



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

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PROCUREMENT AND SYSTEMS  
ACQUISITION DIVISION

B-164912

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The Honorable  
The Secretary of Defense

Attention: Assistant Secretary of Defense  
(Comptroller)

Dear Mr. Secretary:

On January 17, 1973, we advised you that we were initiating a survey of the Department of Defense's (DOD's) preparation and use of Area Coordinating Papers (ACP's) and Technology Coordinating Papers (TCP's) in planning its technology base activities. Subsequently, we limited the scope of our survey to the examination of TCP's primarily because too few ACP's had been completed.

We reviewed the completed TCP's and discussed their preparation and usefulness with Defense officials in the Office of the Director, Defense Research and Engineering (ODDR&E), the military services' headquarters, certain "systems commands," and selected laboratories. The survey was performed under our assignment code 952021.

The TCP's were intended to be long-range planning documents designed to bring together in a coherent fashion the exploratory development goals of the military services in given technology fields, and to provide a closer coupling between military requirements and the selection of exploratory development programs. The TCP's were initiated in 1970 as a result of the concern expressed by the Deputy Secretary of Defense, David M. Packard, that supporting technologies in DOD should have a logical relationship to weapon systems and military missions.

In our opinion, the TCP's, when properly prepared, will provide DOD components a continuing opportunity to improve the planning and coordination of their technology base activities.

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Our survey showed, however, that service officials do not use the TCP's in planning or managing their technology base activities primarily because (1) the TCP's do not provide adequate policy guidance or direction for those purposes and (2) the information in the TCP's is presented in formats that are significantly different from those used by the services to plan and manage their technical activities. In the absence of supporting documentation, we were unable to independently verify the accuracy and credibility of the completed TCP's as internal and external reporting documents. These matters are discussed in more detail below.

### Background

Programs to advance DOD's technology base, consisting of research, exploratory development, and nonsystem advanced development activities, involve the annual expenditure of about \$1.5 billion to support about 19,000 separately identifiable work units. These programs are administered by about 30 offices and commands in DOD and the work is performed in several hundred public and private laboratories throughout the country.

In 1970, the Blue Ribbon Defense Panel, appointed by the President and the Secretary of Defense to study the organization, structure, and operation of DOD, reported:

"There is no adequate or coherent planning for investments advancing the technological base. Responsibility and management for conducting such research are widely fragmented among and within the Military Services and Defense Agencies. Research funds so allocated have not always been spent on military-relevant technology, nor are all military-relevant areas of technology appropriately considered in the allocation of research funds."

In an October 4, 1972, GAO report entitled "Observations on the Planning of Research and Exploratory Development" (B-164912), we observed that the major planning problems appeared to be the military services' inability to (1) make long-range predictions of specific requirements for new knowledge and technology--such predictions would be relevant for making current research and exploratory development decisions--and (2) make comparative analyses of the 16,000 to 20,000 separately identifiable research and exploratory development efforts that compete with one another for the same resources.

We also reported that, to help overcome the above disabilities, DOD had directed the military services to prepare tri-service TCP's for each major field of technology in which DOD supports a major work program. In general, the TCP's were to provide policy guidance and direction that would help planners "weed-out" marginal and duplicate programs and spot underfunded and missing programs.

Initially, the following 11 technological and scientific areas were chosen as subjects for the tri-service TCP treatment:

- (1) Missiles and Space Vehicles Propulsion Technology
- (2) Materials
- (3) Structures
- (4) Aircraft Propulsion Technology
- (5) Medical and Biological Sciences
- (6) Aeronautical Vehicle Technology
- (7) Human Resources
- (8) Environmental Sciences
- (9) Electronic Devices
- (10) Surface Vehicles
- (11) Weapons Technology

At the time of our survey only the first 5 TCP's had been completed and available for our use.

Teams were then selected to write the TCP's under the leadership of action officers from the Office of the Deputy Director for Research and Advanced Technology, ODDR&E. Each team usually included knowledgeable representatives from headquarters, "system" commands, and laboratories of each military service. Some teams also included representatives from interested defense agencies, such as the Defense Advanced Research Projects Agency (DARPA) and the Defense Nuclear Agency (DNA). The objective was to bring together knowledgeable technical and managerial persons from the military services and defense agencies who are working in a designated scientific or technical area to prepare a common investment strategy for that area.

ODDR&E officials reported that some of the people who prepared the military services' technical planning papers were selected for the TCP teams, and to the extent possible, the services' technical planning papers are used as inputs to the TCP process. These relationships were looked upon as expedients to save effort on the part of the services and to provide an opportunity for service planners to become familiar with each other's efforts in the field.

DOD officials publicly reported several examples where bringing together knowledgeable technical and managerial persons from the various DOD components enabled them to "weed-out" marginal programs, spot underfunded and missing programs, and implement more cooperative programs. To illustrate, DOD officials reported:

- (1) As a direct result of the first TCP completed (Missile and Space Vehicle Propulsion Technology), the services, at their own instigation, instituted cooperative efforts and joint funding on six tasks with budgets totaling several million dollars. Additionally, the individual services submitted and implemented \$5 million worth of new initiatives, the inspiration and motivation for which can be traced directly to the TCP and the efforts which went into its preparation. Also certain projects were identified as being marginal and were dropped or phased out.
- (2) During the course of writing the Environmental Sciences TCP, the TCP team questioned whether climate had sufficient influence on human performance that it should be a factor in military personnel selection and assignment policies and procedures. Inquiry of medical personnel revealed that this was not a programmed area of research. A new initiative to evaluate this matter was included in the Environmental Sciences TCP, and the medical and psychological aspect will be addressed in the first revision of the Medical and Biological Sciences TCP.

#### Usefulness of TCP's

In addition to the benefits resulting from improved communication as described above, the TCP's are expected to (1) identify the areas most in need of new technology to meet future system requirements, (2) outline the research and exploratory development programs planned by each service to satisfy the above needs, (3) indicate priorities, (4) reveal unnecessary overlaps or duplicate service efforts, and (5) inform managers what new technology to expect and when.

#### For planning and managing technology base activities

When they meet the above objectives, the TCP's are supposed to be used as guides for planning and organizing specific assignments where there is applicable multi-service activity or interest.

Specifically, TCP's are to be utilized by "middle management" as an aid in making decisions on the proper allocation of resources for the various technology areas, and they are expected to serve as a valuable channel between the policymaking levels and the in-house laboratories.

We found, however, with few exceptions, that service officials regarded the TCP as merely another reporting requirement by and solely for the use of ODDR&E. They stated that there were probably some coordination benefits resulting from the preparation of the TCP, but that they had little use for the TCP in planning and managing their technical programs.

Service officials explained that the TCP's are thought of as after-the-fact generalizations of the services' existing technical plans and programs that have been reorganized into mission-oriented categories. To illustrate the reorganizational aspects, the materials TCP is organized on the basis of materials for submarines, ships, airplanes, armored vehicles, etc., as opposed to technical areas such as structural materials, thermo-protective devices, electronic and electromagnetic materials, propulsion materials, fluids, lubricants and seals, etc., used by the services to plan and manage their activities. The substantial overlap between these mission areas and technical areas makes the transposition of information from one to the other difficult and confusing.

Service officials stated that the TCP's may be useful to top management, especially ODDR&E, in fulfilling their oversight responsibilities and in directing service programs toward national and overall DOD goals, but not to the services. Service officials stated that they need more specific information concerning requirements, needs and priorities presented in a format compatible with the way their respective services plan and manage technical activities.

For internal and external reporting purposes

When completed, the 11 TCP's are expected to cover about 70 percent of DOD's technology base activities involving about 30 offices and commands within DOD. These activities will encompass most if not all the many disciplines that make up science and engineering.

Because of the complexity of the subjects covered and the diversity of the management agreements involved, the TCP's are being designed as reporting documents to show (1) top management in DOD and the military services that the planned investment in the technology base will adequately provide for their future defense needs and (2) the Congress that the funds authorized and appropriated for defense technology are well spent.

The ability, however, of the TCP's to provide the above assurances is dependent upon the accuracy and credibility with which the TCP's summarize and analyze their particular technological areas. Because of the absence of supporting documentation, we could not directly relate the TCP's to the services' technical programs and the many small work units. Accordingly, we did not attempt to independently verify the accuracy of the information contained in the TCP's nor did we attempt to ascertain the extent to which the completed TCP's demonstrate the technological areas are well planned, coordinated, and managed.

#### Opposition to the TCP

In general, the military services' attitudes towards the TCP's appeared to range from skeptical acceptance to opposition. The TCP's, if they meet their objectives, will give ODDR&E the visibility needed to exercise more direct supervision and control over the military services' programs than previously possible. Many service officials believe that, on the basis of assigned responsibilities and expertise, the services are better able to plan and manage the research programs needed to meet their future needs than ODDR&E or others.

In particular, some service officials have expressed concern that, during the preparation of the TCP's, researchers may be encouraged to justify their programs directly to ODDR&E and by-pass the services' R&D officials. In addition, service officials have stated that the TCP's could impose "bureaucratic rigidity" and constrain technical initiative because the TCP concept is to evaluate applied research and exploratory development programs on the basis of their potential military utility. They feel that this could inhibit innovative or unconventional exploration of technologies whose future military potential cannot yet be projected.

In view of the services' opposition, ODDR&E officials have emphasized the advisory nature of the TCP's. They have stated that there is no intent to force multi-service developments that are counter to individual service desires. In this regard, the TCP's are considered to be basically service-prepared documents although action officers in ODDR&E are responsible for preparing executive summaries that define the major management issues. The summaries are considered advisory in nature.

Our survey of the TCP summaries showed that the executive summaries were very general and the few issues that were presented were both general and noncontroversial.

Our discussion with an ODDR&E official responsible for one TCP that has been in process for several years showed that considerable give-and-take is involved in trying to develop a common investment strategy for that area. Because TCP's are not published or otherwise made available to us in draft form until controversial issues are either resolved or eliminated, making it possible for top-level R&D officials to approve and sign the documents, we could not evaluate this give-and-take process.

In 1973, The Center for Strategic and International Studies, Georgetown University, issued Special Report No. 14 on its study of the management of United States military research and development. The report recommended that the TCP's, along with other management tools, be used with more vigor. The report explained the recommendation as follows:

"These papers are designed to help OSD and the Services determine the optimum directions for R&D programs and help them check on progress, but, for a number of bureaucratic reasons, the papers have been under-utilized. Many ACPs and TCPs simply have not been brought to a useable stage because they frequently cut across the Service interests and the Services delay and dilute them. This panel believes that guidance papers such as these are potentially so important that DDR&E should be given adequate resources to draft the papers, with Service comment. They will always be difficult to formulate well, and the best of the DDR&E professionals should be assigned to them." (Underscoring added.)

### Conclusions

In our opinion the TCP process offers the military services a continuing opportunity to improve the planning and coordination of their technology base activities.

We believe, however, the TCP's are not used by the military services to plan and organize their technology base activities primarily because the TCP's do not provide the direction or policy guidance needed for those purposes. Even if adequate direction or guidance were given, we believe that the difficulties in directly relating the TCP's to the services' technical planning documents would frustrate and defeat the services' use of the guidance.

As previously noted, the usefulness of the TCP's is dependent on both their accuracy as overviews and their credibility as summary analyses of the respective technological areas. We recognize that informality has played a significant role in the TCP process. However, to better ensure both accuracy and credibility, we believe it advisable to establish more formal and visible relationships between the TCP's and the military services' planning and management documents and systems. In our opinion, the visibility will improve the supervision, review, and audit of these activities which, in turn, will better assure users that the TCP's accurately summarize the work that is being done in the prescribed technological areas and credibly represent the spectrum of informed opinions concerning what should be done.

We recognize that the TCP process will change, and is changing, long-standing management relationships within the military services and between the services and ODDR&E, and that such changes are difficult and require time. However, in view of the fact that it has been more than 3 years since the TCP's were initiated, we believe special efforts should be taken to better ensure the accuracy, credibility, and usefulness of the TCP's.

#### Recommendations

In order to better realize the potential benefits of the TCP's, we recommend to the Secretary of Defense that:

- (1) increased emphasis be given to the preparation and use of the TCP's in order to resolve service opposition to the establishment of the new management relationships; and
- (2) a formal, direct and visible relationship be established between the TCP's and the military services' planning and management documents and processes to promote the TCP's accuracy, credibility and use.

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We would appreciate your comments and advice on the matters discussed above and especially on any actions taken or planned. If you or your representatives wish to discuss these matters, please contact Mr. Harold H. Rubin, Deputy Director (Technology Advancement) on code 129, extension 4325.



Copies of this letter are being sent to the House and Senate Committees on Appropriations, Armed Services, and Government Operations. Copies are also being sent to the Director of Defense Research and Engineering and to the Secretaries of the Army, Navy, and Air Force for their information.

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Sincerely yours,



Director