BY THE COMPTROLLER GENERAL 110320

Report To The Congress

OF THE UNITED STATES

Manufacturing Technology--A Cost Reduction Tool At The Department Of Defense That Needs Sharpening

The Department of Defense's Manufacturing Technology program has the potential for reducing costs of producing defense systems by applying new or improved technologies. Much needs to be done to determine systematically what benefits are achieved from the annual expenditure of program funds.

Present funding is about $120 million per year, and Defense plans to increase that to $200 million by fiscal year 1983. Before that happens, Defense needs management controls to improve project selection, reporting of project results, program evaluation, and the active promotion of using new technology in the production of defense equipment.

PSAD-79-99

SEPTEMBER 11, 1979

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-175132

To the President of the Senate and the
Speaker of the House of Representatives

This report describes Department of Defense efforts to reduce acquisition costs of defense systems through its Manufacturing Technology program. We undertook this review because Defense has funded almost $660 million for this program from fiscal years 1973-79, yet a complete program evaluation has never been made. Present funding is about $120 million annually, and Defense plans to increase this to about $200 million by fiscal year 1983. We suggest that the Congress consider withholding increases in program funding until recommended improvements in program controls are made by the Secretary of Defense.

We are sending copies of this report to interested congressional committees and Members of the Congress; the Director, Office of Management and Budget; the Secretary of Defense; and the Acting Administrator, Office of Federal Procurement Policy.

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

MANUFACTURING TECHNOLOGY--A COST REDUCTION TOOL AT THE DEPARTMENT OF DEFENSE THAT NEEDS SHARPENING

D I G E S T

The objective of the Department of Defense's (DOD's) Manufacturing Technology program is to develop or improve manufacturing processes, techniques, materials, and equipment to provide timely, reliable, and economical production of defense materiel.

The program could be improved to become a significant contributing factor in DOD's efforts to reduce materiel acquisition costs. DOD has recognized the program's potential value and its need for more attention and funding. DOD also recognized the need for improvement in managing the program. (See pp. 2 and 3.)

The Manufacturing Technology program has weak controls. Managers were not aware of how well the program was working and lacked specific information on program benefits or results. Management control should include features that allow managers to check performance, evaluate results, and take corrective action when necessary. Although DOD has recognized the need for program improvements since 1975, only now are its actions starting to take effect. Much more needs to be done. (See pp. 2, 13, and 14.)

GAO found that:

--DOD's criteria for funding projects are broadly and generally interpreted and do not focus specifically on the program's primary goals; that is, improving manufacturing productivity and reducing costs. (See pp. 5 to 7.)

--DOD does not have a consistent project ranking system applicable to all services to assure that funds are allocated only to the most beneficial projects. (See p. 7.)

--DOD was unable to readily provide basic program data on completed projects and projects implemented into production. (See p. 7.)

--The implementing instructions of the Army, Navy, and Air Force contain many procedures and requirements that are neither complied with nor enforced. (See pp. 7 and 8.)

--DOD has not developed a system to periodically evaluate the program's effectiveness and, therefore, has no assurance that its resources are being used in the most economical, efficient, and effective manner. Although the program has been in existence for over 10 years, no one can fully document benefits resulting from the expenditure of program funds. (See p. 8.)

--There have been many completed Manufacturing Technology projects that have never been implemented, yet very little has been done to actively promote, track, or document the implementation of project results into defense contracts. (See pp. 8 to 10.)

RECOMMENDATIONS

GAO recognizes DOD's efforts to improve the program as outlined in the June 1978 Defense memorandum as a step in the right direction. (See app. I.) In addition to these efforts, GAO recommends that the Secretary of Defense:

--Ensure that the services exercise their criteria for funding projects so they specifically focus on achieving the program's primary goals; that is, improving manufacturing productivity and reducing materiel acquisition costs. (See p. 15.)

--Devise and institute a consistent project ranking system, applicable to all services, to assure that program resources are spent on the most beneficial projects within each service. (See p. 15.)

--Develop and institute a uniform, centralized management data system that would allow program managers to evaluate and control program effectiveness. (See p. 15.)

--Insist that the services comply with their own implementing instructions regarding the reporting of cost savings and lessons learned. (See p. 15.)

--Have the services make regular evaluations of their programs and identify and correct deficiencies. Quantifiable measures of effectiveness must be developed that correspond to program goals. (See p. 15.)

--Have the services actively promote the use of Manufacturing Technology project results. At the very minimum, the services should have a plan for implementing project results into the production contract of the target system the Manufacturing Technology project was demonstrated on. (See p. 15.)

--Have the services account for use of program funds by documenting for each project what was spent, where it was spent, what benefits were expected, and what benefits were actually realized. (See p. 15.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

This program has the potential to provide significant benefits to the Government. However, because it needs considerable improvement in management controls and procedures, the Congress should consider withholding approval of the increases in funding proposed by DOD until the Secretary of Defense can demonstrate that these improvements have been instituted and are effective.

DOD COMMENTS

While DOD generally agreed with GAO's conclusions and recommendations, it took exception to those concerning criteria and setting of

priorities for projects. The full text of DOD's comments is in the appendix. (See pp. 19 to 28.) GAO's evaluation of those comments is set forth in chapter 4. (See pp. 17 and 18.)

Contents

ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
MT	Manufacturing Technology
MTAG	Manufacturing Technology Advisory Group
R&D	research and development

CHAPTER 1

INTRODUCTION

The annual rate of growth of manufacturing productivity in the United States for the period 1960-77 has been less than most other major industrialized countries. The Bureau of Labor Statistics reports that it increased only 2.6 percent in 1977, as compared to 4.6 percent in 1975 and 4.7 percent in 1976. The failure of productivity increases to keep pace with hourly wage increases is a contributing factor to the current inflation problem.

Increasing manufacturing productivity has been and is a matter of our continuing concern. In a June 1976 report to the Congress (LCD-75-436) entitled "Manufacturing Technology--A Changing Challenge to Improved Productivity," we concluded that to remain internationally competitive and to maintain a strong industrial base, manufacturing productivity must be a national priority.

PROGRAM OBJECTIVES

Continually faced with a limited budget, increasing equipment requirements, and increasing acquisitions costs, the Department of Defense (DOD) initiated the Manufacturing Technology (MT) program in an attempt to help solve these problems. The program's objective is to develop and improve manufacturing processes, techniques, materials, and equipment to provide timely, reliable, and economical production of defense equipment. The program is designed to "bridge the gap" between research and development (R&D) innovations and full-scale production applications. MT projects are to be funded only after preliminary research work has been completed and the feasibility of the innovation has been adequately demonstrated in the laboratory. An important MT program goal is to assure that the results of laboratory research and development investments can be translated into the production of defense equipment at the factory level.

PROGRAM HISTORY

In the early 1950s, the Air Force began its program for improving manufacturing techniques in the aerospace industry. The Army started a similar program in 1964, with particular emphasis in the munitions industry. The Navy has been performing work related to MT since the late 1960s.

In February 1968, under DOD direction, a Manufacturing Technology Advisory Group (MTAG) was established by a triservice agreement. MTAG includes representatives from the three services and was initially formed to reduce the possibility of duplication of effort by providing triservice coordination. It is also concerned with (1) encouraging joint participation by the services in projects which have broad application and (2) promoting the widest possible dissemination and use of MT project results.

In February 1975 the Secretary of Defense, recognizing the MT program's potential value, directed the services to increase their emphasis and support of the program. In April 1975 the services were directed by the Deputy Secretary of Defense to

--establish centralized program management and control with adequate, qualified staff that have sufficient authority to promote the programs objectives and

--identify new MT efforts and major weapon system programs where the application of MT promises a high return on investment and plan to fund these on a demonstration basis.

DOD Directive 5000.34, dated October 31, 1977, established new policy for production management during the acquisition cycle. Among other things, it emphasized the importance of the MT program by requiring that MT deficiencies be identified in proposed weapon systems and MT projects be initiated to assure producibility.

There are about 600 MT projects ongoing at any one time. The projects address manufacturing improvements and can involve almost any item DOD buys. DOD views the program as a long-term investment or "seed money" targeted at reducing future procurement and life-cycle costs. After DOD funds an initial demonstration of the new or improved technology, it expects industry to apply the technology in producing defense systems. The rationale is that these seed money projects reduce the contractors' implementation risks and, thus, motivate the private sector to adopt new technologies using private funds. A DOD official said that manufacturers will not always invest their own resources to develop cost-reducing technologies on defense contracts because of the potential risks involved in Government contracting. For these reasons, DOD believes that the MT program is necessary to encourage manufacturers to develop new manufacturing techniques that will reduce production costs for defense materiel.

On June 1, 1978, about 3 months after our review began, the Under Secretary of Defense, Research and Engineering, in a memorandum to the military departments (see app. I), emphasized the need for a strong and effective MT program. The memorandum outlined several areas that require management attention.

CONGRESSIONAL CONCERN

Recently, congressional committees have reduced MT budget requests for all three services. The reductions occurred for the Army and Navy because of the belief that some projects were R&D and should more appropriately have been funded from R&D rather than procurement appropriations. The Air Force budget was reduced because of the belief that competition alone between industrial manufacturers should eliminate much of the need for the MT program.

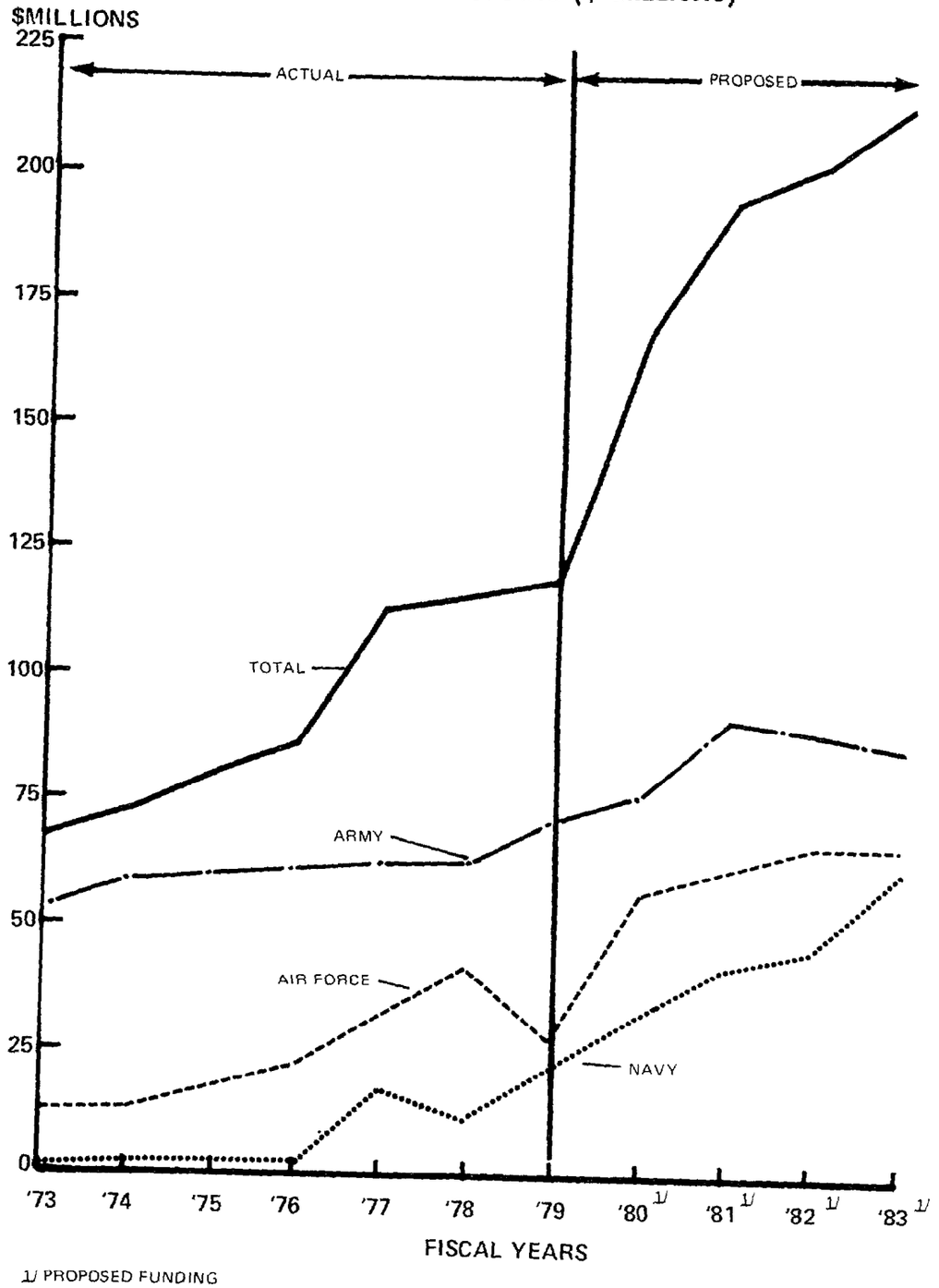
PROGRAM FUNDING

While program funding was not large initially, it approximated almost $660 million during the 7-year period, fiscal years 1973-79. Funding for fiscal year 1979 is about $120 million, but DOD plans to increase this to over $200 million by fiscal year 1983, which would bring total program funding from fiscal years 1973-83 to almost $1.5 billion. The graph on the following page summarizes program funding for the period, fiscal years 1973-83.

SCOPE OF REVIEW

Our work was performed during the period March 1978 through April 1979. We visited and held discussions with responsible MT program officials at the DOD, Army, Navy, and Air Force Headquarters, as well as with several of their subordinate commands. We obtained information on the goals, objectives, organizational structure, management policies, procedures, and controls of the MT program. In addition, we sought to obtain specific data on program results from all three services that could be used to evaluate the program.

MT PROGRAM FUNDING ($ MILLIONS)



1/ PROPOSED FUNDING

CHAPTER 2

MAJOR IMPROVEMENTS ARE NEEDED IN PROGRAM MANAGEMENT

While we recognize the potential value of the MT program to DOD's efforts to control acquisition costs, major improvements are needed in management's control of the program. For example, criteria for funding projects are broadly and generally interpreted so that they do not always specifically focus on the program's primary goals. DOD does not use a consistent project ranking system in allocating limited program resources. Program data is not readily available at the service management level. In many cases the military services have not complied with their own implementing instructions to track and document project benefits. The program's effectiveness has not been evaluated. Little or no attention is given to the large number of completed projects not put into production. In summary, there appears to be little or no accountability for the use of program funds.

FUNDING CRITERIA ARE BROADLY INTERPRETED

The primary purposes of the MT program, as established by DOD, are to improve manufacturing productivity and to reduce acquisition costs. While these are commendable goals that should be aggressively pursued, the services have not followed DOD's criteria of selecting projects that clearly and specifically address the advancement of these goals as a prerequisite for funding. The present criteria are so broadly and generally interpreted that practically any reasonably conceived project can qualify. We noted the following:

--Some projects did not appear to meet the criteria requiring that innovations be adequately demonstrated on a laboratory basis. For example, an MT project entitled "Automated Line for Melt-Pour Processing of High Explosives" was cited by the Army as an effective MT application. The Army described this project as providing basic designs which, to be useful, had to be scaled-up and implemented under another MT project. Army regulations state that MT projects are supposed to start with the completion of prototype production and extend to the beginning of full-scale production.

While the scaling-up and implementation of this process were correctly funded from the MT program, the project for providing the basic design should have been funded from R&D appropriations.

--Some projects labeled as "MT Support" only provided administrative and technical support to the services' MT headquarters. As an example, Navy project SEA 1-78, entitled "MT Support," had as its objective, "To provide technical expertise support to assist HQ in operation of MT program." This project was funded for over one-half million dollars for fiscal year 1978. The recipients of this money were the Naval Weapons Station, Washington, D.C.; the Naval Ship Engineering Center, Philadelphia, Pennsylvania; and the Naval Ocean Systems Center, San Diego, California. The Navy has funded support-type MT projects each year since at least 1972. Navy instructions define an MT project as a specific endeavor under the MT program which has as its objective the development of a new or improved manufacturing process, method, technique, or item of equipment for application to production of defense material and/or weapon systems. Support projects do not fit this definition.

--Some projects were funded with the objective of furthering the goals of other Government programs, such as pollution control, worker safety, and energy conservation. Environmental considerations were added to the MT program in 1972, however, we believe these activities are not really manufacturing technology oriented. An example of projects of this type is an Army project entitled, "Development of Methods to Minimize Environmental Pollution." The project's purpose was to "* * * insure plant conformance with environmental statutes." The project involved constructing a prototype water pollution abatement surface treatment line at Scranton Army Ammunition Plant to manufacture metal parts for artillery shells. The prototype line met the requirements of the Environmental Protection Agency for the best available technology economically achievable. Aside from the question of using MT funds for meeting environmental regulations, if the project used the best available technology economically achievable, it should not have been funded as an MT project.

The way present criteria are applied does not provide assurance that MT funds will be consistently used for their intended purposes.

CONSISTENT PROJECT RANKING SYSTEM IS NEEDED

For DOD to obtain the best overall return on its MT investments, limited resources must be allocated to the most beneficial projects. Because DOD has not provided guidance to the services for making these allocations, there is the potential that a relatively low priority project will be funded before one that more fully satisfies DOD goals. As a consequence, the program's resources may not be used in the most economical, efficient, and effective manner possible.

PROGRAM DATA NOT READILY AVAILABLE

In attempting to gather the data necessary to assess the program's effectiveness, we repeatedly requested DOD and the services to provide a listing and descriptions of all completed projects and all projects put into production. In meeting with MT officials, we did receive some of the requested data, but most of the responses were slow and frequently incomplete or inadequate. The inability to readily provide this data was attributable to the fact that program records are not centrally maintained. The services had to request their commands, major acquisition program offices, and MT contractors to provide the information. Although each service has been required since 1975 to establish central management of their MT programs, their inability to adequately respond to our data requests indicate that significant improvements need to be made to centralize program control.

PROGRAM INSTRUCTIONS NOT COMPLIED WITH

Although required by the program's implementing instructions to evaluate and report on benefits resulting from MT projects, the Army, Navy, and Air Force have not adequately done so. These instructions require evaluating the program's effectiveness, submitting cost savings reports, and documenting the reasons and "lessons learned" for projects not adopted.

Good management practice dictates that an effective system of control be designed so that management can check on performance, evaluate the results obtained, and take corrective action when and where needed. This information is a fundamental element of control by which management can gage performance. When management is not fully aware of the benefits resulting from its projects (and hence the program), it cannot make a proper appraisal of the results obtained or take necessary corrective action.

IS THE PROGRAM EFFECTIVE?

DOD officials said that a thorough evaluation of the program's effectiveness has never been undertaken. The basic data we requested on completed and implemented projects would constitute a major portion of the data needed by management to make such an evaluation. Therefore, DOD's inability to provide this data indicates to us that it cannot make a meaningful program evaluation. Without such data, DOD must estimate the value of the program on the basis of a small (and perhaps biased) sample of projects. We question the validity of this approach.

How effective is the MT program? No one knows for sure, including DOD. Defense journals and publications have featured MT-generated advances in the manufacturing state-of-the-art that have benefited the defense community and provided "spinoff" benefits to industry at large. Although the program has been in existence for over 10 years, no one can fully document the benefits resulting from the expenditure of program funds. The program's full potential has not and will not be realized until improvements are made.

MANY COMPLETED PROJECTS NOT IMPLEMENTED

To meet the program's primary objective of reducing defense acquisition costs through the application of new or improved MT, the results of MT projects must be used in the production of defense equipment. However, although their instructions call for it, DOD or the services have done very little to promote, track, and document implementation of project results into production.

For example, a recent analysis prepared by the Navy indicated that

"* * * a large percentage of the projects funded during the FY72 to FY7T [July 1 to September 30, 1976] time period were either not implemented or there were no documented savings. This can be attributed to the fact that there were no Navy MT requirements to document savings or to push for implementation of completed projects * * *."

That analysis showed that only 18 out of 103 Navy projects provided actual benefits in terms of dollar savings. However, the Navy claimed those savings totaled $43.5 million, compared to a total cost of $9.5 million for all 103 projects.

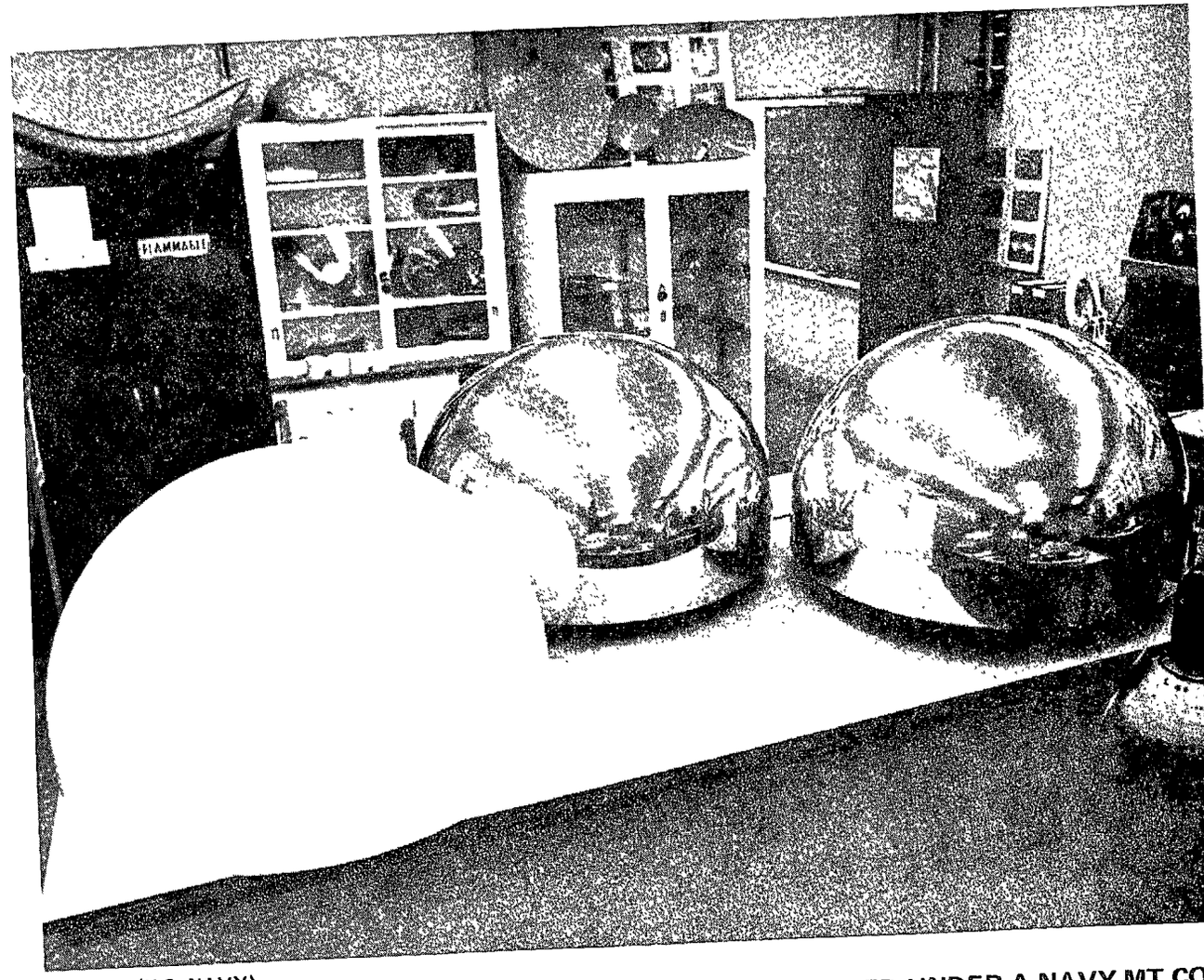
Based on data received to date, the Army and the Air Force have not been much more successful in implementing the results of their MT projects. For example:

--As of June 1978, the Army could list only 18 of 536 completed projects as having been put into production. A January 26, 1979, report claimed that 187 Army projects had been implemented out of 348 completed efforts. However, we did not receive a listing or any other information to substantiate this. Then, on June 13, 1979, we received a copy of the final report of the Army's MT implementation study, which was dated February 1979. This report stated that 190, or 55 percent, of 347 efforts were either implemented or are in the process of being implemented. However, when analyzed, the Army's report shows that only 135 of the 347 efforts had been implemented; 17 were in the process of being implemented; 18 had plans for implementation; and 20 were available for implementation. The implementation rate, based upon the Army's own figures, for completed implementations was 39 percent.

--Because they did not have their own data, the Air Force had to conduct a survey of its MT contractors to determine which projects had been implemented and what benefits, if any, had been realized. While this effort had not been completed when we finished our fieldwork, preliminary data (unverified) showed that of 152 projects, only 77 had been implemented.

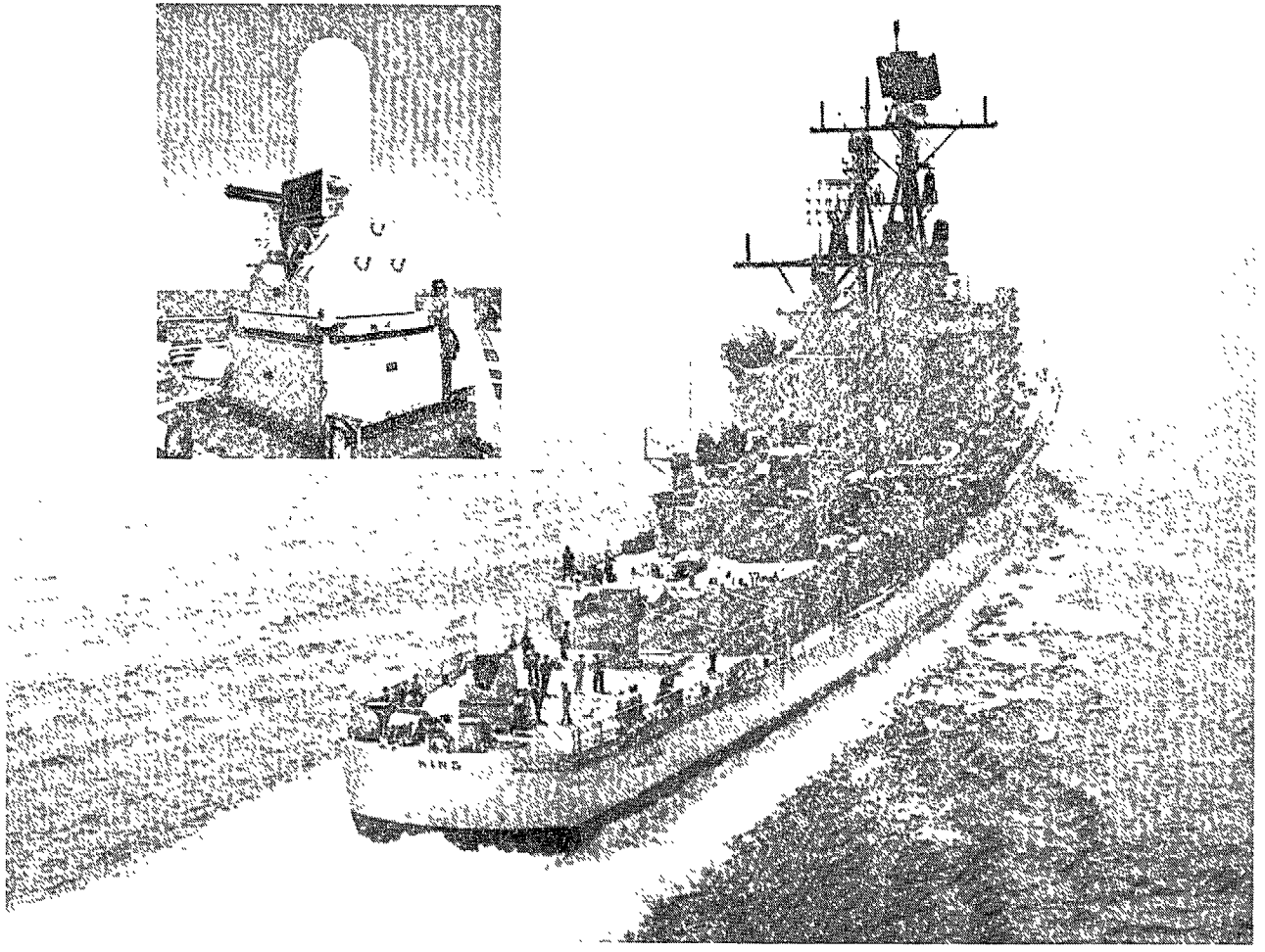
While DOD does not know exactly how many completed MT projects have been used in production, it is clear from the data they provided us that many completed projects have not been implemented.

To show the potential for savings that could be realized if MT project results are implemented into defense production, we cite a fiscal year 1977 Navy project for developing a low cost process for fabricating radomes (a protective cover for radar antennas) using a fiberglass-foam material as an alternative to a high-cost fiberglass honeycomb process. This successful project has been put into the production of the Navy's Close In Weapon Support System and is a candidate for use in a similar Army system called the Division Air Defense Gun System. The Navy estimates that, under its present procurement plans for the Navy system, it will save about $2 million on an MT investment of $116,000. Pictures of the radome and tooling developed under the MT contract and of the Navy weapon system are shown pages 11 and 12.



SOURCE (U.S. NAVY)

A LOW-COST, FIBERGLASS-FOAM RADOME AND TOOLING DEVELOPED UNDER A NAVY MT CONTRACT FOR USE IN THE NAVY'S CLOSE IN WEAPON SUPPORT SYSTEM.



SOURCE (U.S. NAVY)

A WEAPON SYSTEM WITH THE FIBERGLASS-FOAM RADOME BEING DEPLOYED AS A FEASIBILITY DEMONSTRATION ON BOARD THE U.S.S. KING.

CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

We endorse the goals and objectives of the DOD MT program and believe it has the potential to provide significant improvements in MT and substantial reductions in the acquisition costs of defense systems. However, unless certain improvements are made in the program's management controls, we believe that its full potential will not be realized.

Over $660 million has been spent on the program to date, yet DOD has not provided data that can demonstrate that this money was well spent. The full benefits from this program can be obtained only if project results are actually used in production. In general, we conclude that despite numerous high-level memorandums and directives, centralized management control of the program needs to be significantly improved. Specifically:

--The criteria used to select proposed projects for funding are too broadly and generally interpreted and do not always clearly and specifically address the advancement of program goals. More emphasis must be placed on assuring that projects selected for funding are in agreement with program goals.

--There is no consistent project ranking system presently used by all services to assure that limited program resources will be allocated to the most beneficial projects. A uniform project ranking system is needed to screen and prioritize proposed projects. This selection process prior to funding ensures that only the very best ideas are selected and enhances the probability that project results will be implemented. This would not involve transfer of funds between appropriations, but simply assure that the best projects within each service are selected in accordance with a uniform criteria.

--There is no centralized management data system at the service level that would allow the managers of the program to evaluate how effective the program has been. A uniform, centralized management data reporting system is needed to regularly keep track of project status, completions, implementations, and benefits.

--The services have not fully complied with their own implementing instructions regarding the reporting of cost savings resulting from implemented projects and documenting "lessons learned" for projects not implemented. We believe the program could be made more effective if the present instructions were complied with.

--No one in DOD can say how effective the MT program has been in its entirety. Program managers claim impressive accomplishments on selective projects. However, the total benefits from the program are largely unknown. DOD needs to evaluate the effectiveness of the entire program on a regular and continuing basis if it is to achieve the program's full potential. Before this can be done, however, a measure of effectiveness must be selected. We believe this measure of effectiveness, to be useful, must be one that can be quantified. One such measure could be in terms of dollars saved as a result of the program versus the cost of the program. Benefits must be real and auditable, not just estimates of future savings or intangibles such as "improved environment," "upgraded safety standards," "established data base," or "developed guidelines for future designs."

--Many projects have been completed, but have not been used in defense production. The MT program, as presently managed, stops short of actively promoting the use of project results in defense production. If the results of MT projects are not used, the program is not meeting its objectives and should not be continued. Systematic procedures are needed to actively promote the use of MT project results.

--Accountability for program results is needed. The MT program has been in existence for over 10 years, yet no one can document the benefits. By strengthening the accountability for the application of MT funds, DOD will be better able to fully realize the benefits from the program.

RECOMMENDATIONS

We recognize DOD's efforts to improve the program as outlined in the Under Secretary of Defense, Research and Engineering's June 1978 memorandum as a step in the right direction. The complete text of this memorandum is included as the appendix.

In addition, we recommend that the Secretary of Defense:

--Ensure that the services exercise their criteria for funding projects so they specifically focus on achieving the programs' primary goals, that is, improving manufacturing productivity and reducing materiel acquisition costs.

--Devise and institute a consistent project ranking system, applicable to all services, to assure that program resources are spent on the most beneficial projects within each service.

--Develop and institute a uniform, centralized management data system that would allow program managers to evaluate and control program effectiveness. At a minimum, this system should present, in a uniform format from all three services, data on project funding, project status, project completions, project implementations, and benefits resulting from the program. This will require developing procedures to track completed and implemented projects.

--Insist that the services comply with their own implementing instructions regarding the reporting of cost savings and lessons learned. These reports can be made a part of the uniform, centralized management data system we recommended above.

--Have the services make regular evaluations of their programs and require them to identify and correct deficiencies. Also, the services' MT programs should be reviewed on a regular and continuing basis at the DOD level. These evaluations should be made in quantifiable terms and not deal with intangibles. Quantifiable measures of effectiveness must be developed that correspond to program goals.

--Have the services actively promote the use of MT project results. At the very minimum, the services should have a plan for implementing project results into the production contract of the target system the MT project was demonstrated on.

--Have the services account for the use of program funds by documenting for each project what was spent, where it was spent, what benefits were expected, and what benefits were actually realized.

MATTERS FOR CONSIDERATION BY THE CONGRESS

This program has the potential to provide significant benefits to the Government. However, because it needs considerable improvement in management controls and procedures, the Congress should consider withholding approval of the increases in funding proposed by DOD until the Secretary of Defense demonstrates that promised improvements have been instituted and are effective.

CHAPTER 4

AGENCY COMMENTS AND OUR EVALUATION

We provided DOD, the Army, Navy, and Air Force draft copies of this report for their comments. The DOD comments are included as an appendix to this report.

DOD acknowledges weaknesses in its management of the MT program and the need for improvements in evaluating program results. DOD officials believe that there is a substantial payback from the program, but that belief is based on sporadic success stories with unaudited estimates of savings. They make the point that it might not be cost effective to measure the benefits from each and every project over an extended period of time and through all tiers of implementation. We believe, however, that the services should account for the use of program funds and document what was spent, where it was spent, what benefits were anticipated, and what benefits were actually realized for the initial implementation or use of project results. The whole point of our report is that while the MT program has the potential for providing benefits to the Government, if MT projects are not implemented into production of defense systems, the program cannot satisfy its intended goals. DOD must devise a procedure to ensure that MT project results are implemented into production of defense systems and must devise a procedure to track and document such implementations and ensuing benefits. At the minimum, the services should have a plan for implementing MT project results into the production of the system the project was intended for and for tracking and documenting benefits resulting from these implementations.

DOD officials agree that strengthening centralized program management will provide a positive response to the majority of our conclusions and recommendations. However, the services have been directed to centralize program management since at least 1975, yet significant problems with the program remain unresolved.

DOD officials agree that they do not use a consolidated priority system for all MT projects. They take exception, however, with our conclusion that because of this program, resources may not be used in the most economical, efficient, and effective manner possible. They also state that because of the realities of the budgeting system, funds are not transferred between appropriations and a consolidated prioritization system would not improve the project selection

process nor improve program effectiveness. Our recommendation would not involve transfers of funds between appropriations, but simply assure that the best projects within each service are selected in accordance with a uniform criteria. We believe this would allow DOD to better compare projects on a uniform, consistent basis.

DOD officials also take exception with our view concerning the criteria for selecting MT projects. They agree that cost reduction and productivity enhancement are the primary justification criteria. However, they state that in their view, project criteria should also include MT projects to provide technology required to conform with regulations concerning safety, health, pollution abatement, and energy conservation. We disagree. Funding projects that do not directly satisfy the MT programs goals of improving productivity and reducing cost can create the impression that the program is doing more in these areas than it really is. We believe safety, health, pollution abatement, and energy conservation projects should at least be separately identified, if they are not taken out of the MT program, so a clear picture of cost reduction and productivity enhancement efforts may be given to the Congress. Further, by separating out projects which are designed to satisfy regulatory requirements, a clearer indication of the cost of these requirements may be obtained. Also, projects which would satisfy regulatory requirements were not the only problems we found with the way present criteria are interpeted. As we pointed out in our report, we noted projects for which the anticipated innovations did not appear to have been adequately demonstrated on a laboratory basis and projects that were labeled as MT Support, with their objective being to provide administrative and technical support to the services' MT headquarters.

APPENDIX I

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

19 JUN 1979

Mr. J.H. Stolarow
Director
Procurement and Systems Division
United States General Accounting
Office
Washington, D.C. 20548

Dear Mr. Stolarow:

This is in reply to your letter to the Secretary of Defense regarding your report dated 17 April 1979, on "The Department of Defense Manufacturing Technology Program -- A Tool for Improving Productivity that Needs Sharpening" (OSD Case 5153) (Code 950438).

We are pleased to see that while you have identified an area of the management of the Manufacturing Technology Program (MTP) which needs strengthening, you also recognize that the benefits we are deriving from the MTP are substantial. The MTP is a high leverage program as is illustrated by your reference to the $43.5 million in benefits derived from only 18 of the 103 projects funded by the Navy with a total investment of only $9.5 million. We believe these benefits are typical and because high weapons systems acquisition costs continue to be a reality, we have made manufacturing cost reduction through the application of technology one of our major materiel acquisition management initiatives for Fiscal Year 1980. The MTP will play a key role in this initiative.

We recognize your report is correct in pointing out that we have not measured the benefits and/or payback from each and every MT project funded and that our perception of a substantial payback, as is cited above, is based upon a sample of selected projects. Measurement of program effectiveness could be improved if benefit and/or payback analysis were made of each and every project over an extended period of time through all tiers of implementation. However, in our view, this approach may not be cost effective nor even feasible. In fact, the GAO representative who conducted this

APPENDIX I

survey recognized such an effort would be "horrendously expensive" and suggested we improve our sampling system of documenting program benefits. The enclosed 1 June 1978 memorandum of the Under Secretary of Defense Research and Engineering identified the need for improvements in evaluating program results and directed the Services to strengthen program management and to improve this aspect of the program. They have taken positive steps to implement this guidance.

Strengthening centralized program management within each Service will provide a positive response to the majority of the conclusions and recommendations of your draft report. It will assure that the Services are: (a) following existing procedures, (b) conducting regular evaluations of program effectiveness, (c) monitoring and promoting use of project results, (d) improving documentation of program benefits and/or payback and (e) emphasizing implementation planning during the project selection process. All of the above will thereby enable us to measure the overall program effectiveness more comprehensively.

We take exception with your conclusion and recommendations concerning MT projects prioritization. You are correct in asserting that we do not use a consolidated priority system for all DoD MT projects. The MTP is funded in various appropriations defined by fiscal codes within each Military Department. MT projects are prioritized within the fiscal codes but because of the realities of the budgeting system, funds are not transferred between appropriations and a consolidated prioritization system would not improve the project selection process nor improve program effectiveness.

We also take exception with your view concerning the criteria for selecting MT projects. Our guidance requires that every project shall satisfy a current or anticipated Military Department requirement for needed manufacturing technology. In our view this not only includes cost reduction and productivity enhancement, which are in general the primary project justification criteria, but also includes providing other manufacturing technology required to conform with public law, executive orders and regulations (e.g., safety, health, pollution abatement, energy conservation). We believe that if a new manufacturing technology is needed by the Military Departments to conform to these external requirements and if it is not available from the private sector, the MTP is the logical vehicle for DoD to provide the necessary funds.

While we are in basic agreement with most of your recommendations, we suggest the draft report be revised to reflect a more

balanced expression of the positive aspects of the MTP benefits to the DoD versus your identification of one program management deficiency. A list of suggestions for revision on a line by line basis is enclosed.

Sincerely,

Gerald P. Dinneen

Gerald P. Dinneen
Principal Deputy

Enclosures

APPENDIX I

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

1 JUN 1978

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS

SUBJECT: Manufacturing Technology

During the past several months, my staff and I have been developing and implementing materiel acquisition policies strongly emphasizing business management aspects similar to those used by the firms comprising the defense industrial base. Our objective is to formulate an acquisition policy spanning the system life cycle and bringing to bear the business management factors necessary to develop and produce a successful product on time at the lowest possible cost. The challenges are enormous but the potential payoffs are equally large. Part of our strategy is to improve and more fully utilize the strengths of our defense industrial base. We must continue to improve production capability and industrial productivity. This includes emphasizing production management, encouraging capital investment and advancing manufacturing technology.

We have had a procurement-funded DoD Manufacturing Technology Program for many years. Its purpose is to reduce production costs by applying recently developed manufacturing technology to new or improved production equipment, processes and methods. It has been and continues to be a very sound investment. In 1975 the Deputy Secretary of Defense requested that the Military Departments provide increased emphasis to manufacturing technology including centralized management, increased funding and visibility and identification of significant cost reduction initiatives (Attachment (1)). I fully support the thrust of that memo. While we have made marked improvements during the past three years, I am confident that further improvements can and should be made. We need a strong, effective manufacturing technology program.

I have outlined eight areas which I believe deserve your attention and support (Attachment (2)). These are aimed at continuous identification and vigorous prosecution of manufacturing technology cost reduction opportunities arising throughout the life cycle of our weapons systems. I want to make sure that we have a strong manufacturing technology organization to plan, program, budget, execute and follow through to see that the results are implemented and diffused throughout our defense industrial base.

Enclosure 1

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Please be prepared to brief me within 120 days of the initial actions and plans you have taken to pursue these items. In addition, I would appreciate any additional ideas that offer the potential for increasing manufacturing productivity. I have asked Dr. Ruth Davis (Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology) to coordinate this effort and she can furnish any additional information you may require.

William J. Perry

Attachments 2

APPENDIX I

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

APR 11 1975

MEMORANDUM FOR The Secretaries of the Military Departments

SUBJECT: Cost Reduction Initiatives

Each of you is fully aware of the critical cost problems we have faced and will continue to face in weapons systems acquisition. We have addressed them from almost every conceivable aspect. However, many remain today and it is my intention to make a renewed attack on these problems.

During the past several months, I have asked my staff to prepare a list of potential DoD initiatives which, if implemented, would reduce the cost of material acquisition and improve the productivity of our contractors. They have developed a number of separate but closely related tasks we will be considering in the near future. These include such things as: adjustment of weighted guidelines to provide greater incentive for contractor capital investments in modern, more efficient manufacturing facilities; establishing a revolving capital fund for DoD procurement of modern production equipment; Production Support Engineering (PSE) funding - "seed money" aimed at manufacturing productivity improvement (similar to IR&D); evaluating ASPR provisions to insure that cost effective contractor capital equipment investments are encouraged; re-evaluating the feasibility of multi-year contracting, etc. There may be others that you may suggest which we should also consider.

You will recognize that several of these present many complex problems and could require action outside the DoD environment before we could implement them. However, there is one area where I believe we can start immediately with definitive action.

I am convinced there are numerous opportunities to obtain significant cost savings in the production of Defense materiel by increasing the application of state-of-the-art manufacturing techniques and by the development of new or improved manufacturing technology. For example, not only should we be making more effective use of

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numerically controlled machine tools and other new, highly productive manufacturing processes but we should also be exploiting emerging technologies such as computer aided manufacturing, laser welding, diffusion bonding, use of composites, etc.

I am informed that we are spending approximately $60 billion each year in this country to remove metal from parts where it is not needed. We should therefore develop and apply manufacturing processes that permit fabrication of parts closer to required net shape. This would not only reduce metal removal costs, but would also conserve many critically short, expensive strategic materials.

While I am aware that many of these opportunities are presently being pursued to some degree, I am convinced we must increase our efforts manyfold if we are to get the payoff that is needed to bring DoD systems and equipment costs down significantly.

The recently published guidance in the PPGM on the DoD Manufacturing Technology Program directed significant increases in emphasis and funding levels to realize our productivity goals. To assure that we are directing our efforts to the areas of greatest need and greatest payoff, to prevent duplication of effort and to promote widest possible application of new manufacturing technology advances across the board to all systems this guidance further stated the program should be centrally managed within each Service.

I am therefore directing the organization be structured in each Service to provide for central management and control of this program and that it be adequately staffed with highly qualified personnel that have sufficient authority to promote the objectives of this effort.

As a next step to permit realization of the savings and benefits that I believe exist, I am directing that a new "initiative" be established. Under this new "initiative", I want to identify and then aggressively exploit application of manufacturing technology cost reduction opportunities. Each Military Department is asked to identify a number of new manufacturing technology efforts, and a number of major weapon system programs where the application of existing or new manufacturing technology promises a high return on investment. You should plan to fund the opportunities identified on a demonstration basis. Special funding may be required. If the payoff appears to be significant, and if it is necessary, I am prepared to take this program to Congress.

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Please be prepared to brief me within 120 days of the initial actions and plans that you have taken to pursue this initiative. The briefing should include: A description of the organizational structure that will provide for centralized management and control of the manufacturing technology program in your Service; an identification of the weapon systems that have been selected for the cost reduction efforts, to include a description of proposed manufacturing improvement actions with associated costs; an analysis of potential benefits to be realized; a time-phased plan for implementation; a listing of other major manufacturing technology projects, and a projection of funds identified by program element, that will support the total Manufacturing Technology Program through FY 81. In addition, I would also appreciate any additional ideas that offer the potential for increasing manufacturing productivity and reducing costs.

I believe we cannot delay in taking affirmative action to exploit the cost saving opportunities offered in this area. As a result, I have appointed Jacques S. Gansler, Deputy Assistant Secretary of Defense (Materiel Acquisition), OASD(I&L), to direct this program during the initial stages, and he can furnish any additional information you require. Some initial dialogue has already taken place between OASD(I&L) and representatives of your staff.

In view of the potential for a large return on these investments and the resulting opportunities to demonstrate to Congress that we are making a concerted effort to reduce materiel acquisition costs, I solicit your personal assistance and involvement in carrying out this program.

Signed
W. P. CLEMENTS JR.

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Attachment (2)

Manufacturing Technology Program Improvement Areas

References:

a. DoD I 4200.15, dtd 14 July 1972, "Manufacturing Technology Program"
b. DoD D 5000.1, dtd 18 January 1977, "Major System Acquisitions"
c. DoD D 5000.2, dtd 18 January 1977, "Major System Acquisition Process"
d. DoD D 5000.34, dtd 31 October 1977, "Defense Production Management"

1. Manufacturing Technology Budgets

The Consolidated Guidance calls for specific levels of manufacturing technology funding. Strong, technically sound programs should be identified, supported and given sufficient priority to assure that those levels are actually funded. A $200 million/year program is called for in FY 1983.

2. RDT&E Manufacturing Technology Development Line Item

The procurement funded Manufacturing Technology Program is limited to funding only those generic efforts whose feasibility has been previously demonstrated in an R&D environment. However, manufacturing technology opportunities often surface which have not been previously demonstrated. An RDT&E funding mechanism is needed to pursue them. Once demonstrated, procurement funds can be used to fully exploit them. Navy has established a manufacturing technology development RDT&E line item. Army and Air Force should establish a similar manufacturing technology RDT&E funding source(s).

3. Production Cost Driver Analyses

During the past several years, the manufacturing technology offices have conducted various commodity oriented, production "cost driver" conferences and studies. These efforts have materially assisted us to identify and prioritize high payback manufacturing technology investment areas. These efforts should be continued and a long-range tri-Service plan should be developed to assure key areas are not overlooked.

4. Manufacturing Technology Office/Weapons Program Office Interaction

Our new 5000 series directives (references b, c, and d) require incorporating manufacturing technology assessments and action to correct deficiencies during the DSARC process. Because the manufacturing technology offices have a broad overall perspective of the current state-of-the-art, they can be an invaluable asset to the weapons systems' sponsors if used effectively. An open line of communication between the weapons systems offices and the manufacturing technology offices should be established and maintained.

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5. Manufacturing Technology Office Resources

As a result of implementing References a-d, the manufacturing technology offices will play an important role in the life cycle of our weapons systems. Their involvement in the DSARC process and during full-scale production requires that they be adequately staffed and funded. A review of the manufacturing technology offices should be made to assure they have the resources necessary to do the job expected of them.

6. Industry Interaction/Coordination

The Manufacturing Technology Program cannot be effective in a vacuum. During the past three years, marked improvements have been made in both tri-Service and government/industry interaction and coordination through the efforts of the Manufacturing Technology Advisory Group (MTAG). This has been an evolutionary process and should continue. Manufacturing technology developed by private capital should be used where possible. Unintentional duplication of effort should be avoided. Our manufacturing technology "seed money" should be used where necessary in first case application, but the private sector must then follow through. A synergistic combination will result only if there is full and open lines of communication and technology flow in both directions. MTAG and the manufacturing technology offices should work to strengthen this government/industry coordination and cooperation.

7. Implementation of Manufacturing Technology Project Results

The results of manufacturing technology projects must be implemented as widely as possible if the investment payback potential is to be fully realized. The potential breadth and probability of implementation should be considered during the project review process. Project completion is really the beginning. Implementation cannot be left to chance. Each manufacturing technology office should have an active technology diffusion/implementation program to assure that results are made available to the defense production base.

8. Effective Feedback

The process of determining the effectiveness of the manufacturing technology program needs to be improved. Today, reliance is placed on random samples identifying how project results were utilized and what payoffs were achieved. Many are impressive. But the process must be more disciplined. Each manufacturing technology office should establish a mechanism to monitor program payback.

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