STATUS OF MSC PRODUCTS, 1984

M. A. Gockel

Vice President, Technical Services

VERSION 64

NEW FEATURE - STATIC AEROELASTICITY

Inputs

- Structural Model
- State of Flight (Airspeed, etc.)
- Aerodynamic Elements
- Static Loads (Option)
- Trim Variables (Angle of Attack, g Factor, etc.)

NEW FEATURE – STATIC AEROELASTICITY (Cont.)

Outputs

- Aerodynamic Forces and Pressures
- Stability and Control Derivatives
- Unconstrained Trim Variables
- All Structural Outputs (Static Analysis)

Project Manager: C. T. Wilson

Lead Programmer: L. Komzsik

Contributors: E. D. Bellinger, T. L. Bock, G. A. Dilley, D. N. Herting, W. P. Rodden

VERSION 64

NEW FEATURE – MODERN TETRAHEDRON ELEMENT

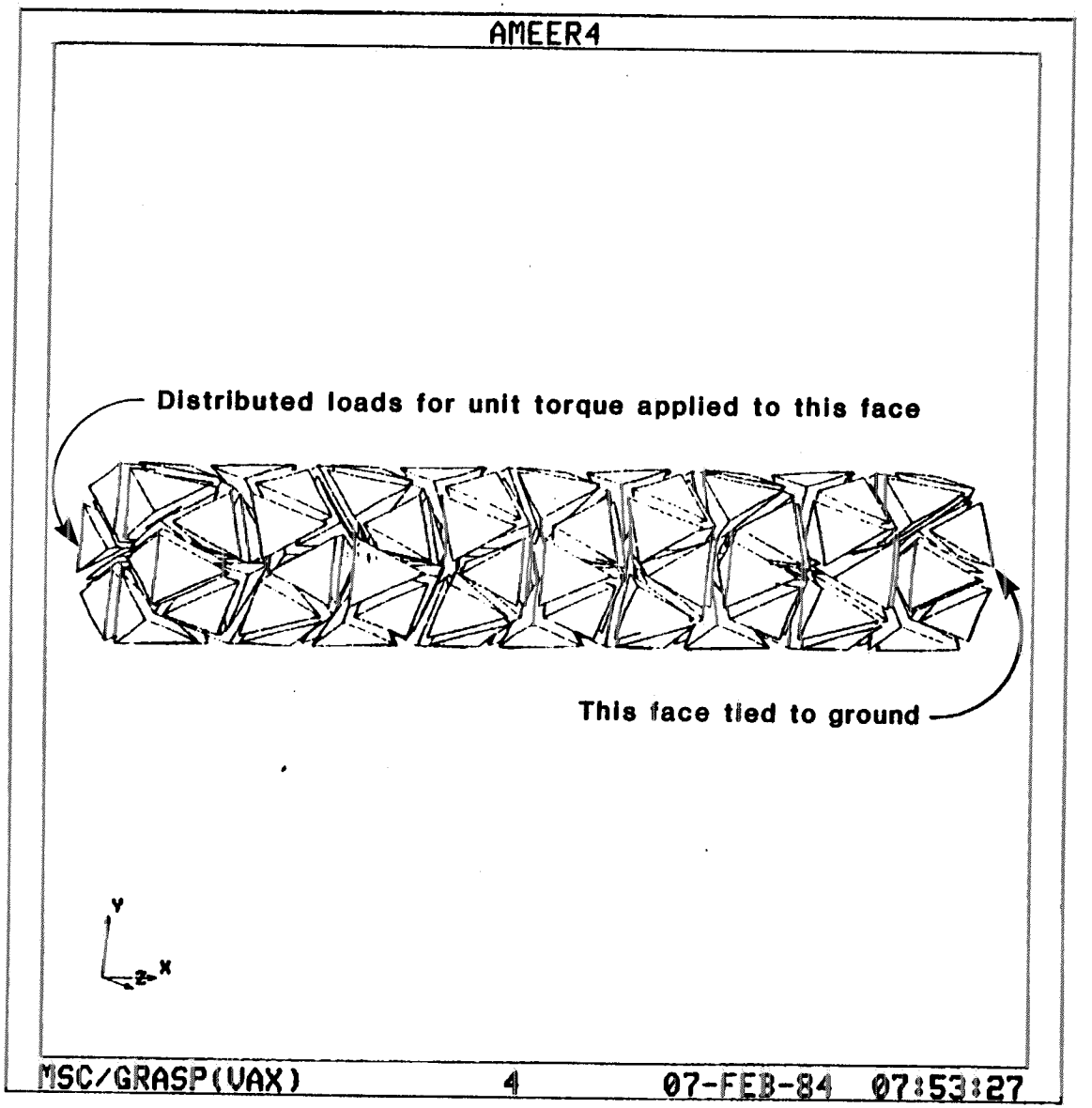
- Complements HEXA, PENTA
- Isoparametric, Midside Nodes
- Design Intent Is Full Implementation
- Uses Old CTETRA Card. Change MAT ID to PSØLID ID.

Project Manager: T. E. Wolverton
Lead Programmer: G. K. Nagendra
Contributors: R. L. Harder, S. H. Lee, W. S. Moffitt

SHAFT MADE FROM TETRA ELEMENTS

Results of Cantilevered Torsion Test

Stress at 3/4 radius, root within 3.6% of theoretical result, simple theory.



VERSION 64

ENHANCEMENTS

- Nonlinear Phase IV
- Interactive Model Generation in MSC/GRASP
- Sturm Sequence Built Into Inverse Power Algorithm
- Householder Tridiagonalization Method for Eigensolution
- Geometric Pressure Load Variation from MSGMESH
- Replicate Continuation Cards (RPB)
- More than 10 Other TOPICS

VERSION 64

NONLINEAR ANALYSIS PHASE IV

- Nonlinear and Linear Output Files Merged (SØL 66)
- Improved Quasi-Newton and Line Search Methods (SØLS 66, 99)
- Data Recovery Has Improved Labeling, Redundant Output Has Been Eliminated, Built-In, Contour Plots for Stress, XY Plots of Output Vs. Load Step

NONLINEAR ANALYSIS PHASE IV (Cont.)

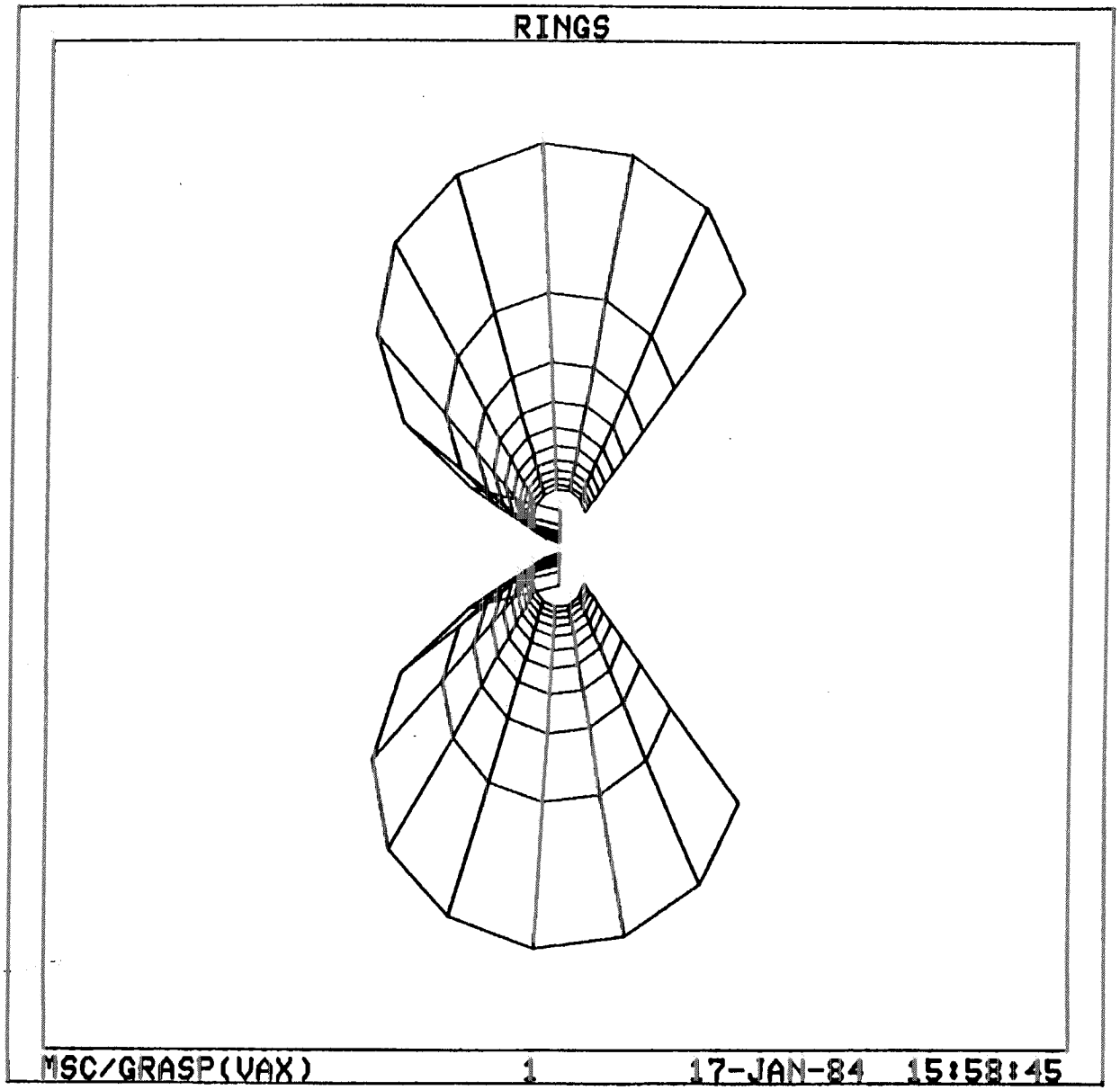
- Transient Analysis Allows Initial Conditions, Extra Points, NØLINi Cards (SØL 99)
- More than 10 "Clean-Up" Enhancements

Project Manager:	S. H. Lee
Lead Programmer:	G. K. Nagendra
Contributors:	T. L. Bock, D. N. Herting, K. K. Karlsten, D. M. McLean, W. S. Moffitt

MSC/GRASP

- Interactive Model and Data Generation
- Output
  - Pen Plotter
  - Printer Text
  - Bulk Data Deck
- Apollo DN-600 Color Raster
- More than Ten Minor Enhancements

Branch Manager: J. R. Halcomb
Lead Programmer: J. S. San Marco
Current Contributors: W. H. Booth, C. A. Charlton, K. K. Karlsten, L. Komzsik, D. M. McLean, C. D. Privett


RINGS
MSC/GRASP(VAX)
1
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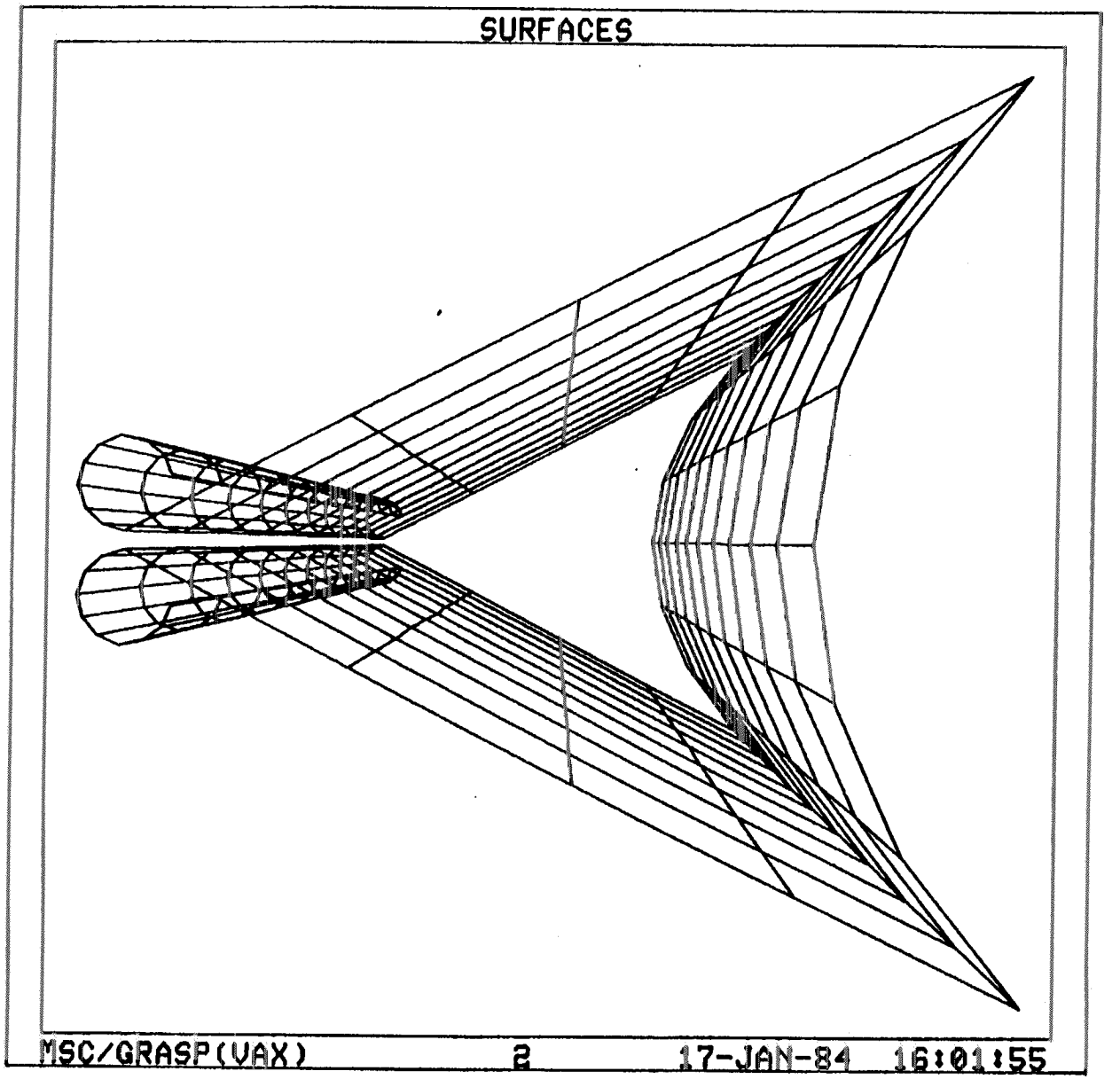
SURFACES
MSC/GRASP(VAX)
2
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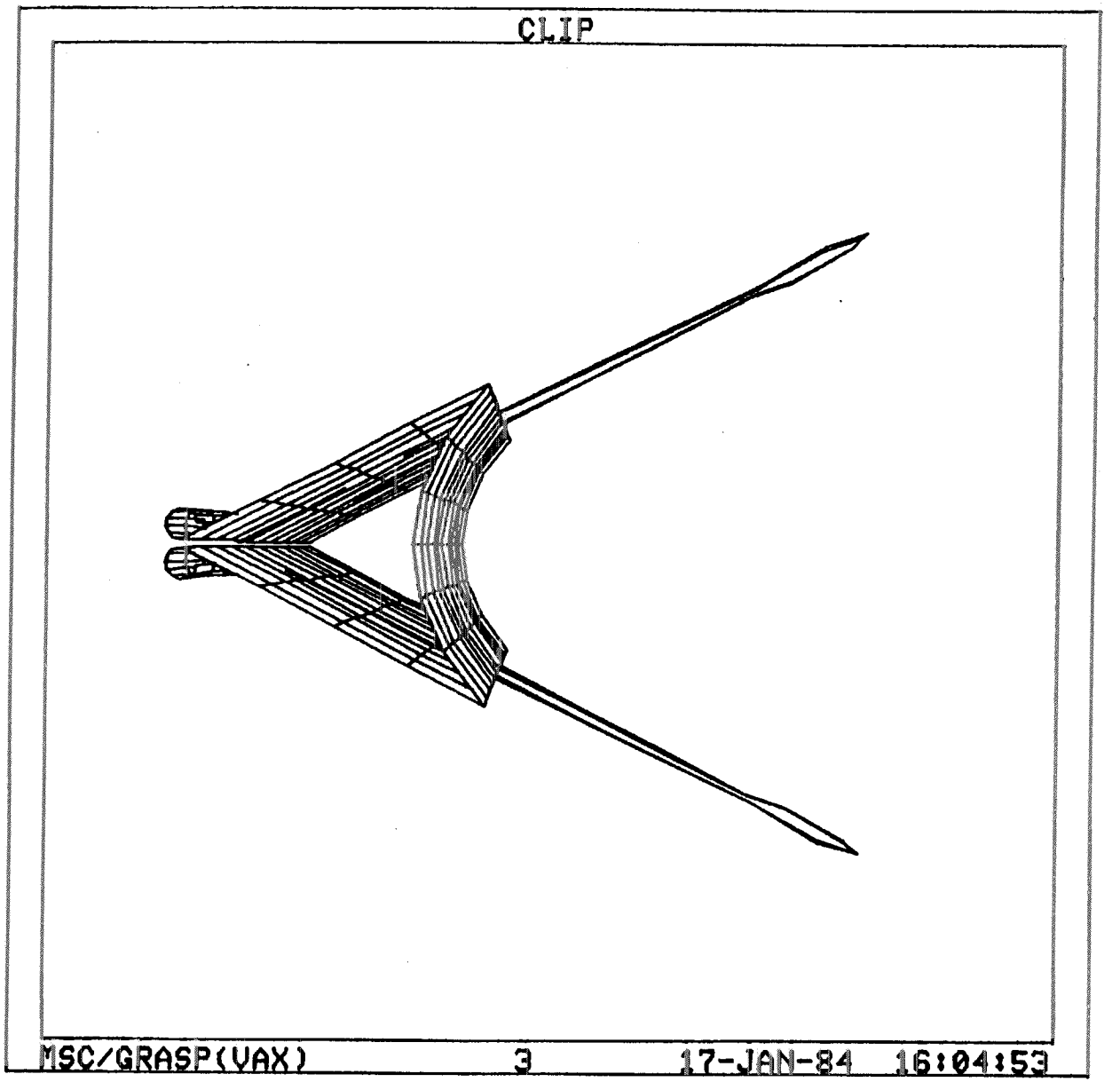

CLIP
MSC/GRASP(VAX)
3
17-JAN-84 16:04:53

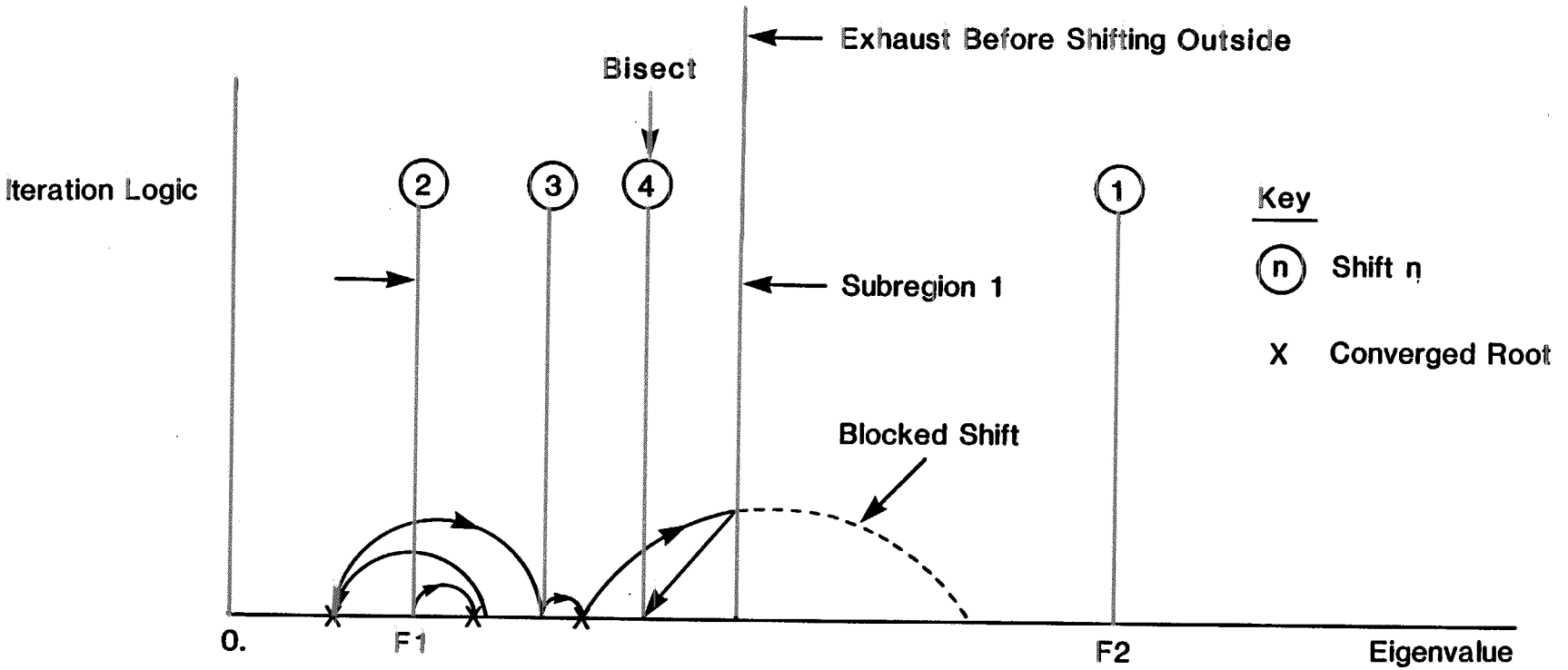
STURM SEQUENCE BUILT INTO INVERSE POWER ALGORITHM

- Change "INV" to "SINV" on EIGR Card
- No Redundant Input Data Required (i.e., No "NE", "ND")
- Available for Normal Modes and Buckling Analysis

Project Manager: L. Komzsik

Contributors: M. A. Gockel, D. V. Wallerstein

STURM SEQUENCE BUILT INTO INVERSE POWER ALGORITHM (Cont.)



STURM SEQUENCE BUILT INTO INVERSE POWER ALGORITHM (Cont.)

- Compute Sturm Number ("Number of Roots Below") at Top of Range, F2.
- Start Iterating at Bottom of Range, F1.
- Allow Shifts Inside Subregion.
- Block Shifts Outside Subregion Until it Is Exhausted, Using Sturm Number Criterion. Bisect, within Reason.
- Good Automatic Diagnostics Provided, Need Some Polishing.

HOUSEHOLDER TRIDIAGONALIZATION METHOD FOR EIGENSOLUTION

- Mathematically Equivalent to Givens, Theoretically Twice as Fast, Half the Storage.
- Testing Shows Faster than Givens if No Spill. Machine Dependent, Vectorizable.
- Needs Much Polishing. Prototype Release.

Project Manager: L. Komzsik

Contributors: D. V. Wallerstein, G. A. Dilley

MSGMESH ENHANCEMENTS

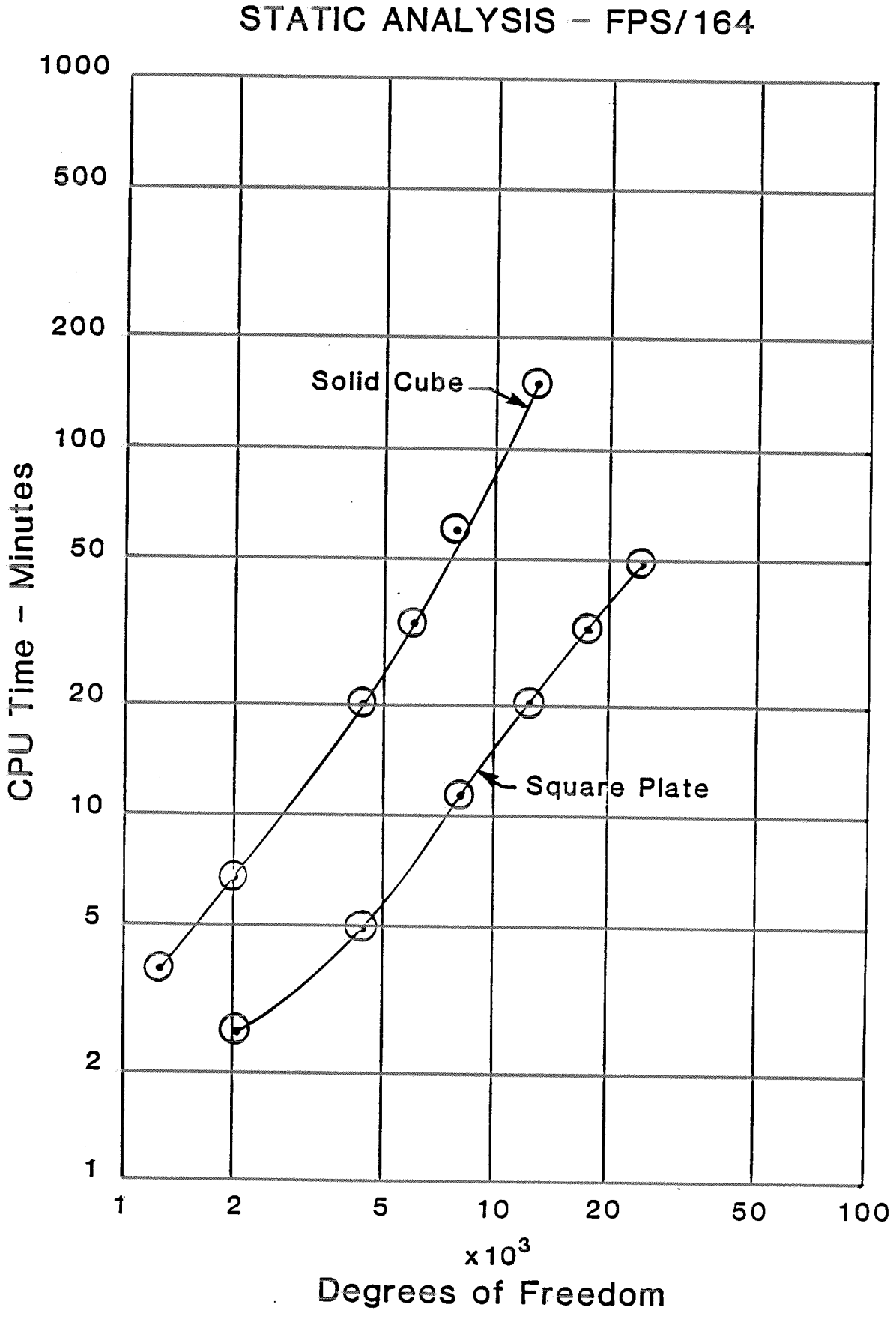
- PLØADG2 Card – Adds Geometric Pressure Load Variation, in Addition to Topological Variation of Present PLØADG Card

Project Manager: W. H. Booth

Lead Programmer: M. E. Márkovitz

NEW COMPUTERS OR OPERATING SYSTEMS

Type	Status
IBM/XA	Upward Compatible from Present System
FPS/164 R. P. Bilyeu, J. Ou, M. Bent	Beta Test Version of MSC/NASTRAN Delivered
Data General MV/4000 M. L. Caetta, K. D. Blakely	Computer Installed
Hewlett Packard/9000 W. S. Moffitt, G. A. Dilley	Computer Installed
PRIME	Computer Installed
CYBER/VE	Under Study


STATIC ANALYSIS - FPS/164
1000
500
200
100
50
20
10
5
2
1
CPU Time - Minutes
Solid Cube
Square Plate
1
2
5
10
20
50
100
x10³
Degrees of Freedom

DOCUMENTATION

Title	Status
MSGMESH Analyst's Guide (V63)	Done
Nonlinear Handbook (SHL)	1/4 Done
Thermal Handbook (WHB)	1/2 Done
DMAP Handbook (MAG)	1/2 Done
Demonstration Problem Manual (JRH)	3/4 Done

DOCUMENTATION (Cont.)

Title	Status
Theoretical Manual (DVW)	* See Below
Superelement Handbook Update (MAG)	1/2 Done
Dynamics Handbook Update (KDB)	1/4 Done
Programmer's Manual Update (MLC)	1/4 Done

* Will experiment on delivering sections of Theoretical Manual in Application Manual Section 1.3

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

* Lined-Thru Subjects Represent Completed Projects

CURRENT PROJECTS (Cont.)

- Heat Transfer in SØL 66, 99
- Rigid Element With Large Displacement Capability, Improved GAP Element
- Update Subspace Iteration RFAlter
- 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
  (New Hessenberg with Spill, Improved Accuracy)
- ~~Householder Transformation~~
- Elastic and Viscoelastic Material
- ~~Improved In-Core Numerical Routines~~
  ~~(READ, Aero Modules)~~
- Modernize GPSP1
- Uniform Output Capabilities
- Secondary Superelement Enhancements
- Complex GPFDR Module
- Enforced Motion, Initial Conditions
  for Modal Analysis

CURRENT PROJECTS (Cont.)

- Improved GAP Element
- Batch Plotter Update
- Print USET Table in External Sort
- Tektronix 4107, 4109 , and 4115
- Full Deck Generator
- Enhanced Model Generation
- Initial Graphics Specifications (IGES)
- Enhanced Solution Support, 99, H.T., Cyclic
- Enhanced MSC/NASTRAN Support Composites, Image Superelements

JOINT DEVELOPMENT/MARKETING EFFORTS

- Joint Marketing of Pre-Postprocessor Programs
  - Model Generator (PDA Corp.)
  - Resizing/Optimization Driver (CSAR Corp.)
- Installation of Special DMAP Alters (ARI Corp.)

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.)

PRESENT STATUS

- Prototype DMAP Compiler Under Testing
- Compatibility with MSC/GRASP in Design
- Deliver with a Later Version, After Thorough Shake Down

Current Team: J. C. Hodge, D. P. Layfield, C. T. Wilson, D. V. Wallerstein, J. San Marco