ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

ISSN NO. 2320-5407

REVIEWER'S REPORT

Manuscript No.: **IJAR-53150** Date: 08-08-2025

Title: Structural Integrity Analysis of Lightweight Alloys for Aerospace Applications

Recommendation:
Accept as it is ………………YES………………
Accept after minor revision………………
Accept after major revision ………………
Do not accept (*Reasons below*) ………

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity		✓		
Significance		✓		

Reviewer Name: Mr Bilal Mir

Reviewer's Comment for Publication.

Here is the **review report** for the manuscript titled:

General Evaluation:

The manuscript presents a focused and well-articulated structural integrity analysis of high-pressure turbine (HPT) blades fabricated using three nickel-based single-crystal superalloys: CMSX-4, CMSX-8, and CMSX-4 Plus. The investigation leverages finite element analysis (FEA) to assess and compare these materials under realistic aero-engine operating conditions. The study contributes meaningfully to the domain of aerospace materials engineering by offering comparative insights into advanced superalloy performance.

Scientific Significance and Originality:

The selection and analysis of CMSX-4, CMSX-8, and CMSX-4 Plus represent a relevant and technically sound approach in evaluating the mechanical viability of modern turbine blade materials. The manuscript identifies and compares structural responses such as stress, strain, deformation, and safety factors, providing a solid basis for selecting suitable materials for next-generation aerospace components. The study demonstrates originality in its comparative

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

assessment and offers data-driven conclusions about the superior performance of CMSX-8 under combined thermal and mechanical loading.

Methodological Rigor:

The finite element method has been appropriately used for evaluating the mechanical behavior of the HPT blade under service-like conditions. The modeling involves accurate representation of aerodynamic blade geometry, proper meshing using tetrahedral elements, and application of realistic boundary conditions (e.g., fixed support at root, constant surface pressure). The alloy-specific material properties were accurately incorporated, reinforcing the validity of the simulation results. The consistency and alignment of the methodology with real-world turbine operating conditions enhances the scientific integrity of the study.

Presentation and Data Interpretation:

The manuscript clearly explains the methodology, the reasoning behind material selection, and the interpretation of simulation outputs. It highlights the comparative advantages of CMSX-8 in terms of reduced deformation and higher safety margins, affirming its mechanical superiority. The logical presentation of data and the systematic comparison across materials strengthen the clarity and coherence of the study.

Technical Terminology and Relevance:

The use of technical terminology is accurate and appropriate to the field. Concepts like creep resistance, phase stability, equivalent stress, and factor of safety are used correctly and in relevant context. The study reflects a solid understanding of advanced materials science as it pertains to the design of critical aerospace components. It is of particular relevance to professionals engaged in turbine engineering, structural simulation, and materials development for extreme environments.

Conclusion and Practical Implications:

The study effectively concludes that CMSX-8 offers superior mechanical performance among the materials analyzed, which has direct implications for its adoption in high-performance turbine blade manufacturing. The results underscore the importance of advanced superalloys in achieving efficiency, durability, and reliability in modern jet engines.

ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Final Remark:

The manuscript is technically sound, well-structured, and contributes positively to the literature on aerospace-grade materials and structural integrity assessment through FEA-based approaches.