

# **INTEGRATED FEM/FEA**

on

## **PowerMac**

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### **ABSTRACT**

LAPCAD Engineering introduces LapFEA, a logical union of LapCAD and MSC/pal 2. The model is created in LapFEA, complete with connectivities, properties and loads. Then, the analysis is executed with icons in the Solver tool pallet. Post processing and documentation with a word processor is completed from within LapCAD.

## **PROBLEM**

LapCAD users have requested that a solver be available on the Macintosh PowerPC, that provides results that are consistent with the results from MSC/NASTRAN. Preferably that solver would be integrated with LapCAD, in order to provide a seamless interaction between the model creation activity and the solving of the model. These customers create small models that later become part of a larger MSC/NASTRAN model. They also want to take a part of a MSC/NASTRAN model and run this segment stand-alone on the PowerPC.

## **SOLUTION**

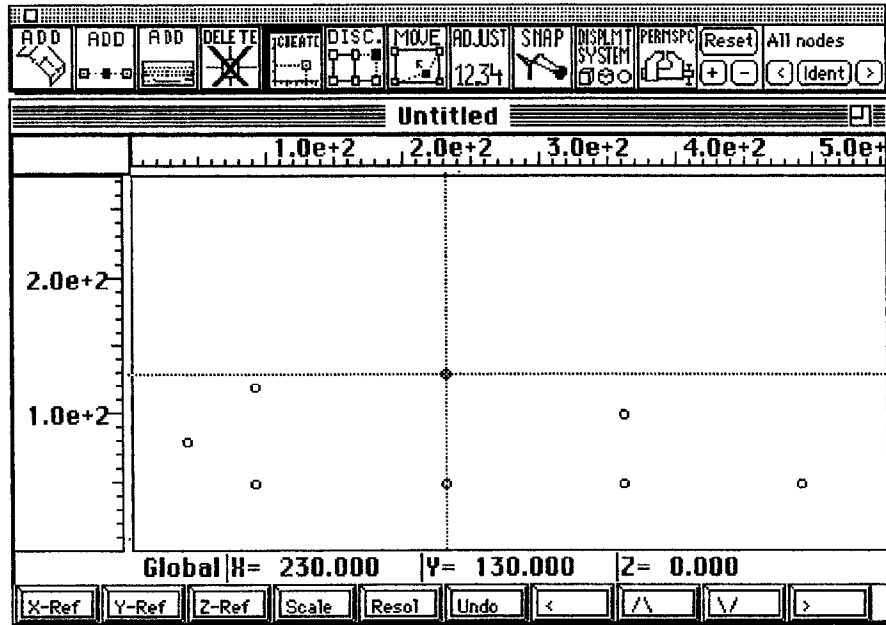
LAPCAD Engineering, with the assistance of The MacNeal-Schwendler Corporation, has integrated MSC's MSC/pal 2 with LapCAD, into an application titled LapFEA. This application imports and exports MSC/pal 2 as well as MSC/NASTRAN ASCII model files.

## **DEMONSTRATION**

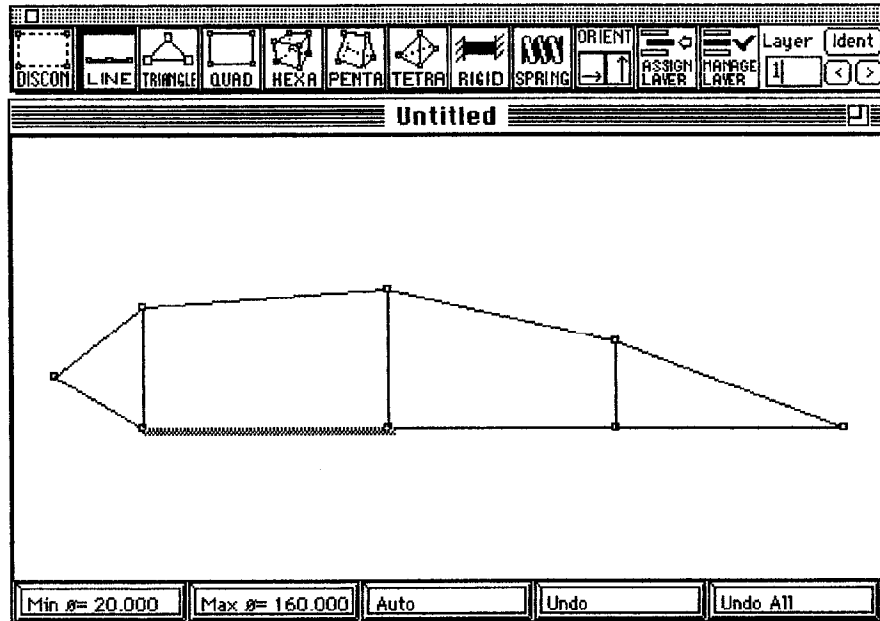
The functionality of this integrated package may be best illustrated with an example. The following task includes the creation (preprocessing) of a wing structure, the solving of the model, and the display of results (postprocessing).

**Preprocessing:**

Nodes are first created via the Node tool pallet:

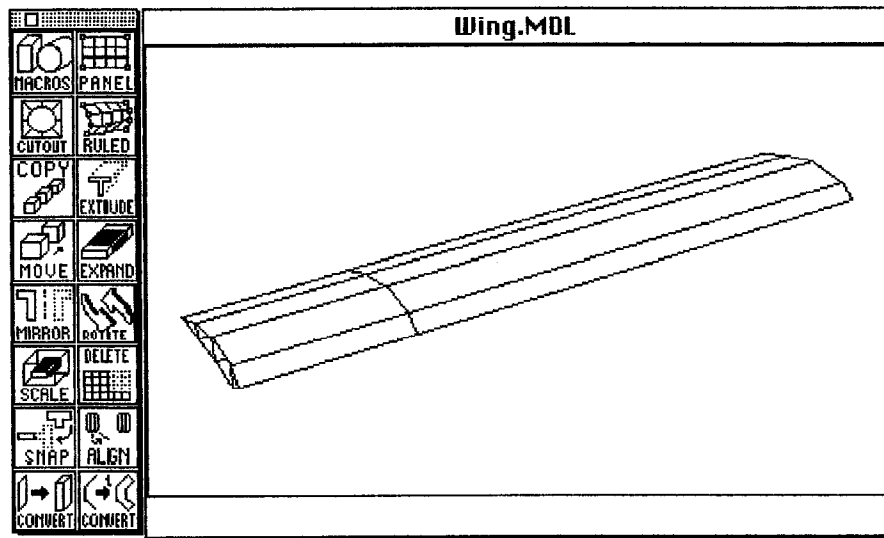


The nodes are connected with lines using the Connectivities tool pallet:

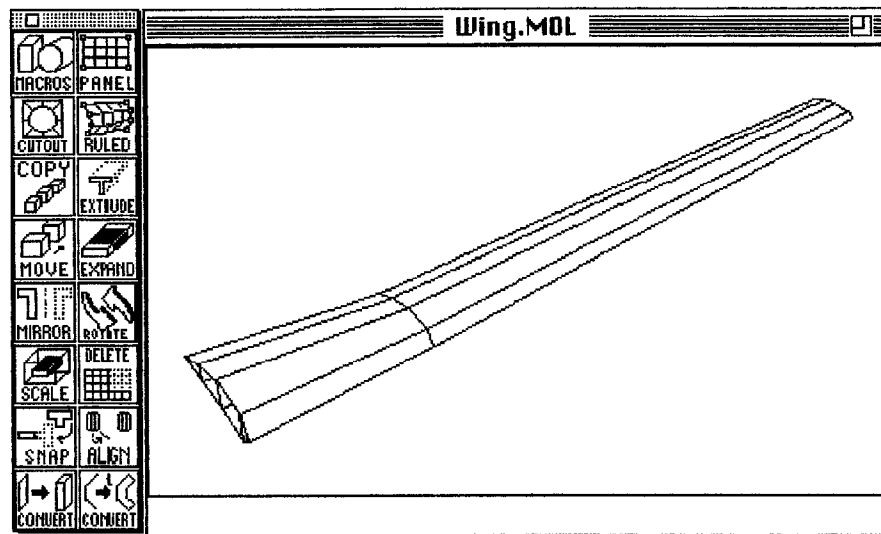


*Preprocessing, continued:*

The profile is extruded into two segments, using the Segment tool pallet:

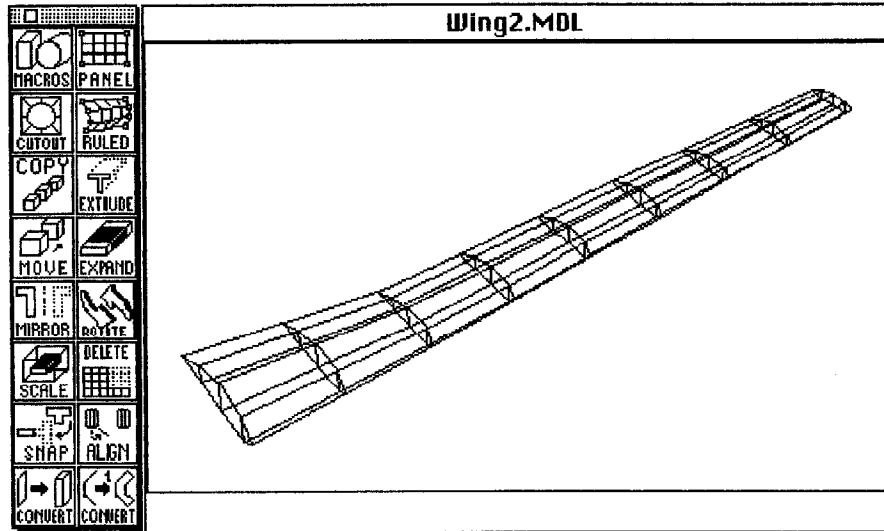


The intermediate and outboard sections are scaled down:

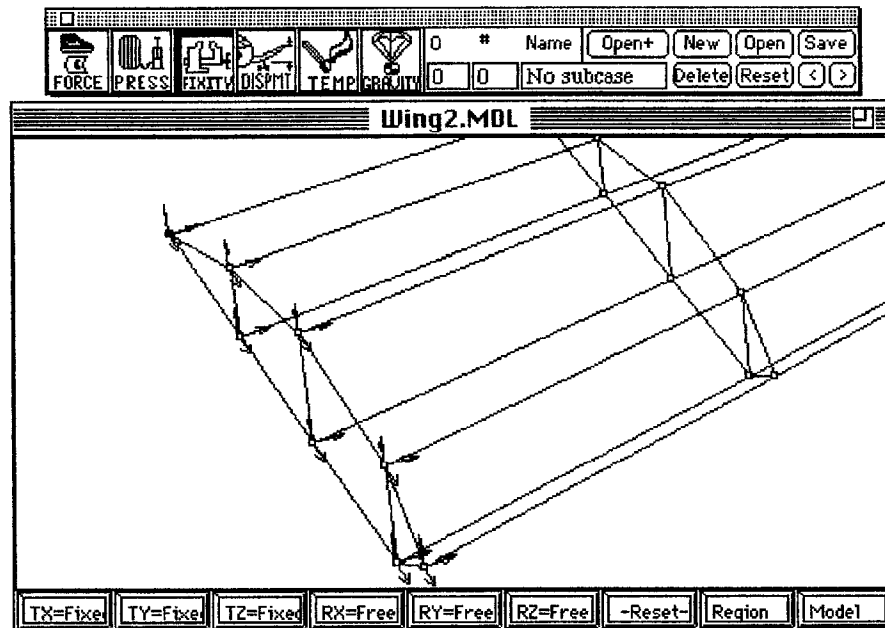


*Preprocessing, continued:*

The two segments are divided up using the QuadEdit tool pallet:

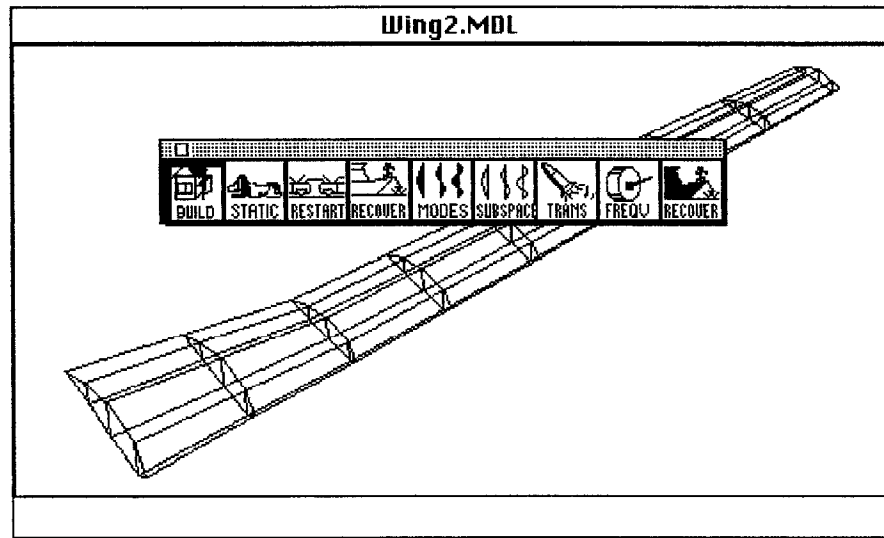


Constraints are applied using the Loads tool pallet:

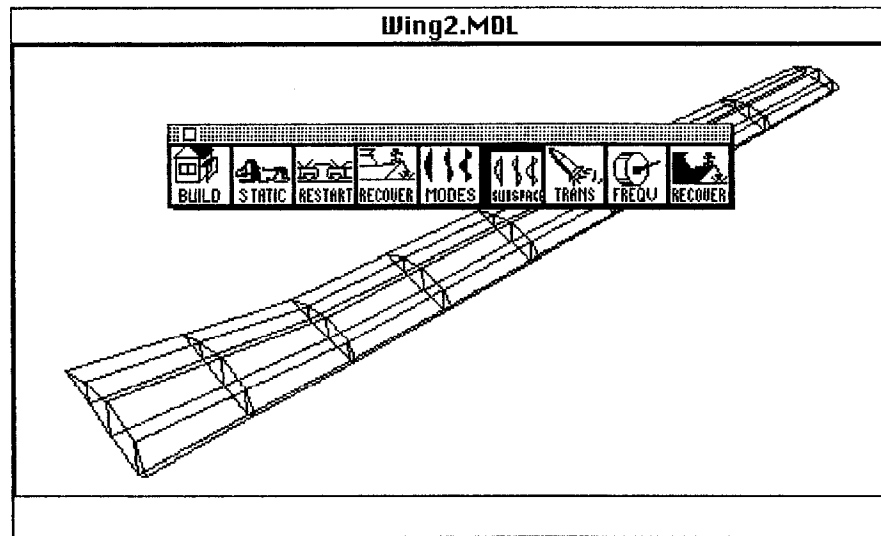


**Solving:**

The solution is initiated via the "BUILD" icon in the Solver tool pallet:

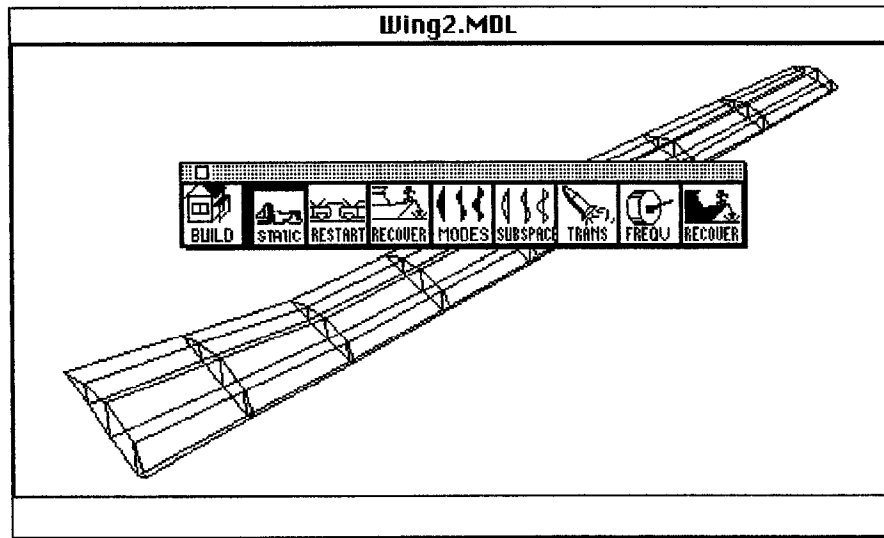


The modal analysis is launched with the "SUBSPACE" icon:

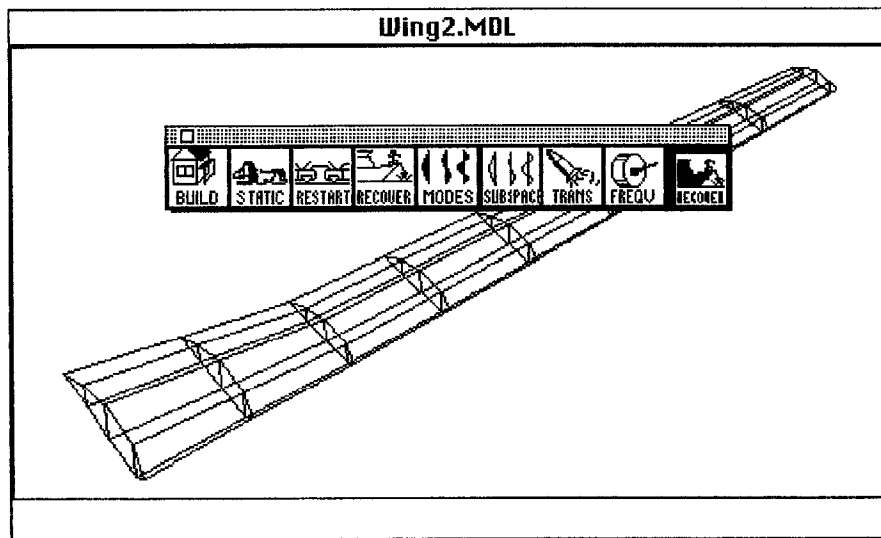


*Solving, continued:*

A static solution is obtained with the "STATIC" icon:

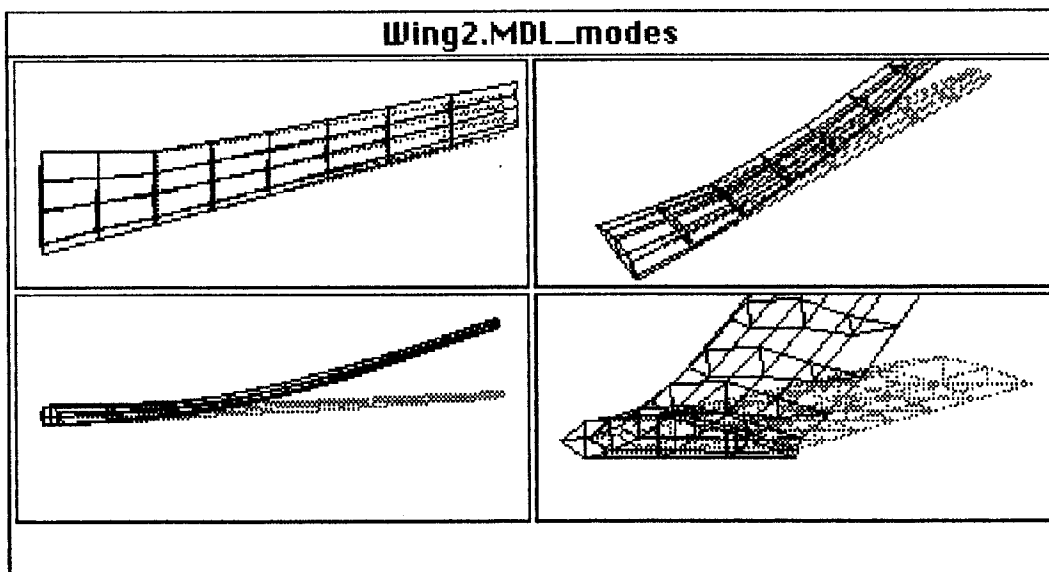
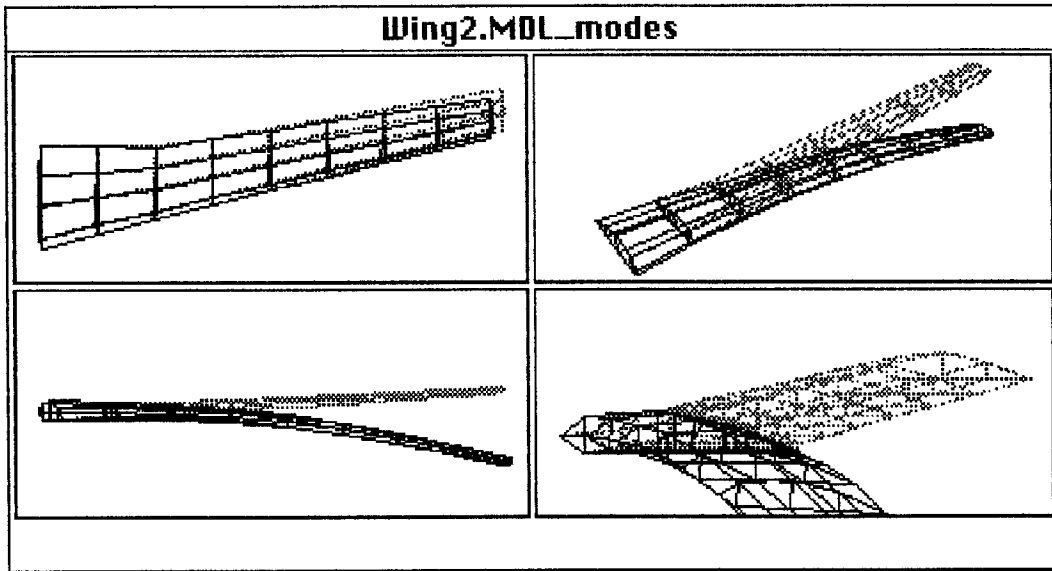


Data recovery is executed with the "RECOVER" icon:



**Postprocessing:**

Shown below are the first and the sixth modes, in four views:



## **SUMMARY AND CONCLUSIONS**

As demonstrated above, the LapFEA application provides the analyst with an easy to use stand-alone application, running on the PowerPC, that can create as well as solve smaller MSC/NASTRAN models, later targeted for the MSC/NASTRAN solver.

## **ACKNOWLEDGEMENTS**

The author gratefully acknowledge the cooperation provided by The MacNeal-Schwendler Corporation, without which this project would not have been possible.

## **REFERENCES**

- [1] MSC/pal 2 User's Manual, Version 3.5, July 1989, The MacNeal-Schwendler Corporation, 815 Colorado Blvd., Los Angeles, CA 90041
- [2] MSC 1990 WORLD USERS CONFERENCE, Proceedings, Volume II, Paper #36. Titled "LAPCAD, A MSC/NASTRAN PRE/POST-PROCESSOR ON THE MACINTOSH", by Gert Lundgren, LAPCAD Engineering.