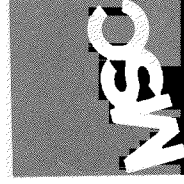


STATUS OF MSC PRODUCTS, 1986

M. A. Gockel

Vice President, Technical Services



TOPICS

- **VERSION 66 PREVIEW (CODE IN PLACE)**
- **VERSION 65 REVIEW**
- **MSC/GRASP STATUS**
- **MSC PC PRODUCT STATUS**
- **ENHANCEMENT STATUS**
- **COMPUTERS SUPPORTED**
- **DOCUMENTATION STATUS**

VERSION 66 PREVIEW

NEW FEATURE - NEW EXECUTIVE SYSTEM

- **Supports Automatic Restart in All Solution Sequences**
- **Introduces New Modules in Upward Compatible Manner, Regarding Restart**
- **Replaces Sequential Data Storage with Direct Access**
- **Maintain the Viability of MSC/NASTRAN for New Architectures, Parallel Processing**
- **First Step in Project Data Management**
- **Will Be Discussed in Detail in Later Paper**

NEW EXECUTIVE SYSTEM, (Cont.)

STATUS AS OF MARCH 1986

- **Able to Compile DMAPS**
- **Able to Run Small Problems**

PRESENT PLANS

- **Deliver in V66**
- **Seeking Partners for Beta Site, Joint Developments of Other Software
Based on New Executive - New Data Base**

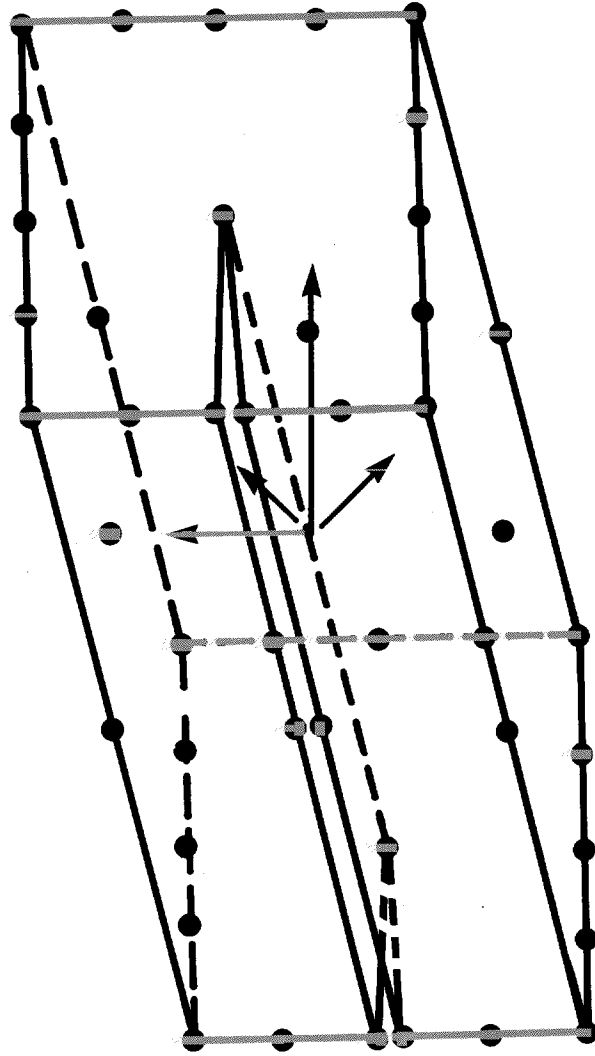
NEW EXECUTIVE SYSTEM, (Cont.)

Project Manager: D. V. Wallerstein

**Contributors: J. C. Hodge, D. P. Layfield, C. T. Wilson,
M. E. Markovitz, W. F. Hart, M. A. Reymond,
T. L. Bock, P. A. Zelinski, S. Wilder, J. Ou**

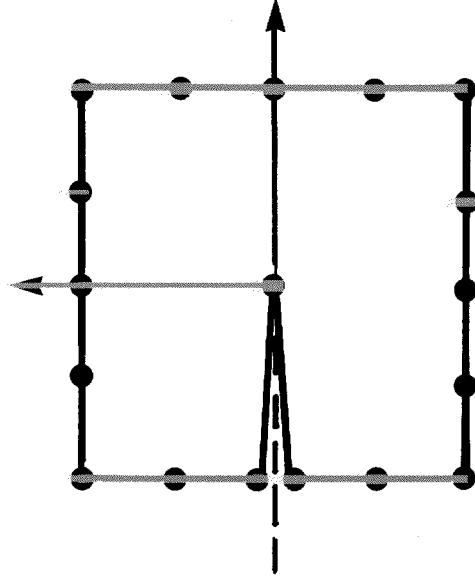
VERSION 66

CRACK TIP ELEMENT



VERSION 66

CRACK TIP ELEMENT, (Cont.)



VERSION 66

CRACK TIP ELEMENT, (Cont.)

- **Mode 1 and Mode 2 Stress Intensity Factors**
- **Linear Elastic**
- **Funding Being Sought for General Nonlinear Capability, J Integral, Other Types of Singularities**

Project Manager: K. Izadpanah

Contributors: D. P. Layfield, D. V. Wallerstein
Anamet Labs: D. Woytowitz, R. Arnold, J. Parehk,
R. Citerly

VERSION 66

REAL EIGENSOLUTION, LANCZOS METHOD, PHASE II

- **Improved Shift Logic for Widely Separated Modes**
- **Use Rigid Body Modes From “SUPPORT”, Reliably**
- **Use Modes From Prior Run on Restart, Reliably**
- **Use User-Supplied Vectors to Increase Efficiency**

Project Manager: L. Komzsik

Contributors: G. A. Dilley

BCS: J. G. Lewis, H. D. Simon, R. G. Grimes

VERSION 66

MODERNIZE TRIAX6 AXISYMMETRIC ELEMENT

- **Isoparametric Theory, Like Other Elements**
- **Heat Transfer Capability**
- **More Convenient Pressure Load Input**
- **Non-Upward Compatible if Mid-Side Nodes Not at Edge Centers, Mass (Like Other Modern Elements)**
- **Will Obsolete TRAPARG, TRIARG Axisymmetric Elements**

Project Manager: G. K. Nagendra

Contributor: W. F. Hart

NONLINEAR ANALYSIS, PHASE VI

- **Displacement Control for Nonlinear Analysis**
- **Provides Stable Solution in Post-Buckled State**
- **Carry Forward Version 65 Enhancements for Static Analysis (SOL 66) to Nonlinear Analysis (SOL 99)**
 - **Stiffness Update Strategy**
 - **Line-Search Method**
 - **QN Method**
- **Continuing Cleanup**

Project Manager: S. H. Lee

Contributors: R. L. Harder, T. L. Bock, G. A. Dille, K. O. Kim

DESIGN SENSITIVITY FOR COMPOSITE ANALYSIS

- **Design Variables May Be:**
 - **Laminar Thickness**
 - **Orientation Angles**
 - **Material Properties**
 - **Combinations**

- **Design Constraints**
 - **Laminar Stresses**
 - **Failure Indices**

Project Manager: G. K. Nagendra

Contributor: D. P. Layfield

VERSION 66

COMPLEX EIGENSOLUTIONS FOR LARGE PROBLEMS

- **Hessenberg Method, with Efficient Spill**
- **Improved Numerical Stability**
- **Uses Householder Rotations**
- **User Interface Unchanged**

Project Manager: L. Komzsik

Contributors: G. A. Diley, B. J. Blumberg

PARALLEL PROCESSING IN MSC PRODUCTS

Approach: Make Methods Portable Across Different Machines

Available: Some Prototype Subroutines

Some Computers, V65, Available on Request

- **Forward-Backward Solutions of Linear Equations ("FBS")**
- **Householder Reduction ("READ")**

PARALLEL PROCESSING IN MSC PRODUCTS (Cont.)

DESIGNS COMPLETED

- **Decomposition or Linear Solution ("DECOMP")**

STATUS

- **Waiting for Right Machine, Client Requests**
- **Homework Underway**

Project Manager: L. Komzsik

Contributors: B. J. Blumberg, H. B. Holmes

VERSION 65 REVIEW

- **Approximately 20% Shipped to Clients As Of March 1986**
- **Remainder to be Shipped This Year**
- **MSC/NASTRAN II Being Shipped Now**
- **Real Eigensolution, Lanczos Method, Phase I Works Well on Vector Processors**
- **Four Other Eigensolution Enhancements**
- **Nonlinear Phase V**
 - Improved Restarts**
 - Bilateral Uniaxial Material Property**
 - Composite Beam Element**
- **Six Other Major Enhancements**

MSC/GRASP VERSION III

- **VAX, APOLLO Being Shipped Now**
- **Remainder to be Shipped This Year**
- **Complete Input Generator**
 - **Static and Normal Modes Analysis**
- **Simultaneously Create and Display**
 - **View Graphical Displays as Data is Entered**
- **TEKTRONIX Color Raster Devices**
 - **Models 4106, -07, -09, -11, -13, -15**
- **IGES V 2.0, 3.0 Compatibility**
 - **Translate Finite Element MESH from Neutral to MSC/NASTRAN Format**
- **“Bulk” Processor Puts More Card Types into GRASP Data Base, to be Passed on to MSC/NASTRAN**

MSC/GRASP VERSION III, (Cont.)

Grid Points, Elements, Properties, Loads and Constraints

- **CADAM Interface In Development**
 - **Convert Bulk Data Decks to CADAM Drawings**
 - **Convert CADAM Drawings to Bulk Data Decks**
 - **Post-Process in CADAM, Using Present GRASP III Technology**

Project Manager: K. K. Karlsten

Lead Programmer: J. San Marco

Contributors: C. A. Charlton, M. A. Charlton, A. S. Amurao

MSC PC PRODUCT STATUS

IN FIELD USE SINCE

**MSC/Pal - Introductory F. E. Package - Interactive
Floppy Disk** **Oct 84**

**MSC/Pal 2 - Advanced Version - Larger Size,
More Elements Hard Disk - AT** **Oct 85**

MSC/CASE - Solves Many Structures Equations **Aug 85**

MSC/MATE - Matrix Algebra Solver **Oct 85**

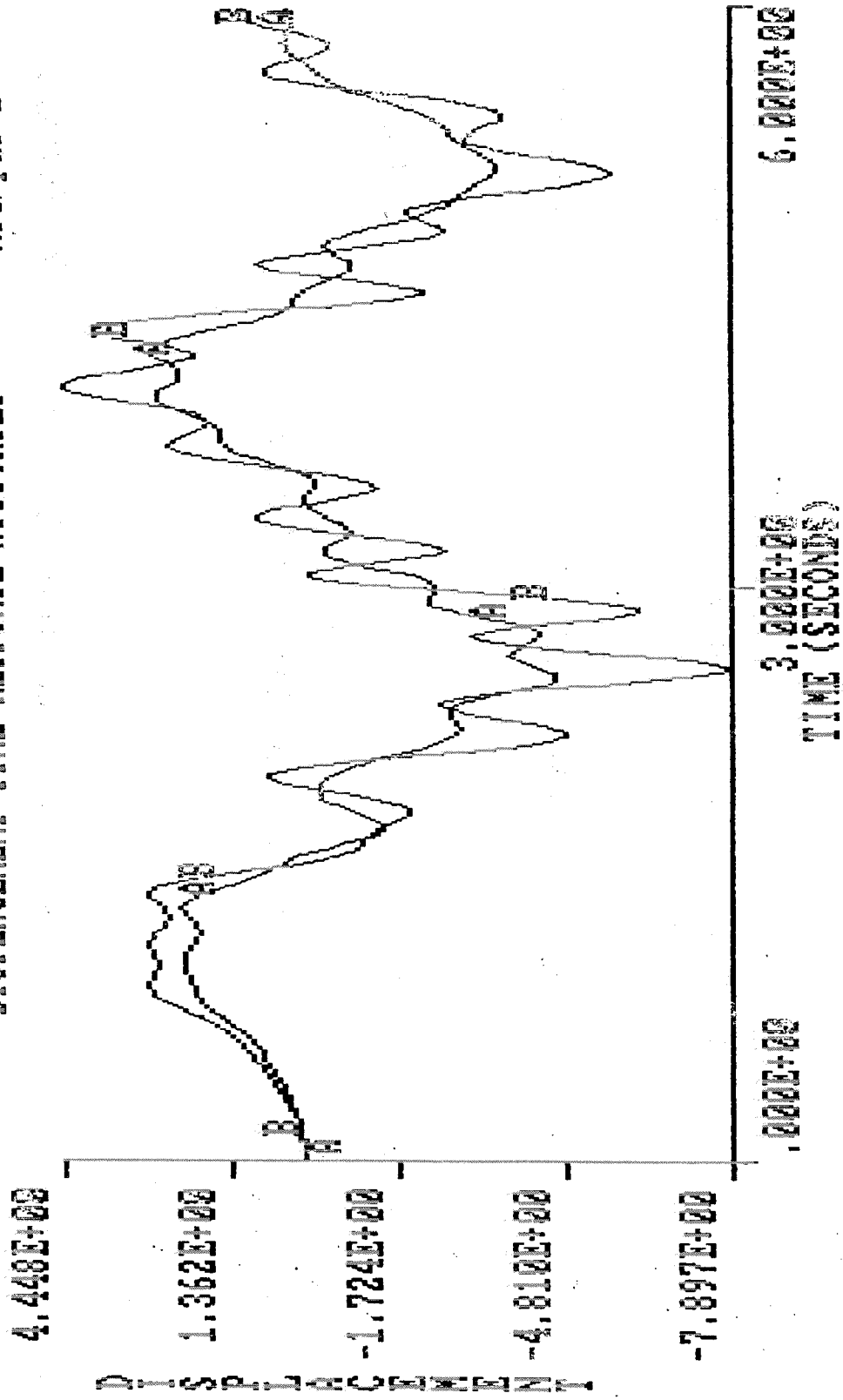
Brochures at Back Of Room

Product Manager: R. S. Lahey

**Contributors: K. D. Blakely, J. R. Halcomb, W. K. Ho, L. Y. Huang,
R. Lentz, R. E. Louwers, W. S. Moffitt**

Colleagues: Dan Schiavello, Frank Potts, John Robinson

DISPLACEMENT-TIME RESPONSE HISTORIES MSC/pal 2

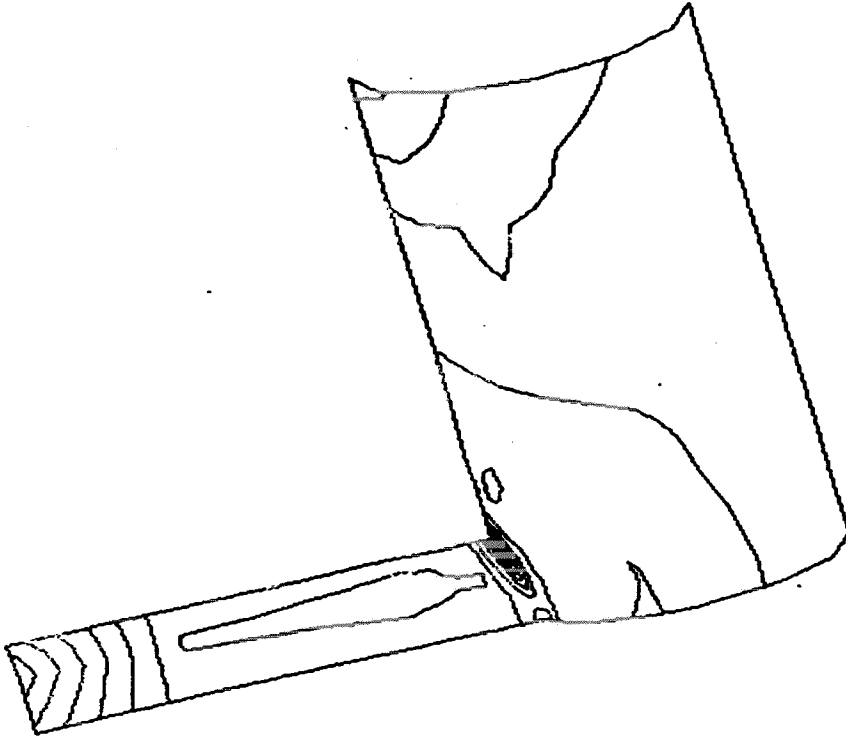


A=TX DISP 1 B=TX DISP 33 C= D= E=
 SCALE= 1.00E+00 SCALE= 1.00E+00 SCALE= 1.00E+00 SCALE= 1.00E+00

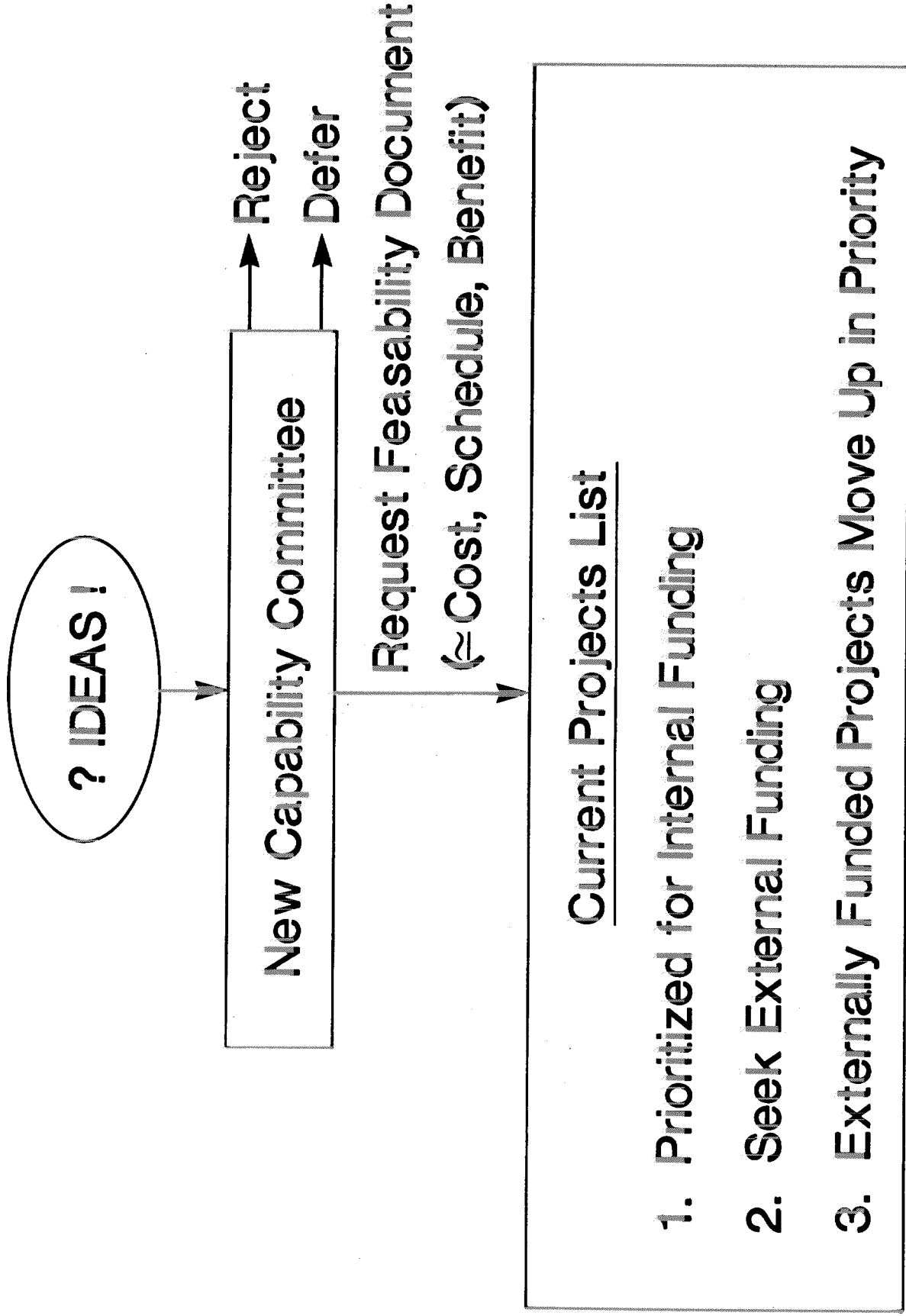
CONTOUR PLOT

- F1 MAJOR STRESS
- F2 MINOR STRESS
- F3 MAXIMUM SHEAR
- F4 CONTOUR OPT.
- F5 MISES STRESS
- F6 USER FILE
- F7 SUBCASE
- F8 TRANSL. DEFL.
- F9 ROTAT. DEFL.
- F10 RETURN

STRESS CONTOUR PLOT (VON-MISES)



MSC/NASTRAN ENHANCEMENT FLOW



MSC/NASTRAN ENHANCEMENT FLOW (Cont.)

DELIVERY OPTIONS

- **Custom MSC/NASTRAN Now Available**
 - **Primarily for “Local” Enhancements**
 - **Faster Delivery – Higher Cost**
- **Delivery in Next Field Version**
 - **Two-Year Delivery – Lower Cost**

CURRENT PROJECTS, IN ORDER OF PRIORITY

- **New Strain Functions For Isoparametric Plates V66**
- **Heat Transfer TRIAX6, V66**
- **Optimization**
- **Output Strains For Solid Elements V65**
- **Generalized Structural Coordinates**
- **Failure Due To Limit Stress/Strain**
- **Rigid Element With Element-Aligned Releases**
- **Field Elements (Electromagnetics)**

CURRENT PROJECTS (Cont.)

- **Heat Transfer in SOL 66, 99**
- **Rigid Element With Large Displacement Capability, Improved GAP Element**
- **Convert Most Single-Precision Code to Double Precision**
- **Improve Efficiency of ADD, MERGE, PARTITION, Modules**

CURRENT PROJECTS (Cont.)

- **Improved GAP Element**
- **Batch Plotter Update**
- **Enhanced Solution Support, 99, H.T., Cyclic**
- **Enhanced GRASP Support Composites, Image Superelements**
- **Improve Sequencer-Superelement Interface**
- **User Link for All Applicable Computers**
- **Indefinite Matrix Linear Equation Solution**

CURRENT PROJECTS (Cont.)

- **New Complex Eigenvalue Option V66
(New Hessenberg with Spill, Improved Accuracy) Client Funded**
- **Elastic and Viscoelastic Material**
- **Uniform Output Capabilities**
- **Secondary Superelement Enhancements**
- **Complex GPFDR Module (ESE, GPFO)**
- **Enforced Motion, Initial Conditions, for Modal Analysis**

CURRENT PROJECTS (Cont.)

- **Uniform Output Capabilities**
- **Prototype Expert System**
- **Complex Lanczos Eigensolution**
- **Displacement Control for Nonlinear Statics ("Snap-Thru")**
- **"p" Version of Finite Elements (Research)**
- **Design Model (Research)**
- **Large Strain Elements**

CURRENT PROJECTS (Cont.)

- **Temperature-Dependent Material Constants**
- **Smearred Crack Element (Model Concrete)**
- **Initial Strain in Nonlinear Analysis**
- **Tension-Only Membrane**
- **Self-Adaptive Time Increment in SOL 99**
- **Self-Adaptive Load Increment in SOL 66**
- **Follower Forces in SOL 99**

NEW COMPUTERS OR OPERATING SYSTEMS

Type	Status
Hewlett Packard/9000 B. N. Casey, G. A. Dilley	Available
PRIME C. D. Privett, A. B. Boyadjian	Available
IBM VM/CMS M. L. Caetta, M. A. Reymond	Available
IBM MVS/XA/VF H. B. Holmes, A. B. Boyadjian	Available
CYBER NOS/VE J. Ou, K. O. Klim	Available
ELXSI R. Pyle, F. J. Astudillo	Available

If This is Not the Next Generation of Computers, We Are at Least Seeing Nephews

UNIQUE VERSIONS OF MSC/NASTRAN, MSC/GRASP

PRODUCTION SYSTEMS

1. APOLLO X20, SR8 (G)
2. APOLLO X60, SR8 (G)
3. APOLLO X60, SR9, (G), (+II)
4. APOLLO 68020, SR9 (G)
5. CDC NOS
6. CDC NOS/VE
7. CRAY/1S/COS
8. CRAY/XMP/COS
9. CRAY/1S/CTSS
10. DATA GENERAL
11. ELXSI 6400
12. FPS X64
13. HP 9000 1500
14. IBM/MVS (G)
15. IBM VM/CMS (G)
16. IBM/XA/VF (G)
17. PRIME 50
18. SPERRY/FIELDDATA
19. VAX (G), (+II)
1. AMDAHL/FUJITSU/SIEMENS VP
2. CONVEX/C1
3. CRAY/2/CTSS
4. CRAY/X-MP/UNIX
5. ETA-10 (CDC CYBER 205)
6. IBM RT/PC (II)
7. MASSCOMP (II)
8. NAS 91XX VP
9. RIDGE 32
10. SPERRY/ASCII

KEY

(G) GRASP Available

(II) MSC/NASTRAN/II Only, at Present - Linear NASTRAN + GRASP/III

(+II) MSC/NASTRAN/II Available Also, on Workstation - Class Only

NEW DOCUMENTATION

- **Demonstration Problem Manual V64 (JRH)**
- **Verification Problem Manual V64 (EDB)**
- **Theoretical Manual (DVW) ***
- **MSC/GRASP User's Manual V3 (JSM)**
- **Linear Handbook Update (GAD)**

*** Two More Subsections of Theoretical Manual in Application Manual Section 1.3. Will Deliver More This Year.**