. It was important for me that I did not procrastinate and therefore I gave each one of my tasks a lot of time and I started to create my product early. I also had a detail section for each task where I justified my tasks. Because the research played a big role in my project, I have divided it into 3 categories. The research for each category was related to one another. This technique has helped me get the most information out of each aspect while taking my time. I have also created my reliability grid right after each categorized research so that I do not miss out on any important sources that I have used. I have also divided the process of creating my product into 2 parts which has led to a more organized and highquality product. Another task for me was to always work on my personal project twice a week (minimum) which has helped me create a high-quality product on the due date.

Plan for achieving the product (detailed)

Task	Details	Dates	Note
Research 1 / summarizing	<ul style="list-style-type: none"> . Research about the aerodynamics of an aircraft. . Research on how jet engines and electric motors work. . Create reliability grid for important sources. 	Nov 2 - 15	Done
Research 2 / summarizing	<ul style="list-style-type: none"> . Research on why large electric aircrafts don't exist. . Research and investigate data regarding the negative impact that kerosine powered aircrafts are causing. . Research on how electric aircrafts could be beneficial to humanity in many ways. 	Nov 15 - 25	Done

Research 3 / summarizing	. Investigation on the mechanism of the past electric aircraft inventions. . Researching on how people are using electric aircrafts today. . Researching why the flight of small electric aircrafts can be possible.	Nov 25 - Dec 7	Done
Interviews	. Physics teacher . Chemistry teacher . Others (any time)	Dec 9 Dec 11 XXX	Done
Writing the video script	. Rephrasing summarized research and turning it into a script.	Dec 12 - 20	Done
Creating the product 1	. Creating an introduction to the video. . Applying Research 1 to the video.	Dec 20 - Jan 1	Done
Creating the product 2	. Applying research 2 and 3 to the video. . Citing video / photo sources.	Jan 2 - Jan 9	Done
Meeting supervisor with the finalized product.	. Checking if there could be any improvements made to my product.	Jan 13	Done
Submitting the product	. Submitting the work on time.	Jan 16	Done

Objective B: Applying skills

First ATL skill: Research skill

As part of my project, I conducted a lot of research to create an accurate and highly informative product. Although I had some prior knowledge that was beneficial to my project, it was important to make sure that every piece of information was correct by applying my research skills and checking several online websites and articles. My entire research took around a month and a half including the source evaluations and the several interviews I had with my teachers. My research was the most crucial part of my project and therefore, I needed a detailed and specific research plan to achieve my product goal without leaving anything out. I have used the research plan multiple times to look back at the questions whenever I got confused or stuck. After creating a research plan, I directly proceeded to my research following the specific dates I have set for myself. Dividing my research into 3 parts was very helpful because I was able to concentrate on each aspect of my product one by one which made the research process much easier, less complicated and accurate (Evidence: Objective A). Most of my research required the help of some internet articles and videos. Because the electric aircraft industry hasn't quite succeeded yet, there seemed to be some limited information for a minor part of my research questions. For example, the question "What are other benefits of electric aircrafts other than environmental factors?". There were multiple answers on the internet, however, it referred to the currently existing 2-seater electric planes. The functions and mechanism of future commercial electric aircrafts could differ massively. This would make the product information inaccurate. Luckily, my Personal project supervisor is also a physics teacher. This has been very convenient for my overall project. Any information that I was not sure of or simply couldn't find during my research, I went to my supervisor to discuss it with him and analyse multiple sources to get to a conclusion. This way, I was able to ask him questions about the previous example and get an answer if the solution should be assumed. Although there were limited number of websites and articles to get my research information from, it was necessary to investigate more than one website for each question in my research plan so that I was sure that everything was correct. The thorough research for every question helped me accomplish my main learning goal. By the end of my research, I was able to understand everything I have

investigated, and I have definitely developed my knowledge for the mechanism and aeronautics of the current and future aircrafts. During my research, I made notes which I then summarized right after I finished answering each question. I always highlighted the most important facts in my summary to identify key information's. I always repeated the pattern of writing down my prior knowledge, developing research, evaluating and then summarizing everything at the end. This has led to a more smooth, accurate and easier research process. I highlighted the key points, and each summary was around 100 – 150 words. In the cases where I found two different conclusions for one question, I either investigated another website or used the CRAAP evaluation method (only when sources were limited) to decide on which one is correct. I evaluated the most common sources that I used for my product using the CRAAP method as well to identify the reliability of key information's. It was important for me to evaluate the sources directly after answering a research question so that I do not procrastinate for the evaluation at the end and risk the case of missing out some important steps. These research skills have been applied and has made my product successful.

Research plan

Modern (current) aircrafts.	<ul style="list-style-type: none"> . How do planes increase altitude? . How do planes change direction? . How many percent of an aircraft is fuel? . How does a jet engine work? . How much power does a jet engine produce? . How is aircraft endurance calculated?
Electric aircrafts and its engine.	<ul style="list-style-type: none"> . How does an electric motor work? . How is an electric motor used as an engine for aircrafts? . Can electric motors produce the same power as jet engines? . How powerful is the endurance of electric aircrafts when compared to kerosine aircrafts?
The problem with aerodynamics and electric aircrafts.	<ul style="list-style-type: none"> . What is the main problem that makes large electric aircrafts impossible? . What are scientists and engineers doing to solve this problem? . Could there be a solution to this problem anytime soon? . How much power can be generated from an electric engine? . Other problems that are blocking this innovation.
How are electric aircrafts beneficial compared to kerosine aircrafts?	<ul style="list-style-type: none"> . How are electric aircrafts beneficial to the environment? . How effective are electric aircrafts going to be? . Doesn't the production of electricity harm the environment as well? . What are other benefits of electric aircrafts other than environmental factors?
Why do kerosine aircrafts cause harm to the environment?	<ul style="list-style-type: none"> . Why do kerosine aircrafts cause harm to the Environment?
Successful electric aircraft inventions.	<ul style="list-style-type: none"> . State some of the successful electric aircraft flights. . How long did the flights last? . What were the maximum speeds? . How were the aircrafts structured? . How many inventions are approved to be used by the public?
Hybrid aircrafts.	<ul style="list-style-type: none"> . What are the ideas of hybrid aircrafts and how would they work? . Are the ideas realistic? . How effective will they be to the environment?

<p>Interviews (Qualitative research) (After research above)</p> <p>Explain the different aspects of previous research before asking the questions.</p>	<p>Physics teacher</p> <ul style="list-style-type: none"> . Why are batteries heavy? . Why do you think batteries can't have more energy with the same weight? . What do you think of jet engines being replaced with electric motors? . Do you think fully electric aircrafts are possible? <p>Chemistry teacher</p> <ul style="list-style-type: none"> . Considering the greenhouse gas emission from aircrafts, do you think it is necessary for people to develop electric aircrafts? . For hybrid aircrafts, do you think an after-treatment of fuel could be beneficial? <p>Other teachers (opinions)</p> <ul style="list-style-type: none"> . What do you think of the electric aircraft industry? Will it succeed?
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“CRAAP” evaluation

<p>Total: 40 (good)</p>	<p>Source: Dries Verstraete. “Climate Explained: Why Don’t We Have Electric Aircraft?” <i>The Conversation</i>, 20 Sept. 2019, theconversation.com/climate-explained-why-dont-we-have-electric-aircraft-123910.</p>
<p>Currency: 7</p>	<p>This article has been produced at the end of 2019. It has not been updated till today, but it informs on why electric aircrafts do not exist. The information is still valuable because there have not been major developments of the electric aircraft industry since 2019.</p>
<p>Relevance: 8</p>	<p>The article is relevant and helpful towards by project as it briefly explains why the electric aircraft industry has not been developing that much. It also clarifies why there is a large possibility that small propeller planes and hybrid aircrafts develop further.</p>
<p>Authority: 10</p>	<p>The author is a professor that works at the University of Sydney and teaches aerospace design. The website has a section where they introduce the author in a detailed way and as an aerospace design professor, he has a lot of knowledge regarding the aerodynamics / aeronautics of aircrafts.</p>
<p>Accuracy: 6</p>	<p>As the author has only briefly explained the reasons, he has not applied much evidence. However, the information in his article is very similar to other online articles / videos and his use of language is comprehensible.</p>
<p>Purpose: 9</p>	<p>The purpose of the information is most probably to briefly explain to the readers on why there are multiple ground electric vehicles but no electric aircrafts. The information is factual, and the author <u>is able to</u> explain multiple reasons using example making it very easy to understand.</p>

Interview notes

Interview no.2 (regarding research)
Ms Lynett (physics teacher)

Probable benefits of future electric aircrafts :

- less engine noise
 - safer flights
 - less maintenance
 - cheaper flights
- less delay
- from online websites (research)

Question:

Will these benefits apply to all electric aircrafts in the future?

Answers :

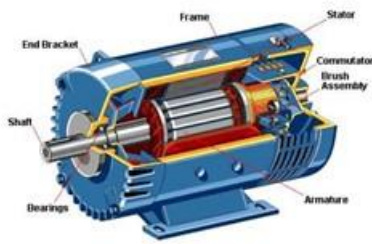
- less engine noise : - Because jet engines require the process of combustion, it is very loud.
 - Should electric engines be powered by an electric motor, it will most probably be much quieter.

- Safer flights : - Considering the fact that electric motors work by a repetition of I movement, it might be more safe.
- less maintenance :
 - However, there must be "something" new applied to the engine which will enhance the speed.
 - Information is inaccurate.

- Cheaper flights : - Most probably considering that electric car owners pay less for maintenance.

Summary for the question "How does an electric motor work?"

I am unfamiliar with the mechanism of an electric motor and I would like to research how it can power up a propeller.



A magnet has a north and south pole. In an electric motor the stator is built with north and south poles with a 1 to 1 ratio around one or more armatures / rotor. The armature also has a north and south pole but can change the poles immediately (controllable). Every time the same pole on the armature and stator meet, the armature will change poles and bounce off from where it stopped and this becomes an ongoing process that spins the shaft.

The electricity is needed to change the poles every time the 2 same poles meet.

Electric aircrafts use multiple armatures to have a continuous spinning motion . The armature loops on electric aircrafts must be made of many wires to make it as strong as possible.

More loops = more spin

The shaft is the place where the propeller goes on. The electric motor will spin the shaft along with the propeller attached to it which will draw the air into the propeller and push it forwards with more force.

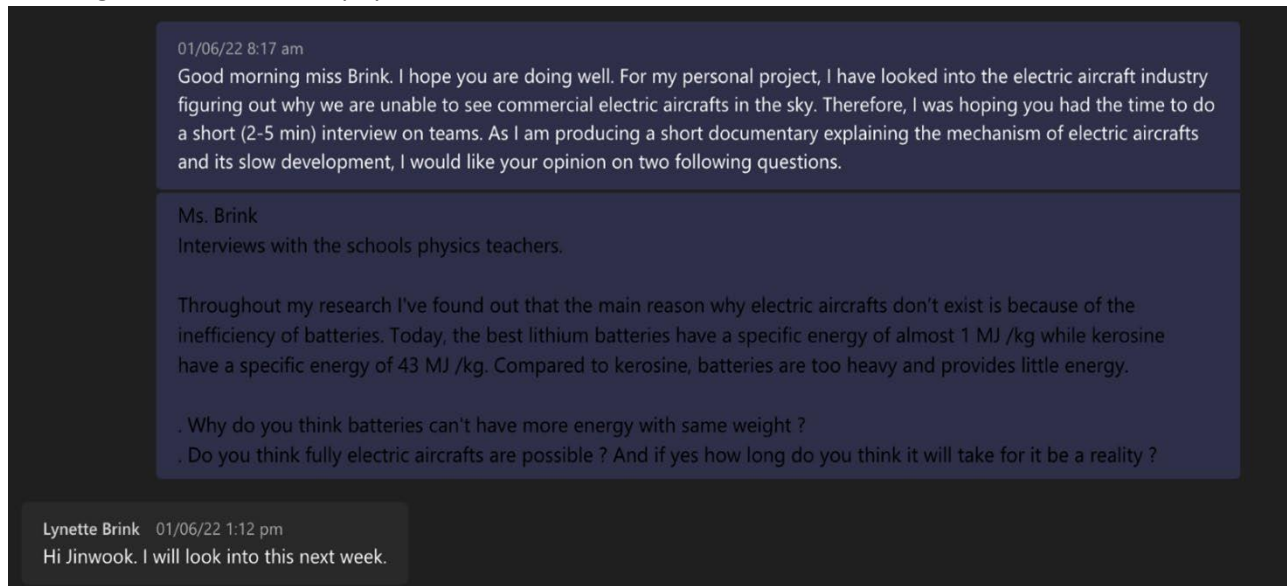
Compared to a jet engine, the process of generating thrust on an electric aircraft is much easier. The energy is generated through a repetition of 1 process which is changing the poles.

Second ATL skill: Communication skills

Along with my thorough research, it has been critical for me to deliver my information to the audience in an appropriate and enjoyable way. After conducting my research, I wrote my video script by rephrasing my summarized information. My goal was to create a script that gives the viewers a feeling that I am communicating with them in real life. Answering every research question was critical but the structure of the sentences had to be convincing and enjoyable as well. In order to achieve this goal, I have used different speaking techniques and script structures. Many of my research questions were discussed in my documentary after I asked the audience the question. For example, "But why do smaller electric aircrafts already exist?". This was a method of updating the audience on the aspects I was talking about during my documentary while also getting them involved in my video. Because electric aircrafts do not exist yet, I have mentioned electric cars multiple times in my script. I have mentioned cars to compare the similarities with electric aircrafts. However, it was also used to grab the viewer's attention as well. Electric automobiles have become one of the newest and famous vehicles in this decade. I have utilized the successful and similar invention so that the viewers are able to understand my script in an easy way and be more motivated to listen to my video because it relates to an interesting topic that many people are aware of. For example, my introduction included the sentence "Why am I not able to see an aircraft with a Tesla logo?". This question gets the audience interested, involved and motivated to watch my video. Most of my research questions were structured in a specific way. I first started off by stating the question or asking the viewers about it and then answered the question before explaining and justifying them. Planning the structure of my script before writing them has speeded up the process of completing my product and the method also led to a further comprehensible video. I have also applied my communication skills for my interviews. I have used it to get opinions from multiple teachers and get further information for specific questions. Because the teachers were spending their own time answering my questions, I wanted it to be done in a respectful and quick way but also get valuable information from all interviews. In order to do that, I planned all interviews 1 week before it was done, and I sent the teachers an email with the questions and a short and comprehensible summary of my topic so that they can understand the questions easily. During the interviews, I listened carefully to the teacher's information and opinion while taking

notes. I also answered any questions that the teachers had in a detailed way, so that I can receive further accurate and detailed answers from the teachers.

Planning interview with the physics teacher



One of the scripts in my documentary

What about hybrid aircrafts? Now, any ideas have been proposed for hybrid aircrafts and most of them were similar. Airbus one of the biggest aircraft manufacturing companies purposed the idea of having 4 engines where two of them are powered by electricity. The electric engines are supposed to get their energy by converting fuel into electricity and put through an aftertreatment before releasing the waste out to the atmosphere. People believe that hybrid aircrafts could soon be used for passenger transportation purposes. There aren't many problems engineers have to face. However, it will take some time for companies to get approved by the "FFA" and to gather enough money for the hybrid aircraft industry to take off.

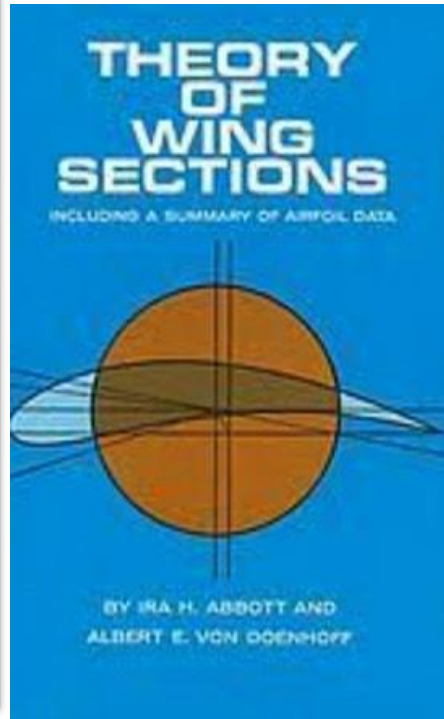
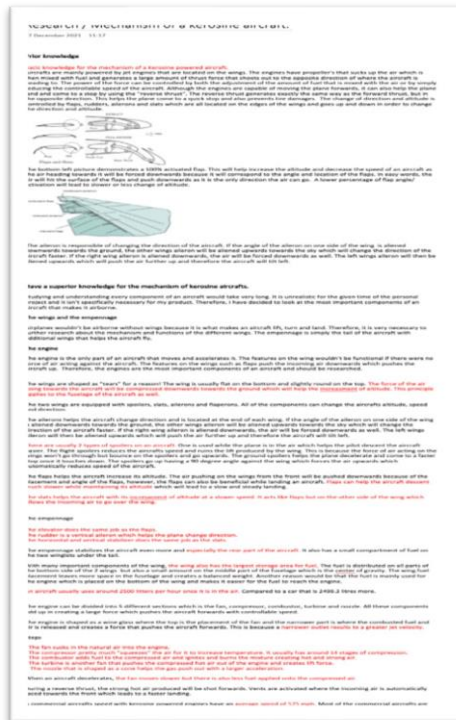
Objective C: Reflecting

Impact of the project

Throughout this project, I have been able to accomplish all my learning goals successfully. I have made progress in developing my knowledge for the aviation industry as expected. This was my priority learning goal because it was a way for me to explore the topic that I am planning to study in university. My research was the main step that helped me accomplish this goal. It included the aerodynamics and function of a Kerosine powered aircraft as well as most of the information I could get about the electric aircraft industry. I did this by following the plan that I have constructed for my product (Research plan: Objective B). I really enjoyed my research process, and I was able to understand most of the sources I have used. I believe that my prior knowledge from the past years has helped me understand some of the complex information that correlated with the basics. However, my passion for aviation has also motivated me to actively research and analyse the questions. Although it was planned to finish my main research in a month time, I managed to finish it in 3 weeks. Researching about one aspect got me interested about the next one which has led to a faster process of finishing my research. I would not consider my action as pre-crastination because I preferred to research for a longer time due to personal interests. I always further investigated the information that did not match up with other sources because I wanted the product to be accurate. I was also personally curious to know what information was correct. At the end of my research, I was able to explain every question that I had in the beginning of my project in a detailed and comprehensible way. I

was able to enhance my knowledge for the aerodynamics and engine of currently existing commercial aircrafts and thoroughly understand the development of electric aircrafts plus its environmental benefits which was one of my planned learning goals as well. Although I did some research about the environmental effects of aircrafts, the reasons for it were justified in most of the source that I used. Therefore, I was able to fully understand the environmental impacts of current aircrafts and the benefits of battery powered vehicles. As an environmentalist, I was curious about the relation between transportation and the environment. I believe that the information about electric vehicles could be beneficial to me for when I travel in the future (example: taking train for short distances instead of an aircraft). The learning goals of my project has not only enhanced my knowledge for the development of aviation, but I have also been able to prove to myself that I have the potential of studying this topic in the future. After finishing my research, I wanted to explore the mechanism of aircrafts and understand the physics behind it. Since a month ago I have started to read a book called “Theory of Wing Section” (P2) which basically explains the reasons on why the wings of a plane are constructed in a specific way. With the knowledge I have from the personal project, I have been able to understand the information in the book easily. I consider this as an opportunity for me to start learning the basics on what I will most probably be studying in my future life.

My summary for one aspect (P1) The book I am currently reading (P2)



The two main ATL skill that I have used during this project was research and communication skills. Although my research was flawlessly conducted, I believe that my notes and summaries I have done during my research could have been better. I used to believe that more notes would help me produce my product effectively, but during my project I have noticed that my summary and notes for my research were way too long and complicated that it took me longer than expected to recap the information that I needed to create my product. In order to speed up my research process in the future, the summaries of research questions must only include the most necessary and valuable information. Above (P1), I have summarized the mechanism of the wings on aircrafts and its aerodynamics. However, only 1/4th of the information was required for my product.

During the interviews for my project, I experienced a lack of communication skills from myself. Although I had a list of things to ask the teachers, I tried my best to improvise, and it did not turn out well. Because my first and second interview was 3 days apart, I had the time to fix my mistakes. I looked back at the

interview recording and have noticed that I am speaking too fast and unclearly. I believe that it was the reason why I lost my confidence and failed to improvise properly. My second interview was much better because I was able to receive more information. I reflected on my first interview by speaking slower, clearer and have reviewed all questions for the interviewee before the meeting. Below is the comparison of my notes for the first and second interview. It is noticeable that my first interview notes do not have much valuable information but rather examples and some facts that is not necessary for my project. However, my second interview includes valid and important bullet points with the most necessary information that is suited to my questions.

Interview 1

Mr. McDonald
Interview with the schools chemistry teacher.

Research shows that 2.5 % of the worlds carbon emission are from planes. With multiple obstacles in front of the development of fully electric aircrafts, I've found out that even if electricity is used instead of fuel it would matter where the energy comes from. Till today, the largest energy source is coal which also emits So₂ and NO_x .

. 2.5 % of the world carbon emission is produced by aircrafts. Electric aircrafts won't require fuel, but electricity. Unfortunately, most of the electricity today is produced through the process of burning coal which also emits greenhouse gasses. Considering all of this, do you think it is necessary for people to develop electric aircrafts ?

. The hybrid aircraft industry developed an idea where 2 of 4 engines are powered from electricity. However, it should be produced by generating fuel into electricity. After the electricity goes through the process, it will be put through an after-treatment before sending the waste out to the troposphere.

Do you think an after-treatment of fuel could be beneficial ?

A lot of countries are trying to resist the coal burning method to produce electricity but it is after all very cheap. Countries with poverty and financial issues are still relying on the coal burning methods even though it emits cO₂ and many different gasses that is unsustainable.

With all the slow development of electric vehicles as a whole, there is a very long way to go until electric vehicles will actually be efficient (emit 0 cO₂ along with the process of producing electricity) unless a new technology of storing electricity is found. (nuclear)

An aftertreatment is always beneficial to gas powered vehicles. It sound identical to the catalytic converters in cars where the gas that goes out through the back of the car is filtered and a lot of the toxic components are resolved. Considering that electrical energy does not combust through the back of the engine, it will be able to hold in/ store the waste and aftertreatments will be possible using machines such as the catalytic converters.

Interview 2

Ms Brink
Interviews with the schools physics teachers / flight attendant (before).

Throughout my research I've found out that the main reason why electric aircrafts don't exist is because of the inefficiency of batteries. Today, the best lithium batteries have a specific energy of almost 1 MJ /kg while kerosine have a specific energy of 43 MJ /kg. Compared to kerosine, batteries are too heavy and provides little energy.

. Why do you think batteries can't have more energy with the same weight ?
. Do you think fully electric aircrafts are possible ? And if yes how long do you think it will take for it be a reality ?

The main reason why electric commercial aircrafts don't exist is because the lift cannot overcome the weight of the batteries required. The metals and electrolytes needed for a battery is very heavy regardless of the energy that it can produce. Plus, the additional materials that go on to that is heavy as well.

These inventions has been around for decades but people are still struggling to find efficient batteries that weigh less.

Advice as a cabin crew : Getting approved by the FFA is a major aspect that cannot be overlooked. Every plane that decides to fly must be approved by the FFA before taking off.

REMEMBER : lift must overcome weight and currently the weight is heavier than the power that aircrafts can produce.

Fuel also combusts meaning that the aircraft loses weight while flying. Just like phones, batteries do not lose weight while it discharges. This will affect the weight and flight speed.

Thinking about this, the efficiency of battery must change in order to create large electric planes.

Considering the pros and cons, electric aircrafts won't change the negative effects of a kerosine aircraft majorly and therefore it isn't really necessary to develop it. There are many other problems occurring in the world regarding the environment to think about. Unless people develop aircrafts that can be powered from solar or wind, the aviation industry will always emit gasses.

OfCourse the emissions will reduce slightly, but there are millions of other things people can concentrate to reduce rather than plane emissions.

There is hope for the hybrid aircraft industry. However, it will cost a lot of money and innovation to reduce emissions directly inside the aircraft (considering the idea above).

My self-management skills where poor in the begging of my project. I couldn't manage my time properly and there were big gaps in between the interviews and the times I worked on my Personal project. After 23 months of superior work, I decided to fix my habit and start working effectively. I created a new action plan with more time for each task, and I followed the guidelines. In the begging of the project, I noticed that I would not be able to finish exams and personal project drafts on time if I have tight deadlines. Therefore, I constructed my second action plan carefully considering all the events and exams. I also set a specific date and time of the week where I worked on my project, which further developed the way I use my time. By the time I started my research, everything was back on track, and I just needed to follow the normal guidelines. I believe that this is an aspect that I must be cautious of in the future because I had to procrastinate a bit in the begging of the project which might have affected the quality of my product.

Success criteria evaluation

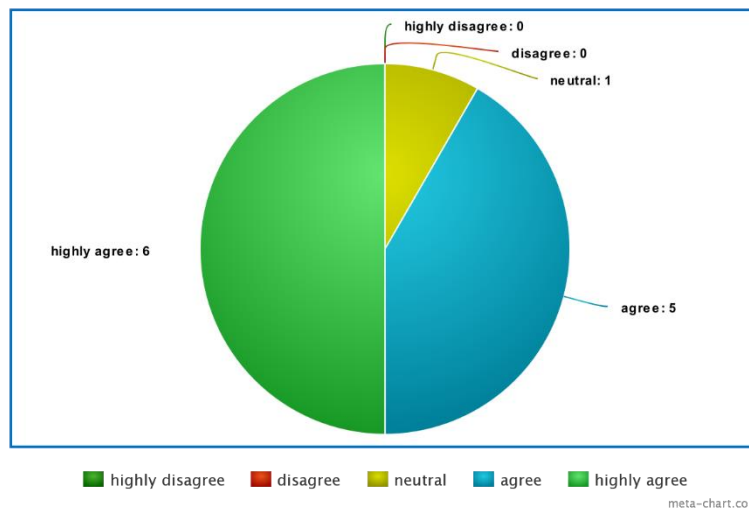
I have managed to finish my product at the end of the expected deadlines that I set while creating my success criterion (Jan 9th). My video turned out to be almost 11-minutes long which was the meeting expectations in terms of the length. However, my supervisor was able to give me feedback on the 13th of January. With some mistakes to fix, I was able to upload my video on the 15th of January which was 1 day before the due date.



The electric aircraft industry.
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Although I managed to submit my product on time, it was not part of my expected plan. I did not have enough time to carefully consider the feedback that my supervisor gave me, and the product could have been better. However, I believe that my product took longer to create due to the unexpected amount of time I have spent on writing a comprehensible and informative script which was also a crucial part of my success criteria. While being busy with school exams and homework, it took me around two weeks to create a comprehensible script that was created with my own words. This part of the project was very important to me because one of my main product goals was to create a video that can be understood by teenagers even if they do not have any knowledge about the topic. The feedback I have gotten from the exhibition, has shown that the criterion was achieved with exceeding expectations.

Exhibition survey results for the criterion: The video was comprehensible, and I have understood what I have watched.

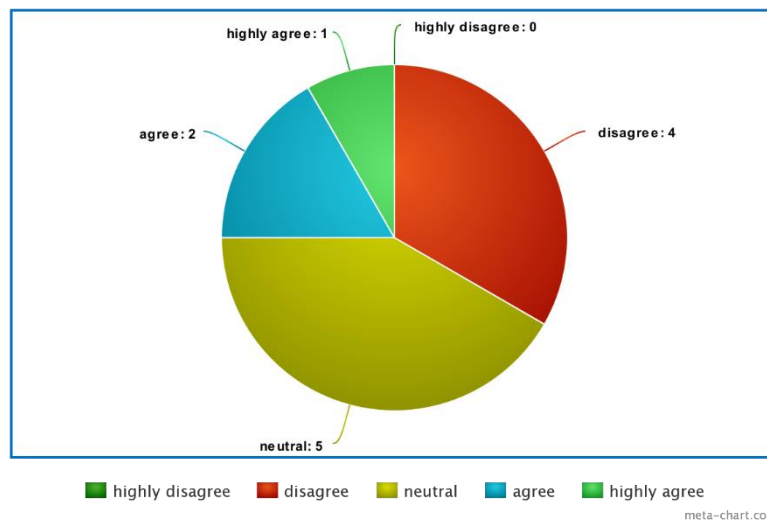


I often said “basically” or “simply said” in my documentary to clarify any complex terms or vocabulary related to physics. For example, “Currently, the best lithium battery has a specific energy of less than 1 MJ/kg. Fuel based aircrafts have 43 MJ/kg which is a massive difference. Simply said, a fuel-based aircraft can get over 40 times more work done with 1 kg of fuel than electric aircrafts with 1 kg of battery.” Here, I have justified the meaning of “Joule” which is a term in physics that many teenagers are not familiar of. By justifying all complex terms in a short and simple way, I have been able to deliver the information so that the audience can understand every bit of my documentary.

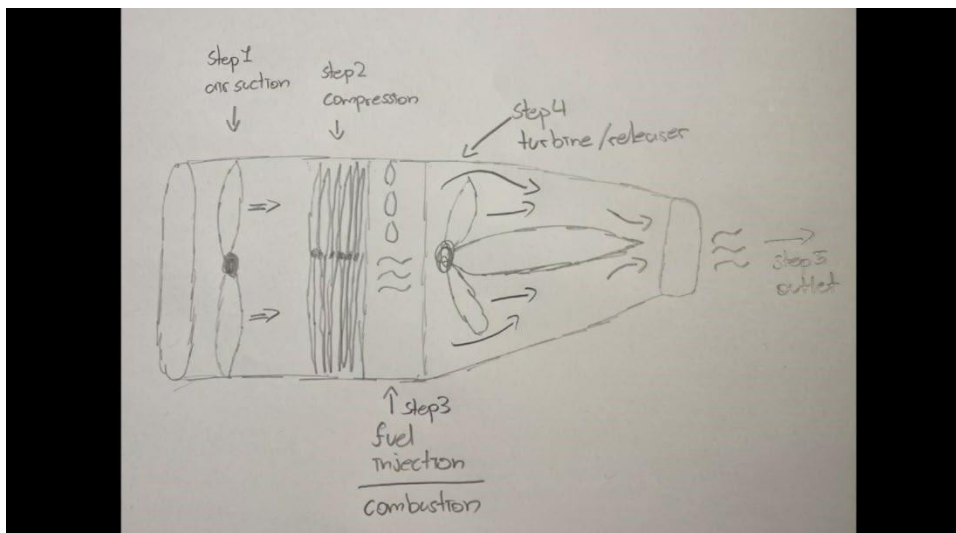
The visuals of my documentary were “ok”, but it was definitely not exceeding expectations. I did not include any self-animated clips in my video because I didn’t do any research on how to create one. If I would have spent more time developing better visuals, I would have had a lot of work at once, and there

could have been more mistakes for the other criterions. However, I did create some drawings for the audience for them to easily understand some points I have made. The drawings were labelled and clearly demonstrated the things I was trying to justify. It was not the best drawing, but I did meet my expectations for the criterion. I didn't put much effort on the visuals as much as the information in the documentary because it was not my prioritized product goal. I have also used appropriate internet images that I have cited at the end, along with clips of my interviews with the teachers. It was used to maintain the viewers interest and it contributed to the visuals of the documentary. The interviews did make the video look more professional and trustworthy. For all visually related criterions, I was able to meet the standard expectations. Although I could have put more effort on the visuals of my product, I prioritized my research and script writing process because it was my main goal to deliver basic knowledge for the electric aircraft industry to the audience.

Exhibition survey results for the criterion: The video was visually pleasing.



One of a few labelled drawings included in my documentary.



I believe that my mistakes in the documentary all have a relation with my poor time management skills. More criterions could have been rated as "exceeding expectations" if I would have managed my time more wisely. Creating my product was not a major challenge and I personally thought that the criterions where not extremely hard to achieve. However, even with my effort of trying to manage my time in a better way, the improvements did take time. With some improvements to make with my self-management skills, believe that I could create similar documentaries in the future that is both visually pleasing and highly informative.

