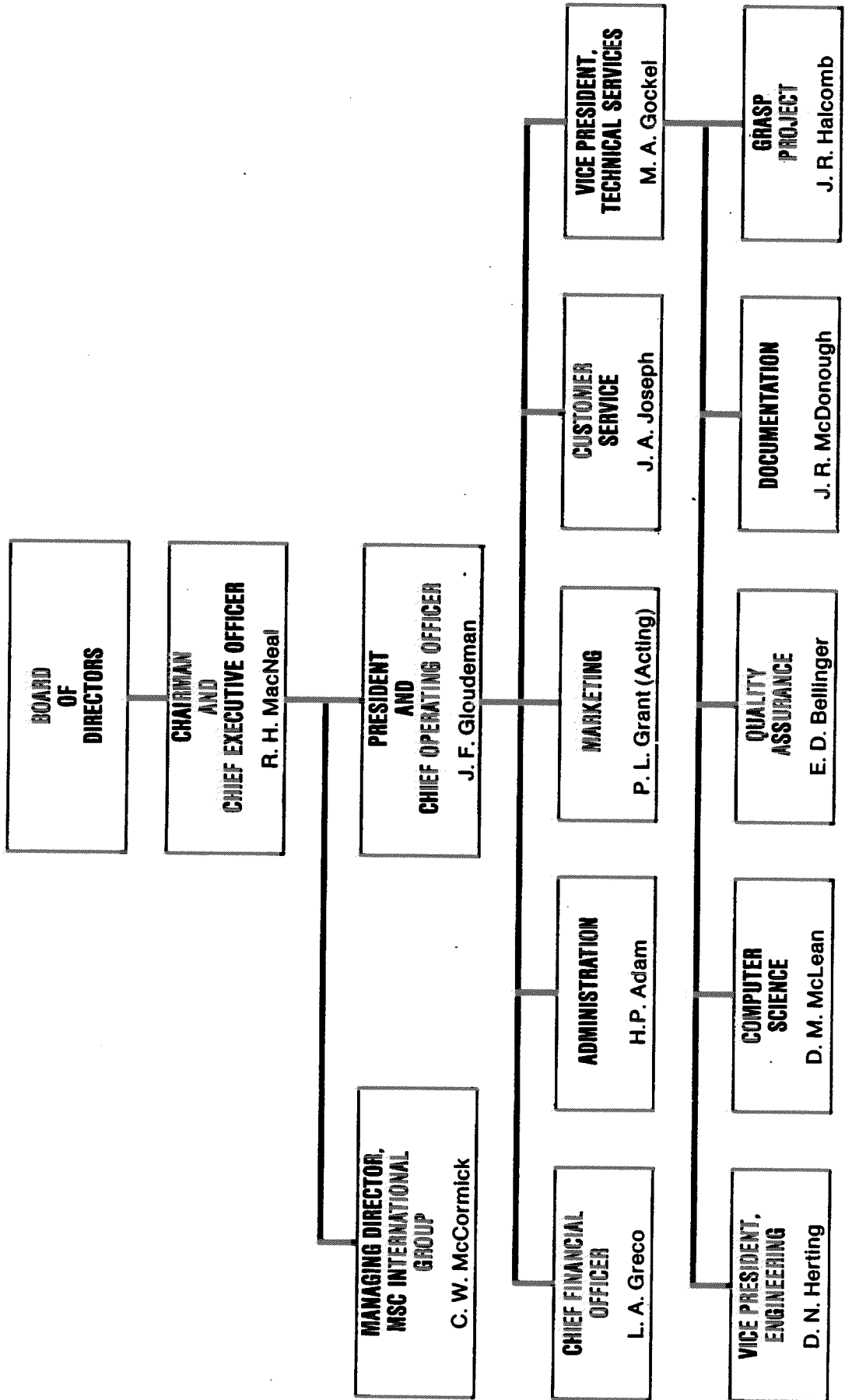


ORGANIZATION STRUCTURE

MARCH 1, 1983



COMPARISON OF ENGINEERING COSTS

YEAR END JANUARY 31		
	1982	1983
CUSTOMER SERVICE	\$ 179,000	\$ 249,000
PRODUCT DEVELOPMENT	912,000	1,437,000
PRODUCT MAINTENANCE	1,194,000	1,379,000

VERSION 63

NEW FEATURE - DESIGN SENSITIVITY

INPUTS

- **Structure Given: Static, Modal, or Buckling Solution**
- **Restart Into Design Sensitivity**
- **List of Design Variables:**
 - **Almost Any Element Property Input Quantity, Some Materials**
 - **Linked Variables In An Element**
 - **Linked Variables Across Elements**

NEW FEATURE - DESIGN SENSITIVITY (Cont.)

INPUTS (Cont.)

- List of Design Constraints:
- Displacement, Stress, or Element Force
- Natural Frequency
- Buckling Load Factor

OUTPUTS

- Table of Actual Constraint Values For Each Load Or Eigenvector
- Design Sensitivity Coefficients For Each Constraint - Load Condition Per Design Variable

NEW FEATURE - DESIGN SENSITIVITY (Cont.)

APPLICATION

- **Quantifies Response And Trends Of Structure To Design Changes**
- **First Step Towards Automated Resizing, Optimization Analysis**

Project Manager: R. S. Lahey

Lead Programmer: D. P. Layfield

**Contributors: D. V. Wallerstein, J. Ou, W. S. Moffitt,
M. L. Caetta**

VERSION 63

ENHANCEMENTS

- **GRASP Phase IA**
- **Nonlinear Analysis Phase III**
- **Plate Element Phase XV**
- **Grid Point Stresses For Solids**
- **Improved Diagnostics For Singularities of Mechanism Type* (C. T. Wilson)**
- **Stresses and Element Forces As Matrices**
- **Matrix Method Enhancements**
- **Improved Diagnostic For Inverse Power* (R. Harder)**

***Not Discussed Further (Project Manager)**

ENHANCEMENTS (Cont.)

- **Rigid Body Shapes in Double Precision (VECPLOT Module)* (D. M. McLean)**
- **Matrix Input For Rectangular Matrices More User – Friendly ("DMIG")* (M. A. Gockel)**
- **Improved Coordinate System Precision* (R. L. Harder)**
- **MSGMESH Enhancements**
- **Plus More Than Fifteen Other Topics**

***Not Discussed Further (Project Manager)**

NEW COMPUTERS

- **CRAY/CTSS - Fall 1982 (H. B. Holmes, H. C. Hodge,
M. T. Fine)**
- **APOLLO - BETA Sites - December 1982
- Version 62A - March 1982
(K. K. Karlsten, W. H. Booth)**

DOCUMENTATION

- **Handbook For Dynamic Analysis (R. H. MacNeal,
M. A. Gockel)**
- **Orders Taken Now**
- **Mail Out In June**

MSC/GRASP

- **Interactive Pre- and Post-Processors**
- **15 Installations, VAX and IBM**
- **Phase IA - Spring 1983**
- **30 Errors Corrected**
- **Color Terminal (RAMTEK 6211)**
- **Apollo Version**
- **Write-thru Feature**
- **Vector Option for Displacements Plot**
- **Display Displacement Numbers at Grid Points**
- **TRIAD Appears on Plots**
- **Grid Point Stresses for Solid Elements in Contour Plots**

MSC/GRASP (Cont.)

- Phase II - Late 1983
- Interactive Model and Data Generation
- Machine to Machine Communication
- Twelve Other Enhancements
- More Color Raster Devices

Project Manager: J. R. Halcomb

Lead Programmer: J. S. San Marco

Current Contributors: R. P. Bilyeu

R. S. Lahey

W. H. Booth

R. H. Lem

C. A. Charlton

D. M. McLean

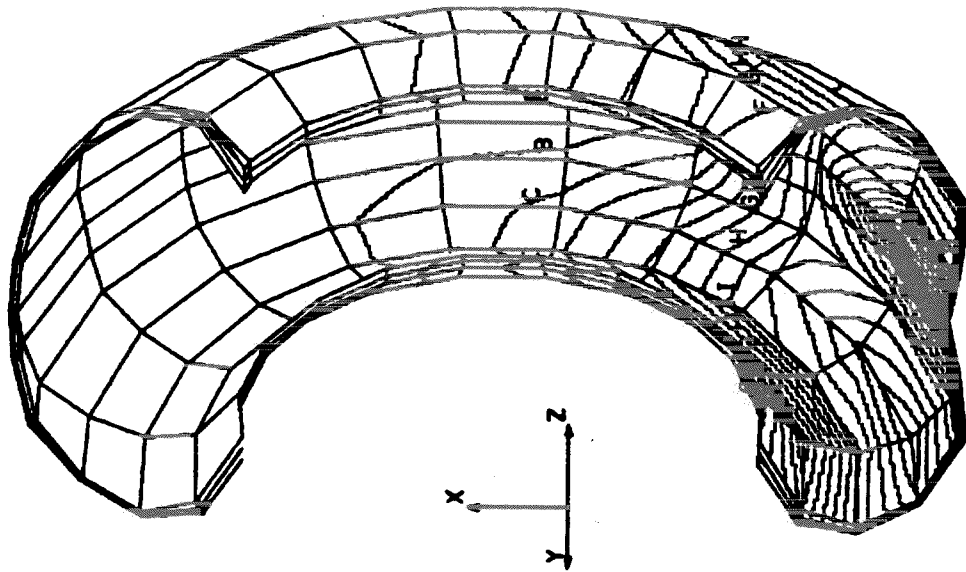
C. W. Hennrich

C. D. Privett

K. K. Karlsten

S. W. Vossler

STRESS CONTOURS ON SOLIDS-TIRE



10-MAR-83 13:28:43

MSC/GRASP (VAX)

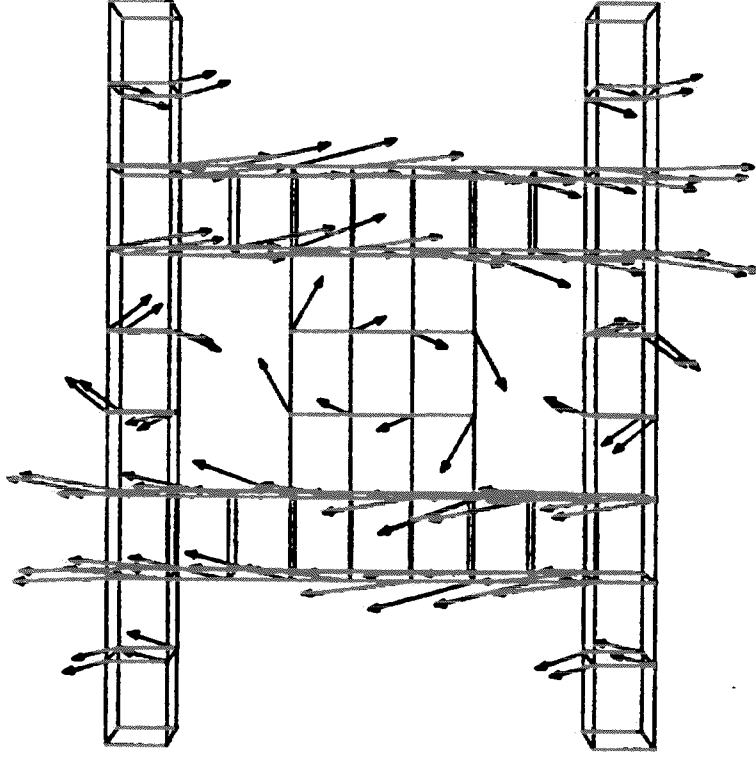
SOLUTION RESULTS FOR
 SUBCASE.....1
 STRESS VOLUME.....2
 MAX DEFORMATION. 2.77-03
 SCALE X,Y,Z... 406.74
 OCT MIN..... 1.30+01
 OCT MAX..... 5.40+03

LEVEL A.....	0.0
LEVEL B.....	2.50+02
LEVEL C.....	5.00+02
LEVEL D.....	7.50+02
LEVEL E.....	1.00+03
LEVEL F.....	1.25+03
LEVEL G.....	1.50+03
LEVEL H.....	1.75+03
LEVEL I.....	2.00+03
LEVEL J.....	2.25+03
LEVEL K.....	2.50+03
LEVEL L.....	2.75+03
LEVEL M.....	3.00+03
LEVEL N.....	3.25+03
LEVEL O.....	3.50+03
LEVEL P.....	3.75+03
LEVEL Q.....	4.00+03
LEVEL R.....	4.25+03
LEVEL S.....	4.50+03
LEVEL T.....	4.75+03
LEVEL U.....	5.00+03
LEVEL V.....	5.25+03
LEVEL W.....	5.50+03

...READY
 >TRI
 COORD SYSTEM(VIEWING)>
 ...READY
 >

NORMAL MODES, SUPERELEMENTS

SOLUTION RESULTS FOR
MODE.....5
EIGENVALUE..... 1.17+07
FREQUENCY..... 545.20
MAX DEFORMATION. 1.20
SCALE X,Y,Z... 10.80
...READY
>



VERSION 63

NONLINEAR ANALYSIS PHASE III

- **Follower Forces in SOL 66 and 99, As Well As SOL 64**
- **Upstream Superelement Data Recovery**
- **Creep Capability**
- **GAP Output Forces**
- **Compatible Restarts With SOL 61, 69 Super-element Solution Sequence**
- **Adjustable Number of Integration Layers For Plates**

NONLINEAR ANALYSIS PHASE III (Cont.)

Project Manager: S. H. Lee

Lead Programmer: K. K. Karlsten

Contributors: M. L. Caetta

R. L. Harder

D. N. Herting

W. S. Moffitt

G. K. Nagendra

C. T. Wilson

VERSION 63

PLATE ELEMENT PHASE XV

- **User-Friendly Offset**
- **Default Z1, Z2**
- **Allow Zero Corner Thickness**
- **User-Friendly Strain and von Mises Output Requests**
- **Plane Strain Option**
- **Most Diagnostics More User-Friendly**
- **Differential Stiffness For Membrane-Only Improved**
- **Anisotropic Materials Allowed For Large Displacements**

PLATE ELEMENT PHASE XV (Cont.)

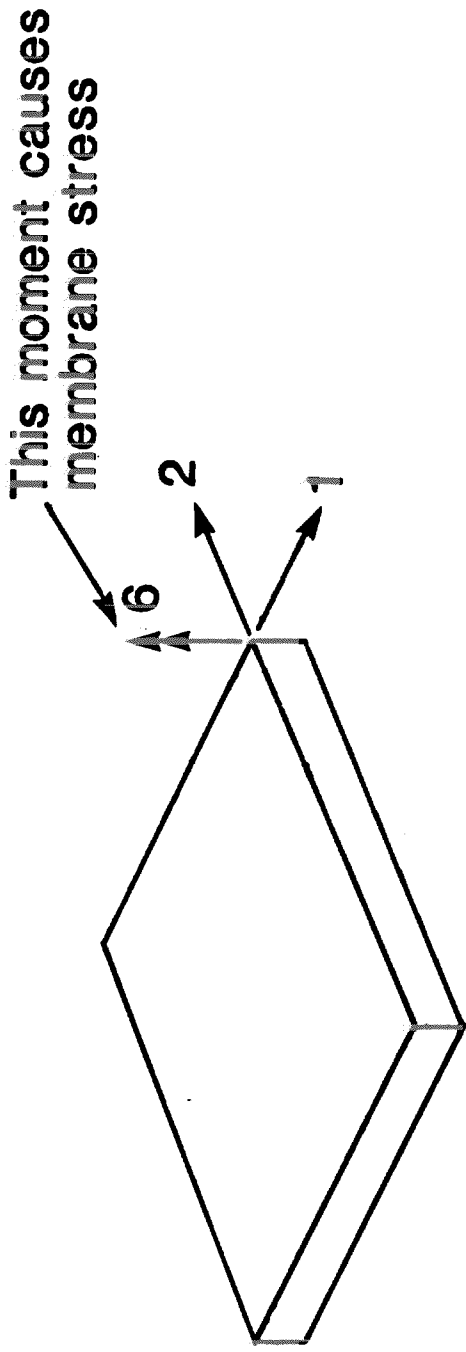
- **Better Theory For Heat Transfer**
- **Shear Factor Changed**
- **Option For Out Of Plane Stiffness**

Project Manager: R. L. Harder

Lead Programmer: G. P. Nagendra

Contributors: K. K. Karlsten, D. M. McLean

PARAM, K6RØT, 1.0



$$\frac{M}{\Theta} = \frac{(10^{-6})(K6RØT) G \cdot \Delta_j \cdot T_i}{2} \frac{(x_p - x_m)^2}{\Delta_j^2}$$

PARAM,K6RØT,1.0 (Cont.)

- **INTENDED FOR:**
 - **Modeling Negligible Stiffness, Especially with Large Displacement Effects In Nonlinear Analysis**
- **NOT INTENDED FOR:**
 - **Reacting Significant Applied Moments**

Part of General Trend Towards More Automatic Modeling, At Some Risk to Rigor

VERSION 63

GRID POINT STRESSES FOR SOLIDS

- **Extension to Plate Element Capability
(Version 61B)**
- **User Defines Elements To Be Used
(VOLUME Card)**
- **Output Printed, May be Used By GRASP for
Contour Plots**

Project Manager: R. S. Lahey
Lead Programmer: D. P. Layfield

VERSION 63

DISPLACEMENTS, SPC FORCES, STRESSES, AND ELEMENT FORCES AS STANDARD MATRICES

- **DRMS1 Module Accepts Output ("OFF") Tables**
- **It Outputs Matrices of Output Quantities**
- **Each Column Corresponds to a Loading Condition**
- **Each Row Corresponds to An Element Stress Or Force, Or A Grid Point Variable**
- **A Table is Created, Correlating Row Number With Element Type, Output Quantity**

DISPLACEMENTS, SPC FORCES, STRESSES, AND ELEMENT FORCES AS STANDARD MATRICES (Cont.)

- **This Allows Linear Combinations, Other Matrix Operations**
- **One Application Is Load Transformation Matrices**

Project Manager: S. H. Lee

Lead Programmer: J. Ou

VERSION 63

MATRIX METHODS PHASE XXX

- **Sequencer Efficiency With Spill Improved**
- **Method 1 MPYAD Take Advantage Of String Logic**
- **FBS Method IA – Improved String Logic**

Project Manager: C. W. McCormick

Lead Programmer: K. H. Redner

Version 64: L. Komzsik

VERSION 63

MSGMESH ENHANCEMENTS

- **EDGER Card – More Convenient Boundary Lines**
- **More Reliable Auto Equiv, With Enhanced Diagnostics**
- **SETG Card, Defines ASETS, CYJOIN, etc.**

Project Manager: L. N. Peterson

CURRENT PROJECTS

- **New Strain Functions For Isoparametric Plates**
- **Static Aeroelasticity**
- **Nonlinear Phase IV**
- **Heat Transfer TRIAX6**
- **Design Sensitivity Phase II**
- **Output Strains For Solid Elements**
- **User Link for IBM**
- **Generalized Structural Coordinates**
- **Failure Due To Limit Stress/Strain**
- **Rigid Element With Element-Aligned Releases**
- **Field Elements**

CURRENT PROJECTS (Cont.)

- **Heat Transfer in SOL 66, 99**
- **Rigid Element With Large Displacement Capability, Improved GAP Element**
- **Update Subspace Iteration RFAIter**
- **Convert Most Single-Precision Code to Double Precision**
- **Improve Efficiency of ADD, MERGE, PARTITION Modules**
- **Sturm Sequence Built Into Inverse Power Algorithm**

CURRENT PROJECTS (Cont.)

- **New Complex Eigenvalue Option**
- **Householder Transformation**
- **Elastic and Viscoelastic Material**

NEW COMPUTERS

- **FPS/164 (R. P. Bilyeu, J. Ou) - Late 1983**
- **CDC/NOS/800 SERIES (R. P. Bilyeu) - Summer 1983**

A LONG-TERM CURRENT PROJECT

EXECUTIVE SYSTEM ENHANCEMENTS

GOALS

- **Support Automatic Restart In All Solution Sequences**
- **Introduce New Modules In Upward Compatible Manner**
- **Replace Sequential Data Storage With Direct Access**
- **Maintain The Viability of MSC/NASTRAN**

EXECUTIVE SYSTEM ENHANCEMENTS (Cont.)

SCHEDULE

- Internal Version In Parallel With Version 64
- Deliver With A Later Version, After Thorough Shake Down

Current Team: J. C. Hodge, D. P. Layfield,
C. T. Wilson

CURRENT DOCUMENTATION PROJECTS

- **MSC/NASTRAN Handbook for Nonlinear Analysis**
- **MSC/NASTRAN Handbook For Thermal Analysis**
- **MSC/NASTRAN Handbook for DMAP Analysis**