

REPORT FROM THE MSC/NASTRAN USERS' ADVISORY COMMITTEE

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Abstract

The Users' Advisory Committee (UAC) was founded by a group of experienced MSC/NASTRAN users during the 1989 MSC/NASTRAN World Conference. The reasons leading up to its formation are discussed in the framework of developments and trends in Computer Aided Engineering. The objectives of the committee are stated and a few activities are described.

Introduction

During the 1989 MSC/NASTRAN Specialists' Technical Forum (STF) and Users' Conference a group of specialists had several meetings to discuss issues of common interest. Representing major user organizations in industry, government research and academia, the group decided to form a MSC/NASTRAN Users' Advisory Committee (UAC).

In the following partial list of participants one can recognize MSC/NASTRAN experts who have made significant contributions to past User Conferences and STF discussions:

T. Butler, Butler Analyses
G. Campbell, Ford Motor Company
M. Chargin, NASA Ames Research Center
R. Cigel, Boeing Computer Services, Eng'g Computing and Analysis
C.-Hsing Chen, B. F. Goodrich, R & D Center
D. Deuermeyer, Cray Research
J. Fitch, GE Nuclear Energy
H. Gans, Air Force Inst. of Technology
V. Genberg, Eastman Kodak, Optical Systems
M. Moharir, General Dynamics, Space Division
A. Mera, Boeing Computer Services, Eng'g Computing and Analysis
R. Margasahayam, Boeing Helicopter
S. Masters, E. I. Dupont
K. Nagabuchi, Nissan Motors, CAD Dept.
L. Nagy, Ford Motor Company, Light Truck Engineering
A. Ozbeki, General Motors, Technical Center
M. Radovanov, Cessna Aircraft
G. Roberts, Westinghouse Electro-Optical
T. Tecco, Navistar Trucks
V. Wilhelmy, SDRC
R. Zarda, Martin Marietta Aerospace

A chairman and a secretary were selected to coordinate future discussions and to interface with MSC. MSC endorsed the concept enthusiastically and appointed Charlie Wilson as technical liaison.

This paper describes relevant trends in Computer Aided Engineering (CAE) which have affected the relationship of Finite Element Analysis (FEA) software, in particular MSC/NASTRAN, to other software tools. We feel that the interplay between human and computing tools has created the pressures leading to the formation of the UAC. Objectives of the UAC are stated and activities are discussed.

Trends in Computer Aided Engineering (CAE)

The current revolution in information technology is constantly changing the role of the various ingredients of a CAE project. To mention just some of the significant trends:

- Through their phenomenal increase in performance and decrease in price, computer applications have been successfully reaching into previously untractable or unaffordable problem areas.

- Man-machine communication has been eased by visual feedback, graphic and menu-driven interfaces. Still the average engineer in a large company has to spend considerable retraining time just to keep up with frequent changes in hardware, operating systems, and networking.
- AI technology and in particular expert system software is enabling the programming and modification of logical processes; this is a valuable complement to numerical analysis tasks.
- New software tools have been implemented to assist the engineer in a multitude of previously manual tasks; the tool kit now contains geometric representation of the structure, material and section property definition, load generation, finite element meshing, analysis, data reduction and graphic display, interpretation, code checking, reanalysis, optimization, etc.

As one consequence of the above trends, large CAE projects now find it necessary and advantageous to tailor an integrated software/hardware system to the engineering problem. In procuring the system, it appears that more and more often the software modules are chosen first, the compatible hardware next. Currently, the most significant bottleneck (some call it threshold of pain) is the lack of integration of the various tools of CAE; the ever changing hardware platforms, software versions and application requirements have prevented standardization and tight coupling from being a rewarding effort. Some loosely coupled CAD/CAE systems provided by individual vendors have proved to be very attractive for certain applications; in most cases, however, users are taking painful action on their own to write temporary interfaces.

A second consequence is a disturbing one: the increase in automation at the expense of engineering insight. Proficiency in mesh generation and in FEA analysis has become an end in itself for some CAE projects interested in fast design-analysis cycles. The project manager (or client) should not confuse the attractive form of a computer generated result with the quality of its content. It takes a good engineer using a good computing tool to create a reliable simulation of a structure's behavior. It is dangerous to blindly trust FEA programs (in fact none of them are warranted products). In assisting beginner technicians and engineers to create reliable FEA models and results, many CAE projects rely not only on the in-house staff group but have been demanding increased technical support from the software vendor. Therefore, the vendor needs to recognize that quality technical support is an integral part of his product offering.

Background to creation of the MSC/NASTRAN Users' Advisory Committee.

MSC has addressed the hardware compatibility issue with an aggressive effort to upgrade and proliferate across computers. This effort has been rewarded by a growing list of installations and number of users. MSC has also developed a brand new MSC/NASTRAN Executive System.

MSC has probably invested more funds than any other FEA software vendor to extend its list of engineering capabilities vertically and horizontally; this was done either by creating or purchasing new software.

Relatively less effort appears to have been spent on an issue of great interest to the advanced MSC/NASTRAN user: being able to extend the program capabilities by himself and linking to other software. In his attempt to create a more versatile CAE capability, the user of MSC/NASTRAN appears to be thwarted by configuration control and product security issues.

It is worthwhile to understand on one hand the software vendors' view of their central role in the CAE world, their relationship to the clients and their product development priorities. A different view of the CAE world is that of a large CAE product user in aerospace or automotive: the engineering team and the data base are in the center of the system, with various software tasks being satellites. These software modules may be vendor supplied or in-house developments. Their proper integration is crucial to the project.

Who is responsible for integrating these islands of automation and providing quality and reliability? Is it an individual company, a government organization who funds a multi-company aerospace project, a certification agency, or a professional society? A closely related question is: how much reward is there to create and maintain a "seamless environment". Will the software vendors form strategic alliances to closely couple their products or will each vendor find more incentive in creating a competitive system?

Such questions have been the topic of discussion not only at MSC/NASTRAN conferences, CAD Chautauquas, or NAFEMS meetings. Given the amount of discussion and communication flowing in all directions, it was maybe inevitable that an interest group would form around a common problem. We can easily name some precedents: DECUŠ, NAFEMS, the CRAY Users Group, the ABAQUS Steering Committee.

The opportunity was provided at the MSC/NASTRAN Specialists' Technical Forum in March 1989. The spark was the suggestion by two authors of this paper that some of the attendees get together to discuss some modifications in the format of the STF. Once some twenty attendees gathered, we found quite a few other issues worth raising. During three lively meetings that week we disagreed on some issues; it is more worthwhile to mention here those issues on which a majority consensus appeared to exist:

- MSC/NASTRAN is not only gaining in popularity, but is becoming a strategic product to industry. Depending on whether a user company sees this fact as excessive dependence or strategic partnership with MSC, it may be more or less concerned with the vendor's technical and commercial priorities.
- As the program becomes larger and larger, it appears to become less manageable. Evidence: number of documented errors, release delays on recent systems. There appears to be a trade-off between generality and maintainability.
- The quality of product technical support needs improvement: responsiveness to error reports, to technical inquiries, to requests for enhancements.

These meetings didn't degenerate into complaint sessions by the large user community against MSC's, a small software house. To the contrary, the realization was emerging that as expert users we have a collective responsibility regarding the future of MSC/NASTRAN.

Objectives of the MSC/NASTRAN UAC

The UAC is not a chartered and funded organization, rather an informal group of expert users. Hence the objectives are, for now, rather modest:

- Encourage more communication directly among users even between MSC/NASTRAN conferences. Create a list of experts in each technical field, encourage direct user exchanges in addition to contacting MSC's Client Services Group.

- Encourage more communication among suppliers of complementary software. Representatives of a few large user companies can positively influence two software vendors to cooperate.
- Take an active role in organizing the 1990 STF.
- Advise and lobby on the most pressing enhancements. Identify when critical mass is reached on issues which may not be at the top of MSC's priority list. Some such possible areas:
 - a. error corrections
 - b. FEA mesh error estimation, adaptive mesh refinement
 - c. new developments and enhancements in nonlinear analysis, component mode synthesis, structural-acoustic interaction, etc.
 - d. use of AI technology
 - e. more effective tools in transferring MSC/NASTRAN data across computers, say for postprocessing and graphic display on a workstation
- Identify possible sources for joint funding of such developments.

Committee Projects: the STF in 1990

In March 1989 the committee discussed at length the format and content of the just concluded STF. There was a consensus that a few changes could make this two-day event a more exciting and worthwhile event for the attendees:

- As its name implies, the STF should provide an effective forum for MSC/NASTRAN specialists to exchange technical information with other expert users and with MSC. Unlike the Users' Conference, where there are presentations with limited discussion, the STF is an opportunity for plenty of discussion and questions on preselected topics. Unlike training seminars, it is assumed at the STF that the attendees know a lot about their subject of interest.
- The UAC proposed a technical agenda based on discussions with members of the UAC and with MSC. It was agreed with MSC that marketing issues would be given a lower profile during the STF.
- Session chairman selection criteria: expertise in the topic and in MSC/NASTRAN, the availability and interest in accepting the task. Collectively the STF organizers should represent a good cross-section of the user community.
- Objectives for each technical topic: evaluate capabilities, discuss strengths/weaknesses, compare to other codes, review trends, propose enhancements, answer questions.

We'd like to take this opportunity to thank John Brown, Lajos Nagy, Mike Moharir, Tom Butler, Randy Cigel, Richard DeVries, Steve Masters and Mladen Chargin for their contribution in preparing and co-chairing a session at the STF.

Another activity was Mladen Chargin and Andy Mera establishing contact with similar interest groups: the "German Automobile FEA Club" in Munich and the English Users' Group headed by Prof. Shippen at the University of Birmingham.

Conclusions

The UAC has made a modest beginning by "agreeing to keep in touch", by winning MSC's endorsement and by taking a leadership role in organizing the 1990 STF.

How strong a role should the committee play? This depends in part on the interest shown by its members, most of whom currently have technical work assignments. Management endorsement of the committee's objectives, in terms of the commitment of time and funds will have an influence. We still regret the fading away of the AIAA FEM Standards Committee; its effort in having the FEA codes measure against a common set of test problems was a very worthwhile cause. This work has since been continued and expanded by government and private funding to NAFEMS in the U.K.

The next committee meeting will take place on March 28, 1990. The user community will be informed via the MSC/NASTRAN Newsletter. If you are interested in participating in activities of the committee, please contact the current officers:

Andy Mera, Chairman, tel (206) 865-3548
Ali Ozbeki, Secretary, tel (313) 986-6122

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