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The Materials and Structures Technology Conference is a meeting, generally held biennially, to inform the audience of the technology needs of the Department of Defense for military vehicles, weapons, and mission areas for each of the Services. A National Research Council committee evaluated the most recent conference and concluded that it was successful and worthwhile. Nevertheless, the committee presented some recommendations for the improvement of future conferences.

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Evaluation of the Department of Defense Materials and Structures Technology Conference

Report of the Committee on Materials and Structures Technology Conference

NATIONAL MATERIALS ADVISORY BOARD
Commission on Engineering and Technical Systems
National Research Council

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The report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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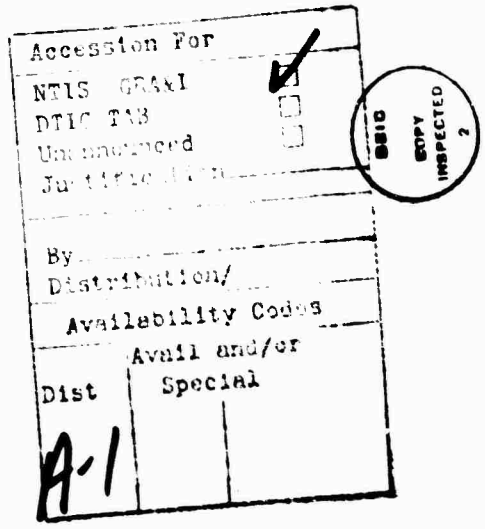
ABSTRACT

The Materials and Structures Technology Conference is a meeting, generally held biennially, to inform the audience of the technology needs of the Department of Defense for military vehicles, weapons, and mission areas for each of the services. A National Research Council committee evaluated the most recent conference and concluded that it was successful and worthwhile. Nevertheless, the committee presented some recommendations for the improvement of future conferences.



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I. INTRODUCTION

OBJECTIVE

The intent and purpose of the Materials and Structures Technology Conference is to present to the industrial and academic communities a concise statement of the research and development needs of forthcoming military systems in materials and structures. Presentations emphasize requirements and program plans for the near future (about 1 to 5 years). The conference also provides an opportunity for the Department of Defense (DOD) to exchange information and thoughts about these needs with the conferees and to establish contacts that may facilitate such exchanges after the conference.

HISTORICAL BACKGROUND

Before the Materials and Structures Technology Conferences were initiated, interested parties were informed of DOD's program and needs by Technology Coordinating Papers (TCPs). The TCPs included subjects categorized by military areas. The Materials TCP and Structures TCP are two of eleven such papers prepared by DOD. Structures TCPs were published in November 1971, May 1972, and the last edition in July 1976. Materials TCPs were published in December 1972, February 1975, and December 1977. TCPs were eventually discontinued because the overall cost was mounting and the approach was becoming less cost-effective.

The first Materials Technology Conference was held in May 1972 at the National Bureau of Standards; another was held in February 1978 at the Institute for Defense Analysis (IDA). The first Structures Technology Conference was conducted in April 1974 at Battelle-Columbus Laboratories; a second conference was held in November 1976. In November 1980 the two conferences were combined into a single conference held at IDA.

The purpose of the conference was to present ongoing DOD programs and future needs and to establish a dialogue between DOD and industry and academia to promote new ideas. The goal was to generate primarily long-term proposals by industry and academia as well as solicit responses to Requests for Proposals (RFPs); the latter are DOD-expressed needs and tend to be short-term. Unlike the many DOD conferences dedicated to specific topics, the Materials and Structures Technology Conference presented broad needs to an audience with the intention of encouraging unsolicited proposals from individuals, companies large and small, and academicians. Attendees at the conference received information from the various services on a wide variety of topics. This method was intended to avoid the procedure of giving individual briefings by service personnel to persons requesting information.

CONFERENCE OF JUNE 1983

Presentations were made at the conference by groups from the Services within DOD, the Defense Advanced Research Projects Agency (DARPA), and the Defense Intelligence Agency (DIA). Liaison representatives from DOD selected speakers and with the aid of NMAB staff organized the program for the June 1983 conference. The major portion of the program consisted of prepared talks supplemented by printed presentation aids distributed to the audience during the registration period. Some time was allotted for questions after each presentation. The balance of the program was devoted to fostering a dialogue between DOD personnel and the audience. This was accomplished during the evening of the second day by having concurrent sessions on four topical areas. DOD personnel were present at each session to answer questions. Also, during an informal session on the afternoon of the last day and at a reception on the evening of the first day, opportunities were provided for presenters and participants to exchange viewpoints (see Appendix A for the detailed program).

EVALUATION OF THE CONFERENCE

The National Materials Advisory Board (NMAB) conducts studies on material-related topics. DOD requested that NMAB organize and conduct the materials and structures conference as one of the of the tasks under its contractual obligation. DOD also wanted an assessment conference by an NMAB-appointed committee to determine whether the endeavor was worthwhile and, if so, whether the traditional conference approach was the proper format for disseminating information and publicizing DOD needs.

NMAB appointed a committee (see pp. v and 33) to evaluate the conference. The chairman of the committee, as part of the conference program, briefed the audience on the activities of the committee, emphasizing that the participants could be helpful in aiding the committee by commenting on the proceedings. The audience's responses were obtained by circulating a questionnaire (Appendix B) and by asking for comments during a general discussion session on the last day of the conference. Another questionnaire (Appendix C) was also given to the presenters.

This report evaluates the conference. The data from the questionnaires are tabulated and an interpretation is presented. The committee formulated its conclusions and recommendations based on the questionnaires and their personal observations and expertise. These conclusions and recommendations are transmitted to the sponsor via this report.

II. ISSUES AND ANALYSIS

The conference can be evaluated according to two different, although related, questions. First, how "successful" was it? And second, was the conference "worth it?"

HOW SUCCESSFUL WAS THE CONFERENCE?

Assessing how successful the conference was requires that we measure the conference's success (or failure) according to criteria of an ideal meeting of its kind. Clearly, we would judge a conference to have succeeded if it attracted organizations or people who had not attended previous meetings of this kind, who attended the entire meeting and participated in all of its sessions, who held positions within their organizations that provided them with opportunities to influence the direction of research and development within their organizations, and who subsequently changed the way in which they or their organizations conducted R&D in materials and structures as a consequence of their attendance. We would also judge a conference to have succeeded if the participants benefited by attending and if they themselves judged the meeting to be a success.

According to these criteria, the 1983 Conference on Materials and Structures could be classified as successful, but with room for improvement.

Participants' Evaluation of the Conference

The primary purpose of the conference was to inform representatives from industry and academia of DOD's needs for R&D in the fields of materials and structures. And in this regard, the conference appears to have been moderately successful with the possible exception that structures received relatively little coverage (see p. 11). Majorities of conference participants judged all of the agencies and services to have informed them at least "moderately well" of the military's R&D needs in these fields (see Table 1).

Similarly, participants gave relatively high marks to the conference for the opportunity it provided to discuss these needs as well as to be simply informed of them. For example, 70 percent of the participants thought that the conference provided an "adequate" opportunity to discuss R&D needs with representatives from DOD. The smaller, concurrent sessions and evening reception may have contributed to this favorable evaluation more than the larger plenary sessions, in which the audiences tended to refrain from asking questions.

TABLE 1 How Well the Conference Informed Participants of the Needs of Each Service or Agency

Service or Agency	"Very Well" or "Moderately Well" Responses	
	Number	Percent*
Navy	269	92
Air Force	239	86
Army	193	77
DIA	131	72
DARPA	171	89

*Percent of those responding to question 13. See Appendix B for the specific wording of the question and the distribution of responses.

Of course, participants may have attended the conference for reasons other than learning of DOD's needs in these fields. They did not appear to do so, however; 83 percent of the conference participants attended the meeting to learn of these needs. Another 8 percent attended primarily to learn more about the R&D being performed by other conference participants, 4 percent attended primarily to meet representatives from DOD, and 2 percent attended to express their views of these needs. But even with respect to these other purposes, participants were largely satisfied. Some 18 percent of the participants were "completely" satisfied that their primary reason for attending had been met, and 69 percent were at least "somewhat" pleased.

In sum, an important "consumer" of the conference's products--its participants--evaluated the conference favorably. On the whole they thought that the conference informed them of DOD's R&D needs in materials and structures, provided an opportunity to discuss these needs with representatives from DOD, and were at least somewhat pleased that their primary reason for attending the meeting had been satisfied.

Consequences of the Conference

If participants had done nothing more than spend three days meeting with colleagues while quietly listening to the presentations of service representatives, the meeting would have accomplished little. The committee thought it insufficient simply to convey information about the R&D needs of the military to conference participants, which it appeared to do fairly well, as indicated above. Although conveying information is an important and necessary function of the conference, a more important goal is the effect this information has on the intentions and subsequent behavior of participants.

Here again, the conference appeared successful. Although the committee could measure only the intended behavior of participants, their professed intentions were impressive, even when discounted by the realization that many intentions remain unfulfilled. As can be seen in Table 2, 75 percent of the conference participants (for whom our questions were applicable) thought it at least "very" or "fairly likely" that their organization would "submit an unsolicited proposal to a U.S. military agency" during the next 12 months as a consequence of their attendance at the conference. A similar proportion (79 percent) thought that they would respond to an RFP within the next 12 months. Some 62 percent of the participants thought it likely that their organization would change one or more of its projects in materials and structures, and 64 percent reported that they think differently about DOD's needs in materials and structures as a consequence of their attendance.

TABLE 2 Participants' Intentions Following the Conference

	"Very" or "Fairly Likely" Responses	
Intend to	Number	Percent*
Submit an unsolicited proposal to a U.S. military agency	198	75
Respond to an RFP from a U.S. military agency	176	79
Modify one or more of the organization's projects in materials or structures	167	62
Think differently about the needs of the DOD in materials and structures	175	64

*Percent of those responding to question 16. See Appendix B for the specific wording of the question and the distribution of responses.

Admittedly, the committee measured only intentions by questions of this kind. It would be useful, but was beyond the resources of the committee, to examine the number and the source of proposals received by DOD the year prior to and the year following the conference to judge whether intentions were acted upon.

Patterns of Conference Attendance

Among other criteria for a successful meeting, the committee thought it important that conference participants attend nearly all of the sessions. The pattern of attendance was especially important in light of the unique characteristic of the Materials and Structures Technology Conference. Although DOD presents its research and development needs of forthcoming military systems at numerous conferences, the Materials and Structures

Technology Conference is the only such meeting at which a wide the breadth of these needs is presented. This feature of the conference would have been undermined had participants selectively attended service-specific sessions--for example, only the presentation by the Army and the concurrent session on land combat systems. Such was not the case.

Most participants attended every substantive session of the conference. As Table 3 indicates, attendance ranged from a peak of 97 percent during the presentation of the Naval R&D to 71 percent during the presentations by the Defense Intelligence Agency (DIA) and the Defense Advanced Research Projects Agency (DARPA). Concurrent sessions attracted nearly three-quarters of the participants, and approximately two-thirds took advantage of the opportunity to meet DOD members and other participants during the evening reception on June 14.

Furthermore, not only did most participants attend all of the service presentations, but the broadest-based concurrent session on materials and structures research was the most widely attended of these sessions (32 percent), suggesting that many conference participants were themselves interested in acquiring an overview of DOD's entire program of R&D in the fields of materials and structures.

TABLE 3 Patterns of Conference Attendance

Session	Number Attending	Percent*
Tuesday, June 14		
Introduction	288	93
Navy R&D	299	97
Reception	191	62
Wednesday, June 15		
Air Force R&D	289	93
Army R&D	264	85
Concurrent Sessions		
1. Aircraft and Missiles	60	19
2. Ships and Submarines	39	13
3. Land Combat Systems	29	9
4. Materials and Structures Research	99	32
Thursday, June 16		
DIA/DARPA	220	71
Informal Discussion	80	26

*Percent of those responding to question 11. See Appendix B for the specific wording of the question.

Establishing Contacts With DOD Representatives

The reception, which 62 percent of the participants attended, may have contributed to an important secondary goal of the conference and thus was another measure of the meeting's success. Furthermore, 84 percent of the participants reported establishing "contacts with representatives from the meeting or other conference participants that will be useful in proposing or conducting R&D in the fields of materials and structures." This may eventually promote collaborative research and open channels of communication between participants and appropriate program officers of DOD long after the conference itself adjourned. It may have also contributed to the impressive expression of intentions to submit unsolicited proposals and respond to RFPs as noted earlier.

Ambiguous Measures of the Meeting's Success

There were several responses to the committee's questionnaire that cannot be easily placed within a framework of measuring the success of the conference. Whereas the committee thought it important that relatively senior representatives of organizations attend the meeting and judged it to have largely succeeded in this regard, it was unclear, for example, how other measured characteristics of the represented organizations and participants could be evaluated, although we thought it important to collect and report this information.

The conference clearly attracted representatives of large organizations, especially private industries. Eighty-four percent of those representing nongovernmental agencies came from organizations with more than 1000 employees, while only 11 percent represented organizations whose size the Small Business Administration would classify as "small" (i.e., 500 or fewer employees). The committee believes that DOD benefits from establishing contacts with people and organizations with relevant skills and knowledge who may not already know of the agency's needs from previous contacts. And in this regard, the committee was pleased to note that this conference was the first DOD meeting on materials and/or structures for two-thirds of the participants, although many of these individuals were from organizations that probably had sent representatives to previous conferences. It was more difficult, however, to judge whether the representation of small businesses was too small, too large, or about right in the absence of a study of the population of organizations that conduct R&D in materials and structures.

Similarly difficult to interpret are data on the proportion of the (nongovernment) represented organizations' current R&D budget that is funded by DOD. Over half of these respondents (53 percent) reported that DOD provided 0-25 percent of their companies' current R&D budgets.

WAS THE CONFERENCE WORTH IT?

Judging whether the conference was worth it is also difficult because many costs and benefits cannot be easily calculated. The costs for NMAB and DOD personnel who planned and participated in the Conference were

estimated at approximately $70,000*. But we cannot calculate the costs borne by the nearly 400 participants in attending the conference nor calculate the value of the activities that they may have performed had they managed their organizations, conducted research, or marketed their company's products instead of attending the conference. Equally hard to assign values to are the benefits derived from the conference, since these may require years to reach fruition. The committee, therefore, relied on the responses of conference presenters and participants to answer whether the conference was "worth it." Their responses suggest it was.

Although the committee could not calculate the full costs and benefits of the conference, it had available two somewhat indirect means of judging the worth of the meeting. First, we turned to conference participants for this assessment of its value, and then we added the evaluation of conference presenters.

Benefit/Cost Analyses of Conference Participants

One measure of an individual's benefit/cost calculation regarding the worth of the conference is revealed in that person's desire to attend the conference again or to recommend that someone else from his or her organization attend. Insofar as the desire to attend is a valid measure of the meeting's value to participants, the conference could be judged worth sponsoring again. Ninety-four percent of the participants hoped to attend the next conference or recommend that someone else from their organization do so. In the aggregate these responses suggest that the conference was worth sponsoring, as do the responses from DOD representatives.

Speakers' Evaluation of the Conference

Of equal interest and value to the committee in its evaluation of the worth of the conference were the opinions of the speakers. Their evaluation is doubly important since they represented technical management within DOD that would have a direct impact on the direction and content of future DOD Materials and Structures Technology programs and because their participation in the conference represented a sizable investment of time and money.

The evaluation by the conference speakers was overwhelmingly favorable (see Appendix C for questionnaire and response frequencies). Of the 16 speakers who provided an overall assessment of the conference, all were favorable. Twenty of twenty-one who commented thought that the

*The NMAB share of the cost in organizing the conference (excludes the committee task in evaluating the conference) was estimated to be $28,000 based on four months of effort at $7,000 per month. Twenty-eight DOD presenters and four Naval Surface Weapons Center (NSWC) personnel were assumed to have contributed six days time (three days for presentations and three days for preparation) at $200 per day for a total of $38,400. Finally, the NSWC security people worked on clearances over the course of four months. Estimating that this involved 20 working days at $200 per day, the cost becomes $4,000. The grand total is approximately $70,000.

conference was a good vehicle for informing industry of DOD's R&D needs. The extent of this favorable evaluation should not be surprising inasmuch as many of the speakers held senior positions and the conference is a means for avoiding individual briefings or making several such presentations during the year. Indeed, only one-third of the speakers had made similar presentations within the last year. All the speakers reported being approached for additional information by those attending the conference, and all the speakers met new people during the meeting.

Suggestions for improvement focused on allowing more time for interaction between speakers and attendees, expanding the presentation of classified materials, and coordinating better the presentations prior to the conference.

In sum, the speakers thought favorably of the conference, suggested its continuation with minor changes, and thought it was a useful and worthwhile investment of their time and resources.

SHOULD THE CONFERENCE BE HELD AGAIN?

It may seem presumptuous on the part of the committee to advise DOD that it should devote resources to another conference on materials and structures approximately two years from now. Although our conclusion is somewhat qualified, it follows from the positive evaluation of the conference stated earlier--namely, if DOD wishes to communicate the wide breadth of its needs for future R&D in materials and structures, the conference should be held again.

The conference participants and DOD representatives on the whole judged the conference to have met its goals. Moreover, the committee--in weighing these judgments and its own assessments--concludes that the conference (1) permitted a productive interaction among technically sophisticated participants, (2) clearly presented the scope of the R&D needs of DOD, and (3) appears to have made efficient use of DOD personnel.

Alternative means of communicating DOD needs in materials and structures undoubtedly exist. Publications can convey concerns to a large number of readers. More focused, technical conferences can help establish personal relationships that facilitate future contacts and provide opportunities for an exchange of views. Personal visits to DOD personnel from corporate and university representatives also provide for an exchange of views. But none of these alternative mechanisms combines interaction, wide breadth of coverage of topics, and efficient use of staff time and resources that a conference such as the 1983 meeting provided.

OPPORTUNITIES FOR IMPROVEMENT

The survey produced substantial information about the nature of participation in the conference and data about the attitudes of speakers and participants. Because the response rate was high, the committee has confidence that characterizing the conference as successful is warranted.

The question of whether and how such a conference can be improved still remains, however. The committee approached this question in two ways. First, discussion among committee members uncovered some issues that emerge periodically in debates about such conferences. Second, the conference participants themselves registered concerns and suggestions for improvement orally on the third day of the conference and in written comments to an open-ended invitation on the survey questionnaire (see Appendix B, Question 18).

The following sections summarize issues so identified, options, and the committee's view on action to be taken.

Academic vs. Business Representation

Issue--Few individuals who attended the conference came from university environments--only about 4 percent. One might expect them to participate for several reasons. First, broad basic needs (DOD's 6.1 category) as well as applied research needs (the 6.2 category) are discussed. Indeed, the conference covered areas to which the largest research budget in the world will be dedicated. It seems sensible to expect the basic category to be of substantial interest to university people.

On the other hand, academicians have limited funds to travel to conferences of this kind. Furthermore, many either do not possess the requisite security clearance or work at universities that discourage participation in classified research. Another possible explanation for the relatively meager attendance of university researchers is that they learn about basic research needs from other DOD-sponsored conferences and so have no need to attend this one.

Options--Assuming that the latter view--lack of need--is true, then there is no point in shifting the conference's invitation strategy, publicity, or contents to encourage greater participation by the university sector.

If the first view is true, then far more needs to be done.

The conference coverage is broad. This suggests that administrators of university-based endeavors are a primary target, not individual researchers whose work is considerably more technical and narrowly focused. Such administrators might include, for example, the Vice President of Research, Dean of the Engineering School, or the head of a materials science research center. To judge from the survey questionnaire, the greatest proportion of participants are invited directly by mail. Others learned of the conference from announcements published in journals (see Appendix D). The implication for DOD is that the list of individuals to be invited should be expanded to include academic administrators. Because the content coverage is so broad, it is doubtful that the meeting would be sufficiently relevant to work by individual professors to justify an elaborate system for inviting these individuals.

Position--The committee's view is that more vigorous efforts should be made to identify university-based research administrators and to invite their participation. This should be done on a trial basis and evaluated, since it is not yet clear that this group needs to participate.

Materials vs. Structures

Issue--Most of the presentations at the conference and the written papers concerned materials. Structures received very little focused attention. The imbalance generated some discomfort, to judge from oral comments made by participants at the conference itself. Some spontaneous comments to the same effect also appeared on the survey questionnaire. That is, the conference was supposed to deal with structures but did not.

Options--We may discount the seriousness of the issue on grounds that less than 5 percent of the participants registered this complaint. Still, the structures research budget is substantial--about half the size of the materials budget. Further, there are substantial needs for research and development in the area, judging from experts and some of the DOD conference presentations.

If indeed structures research is important, then the contents of the papers should be more explicit about the kinds of work that are needed, the level of investment, and so on.

Position--The committee believes that structures R&D is sufficiently important to justify putting much more stress on the topic at the conference. This may involve increasing the number of DOD presenters with expertise in structures and dedicating more attention to structures needs in oral and written presentations.

Future Needs vs. Current Programs

Issue--A number of participants complained that current programs were discussed much more heavily than future needs. About 10 percent of those who made written comments on the questionnaire took this view, suggesting, for example, that "the current approach inhibits innovation...," "less history is needed...more on growing interest areas...," and "less emphasis on current program...more on new initiative...."

These comments are also pertinent to the complaint that budgets for the next five years were not presented routinely.

Options--Again, if sheer number of complaints is used to judge severity of the problem, then it must be regarded as unimportant. If, however, the matter is crucial for some important fraction of participants in principle, then it ought to be taken more seriously. The concern, for example, is a legitimate one for major suppliers and the secondary contractors that are an important part of the nation's industrial base.

More generally, if forecasts of needs and budgets are in fact available, then it seems sensible to provide them in this context. The participants do respond to such information by modifying plans and programs.

Position--The committee believes that stressing future needs, including forecasts of budget allocations, is warranted. Where information about needs, budgets, etc., is not yet clear, then some time schedule for producing the information ought to be given. Finally, guidelines for DOD presenters ought to strongly encourage presentations that are as future-oriented as possible.

Specific vs. General Information

Issue--There were complaints that topical coverage in papers and oral presentations was too broad and that more detail was needed. About a fifth of the participants' written comments in the questionnaire concerned this issue. These were some of their remarks: "more quantitative data," "more technical conferences," "greater depth...in organic composites, etc.," "smaller sessions and greater exchange," "I like DOD to tell me they need a tank tread capable of..., a turbine blade for use at 2300°F, and a gun with a life of...."

Despite these complaints, there was fair amount of detail discussed in evening meetings. Moreover, there were a few spontaneous comments that said the level of generality was fine. One participant, for example, encouraged "keeping the conference as an industry information meeting rather than a technical meeting."

The issue is also related to academic participation. The level of current coverage is most likely to be relevant to a Vice President of Research, Dean, Center Director, or development staffer. More technical detail is likely to be more attractive to active researchers.

The issue is also related to comments that more "one-on-one" discussions are needed. About 25 percent of the comments stressed this concern.

Options--The first option is to take the complaints seriously and as a warrant for changing the style of the conference or even terminating it. Detail is, after all, crucial to a great many R&D efforts. Further, many participants come with the expectation that detail will be considered. Finally, providing more detail may attract a wider audience.

A second option is to recognize that such complaints are relatively infrequent and therefore unimportant and, moreover, that the proper object of the meeting is to give broad coverage. The issue then ought to be ignored; that is, no major change in conference format is warranted.

A third option is to assume that detail is crucial despite the broad purpose of the conference. This in turn implies that concurrent evening sessions ought to be expanded. And this in turn may require increasing the length of the meetings. Adding a day for strictly technical issues

is likely to satisfy the complaints in some measure. Also, it might help in meeting the need for more "one-on-one" exchanges and identification of new ideas.

Position--The committee members agreed that a broad conference is essential to informing the R&D community of DOD needs. Moreover, it appears that most participants expect and appreciate the broad coverage. There is no justification for major change.

The committee also believes that such concerns are legitimate for some new, rather than repeat, participants and with participants who are unfamiliar with other conferences that are purposefully designed to provide a great deal of detail. To be sure that invitees recognize in advance the purpose of this conference, the general nature ought to be stressed in pamphlets and advance literature. To ensure that they learn that more focused conferences are conducted, lists of such meetings and topics ought to be provided to invitees along with information about the Materials and Structures Technology Conference itself.

Redundancy

Issue--Some participants were concerned that the presentations appeared to be redundant. The redundancy seems also to be tied in with complaints about too much generality and too little detail and with criticisms that the speakers were not adequately coordinated prior to the meeting.

Is the concern a sensible one? Yes, if the criterion for judging redundancy is simply the fact that a topic is mentioned by each service as an important one. One may regard this as a poor criterion, however, insofar as it ignores the subtle differences among services' needs. The same material, for instance, may be important to each service but may vary considerably in the context of its use, the properties demanded of the material, and so on.

Options--To reduce the appearance of redundancy, at least several options are worth considering.

First, better guidance of the contents of the presenters' papers is warranted. The guidance may take the form of determining what authors plan to say and reading drafts, asking them to highlight distinctive features of their needs, and so forth.

Second, the conference presentations could be reorganized so that only one service member covers a given broad area for all services--e.g., ceramics. This probably reduces redundancy to a minimum, but it does require a good deal of work by the particular presenter. It would still require highlighting cross-service differences. The presence of personnel from the other services is warranted so that technical details and special service needs can be addressed.

Position--The committee believes that redundancy is not a substantial problem. Small improvements might be obtained by urging presenters to highlight unique features of their needs in a way that makes clear the differences among services. The encouragement could be part of better guidelines for DOD presentations.

Classified vs. Unclassified Material

Issue--At least a few people expected to review classified research needs, and they expressed concern that such information was not provided. Another aspect of this issue is that labeling the conference as classified is thought to restrict participation in it by certain potentially relevant individuals--e.g., university-based researchers.

Options--Does the conference really cover classified work? In fact, the conference does cover classified work. The level of security varies, however, and this implicit variation is likely to confuse at least some participants. The topics considered in broad oral presentations are at least secret, to put the matter crudely, but from time to time even those contained more critical information. The concurrent sessions more frequently involve discussions that are important to security. Although there may be no labeling, it is implicit in discussions of new materials, their properties, and their applications in a particular context.

The security requirement then serves as a control on the individuals invited to participate and on the information they receive. But the level of the requirement differs, depending on which session the individual attends.

One option then is to plan sessions so that only persons with the appropriate clearance attend particular sessions. This is cumbersome but may be warranted to clarify matters for participants. It may also be warranted to enlarge the pool of talent available for participation--e.g., university-based researchers.

A second option is that the classified label should be abandoned if relevant information is in fact not considered at the meetings. This action resolves that complaint and removes an obstacle to participation by university-based researchers, new small businesses, and so forth.

Position--The committee believes the general clearance requirement is warranted. It is absurd to eliminate it.

Further, the committee believes that extending the pool of individuals who are able and capable of responding to DOD R&D needs is desirable. Insofar as clearance requirements are an obstacle, DOD should make every effort to inform individuals about how to obtain the clearance before such conferences occur.

The committee is not able to reach a conclusion about the usefulness of maintaining different security requirements for different sessions.

Organization and Logistical Issues

A mixture of small problems was identified orally at the open conference discussion and in the comments written on questionnaires. The details seem tractable, and a brief discussion of possible resolutions follows.

Issue/Concern--Individuals should be identified better to facilitate "one-on-one" meetings, follow-up, and so on.

Position--The committee urges that DOD provide a list of all presenters and participants at the conference in advance of the conference if possible. More importantly, whenever possible, presenters ought to be identified by subject area in which they have expertise--e.g., rapid solidification technology. Identification might be made easier at the conference simply by providing presenters and audience with different-colored badges.

Issue/Concern--There was a concern among a few participants that they could not get in-depth information on some topics because they were unaware of other DOD-sponsored conferences on the topic. The comments about the need for more detail could be misguided in the same sense that other DOD-sponsored conferences do indeed provide technical depth.

Position--A list of related conferences sponsored by DOD should be provided, along with dates of the meetings, contact purposes, and main topics. This might help integrate DOD's conference planning and also permit audience members to plan their own and their staff's trips better.

Topics Considered at the Conference vs. Other Topics

Only certain materials-related topics were covered at the conference. Other materials-related topics, regarded as important by some participants, were not treated. These topics were identified in comments made on the survey questionnaire and during the post-conference discussion session. They included calls for treatment of radar absorbing materials and radar-absorbing structures (RAM/RAS), space-related initiatives, and near-term areas such as the advanced technology fighter (ATF) and joint vertical takeoff program (JVX).

Some respondents broached the idea that some "give and take" on what are good new topics is warranted. Comments about other topics, such as procurement and future needs vs. existing programs, surfaced, of course. They are discussed elsewhere in this report.

The issue is this: How many of what kinds of new topics ought to be treated? What in fact is a new topic, and how can these be discussed in terms of military needs?

Options--The first option is based on the recognition that the selection of topics for discussion is based on the expert judgment of DOD. The judgment is based on earlier research and the current state of the art in a large array of areas. Some areas are not regarded as

sufficiently well developed or well articulated to justify treatment at such a conference. If one accepts the DOD's opinion, by and large one must accept the conference coverage. Moreover, despite acceptance, debate in concurrent sessions, objection in open conference discussion, and other avenues are open to the individual who believes a particular R&D area is not well served. Under this option, no special action is warranted.

A second option is based on the commentator's requests for coverage in program areas--e.g., ATF. The implication is that materials and structures R&D should not be the theme for the conference. Rather, the particular aircraft, ships, tanks, or whatever ought to determine the topical structure of the meeting.

Position--The committee believes that the topics chosen for discussion are a legitimate responsibility of DOD and that topics apart from these are considered in other forums. The committee has no evidence to justify suggestions for major changes in this respect.

III. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the committee that follow are based on the results of the attendees' and speakers' questionnaires, discussions with the participants during the informal session and during the course of the conference, and the personal expertise and judgment of the committee members.

1. The conference was successful and worthwhile because

   - o It attracted a sophisticated audience.
   - o The audience is likely to take action.
   - o The speakers and audience themselves judged it to be a success.

2. Evidence and judgment for deeming the conference successful and worthwhile were based on the following key observations:

   - o The pattern of attendance approaches that of an ideal meeting in that most participants attended every substantive session of the conference. Had the participants only selectively attended specific sessions the conference would not have preserved its unique feature of being the only such meeting at which a wide breadth of needs is presented.
   - o A large majority (84 percent) of the participants reported that they established contacts with representatives from the meeting or other conference participants.
   - o The professed intentions of the conference participants to do something as a consequence of their attendance, even when discounted by the realization that intentions may go unfulfilled, are impressive.

3. If DOD wishes to communicate its broad needs for R&D in materials and structures, this conference should be continued:

   - o The conference permits productive interaction among technically sophisticated participants.
   - o The conference makes clear the breadth of DOD needs.

- o The conference appears to make efficient use of DOD personnel's time and effort.

- o The alternatives that the committee considered to such a conference do not have the same advantages.

4. The conference should be held again, but the following opportunities for improvement should be considered:

- o More vigorous efforts should be made to identify university-based research administrators and to invite their participation.

- o Structures R&D is sufficiently important to justify putting more stress on the topic at the conference.

- o Stressing future needs, including forecasts of budget allocations, is warranted.

- o To ensure that participants recognize in advance the purpose of the conference, the broad nature of the conference should be publicized in pamphlets and advance literature.

- o Although redundancy is not a substantial problem, small improvements might be obtained by urging presenters to highlight unique features of their needs in a way that makes clear the differences among services.

- o The DOD should provide a list of all presenters and participants at the conference in advance of the conference if possible. Presenters should be identified by the subject area in which they have expertise.

- o A list of related conferences sponsored by DOD should be provided.

APPENDIX A

PROGRAM FOR THE MATERIALS AND STRUCTURES TECHNOLOGY CONFERENCE

Tuesday, June 14, 1983

8:00 a.m.	REGISTRATION -- NSWC Auditorium Lobby
9:00	WELCOME Captain J. E. Fernandez
9:10	INTRODUCTORY REMARKS Mr. Jerome Persh, Staff Specialist for Materials and Structures, OUSDR&E
9:25	KEYNOTE ADDRESS Dr. Edith W. Martin Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology)
10:15	COFFEE BREAK
10:45	NATIONAL MATERIALS ADVISORY BOARD ACTIVITIES Dr. Klaus Zwilsky, Executive Director, NMAB
11:00	NMAB COMMITTEE OBJECTIVES Dr. Seymour Blum Charles River Associates, Inc.
11:15	INDUSTRIAL BASE CONSIDERATIONS Mr. Richard E. Donnelly, OUSDR&E
12:00 Noon	LUNCH
	NAVY
	Mr. James Kelly, ONT, Session Chairman
	1:30 p.m. Overview of the Navy R&D Program Mr. James Kelly, ONT
1:45	Basic Materials and Structures Research Dr. Charles T. Lynch, ONR
2:15	Requirements for Materials Exploratory Research and Development Dr. Hans Vanderveldt, NAVSEA
2:45	Structural Needs for Ships and Submarines Mr. James Gagorik, NAVSEA

3:15 COFFEE BREAK

3:30 Materials and Structures Requirements for Missiles and Weapon Systems
Mr. Marlin Kinna, NAVSEA

4:00 Naval Facilities Materials R&D Requirements
Mr. Patrick Cave, NAVFAC

4:15 Future Needs in Naval Aircraft Materials Technology
Mr. Richard Schmidt, NAVAIR

4:45 Future Needs in Aircraft Structures Technology
Dr. Daniel Mulville, NAVAIR

5:15 ADJOURN

5:30-8:00 RECEPTION -- NSWC Cafeteria

Wednesday, June 15, 1983

8:00 a.m. REGISTRATION -- NSWC Auditorium Lobby

AIR FORCE

Col. Ralph L. Kuster, Air Force Flight Dynamics Laboratory, Session Chairman

8:30 Basic Research

Air Force Research in Materials and Structures
Dr. Michael Salkind (Office of Scientific Research)

8:55 Materials

Metals and Ceramics
Dr. Vincent Russo (Materials Laboratory)

9:30 Nonmetallic Structural Materials
Mr. Frank Cherry (Materials Laboratory)

10:05 COFFEE BREAK

10:25 Electromagnetic Materials Technology
Dr. Merrill Minges (Materials Laboratory)

11:00 Structures

Requirements and Program Plan for the Structures and Dynamics of USAF Aircraft and Spacecraft
Dr. Jim Olsen (Flight Dynamics Laboratory)

11:25	Advanced Development--Metals and Composites Mr. David Roselius (Flight Dynamics Laboratory)
11:50	Manufacturing R&D
	Manufacturing Science Dr. William Kessler (Materials Laboratory)
12:10 p.m.	LUNCH
	ARMY
	Dr. James Bryant, Department of the Army Session Chairman
1:30	On Establishing a New Procedure for Army Materials R&D Directions Dr. Robert French, AMMRC
1:55	Army Solid Mechanics R&D Needs Mr. Richard Shea, AMMRC
2:20	Materials for Armaments Dr. Jeff Waldman, ARRADCOM
2:45	Army Research Office Basic Research in Materials Basic Research in Structures at the Army Research Office Dr. Philip A. Parrish/Dr. Fred Schmiedeshoff, ARO
3:10	COFFEE BREAK
3:30	Coordinated Tank-Automotive Materials/Manufacturing Thrust Dr. James Chevalier, TACOM
3:55	Army Missile Materials Needs Mr. Phillip A. Ormsby, MICOM
4:20	Materials Opportunities for Future Rotorcraft Dr. Lawrence Roderick, AVRADCOM (Langley)
4:45	ADJOURN
5:00	FUNCTIONS

This session will provide an opportunity for attendees to interact with the presenters. The following four areas are currently being considered (the sessions will be held concurrently in separate rooms):

1. Aircraft and missiles (Mr. James J. Mattice, Air Force Flight Dynamics Laboratory, Session Chairman)
2. Ships and submarines (Dr. Hans Vanderveldt, Mr. James Gagorik, Naval Sea Systems Command, Session Chairmen)
3. Land combat systems (Dr. James Bryant, Department of the Army, Session Chairman)
4. Materials and structures research (Mr. Jerome Persh, OUSDR&E, Session Chairman)

Thursday, June 16, 1983

8:00 a.m.	REGISTRATION -- NSWC Auditorium Lobby
8:30	DEFENSE INTELLIGENCE AGENCY Mr. James McRae, DIA
10:00	COFFEE BREAK
10:30	DEFENSE ADVANCED RESEARCH PROJECTS AGENCY Overview of Defense Advanced Research Projects Agency Materials Program Dr. Steven G. Fishman, DARPA
12:00 Noon	LUNCH
1:30 p.m.	INFORMAL DISCUSSION
3:00	ADJOURN

APPENDIX B

METHODOLOGY AND APPROACH

The committee sought to evaluate the conference by relying primarily on two widely used methods of evaluation--participant observation and survey research. Participant observation methods are largely self-explanatory; members of the committee attended the conference as if they were members of the audience. Unlike members of the audience, however, they asked themselves and other participants as the meeting progressed whether it was accomplishing its purposes. These observations and a plenary session at the conclusion of the conference played an important role in evaluating the conference and in interpreting the results of the second means of evaluation--surveys of participants and presenters.

To gather the opinions of conference participants, the committee designed a self-administered questionnaire in which participants were asked to tell (1) who they are and what type of organizations they represented; (2) how they learned about the conference; (3) what they thought about the meeting; and (4) what they intended to do as a consequence of their attendance.

Questionnaires were distributed to participants with other conference materials as they registered at the meeting. The questionnaire was brought to the attention of participants during introductory remarks and again during the program. Participants completed and returned questionnaires as they left the meeting or used a return envelope for this purpose. A follow-up letter and questionnaire were mailed approximately three weeks after the conference to those who did not respond to the initial request. Of the 361 conference participants (excluding speakers, liaison officers, members of the committee, and NMAB staff), 311 completed and returned questionnaires. This completion rate of 86 percent compares favorably with other self-administered questionnaires of this kind and suggests that undetected nonresponse biases are small if at all present. The questionnaire and response frequencies are provided on pages 25 through 29.

Number_____

Materials and Structures Technology Conference
June 14–16, 1983
Survey of Participants
National Materials Advisory Board (NMAB)
of the
National Academy of Sciences (NAS)

Purpose of meeting and NAS/NMAB evaluation

The main objective of the conference is to present to the attendees the research and development needs of forthcoming military systems in the materials and structures areas. How well the presentors succeed in attaining this objective and how useful this type of conference is to both sponsors and conferees depends on the reaction of the audience. To determine this reaction we ask that you respond to the following questions.

The information you provide will be kept confidential and your name will not be associated with your answers. The information will be used for statistical purposes only.

1. How did you *first* learn about the Materials and Structures Technology Conference? (PLEASE CHECK ONE BOX ONLY)

A member of my organization asked me to attend	(65)	☐	PLEASE ANSWER A BELOW
Newsletter, journal, a posted notice, or posted invitation	(61)	☐	PLEASE GO DIRECTLY TO QUESTION 2
A mailed invitation sent directly to me	(118)	☐	
Conversation with colleague or friends	(42)	☐	
Some other way (PLEASE SPECIFY)	(16)	☐	

_____

A. How did that person learn about the Conference? (PLEASE CHECK ONE BOX ONLY)

A newsletter, journal, a posted notice, or posted invitation	(19)	☐
A mailed invitation sent directly to him	(28)	☐
Conversation with colleague or friend	(1)	☐
Some other way (PLEASE SPECIFY)	(4)	☐

_____

Don't know	(13)	☐

*Numbers in parentheses represent the number of responses to each item.

2. Have you participated in any of the previous DOD technology conferences? (CHECK AS MANY BOXES AS APPLY)

Structures Conference, April 1974	(14)	☐
Structures Conference, November 1976	(24)	☐
Materials Conference, February 1978	(59)	☐
Materials and Structures Conference November 1980	(76)	☐
This is the first conference I have attended	(206)	☐

3. In what area of technology is your primary interest?

Materials technology	(174)	☐
Structures technology	(27)	☐
Both	(104)	☐

4. For what type of organization do you work?

Federally funded research and development center	(22)	☐	PLEASE
Industrial firm	(189)	☐	ANSWER
University or college	(13)	☐	QUESTION
Nonprofit institution	(25)	☐	5 BELOW
State or local government	–	☐	
Department of Defense	(35)	☐	PLEASE GO
Other U.S. government agency	(12)	☐	DIRECTLY TO
Other (PLEASE SPECIFY)	(7)	☐	QUESTION 7

_____

5. About how many people are employed in the *entire* business, corporation or organization for which you work. For example, include employees at all establishments, including parent company and subsidiaries.

Fewer than 10	(2)	☐
10–100	(8)	☐
101–500	(19)	☐
501–1,000	(14)	☐
More than 1,000	(227)	☐
Don't know	(2)	☐

6. Approximately what proportion of the current R&D budget of your organization is funded by the Department of Defense?

0–25%	(137)	☐
26–50%	(34)	☐
51–75%	(32)	☐
76–100%	(57)	☐
Multiresponse	(1)	

7. How many years have you worked in the field of materials and structures?

Less than 2 years	(17)	☐
2 to 5 years	(19)	☐
5 to 10 years	(23)	☐
More than 10 years	(252)	☐

8. What is the *primary* work activity related to your current job?

Management	(111)	☐
Production	(3)	☐
Marketing/Sales	(39)	☐
R&D	(107)	☐
Teaching	(4)	☐
Other (PLEASE SPECIFY)	(11)	☐

_____

9. What was your *primary* reason for attending the Materials and Structures Conference?

To meet representatives of the Department of Defense	(13)	☐
I/my organization was particularly interested in learning more about R&D needs of DOD in materials and structures	(236)	☐
To express my own views or the views of my organizations on needed R&D in materials and structures	(5)	☐
I/my organization wanted to learn more about the R&D being performed by other conference participants	(23)	☐
Some other reason (PLEASE SPECIFY)	(6)	☐

_____

10. To what extent did the conference satisfy your primary reason for attending?

Completely	(54)	☐
Somewhat	(213)	☐
Not very much	(28)	☐
Not at all	(2)	☐

11. Which of the following sessions of the conference did you attend in whole or in part? (CHECK AS MANY AS APPLY)

Tuesday, June 14

Introduction, 9:00am–12:00noon	(288)	☐
Navy R&D, 1:30pm–5:15pm	(299)	☐
Reception, 5:30pm–8:00pm	(191)	☐

Wednesday, June 15

Air Force R&D, 8:30am–12:10pm	(289)	☐
Army R&D, 1:30pm–4:45pm	(264)	☐

Concurrent Sessions 5:00pm–6:30pm

1. Aircraft and Missiles	(60)	☐
2. Ships and Submarines	(39)	☐
3. Land Combat Systems	(29)	☐
4. Materials and Structures Research	(99)	☐

Thursday, June 16

DIA/DARPA, 8:30am–12:00pm	(220)	☐
Informal Discussion, 1:30pm–3:00pm	(80)	☐

12. In general, how well did the conference inform you of DOD's needs for R&D in advanced materials and structures technology in each of the following mission areas? (CHECK ONE BOX IN EACH ROW)

	Very Well	Moderately Well	Poorly	Not at All	Not Applicable
a. Ships and submarines	(65) ☐	(178) ☐	(27) ☐	(2) ☐	- ☐
b. Aircraft	(58) ☐	(193) ☐	(26) ☐	- ☐	- ☐
c. Missiles	(33) ☐	(174) ☐	(67) ☐	(2) ☐	- ☐
d. Spacecraft	(21) ☐	(161) ☐	(71) ☐	(6) ☐	- ☐
e. Land warfare vehicles and armaments	(20) ☐	(149) ☐	(57) ☐	(6) ☐	- ☐
f. Basic research	(36) ☐	(167) ☐	(68) ☐	(3) ☐	- ☐

13. And how well did the conference inform you of the needs for R&D in advanced materials and structures technology for each of the services and agencies represented at the meeting? (CHECK ONE BOX IN EACH ROW)

	Very Well	Moderately Well	Poorly	Not at All	Not Applicable
a. Navy	(98) ☐	(171) ☐	(22) ☐	(1) ☐	- ☐
b. Air Force	(70) ☐	(169) ☐	(37) ☐	(2) ☐	- ☐
c. Army	(28) ☐	(165) ☐	(54) ☐	(4) ☐	- ☐
d. Defense Intelligence Agency (DIA)	(32) ☐	(99) ☐	(31) ☐	(20) ☐	- ☐
e. Defense Advanced Research Projects Agency (DARPA)	(50) ☐	(121) ☐	(18) ☐	(4) ☐	- ☐

14. To what extent did the conference provide an opportunity to discuss R&D needs in materials and structures technology with representatives from DOD?

Adequate opportunity for discussion ..... (207) ☐
Inadequate opportunity ..... (90) ☐

15. Did you establish contacts with representatives from the military or other conference participants that you think will be useful later in proposing or conducting R&D in the fields of materials and structures?

Yes ..... (253) ☐
No ..... (48) ☐

16. During the next 12 months, how likely do you think it is that you or your organization will do any of the following as a consequence of your attendance at the conference?

	Very Likely	Fairly Likely	Not too Likely	Not at all Likely	Not Applicable
a. Submit an unsolicited proposal to a U.S. military agency ...	(116) ☐	(82) ☐	(57) ☐	(11) ☐	(34) ☐
b. Respond to a request for proposal (RFP) from a U.S military agency	(116) ☐	(60) ☐	(49) ☐	(12) ☐	(55) ☐
c. Modify one or more of your organization's projects in materials or structures	(56) ☐	(111) ☐	(82) ☐	(21) ☐	(24) ☐
d. Think differently about the needs of the DOD in materials and structures	(67) ☐	(108) ☐	(84) ☐	(16) ☐	(21) ☐

17. If the conference is held again, would you hope to attend or recommend that someone else from your organization attend?

Yes ..... (286) ☐
No ..... (19) ☐

18. What changes, if any, in the conference format and content could have made this meeting more useful?

_____

_____

_____

_____

_____

Please use the enclosed envelope to return your completed questionnaire to:

Dr. Stanley M. Barkin
National Academy of Sciences
National Materials Advisory Board
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

APPENDIX C

QUESTIONNAIRE FOR CONFERENCE SPEAKERS

In addition to the committee's survey of participants, liaison representatives to the committee distributed questionnaires to conference speakers. The evaluation by personnel from the DOD was an important element of the committee's evaluation and recommendation. (Reproduction of the questionnaire is included below.) Twenty-two of the 26 speakers completed and returned questionnaires for a completion rate of 85 percent. Speakers were asked whether they had made similar presentations during the last year, the extent of their contacts with conference participants, and their assessment of the conference. The committee relied heavily on these responses to judge the potential benefits of the meeting to DOD.

SPEAKERS' QUESTIONNAIRE AND RESPONSES

As you know, the National Materials Advisory Board is evaluating the effectiveness of this conference. Please complete this questionnaire to assist them in this effort.

1. Have you made a similar presentation to industry/university personnel within the last year?

Yes (8) ☐ No (14) ☐

If yes, where: _____

2. Were you approached by attendees during the course of the three day meeting for additional information?

Yes (22) ☐ No (0) ☐

3. Did you meet new people during the conference?

Yes (22) ☐ No (0) ☐

4. Did the Tuesday and Wednesday evening activities assist in meeting the attendees and transferring information?

Yes (15) ☐ No (1) ☐

5. What is your overall assessment of the conference?

(Favorable 16) _____

(Unfavorable 0) _____

(No Comment 6) _____

6. Is this a good way to let industry know our needs?

(Favorable 20) _____

(Unfavorable 1) _____

(No Comment 1) _____

7. Comments:

_____

_____

Name _____

Organization _____

Phone _____

APPENDIX D

LIST OF ORGANIZATIONS RECEIVING CONFERENCE ANNOUNCEMENT

Mr. Jean Caffiaux
Electronic Industries Association
2001 I Street, N.W.
Washington, D.C. 20006

Mr. John C. Williams
Numerical Control Society
11522 Running Cedar
Reston, VA 22091

Mr. Walter Weitner
Aerospace Industries Association
1725 DeSales Street, N.W.
Washington, D.C. 20036

Mr. Bruce Holt
Col. U.S. Air Force (Ret.)
American Defense Preparedness
Association
Suite 900, Rosslyn Center
1700 North Moore Street
Arlington, VA 22209

Mr. Don Vincent
Society of Manufacturing Engineers
Professional and Governmental
Activities Division
One SME Drive
P.O. Box 930
Dearborn, MI 48128

Mr. G. G. Scofield
Forging Industry Association
Room 1121, 55 Public Square
Cleveland, OH 44113

Mr. Walter M. Kiplinger, Jr.
Cast Metals Federation
Washington Representative
918 16th Street, N.W.
Suite 501
Washington, D.C. 20006

Mr. John Deam
National Machine Tool Builders
Association
7901 Westpark Drive
McLean, VA 22102

Mr. Ellsworth Peterson
Society of Naval Architects
& Marine Engineers
Chairman, Ship Production Committee
334 South First Avenue
Sturgeon Bay, WI 54235

Mr. Walter Hurd
American Society for Quality Control
Lockheed Corporation
Corporate Product Assurance Director
Dept. 03-30, Building 61, Box 551
Burbank, CA 91520

Mr. Bernard Sallot
Executive Director
Robot Institute of America
One SME Drive, P.O. Box 930
Dearborn, MI 48128

Mr. Michael Heylin
Editor
Chemical & Engineering News
1155 16th Street, N.W.
Washington, D.C. 20036

Science
American Association for the
Advancement of Science
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

Mr. William H. Gregory
Editor-in-Chief
Aviation Week & Space Technology
McGraw-Hill Building
1221 Avenue of the Americas
New York City, NY 10020

Proceedings
U.S. Naval Institute
Annapolis, MD 21402

Naval Engineers Journal
American Society of Naval Engineers, Inc.
1012 14th Street, N.W., Suite 507
Continental Building
Washington, D.C. 20005

Mr. Robert R. Jones
Editor
Industrial Research and Development
222 S. Riverside Plaza
Chicago, IL 60606

Manufacturing Productivity Frontiers
Manufacturing Productivity Center
IIT Center
10 West 35th Street
Chicago, IL 60616

The Sciences
The New York Academy of Sciences
2 East 63rd Street
New York City, NY 10021

Metal Progress
American Society for Metals
Metals Park, OH 44073

Mr. William J. Smothers
Editor
American Ceramic Society Bulletin
American Ceramic Society
65 Ceramic Drive
Columbus, OH 43214

High Technology
Technology Publishing Company
38 Commercial Wharf
Boston, MA 02110

Andrea Elyse Messer
Editor
Materials & Resources News
Federation of Materials Societies
345 E. 47th Street
New York City, NY 10017

CAB Current Awareness Bulletin
Metals and Ceramics Information Center
Battelle Columbus Laboratories
505 King Avenue
Columbus, OH 43201

Mary Paris
Editor
Professional Engineer
2029 K Street, N.W.
Washington, D.C. 20006

Manufacturing Engineering
Pub. by Society of Manufacturing
Engineers
One SME Drive
P.O. Box 930
Dearborn, MI 48128

SAMPE Journal
Official Journal of the Society for the
Advancement of Materials and
Process Engineering
668 South Azuza Avenue
P.O. Box 613
Azuza, CA 91702

Journal of Metals
Publication of the Metallurgical
Society of AIME
Warrendale, PA 15086

American Institute of Chemical Engineers (AIChE)
345 East 47th Street
New York, NY 10017

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National Association of
Corrosion Engineers (NACE)
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Houston, TX 77027

Society of Manufacturing
Engineers (SME)
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Dearborn, MI 48128

The American Institute of Mining,
Metallurgical & Petroleum Engineers (AIME)
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New York, NY 10017

American Society for Nondestructive
Testing (ASNT)
3200 Riverside Drive
Columbus, OH 43221

Society of Automotive
Engineers, Inc. (SAE)
400 Commonwealth Drive
Warrendale, PA 15096

Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, CA 94303

American Society for Testing and
Materials
1916 Race Street
Philadelphia, PA 19103

The Electrochemical Society, Inc.
10 South Main Street
Pennington, NJ 08534

Institute of Electrical & Electronic
Engineers, Inc.
345 East 47th Street
New York, NY 10017

National Association of Corrosion
Engineers
1440 South Creek
Houston, TX 77084

Society of Plastics Engineers, Inc.
14 Fairfield Drive
Brookfield Center, CT 06805

American Association of Crystal Growth
Princeton, NJ 08540

APPENDIX E

CURRICULA VITAE OF COMMITTEE MEMBERS

SEYMOUR L. BLUM received a B.S. degree from Alfred University and a Sc.D. in ceramics from Massachusetts Institute of Technology. His professional experience includes employment at Raytheon Company, Illinois Institute of Technology Research Institute, Mitre Corporation, and Northern Energy Corporation. Presently he is with Charles River Associates, Inc. His research interests are electronic ceramics, solid state behavior, environmental studies in pollution and waste utilization, solar energy, materials policy, and availability of materials.

ROBERT F. BORUCH received a B.E. degree from Stevens Institute of Technology and a Ph.D. in psychology from Iowa State University. After working with the American Council on Education, he was employed as a professor of psychology at Northwestern University. His research activities include experimental and quasi-experimental design in field settings, evaluation research, and ethical and legal aspects of the use of social statistics.

ROBERT W. PEARSON received a B.A. degree from the University of Missouri and M.A. and Ph.D. degrees in political science from the University of Chicago. Before his current employment with the Social Science Research Council he worked at the National Opinion Research Center. His professional interests are development of opinion surveys, review of grants in social and behavioral sciences, and measurement, analysis, and interpretation of social trends.

MORRIS A. STEINBERG received B.S., M.S., and D.Sc. degrees in metallurgy from Massachusetts Institute of Technology. After graduation he was employed with Horizons, Incorporated, Micrometer Instrument Company, Horizons Titanium Corporation, and Diwolfram Corporation. He is presently Vice President--Science of Lockheed Aircraft Corporation. His research interests include missile and spacecraft materials, extractive metallurgy, powder metallurgy, and high-strength steels.

MAX L. WILLIAMS received a B.S. degree from Carnegie Institute of Technology and M.S., Ae.E., and Ph.D. degrees from California Institute of Technology. He was Dean and Distinguished Professor of Engineering at the University of Utah before becoming a professor at the University of Pittsburgh. At present he is the Dean of the School of Engineering. His research interests include materials, structures, and design, adhesion phenomena, fracture mechanics, and mechanical properties of materials.