1.1 Source Evaluation

All sources used in my dissertation are strictly from academic papers or commercial manufacturers. There are some sources that are online tools, but these tools are made through the use of further academic sources which have been cross-checked on their websites.

Academic papers regarding technical data have a low rate of bias as is the case with sources surround solar powered flight, electronics, etc. These academic papers also have multiples citations and are published papers meaning that they have had to pass through a peer review process, and citation checks. This means that:

(1) Academic papers here are non-biased due to their nature being largely technical and so all facts must be based in reality and physical constraints. This means that it is difficult to have bias and therefore unreliable sources.
(2) Commercial Manufacturer sources in this case are of products' technical specifications such as power consumption, mass, torque, etc. This means that it difficult to be biased here as this data has had to be empirically verified through testing in a datasheet.
(3) Lastly, online tools such as the global sun atlas have a list of used sources which is data that has been cross-checked with multiple organizations.

Overall, my sources are inherently unbiased due their technical nature. The only chance of unreliability in my sources is perhaps experimental errors, this is mitigated through the use of cross-checking technical data with another independent and unrelated source to ensure that data closely matches.

1.2 Presentation Evaluation

I repeated my EPQ presentation outside of Harrow School Online at my physical school in the same time constraints as the one I presented to Harrow School Online, the main reason for this was to obtain feedback on my presentation through a google form.

Thank you for filling out the form below.

Please use the following scale to gauge my performance:
1 = Never
2 = Sometimes
3 = Frequent
4 = Very Frequent
5 = Always

If you have any questions regarding my EPQ, or would like to contact me to discuss any part of my EPQ further, I am available at www.ayanali.net and at ayanali20985@gmail.com

The Presentation

(1) The presentation was engaging.
(2) The presentation was well-structured and easy to follow.
(3) The "Table of Contents" on the right-hand side of the slides were useful in keeping the presentation easy to follow.

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    (4) The presentation slides provided meaningful elaboration to the speaker's
        points.

The Speaker
    (1) The speaker spoke clearly.
    (2) The speaker was audible.
    (3) The speaker delivered the presentation clearly and confidently.
    (4) The speaker was well-organized.
    (5) The mathematics presented by the speaker was disseminated in an easy-to-
        understand method.
    (6) The pace set by the speaker was appropriate.
    (7) The language used by the speaker was appropriate.
    (8) The speaker responded with clear, detailed, and specific answers to questions.
```

Based on the following criteria and questions, the responses were collected after distributing the form are available in the appendix.

Based on the data, I believe my performance was adequate and was suitable for the size and length of my dissertation.

Looking at the data, the following parts are able to be improved:

(1) The presentation was well-structured and easy to follow.
    a. Perhaps instead of having the table of contents on the side, perhaps move it to the bottom of the page so that it can be seen at all times.
(2) The mathematics presented by the speaker was disseminated in an easy-to-understand method.
    a. Perhaps giving out a mathematics handout for those who are keener on understanding the complete idea of the mathematics might be beneficial.
    b. For this who would prefer a general idea, the presentation would be suitable
(3) The pace set by the speaker was appropriate.
    a. Perhaps omitting a sections to slow down slightly so that the presentation can still last 10 minutes might be beneficial. A possible section to omit might be the final moving forward slide, or the slides surrounding why we aren't seeing and solar aircraft today as I did not cover this in my dissertation.
    b. Another way to combat this would be to increase the length of the presentation to greater than 10 minutes.

1.3 Objectives Evaluation

As taken from my project proposal form:

Project objectives:
The main object of such a dissertation is to:

(1) Provide an abstract detailing the promise of how solar flight could revolutionize the industry of search and rescue, agriculture, military surveillance, weather prediction, photography, etc.
(2) Provide an introduction to my motivations behind such a project.

(3) Provide a brief overview / account of previous solar flight and accompanying relevant data.
(4) Provide a summary of the basic principles behind solar based flight, and flight in general:
- a. Principles of controlled flight
- b. Principles of solar flight
  - i. How power delivery works during the day and during the night (Solar Panel Charge Controller Batteries etc.)
  - ii. Metrological factors that must be considered with lightweight aircraft (Such as updrafts, wind, low temperatures, cloudy days, etc.)
- c. Principles of Solar Panels
- d. Principles of Batteries
- e. Principles of RC flight

(5) Provide the challenges faced that prevent prolonged solar flight. (The below is a rough preliminary outline of what majors factors prevent said flight)
- a. Airframe constraints (Aerodynamics, weightiness, flexibility, etc.)
- b. Energy constraints (Batteries, Solar Panels, Battery Charge Controllers, Accompanying flight electronics)
- c. Metrological constraints (High winds, cold/hot air updrafts/downdrafts)

(6) Provide possible solutions to said challenges
(7) Provide a mathematical model that addresses such constraints using available data from previous studies
(8) Use mathematical model to take real-world parameters established in (4) and determine whether it is feasible and practical to have continuous and infinite solar flight.

(9) Provide a conclusion using the analysis based on (8)
(10) Provide a short overview of emerging technologies that may perhaps aid addressing the aforementioned challenges.

Based on these objectives, the following evaluation can be formed:

Objective Point	***Met***	***Partially Met***	***Failed***
1	This has been met as an abstract exists.		
2	This has been met as an introduction with my motivations, scope, goal, etc. exists.		
3		This has been partially met as an overall summary does not	

		explicitly exist but old flight data has been used to inform the mathematical model, most namely in the MPPT chart.	
4	This has been met as every model created has had its first principles established in as much relevant detail as possible.		
5	This is done through the takeaway point tables.		
6	This has been done through ensuring that these takeaway point tables are considered into the mathematical model.		
7	This has been done as a mathematical model exists.		
8	This has been done as Class I, II, and III parameters were first established through a wide range of cross-checked sources. These were input into the model and a conclusion was formed.		
9	A conclusion was formed		
10		Whilst there is no explicitly chapter on this, this has had to be omitted due word count and due it being mostly covered in Chapters 1, 2, 3, and 4.	

Based on the following marking criteria:

(1) Met is equivalent to 1 point
(2) Partially met is equivalent to 0.5 points
(3) Failed is equivalent to -1 points.

I have scored a 9 out of a maximum of 10 points which given that this is my first research paper is an acceptance score.

1.4 Strengths

I believe the strengths of my EPQ lie in the following areas:

(1) Integration of vastly different first principles physics into one large continuous model through a variety of mathematical methods.
(2) Source citations and checks, I have made sure there is bias nor experimental error as given in section 1.1.
(3) EPQ presentation as given by audience's evaluation.\
(4) Project objectives are mostly met.

1.5 Weaknesses, Lessons Learned, and Action Points

I believe the weaknesses of my execution of this EPQ come down to two reasons:

(1) Inadequate planning of unforeseen events
    a. Events such as sickness, large course-loads (4 A-levels, 5 AP exams, mocks, and school internal exams), unexpected school commitments (electric car team lead, etc.), and cancellation of my AS-level further maths exam from the May/June to November by my school have caused delays in the timeline of my EPQ.
    b. A lesson has been learned in the sense that project planning must include: first, time for unforeseen events and second, areas that may take longer than expected. This ensures that this "time for a rainy' day can be utilized to ensure that the project remains within the timeline.
(2) Underestimating word counts
    a. I have underestimated word counts from 8350 words projected to approximately 12500 content related words in the final word count. This has resulted in a lengthy EPQ (which has been shortened from 16000 content related words)
    b. In the future, word count projections should be based on fact through the use of extrapolation of one section of the research paper, using this method the projected word count looks closer to 11000 words if we use Chapter 1 as the initial point of extrapolation.
    c. Extrapolating data ensures that if the word count exceed the limit, measures such as reducing the scope of the paper can be made stay within the word limit. Changing the scope of the paper in the later stages of the paper is difficult as exemplified by removing the autonomous section of my research completely in reducing the scope of my research.

With improvements such as these in the future, long term projects like my EPQ will have more success.

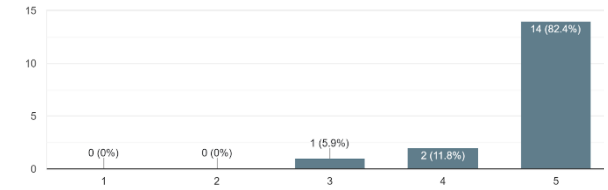
1.6 Skills Acquired

(1) Inkscape 2D graphics software to drawing diagrams
(2) Advanced Excel Functions to create Gantt chart that can adapt and does not have to be manually changed
(3) Project management of long-term project (there have been many lessons learned both from successes and failures)
(4) Thorough Research and proper designing of cross-checks and balances throughout process to ensure reliability of sources
(5) Analytical Mathematics to create large parametric models
(6) Data Analysis to create lines of best fit, graphs, etc.
(7) Variety of computer-based soft skills to manage files, conversions, version management, etc.

2.1 Appendix

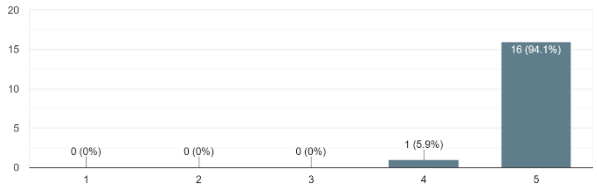
The presentation was well-structured and easy to follow.

17 responses



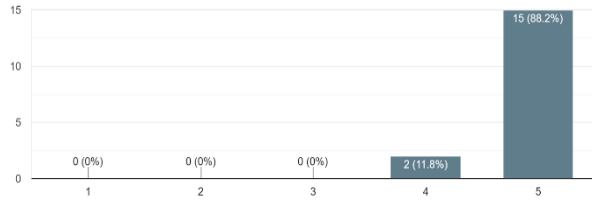
The "Table of Contents" on the right-hand side of the slides were useful in keeping the presentation easy to follow.

17 responses



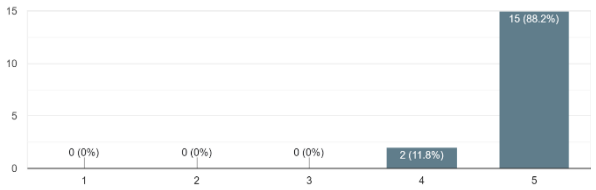
The presentation was engaging.

17 responses



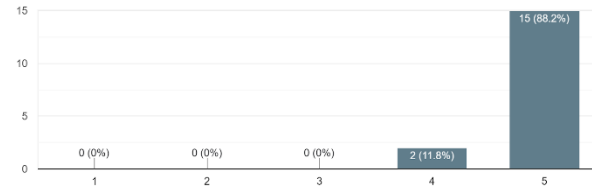
The speaker spoke clearly.

17 responses



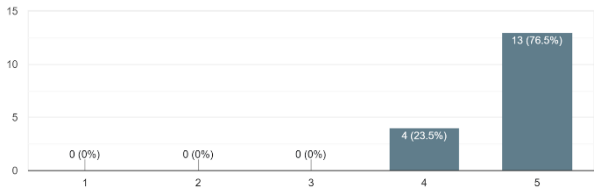
The speaker delivered the presentation clearly and confidently.

17 responses



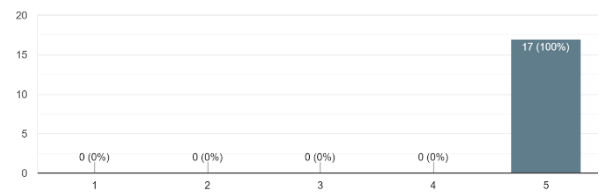
The speaker was well-organized.

17 responses



The speaker was audible.

17 responses



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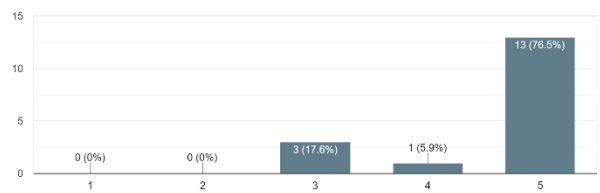
17 responses



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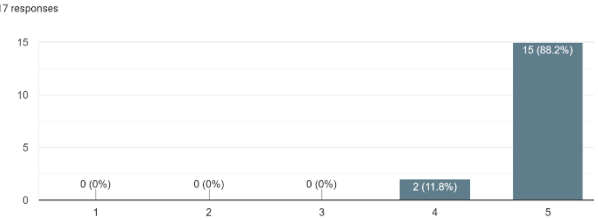
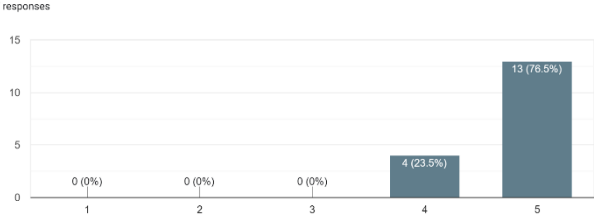


The pace set by the speaker was appropriate.

17 responses



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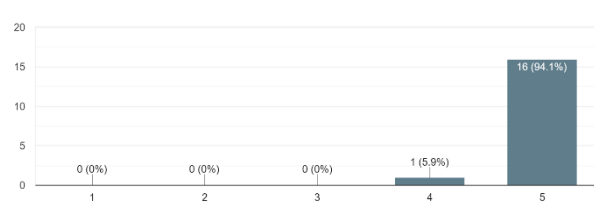
17 responses



The speaker responded with clear, detailed, and specific answers to questions.

17 responses