MSC'S SOLVERS PREDICT THE BEST ATTACHMENT OF THE SUNBEAM TIGER FIBERGLASS FRONT-END

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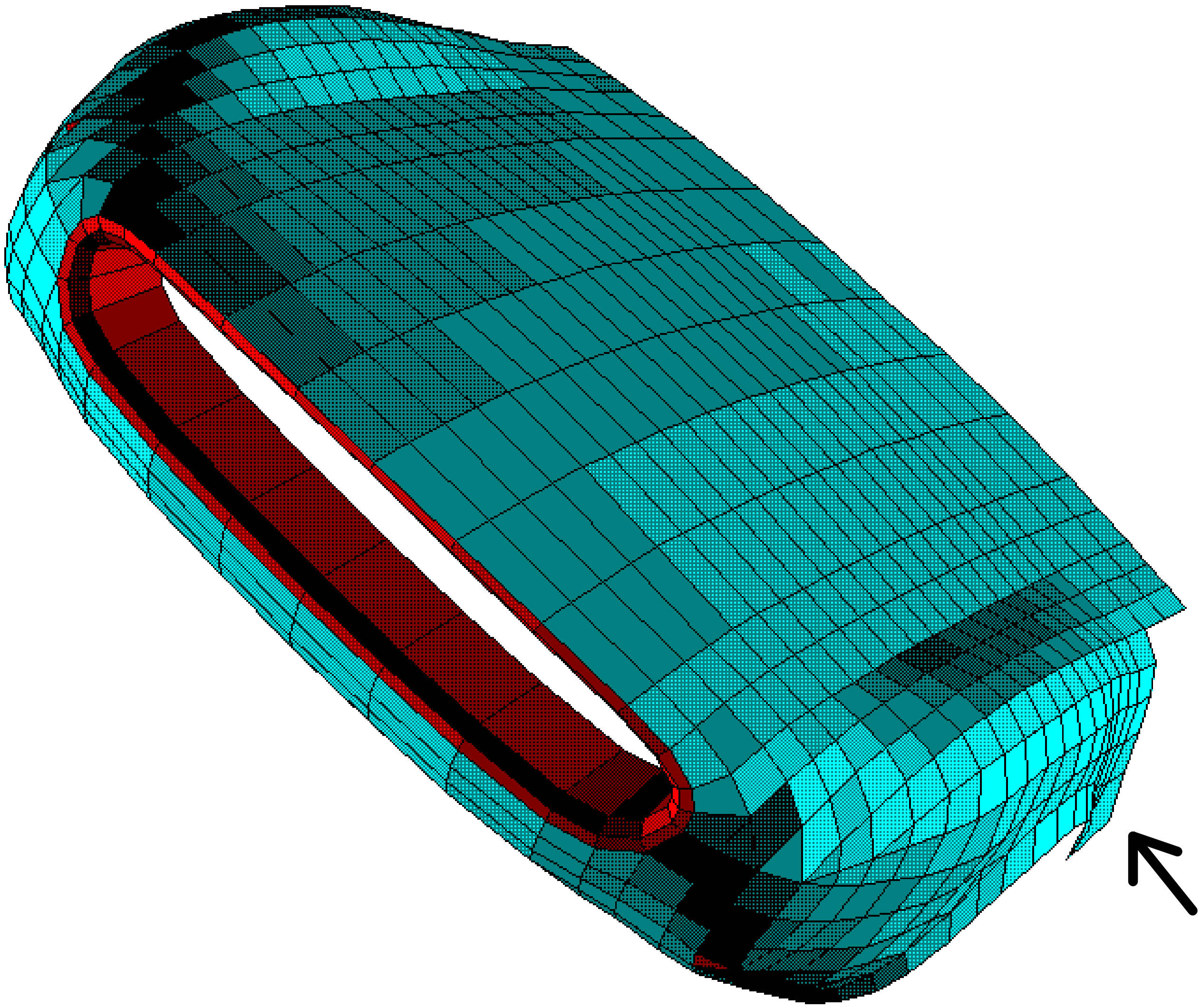
ABSTRACT

This paper demonstrates how MSC's finite element technology can be utilized by the individual hobbyist, for the purpose of solving what traditionally is considered to be a task for the specialist. It shows how the solver helps the individual understand the problem, via the use of modal analysis. It also highlights how finite element analysis is used as a 'what if' tool, and thereby helps the user focus on a practical solution.

Introduction

The aerodynamically shaped after market fiberglass front-end fitted to the Ford V-8 powered British Sunbeam Tiger experienced severe vibration at speeds above 50 miles per hour.



The front-end, which tilts forward and thereby exposes the entire engine compartment when in the open position, was attached at three points; the two forward-mounted hinges and the center latch at the aft end near the windshield.

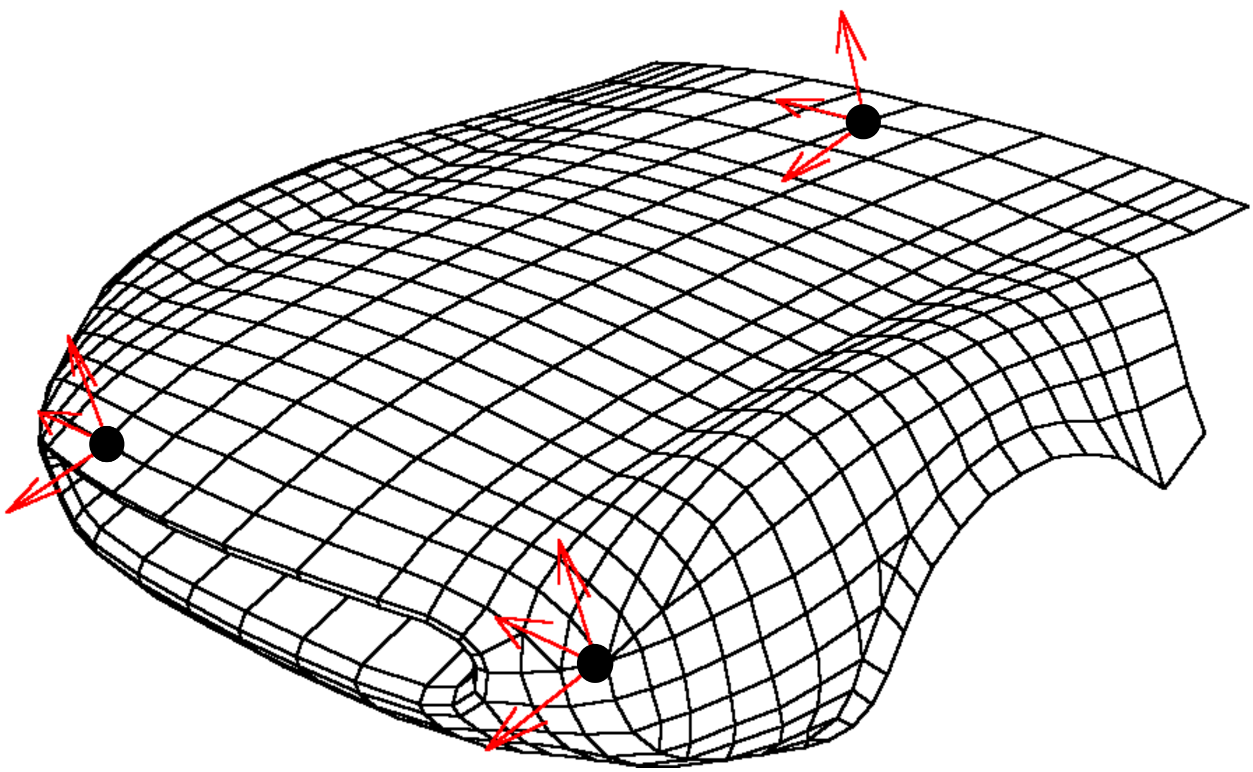
The fiberglass front-end was developed in the early 70s in Seattle [1]. A total of six units were shipped through 1974. New aerospace quality tooling was produced in 1995 [2], for the purpose of resuming limited production.

Problem definition

To find a simple attachment scheme that would dampen out the vibrations without causing undesirable interface loads, when the unibody structure flexes.

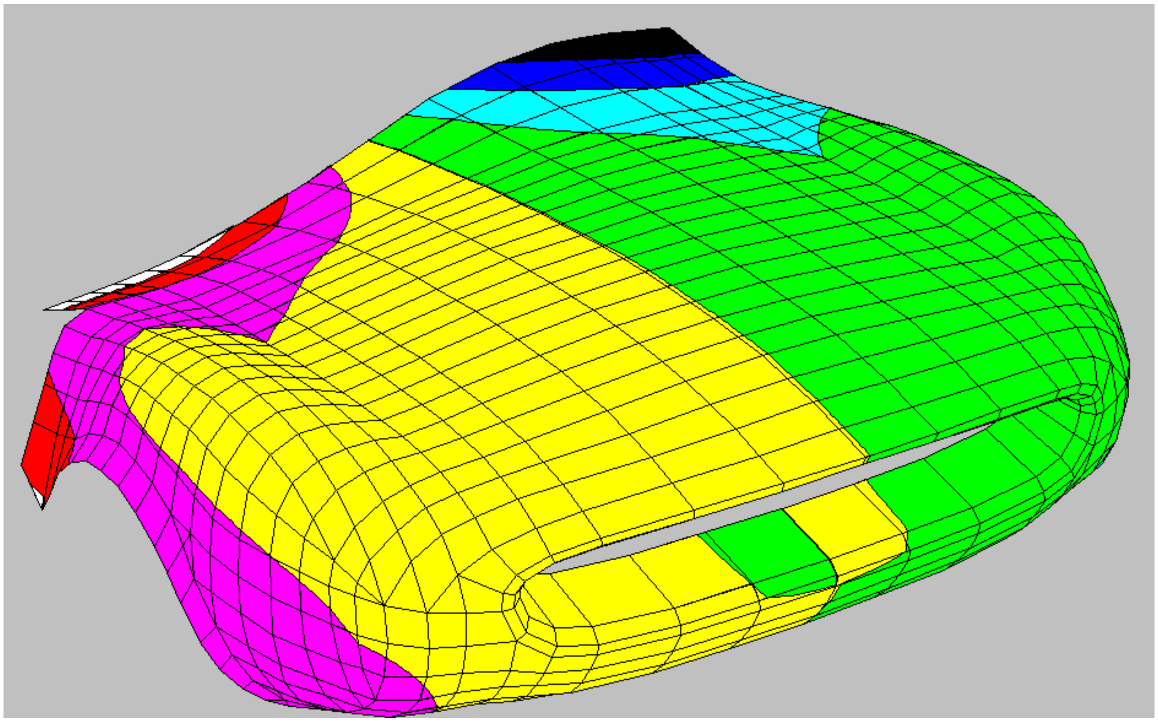
Analysis

A finite element model was created for the fiberglass front-end.



Geometric data was obtained by measuring x, y and z-coordinates from inside the female mold. The creation of the model was carried out with LapFEA on the Power Macintosh [3].

Then a modal analysis was performed with the original attachment configuration, using LapFEA [3]. The first six modes were recorded. Particular attention was paid to the fourth mode, which exhibited flapping of the side skirts, at a natural frequency of 44 cps.



This prompted the constraint of the side skirts at their aft lower corners. Results indicated a substantial increase in the frequency.

Discussions

Consideration was then given to attach rubber tie-down straps at these points, similar to how fiberglass hoods are attached on large trucks.

Candidate straps were tested for stiffness. The side skirts were connected to bar elements with stiffness equivalent to these straps. The resulting frequency was nearly the same as when the corners were fully constrained.

Conclusions

The actual hardware installation, utilizing these straps, performed without vibration at a much higher speed, thereby displaying that predictive engineering, when utilizing MSC's tools, solves real-life problems.

Acknowledgments

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References

[1] Seattle Post-Intelligenser, Sunday Edition, Automotive Section, P. C4, October 14, 1973.

[2] John Simone, Vista, California.

[3] LapFEA for the Macintosh, an integrated finite element pre-, solve and postprocessor, utilizing The MacNeal-Schwendler Corporation's MSC/pal 2 solver technology.