

Student Feedback Report – ACMA6000

Student: Tyler Powell

Student ID: 2318809

Assignment: Manufacture of Wind Turbine Blade

1. Engagement with Literature Skills – 12/20

The report demonstrates a basic to moderate level of engagement with literature, aligning more closely with the descriptor of “good level of engagement with a range of relevant literature,” rather than the higher bands requiring depth and critical integration. The student includes appropriate foundational sources to describe wind turbine concepts, such as when stating that “optimal TSR values... lie between 6 and 8” and discussing C_p limits relative to the Betz limit.

There is evidence that literature has been used to introduce key ideas such as aerodynamic efficiency, blade tapering, and material suitability. For example, the discussion of composites being preferred due to “low density, high strength, and excellent fatigue resistance” reflects correct use of standard engineering references.

However, the engagement remains largely descriptive and does not meet the expectations of “in-depth research” or “critical engagement with literature.” The report presents information from sources but does not evaluate or compare them. There is no clear discussion of conflicting data, no justification of why specific literature values are selected, and no synthesis of multiple sources into deeper engineering insight.

Additionally, while some figures are included, they are limited in analytical value and do not demonstrate literature synthesis through graphs or advanced visual interpretation. The lack of referenced graphs such as C_p vs TSR or aerodynamic performance curves further limits the strength of this section.

To improve significantly, the student must move beyond describing literature and begin critically analysing it, comparing sources, and integrating them into design decisions. Including referenced graphs and deeper discussion would directly increase marks in this criterion.

2. Knowledge and Understanding Skills – 17/30

The submission demonstrates a reasonable level of knowledge and understanding, consistent with the descriptor of “sound knowledge of the subject,” but not reaching the level of detailed or critical understanding expected for higher marks.

The student correctly explains fundamental concepts such as TSR, blade tapering, and the role of aerofoils, and shows awareness of material behaviour and fatigue considerations. For example, the explanation of tapered chord distribution and the use of the NACA 4412 aerofoil indicates basic understanding of aerodynamic design.

There is also some understanding of structural behaviour, as seen in the introduction of the bending stress equation and discussion of loading at the blade root.

However, the knowledge is mostly presented in a descriptive manner without sufficient depth or justification. The student states equations such as the lift equation and bending stress equation, but does not demonstrate full understanding through application. Key parameters such as C_p , TSR, and chord distribution are introduced, but not deeply analysed or justified in the context of the final design.

The work does not consistently demonstrate “coherent and detailed knowledge” or awareness of limitations, which is required for higher bands. There is little discussion of alternative design approaches, no critique of assumptions, and limited connection between theory and final decisions.

To improve, the student must show deeper understanding by applying concepts, justifying choices, and linking theory directly to design outcomes rather than presenting it in isolation.

3. Cognitive and Intellectual Skills – 10/20

The report demonstrates limited critical thinking and aligns more closely with the descriptor of “largely descriptive work with some limited analysis.”

There is some attempt at structured decision-making through the use of a weighted decision matrix, which identifies composites as the most suitable material. However, this process lacks depth. The weighting values are not justified, and the scoring appears assumed rather than derived from quantitative evidence. As a result, the analysis does not demonstrate strong evaluation or independent judgement.

Similarly, the comparative analysis of materials and manufacturing processes remains descriptive. Statements such as metals being “unsuitable due to high density” and ceramics being “limited by brittleness” are correct but not deeply analysed or supported by numerical comparison or engineering calculations.

The conclusions reached are logical but largely predictable and directly follow textbook reasoning, rather than demonstrating “sophisticated judgement” or independent critical thinking. There is no exploration of alternative scenarios, no sensitivity analysis, and no challenge to assumptions made earlier in the report.

To improve this criterion, the student must move from description to analysis by:

- Justifying decisions quantitatively
- Comparing alternatives using evidence
- Exploring how different assumptions affect outcomes

Including analytical graphs such as cost-performance comparisons or weighted contribution charts would significantly enhance this section.

4. Practical Application Skills – 8/20

This is the weakest area of the submission and falls within the lower band of “limited application of methods and techniques.”

While the student introduces relevant engineering equations, such as the lift equation and bending stress equation, there is a lack of full application. For example, the lift equation is presented:

$$L = 1/2 \rho V^2 C_L A$$

but is not followed by complete numerical calculation or engineering output.

Similarly, bending stress is discussed, but there is no clear calculation of bending moment, second moment of area, or resulting stress values. This indicates that the student understands the concept but has not applied it in practice.

The report includes some figures and tables, such as the weighted decision matrix and cost table, and a CAD model is presented. However, the overall level of practical evidence is limited. There are no engineering graphs, no step-by-step calculations, and no clear outputs such as stress distribution, lift variation, or performance curves.

Given that the marking criteria strongly emphasise “detailed aerodynamic, structural, and cost analyses,” the lack of working calculations and engineering outputs significantly reduces the mark.

To improve this section substantially, the student must include:

- Full step-by-step calculations
- Graphs such as lift vs radius and stress distribution
- More detailed Material selections graph outputs
- Additional tables showing calculated results

More figures, calculations, and engineering outputs would directly increase marks in this category.

5. Transferable Skills for Life and Professional Practice – 7/10

The report is generally well structured and follows a logical format, including introduction, literature review, design, material selection, manufacturing, and conclusion. This demonstrates reasonable organisation and communication skills.

Figures and tables are included and labelled, and the report is readable and coherent overall. The inclusion of a CAD model and structured sections supports clarity.

However, the professional standard is limited by the lack of analytical depth in visuals. Many figures are illustrative rather than analytical, and they do not contribute significantly to engineering justification. Additionally, some sections rely heavily on descriptive text, which reduces the effectiveness of communication in a technical report.

To improve this criterion, the student should enhance the report by including more analytical visuals, improving technical explanation clarity, and ensuring that figures directly support engineering conclusions.