



UNITED STATES GENERAL ACCOUNTING OFFICE

WASHINGTON, D.C. 20548

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PROCUREMENT AND SYSTEMS  
ACQUISITION DIVISION

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MAR 14 1974

The Honorable  
The Secretary of Defense 5



Dear Mr. Secretary:

We have completed a survey of the Defense Advanced Research Projects Agency (DARPA) to obtain information on its approach to the management of technology transfer to the military services. We were informed that the agency had successfully effected such transfers. Inasmuch as DARPA has existed for 15 years, we felt that evidence would be available illustrating DARPA's management approaches in technology transfer and that such approaches or lessons learned could be adapted for use in the National Science Foundation's Program Research Applied to National Needs, which was established in August 1968. D.O. 14

DARPA was established in 1958 to act within DOD as an independent source to introduce new technological concepts into the defense establishment. Its mission is to conduct high risk-high payoff research and development in areas where defense technology appears to be falling behind or where the risk of falling behind cannot be afforded. DARPA headquarters is in Arlington, Virginia. A total of 138 professional and nonprofessional personnel are employed in the United States and overseas. DARPA's proposed budget for fiscal year 1974 was \$210.6 million, 5 percent more than its fiscal year 1973 budget of \$199.8 million. 5

The present Director and a former Director of DARPA explained to us their management approach to technology transfer and said that some of the techniques used included:

1. Program directors and other senior professional staff were indoctrinated with the idea that DARPA's role was to initiate and sponsor advanced research with military potential until feasibility of concepts was demonstrated and then to transfer responsibility for sponsorship and support of continuing efforts to one of the military services

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so that DARPA's resources could be reassigned to new challenges.

2. DARPA frequently presents briefings on research and development (R&D) to potential DOD users. It also invites observers from the Army, Navy, or Air Force who may be candidates for inheriting the R&D program. DARPA tries at the earliest possible time to pick the best supplier and/or the DOD component most likely to continue the work.
3. DARPA makes plans for transfers well in advance of project completion, to offer up to 2 years of leadtime in budgetary submissions to enhance continuity of R&D funding. Frequently, DARPA's funding is phased out as one of the services begins supporting the program.
4. DARPA has no laboratories of its own but uses DOD's existing laboratories to do the work or contracts for the best resources wherever they exist, thus minimizing resistance to program changes.
5. When DARPA transfers an R&D program, it transfers the total resources, such as facilities and contracts, to the DOD component continuing the program.

Due to the lack of adequate records, we were unable to objectively evaluate the agency's management approach to technology transfer. We recognize that such transfers to some degree involve subtle human interactions which are not always subject to meticulous recordkeeping. However, top management would be in a better position to assess DARPA's performance if information were available showing the outcome and related costs of DARPA's research efforts.

Accordingly, several matters relating to the management information system which we believe warrant attention are listed below and discussed in the following sections of this report.

1. Maintaining adequate historical documentation for completed research programs.

2. Establishing procedures to determine the outcome of research programs transferred to the services.
3. Developing a reliable accounting system to accurately reflect actual cost of various research programs.

We also discuss the desirability of establishing a definitive plan in conjunction with the Director of Defense Research and Engineering (DDR&E) to identify those areas of research DARPA should undertake.

#### NEED TO MAINTAIN DOCUMENTATION FOR COMPLETED RESEARCH PROGRAMS

On several occasions during our survey we requested information and supporting documentation on the history of selected research programs transferred to the services. In most instances, DARPA was unable to promptly furnish the requested information and supporting documentation. The reasons DARPA officials generally cited were: (1) the staff members who were involved with the programs were no longer employed and (2) the staff, because of its small size and high professional caliber, did not always prepare written reports on its programs.

DARPA has been preparing completion summaries only at the contract level. According to some agency officials, these summaries were too restrictive and did not provide management with sufficient information to adequately analyze its research programs. Since most of the programs include a number of contracts, consolidated information on all related contracts would be of greater value to management. While our survey was in progress, the agency began developing guidelines for the preparation of completion summaries at the program level.

The proposed guidelines for the program completion summaries will require the DARPA program managers to give management narrative descriptions of many facets of their research programs, including objectives, milestones, key management decisions, costs, state of the art of the technology, performance of the agent and contractors, lessons learned, and proposed future efforts. DARPA is

currently testing the proposed guidelines by preparing the summaries on a pilot basis for 15 to 18 major groups of programs. To prepare program completion summaries on a broad basis, DARPA will have to maintain better files as programs progress to completion.

We believe these summaries will help DARPA management evaluate the efficiency and effectiveness of its research programs.

NEED TO ESTABLISH PROCEDURES  
TO DETERMINE OUTCOME OF  
RESEARCH PROGRAMS TRANSFERRED  
TO THE SERVICES

According to the Director of DARPA, one measure of DARPA's success is how well it develops and subsequently transfers technology to the services. We found little or no documentation on the procedures and process of transferring DARPA-developed technology or programs to the services. DARPA considers its responsibility completed when its programs are transferred.

We believe DARPA should monitor the progress of programs to determine their success or failure after transfer. Such monitoring should provide DARPA management with information needed to assess its own technical efforts on the programs and should help insure a smooth transition and proper use by the services of DARPA-developed technology.

In July 1973, DARPA assigned to an Assistant to the Director responsibility for monitoring programs transferred to the services and for obtaining information to assess DARPA's technical efforts applied to these programs.

NEED TO ESTABLISH A  
RELIABLE ACCOUNTING SYSTEM TO  
ACCURATELY REFLECT COSTS OF  
RESEARCH PROGRAMS

DARPA's system for identifying the costs of its programs is not accurate and relies too heavily on the personal knowledge of program managers. Inasmuch as the

programs generally require many years for fruition and DARPA encourages an annual turnover of about 20 percent of its personnel, it seems particularly important that a reliable accounting system be established and maintained so that adequate records are available to provide continuity.

We attempted to verify the costs reported on transferred programs by selecting five programs from a list prepared for us by DARPA showing the programs transferred to the services since fiscal year 1968 and the funds expended on each. We then requested DARPA program managers to explain how the costs on the transfer list for the selected programs were compiled. Our analyses showed that costs for three of the selected programs were higher than those reported on the transfer list while the costs for the remaining two programs were lower than those reported.

For example, the cost on the list for the Large Seismic Arrays and Seismic Array Analysis Center transferred to the Air Force in 1973 was \$48.3 million. The program manager's analysis of the DARPA orders applicable to this program showed a cost of \$58.9 million, or \$10.6 million higher than the cost shown on the transfer list.

The program managers compiled the selected program costs by manually reviewing all of the computer printouts or amendments in the DARPA order files to identify and total those contract line items applicable to the selected programs from inception to completion and transfer.

We could not verify from the information contained in the computer printouts and order files that the contract line items identified by the program managers were applicable to the selected programs. In fact, several of the program managers, when asked to explain the discrepancies in the cost data, indicated that judgment played a large part in deciding what contract line items should be included in the cost of a particular program. They stated that the person preparing the program costs shown on the transfer list may not have been familiar with elements that should have been included in the programs.

In our opinion, an accounting system which depends on the memories and/or judgment of program managers to decide

what should be included in reporting the historical costs of transferred programs is not accurate. This condition should particularly concern an agency such as DARPA, which encourages an annual turnover of about 20 percent of its personnel.

NEED TO ESTABLISH A DEFINITIVE PLAN  
IN CONJUNCTION WITH DDR&E  
TO IDENTIFY AREAS OF RESEARCH  
DARPA SHOULD UNDERTAKE

DARPA was established to assist DOD in obtaining the most effective research, development, test, and evaluation (RDT&E) program possible for certain areas of particular defense importance designated by DDR&E. It was expected to fill important gaps that might exist in defense technology because of the services' tendency to emphasize research required to fill their assigned roles and missions. DDR&E has the overall responsibility of reviewing the research and development programs of the military departments and defense agencies and of initiating projects to be performed by DARPA, other defense agencies, or the services to fill important gaps.

DARPA officials told us that research ideas for its programs originate from several sources in addition to DDR&E, including the military services, other defense agencies, the educational community, unsolicited proposals from contractors, a congressional mandate on nuclear monitoring, and a Presidential directive on the VELA satellite program. DDR&E officials indicated that few research ideas are formally submitted by them to DARPA before project initiation by DARPA. They stated, however, that there is a great deal of informal communication between DDR&E and DARPA concerning areas of technology not being adequately covered.

DARPA and DDR&E officials said DDR&E assigns broad research areas to DARPA in the form of charters. However, an agency study showed that about 30 percent of the research being performed was unsupported by charters and that many of the existing charters were vague and outdated. DARPA has since initiated efforts to prepare charters, for approval by

BEST DOCUMENT AVAILABLE

DDR&E, identifying new research problems as opposed to preparing charters after programs have been initiated.

We believe DARPA and DDR&E need to jointly establish a more definitive plan for identifying those areas of research DARPA should undertake and for assigning priorities to them. The lack of a more definitive research plan could result in DARPA's undertaking research projects which do not make the maximum contribution to advancing DOD's RDT&E program and to closing important gaps in defense technology. Further, a well-defined plan properly presented, justified, and implemented could improve the visibility of the Office of the Secretary of Defense and the Congress of DOD's important research efforts.

As noted above, DARPA has initiated certain actions which should provide a more useful management information system. The Director of DARPA did not agree that a more definitive research plan developed jointly with DDR&E is needed. We believe, however, that such a plan would be useful.

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

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We shall appreciate receiving any comments you may have on these matters. If additional information is desired, please contact Mr. Harold H. Rubin, Deputy Director, on code 129, extension 4325.

Sincerely yours,



R. W. Gutmann  
Director