

ACMA6000 Coursework Feedback

Student	Shay Quinn
Student ID	2319936
Assessment	Manufacture of Wind Turbine Blade
Final mark	71 / 100

1. Engagement with Literature Skills — 15/20

The report demonstrates good independent research across aerodynamics, material behaviour, fatigue, manufacturing, recyclability and wind-turbine blade technology. The source base includes peer-reviewed journal papers, recognised NACA material, NREL work, IEC standards and ORE Catapult information, providing a stronger academic basis than a report relying mainly on general websites. The literature is used to support specific arguments, including the suitability of NACA 4412, the importance of fatigue, the use of VARTM and the recycling limitations of thermoset composites. There is also evidence of recent sources. The mark is limited because some numerical design assumptions and material-ranking scores are not as directly traceable to individual sources as they could be, and some sections remain relatively brief compared with the strongest submissions.

2. Knowledge and Understanding Skills — 21/30

The report demonstrates good understanding of aerodynamic profile selection, rotor geometry, material requirements, manufacturing processes and lifecycle considerations. The NACA 4412 profile is applied at five radial positions and the report explains how chord and profile coordinates are scaled to generate the tapered blade geometry. The student also recognises the significance of tip-speed ratio, relative velocity, lift, drag, fatigue, density and stiffness. Manufacturing coverage is appropriately broad, including casting and extrusion for metals, sintering and additive manufacture for ceramics and RTM or VARTM for composites. The principal weakness is the structural-analysis stage. The report explicitly states that bending stress, torsional stress and safety factors were not calculated because the required section properties were not completed. This leaves an important part of the technical analysis incomplete.

3. Cognitive and Intellectual Skills — 14/20

There is clear evidence of comparison and justified decision-making. The weighted decision matrix gives polymer composites the highest score based on strength, fatigue, density, cost, manufacturability and recyclability. The final selection of E-glass/epoxy is then supported by additional considerations of blade mass, manufacturing suitability, material cost and recyclability rather than relying solely on the matrix. The comparative analysis also recognises that aluminium offers good recyclability and simpler processing, while silicon carbide has attractive engineering properties but is undermined by brittleness, cost and manufacturing difficulty. The main limitation is that the reasoning cannot be fully tested against quantitative structural results because the stress and safety-factor analysis is absent.

4. Practical Application Skills — 14/20

There is meaningful practical engineering work within the submission. The report establishes the rotor radius, tip-speed ratio, power coefficient, lift coefficient and five radial sections, then develops NACA 4412 coordinates and a tapered CAD geometry. The aerodynamic section includes the required equations and raw-material cost is linked directly to the CAD blade volume, with calculated masses and costs for aluminium, silicon carbide and E-glass/epoxy. The CAD requirement is satisfactorily met through an overall engineering drawing showing the external blade form, spanwise stations and chord dimensions; there is no penalty for the absence of internal blade structures. The main limitation is substantial: the report does not present completed section-by-section lift/drag results and explicitly omits bending stress, torsional stress and safety-factor calculations.

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

The report follows a clear engineering structure, moving from literature and design specification through material selection, manufacturing, cost, structural discussion, comparative analysis, CAD and recommendations. The figures and tables support the written discussion, and the conclusion communicates the selected E-glass/epoxy and vacuum-infusion solution clearly. The recommendations appropriately identify the missing structural calculations, fatigue analysis, optimisation and manufacturing trials as future work. The presentation is generally readable, although several grammatical errors, duplicated wording, inconsistent equation and unit formatting, and some table or figure labelling issues reduce the professional finish.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	15
Knowledge and Understanding Skills	30	21
Cognitive and Intellectual Skills	20	14
Practical Application Skills	20	14
Transferable Skills for Life and Professional Practice	10	7
Total	100	71

Overall Feedback

This is a competent and well-structured submission with good independent research, broad manufacturing coverage, an appropriate weighted material-selection process, CAD-volume-based cost calculations and a satisfactory external CAD blade drawing. The selection of E-glass/epoxy and vacuum infusion is supported by a balanced comparison of mass, fatigue, manufacturing, cost and recyclability. The main weakness is the incomplete mechanical-analysis stage. Although aerodynamic equations and loading concepts are introduced, completed lift/drag results are not developed clearly and the report explicitly omits bending stress, torsional stress and safety-factor calculations. The most important improvement would be to complete this structural verification and use the results to confirm or refine the proposed design.