AD-A189 116

# REPORT DOCUMENTATION PAGE

DTIC FILE COPY

| | |
|---|---|
| | 1b. RESTRICTIVE MARKINGS N/A |
| 2a. SECURITY CLASSIFICATION AUTHORITY N/A | 3. DISTRIBUTION/AVAILABILITY OF REPORT |
| 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A | UNCLASSIFIED/UNLIMITED |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S) N/A | 5. MONITORING ORGANIZATION REPORT NUMBER(S) N/A |
| 6a. NAME OF PERFORMING ORGANIZATION: Defense Science Board; 6b. OFFICE SYMBOL (If applicable) | 7a. NAME OF MONITORING ORGANIZATION N/A |
| 6c. ADDRESS (City, State, and ZIP Code) Room 3D1020, The Pentagon, Washington, D.C. 20301 | 7b. ADDRESS (City, State, and ZIP Code) N/A |
| 8a. NAME OF FUNDING/SPONSORING ORGANIZATION: same as 6(a); 8b. OFFICE SYMBOL (If applicable) | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N/A |
| 8c. ADDRESS (City, State, and ZIP Code) same as 6(c) | 10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO. N/A; PROJECT NO.; TASK NO.; WORK UNIT ACCESSION NO. |

11. TITLE (Include Security Classification)
(U) Historical Perspectives: A Review of Studies of the Department of Defense Science and Technology Program

12. PERSONAL AUTHOR(S)
Cattoi, R. L.

| 13a. TYPE OF REPORT | 13b. TIME COVERED | 14. DATE OF REPORT (Year, Month, Day) | 15. PAGE COUNT |
|---|---|---|---|
| N/A | FROM ____ TO ____ | 8707 | 41 |

16. SUPPLEMENTARY NOTATION
Report prepared for the Defense Science Board 1987 Summer Study on Technology Base Management

| 17. COSATI CODES | | |
|---|---|---|
| FIELD | GROUP | SUB-GROUP |
| | | |
| | | |

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
research management, science and technology program, budgets, defense planning, technology transfer, personnel management, research facilities, laboratories, scientists, engineers, (over)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
This report summarizes substantive recommendations and resulting actions of 16 prior studies. A short summary of each of the reports reviewed is included. Summaries of the recommendations of the various reports are grouped by management areas. Assessments of the resulting actions are provided. The studies summarized include: Report on Funding Recommendations (1984); President's Private Sector Survey on Cost Control (1983); Federal Laboratory Review Panel (1983); USDRE Indepedent Review of DoD Laboratories (1982); Report of the Defense Science Board Task Force on University Responsiveness to National Security Requirements (1982); Report of the Defense Science Board 1981 Summer Study Panel on Technology Base (1981); Report of the DoD Laboratory Management Task Force (1980); A Research and Development Management Approach: Report of the Committee on Application of OMB Circular A-76 to R&D (1979); Institional Barriers on DoD Laboratories (1979); Report of the Acquisition Cycle Task Force: Defense Science Board 1977 Summer Study (1978); DSB Task Force on Federal Contract Center Utilization (1976); DoD Medical and Human Resources

| | |
|---|---|
| 20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS | 21. ABSTRACT SECURITY CLASSIFICATION Unclassified |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL William L. Noll | 22b. TELEPHONE (Include Area Code) 694-0205; 22c. OFFICE SYMBOL DUSD(R&AT/RLM) |

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE

DTIC ELECTE DEC 0 7 1987 S D E

18. universities, industries.

19. Laboratory Utilization Study (1976); DSB Summer Study Task Force on Technology Base Strategy (1976); DoD Laboratory Utilization Study (1975); Task Group on Defense In-House Laboratories (1971); DoD In-House Laboratories (1966).

# HISTORICAL PERSPECTIVES:

# A REVIEW OF STUDIES

# OF THE

# DEPARTMENT OF DEFENSE

# SCIENCE AND TECHNOLOGY PROGRAM

R. L. CATTOI
JULY 1987

DEFENSE SCIENCE BOARD 1987 SUMMER STUDY

87 4004

# TABLE OF CONTENTS


- EXECUTIVE SUMMARY
- INTRODUCTION
  - Reports Reviewed
  - Technology Base Management Areas
  - Matrix (Reports vs Tech Base Management)
- REPORT SUMMARIES
  - Title
  - Author & Sponsor
  - Purpose
  - Recommendations
  - Results
- SUMMARY BY TECHNOLOGY BASE MANAGEMENT AREA
  - Science and Technology Strategy
  - Personnel
  - Management/Organization Initiatives
  - Funding
  - Peer Review/Performance
  - Facilities and Equipment
  - University/Industry/Services Interaction
  - Technology Transfer
  - Contracting
- CONCLUSIONS



DTIC COPY INSPECTED 2

Accession For
NTIS GRA&I ☒
DTIC TAB ☐
Unannounced ☐
Justification

By
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

# EXECUTIVE SUMMARY

This report summarizes substantive recommendations and resulting actions of 16 prior studies. A short summary of each ~~of the~~ report~~s~~ reviewed is included. Summaries of the recommendations of the various reports are grouped by management areas. Assessments of the resulting actions are provided.

Several recommendations have led to actions taken to address the particular situation in question. Significant steps have been taken 1) to provide proper balance between technology base performers, and 2) to implement greater interaction between DoD and universities. Advanced Technology Demonstrations were established in 1975 and grew to $1.7B (excluding SDI) in 1987. Formal peer review processes were established. The Federal Technology Transfer Act became law in 1986. Two-year budget cycles are being implemented in the 1988-89 budget cycle.

Several recommendations remain open to further action. The technology base organization and management structure and contracting practices need streamlining. Recommendations to select the "best qualified" lab director (military or civilian), to provide programmatic stability, and give more authority and responsibility to lab directors need additional attention. ~~The~~ recommendations to create a separate personnel system for scientists and engineers to designate lead laboratories with specific missions and to pursue joint Services planning need further work.

0335f/3

# INTRODUCTION

Since 1966 there have been numerous review studies of the DoD Science and Technology Program. These do not include studies of individual technologies within the DoD Science and Technology Program or individual Service or Defense Agency studies of their program components. This report summarizes the substantive recommendations and resulting actions of 14 prior studies which focused on the planning, management, coordination and execution of the Science and Technology Program and on the relative importance of its technical area components. This report is prepared for the Defense Science Board 1987 Summer Study on Technology Base Management.

Figure 1 lists the reports reviewed. Note that all were performed by high-level committees or task forces functioning under the auspices of the White House Office of Science and Technology Policy or the Office of the Secretary of Defense. Also, note that the task forces included many expert individuals renowned in science and technology. The reports were prepared over the past 20 years in response to a need or a problem perceived by the sponsoring office. All seem to have been done with a sense of urgency thus indicating the degree of importance.

## REPORTS REVIEWED

| TITLE | AUTHOR | DATE |
|---|---|---|
| REPORT ON FUNDING RECOMMENDATIONS | FCCSET FUNDING WORKING GROUP CHAIRED BY R. OSWALD | MAY, 1984 |
| PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL | R&D TASK FORCE CO-CHAIRED BY DAVID PACKARD | DEC., 1983 |
| FEDERAL LABORATORY REVIEW PANEL | WHITE HOUSE SCIENCE COUNCIL'S FEDERAL LAB REVIEW PANEL CHAIRED BY DAVID PACKARD | MAY, 1983 |
| USDRE INDEPENDENT REVIEW OF DOD LABORATORIES | ROBERT HERMANN | MAR., 1982 |
| REPORT OF THE DEFENSE SCIENCE BOARD TASK FORCE ON UNIVERSITY RESPONSIVENESS TO NATIONAL SECURITY REQUIREMENTS | DSB TASK FORCE CHAIRED BY IVAN BENNETT | JAN., 1982 |
| REPORT OF THE DEFENSE SCIENCE BOARD 1981 SUMMER STUDY PANEL ON TECHNOLOGY BASE | DSB PANEL CHAIRED BY GEORGE HEILMEIER | NOV., 1981 |
| REPORT OF THE DOD LABORATORY MANAGEMENT TASK FORCE | ARDEN BEMENT | JULY 1980 |
| A RESEARCH & DEVELOPMENT MANAGEMENT APPROACH: REPORT OF THE COMMITTEE ON APPLICATION OF OMB CIRCULAR A-76 TO R&D | FCCSET COMMITTEE CHAIRED BY GERALD GRIFFEN | OCT., 1979 |
| INSTITUTIONAL BARRIERS ON DOD LABORATORIES | SERVICE SENIOR LABORATORY REPRESENTATIVES | OCT., 1979 |
| REPORT OF THE ACQUISITION CYCLE TASK FORCE: DEFENSE SCIENCE BOARD 1977 SUMMER STUDY | ACQUISITION CYCLE TASK FORCE CHAIRED BY DICK DELAUER | MAR., 1978 |

FIGURE 1

## REPORTS REVIEWED (CONTINUED)

| TITLE | AUTHOR | DATE |
|---|---|---|
| DSB TASK FORCE ON FEDERAL CONTRACT CENTER UTILIZATION | DSB TASK FORCE, CHAIRED BY ROBERT DUFFY | FEB., 1976 |
| DOD MEDICAL AND HUMAN RESOURCES LABORATORY UTILIZATION STUDY | JOHN MCCAMBRIDGE AND STANLEY WHITE | SEPT., 1976 |
| DSB SUMMER STUDY TASK FORCE ON TECHNOLOGY BASE STRATEGY | DSB TASK FORCE, CHAIRED NORMAN RASMUSSEN | SEPT., 1976 |
| DOD LABORATORY UTILIZATION STUDY | JOHN ALLEN | APR., 1975 |
| TASK GROUP ON DEFENSE IN-HOUSE LABORATORIES | TASK GROUP CHAIRED BY EDWARD GLASS | JULY, 1971 |
| DOD IN-HOUSE LABORATORIES | DSB TASK FORCE CHAIRED BY LEONARD SHEINGOLD | OCT., 1966 |

FIGURE 1 (CONTINUED)

The recommendations were categorized by the following technology base management areas as identified by Dr. Ronald Kerber, Deputy Under Secretary of Defense (Research and Advanced Technology) in his June 1987 presentation to the Defense Science Board: Science and Technology Strategy, Personnel, Management/Organization Initiatives, Funding, Peer Review/Performance, Facilities and Equipment, University/Industry/Services Interaction, Technology Transfer, and Contracting. These areas, along with the reports reviewed, were then placed into a matrix (Figure 2). Note that some of the reports (such as the Packard and Hermann reports) were very broad ranging, whereas others were narrowly focused. However, few of the reports raised Peer Review or Technology Transfer recommendations.

## REPORTS VS. MANAGEMENT AREAS

FIGURE 2

| | S & T STRATEGY | PERSONNEL | MGT. & ORG | FUNDING | PEER REVIEW | FAC. & EQUIPMT | UNIV/IND/ SERVICES | TECH TRANSFER | CONTRACTING |
|---|---|---|---|---|---|---|---|---|---|
| FCCSET FUNDING GRP RPRT 5/84 | | | | X | | | | | |
| GRACE COMM. R&D TSK FRC RPT 82/83 | | X | X | | | | X | | |
| PACKARD RPT ON FED LABS 82/83 | | X | X | X | X | | | X | X |
| HERMANN RPRT 1981/1982 | X | X | | | X | X | X | X | X |
| BENNETT DSB TSK FRCE RPRT 1981/1982 | | | | X | | X | X | | X |
| HEILMEIER DSB RPRT 1981 | X | X | X | X | | X | X | | X |
| DOD LAB MNGMNT TSK FRCE (BEMENT) 1980 | | | X | | | X | | | X |
| GRIFFEN FCCSET RPRT 10/79 | | | X | | | | | | |
| INSTITUTNL BARRIERS RPRT (DAVIS) 10/79 | | X | X | | | | | | |
| DELAUER DSB RPRT 3/78 | | | | | | | | | X |
| DUFFY DSB RPRT 1975/76 | | | X | | | | | | X |
| MCCAMBRIDGE/WHITE RPRT 1975/76 | X | | X | X | | | | | |
| RASMUSSEN DSB RPT 1976 | X | | X | X | | | | | |
| ALLEN RPRT 1974/75 | X | X | X | X | | | | | |
| GLASS RPT ON IN-HOUSE LABS 1971 | X | X | X | | | | | | X |
| SHEINGOLD RPRT 10/66 | | | X | | | | | | |

0342f

## REPORT SUMMARIES

The following are summaries of each of the reports reviewed. Each one to two page summary includes the report title, task group which prepared the report and it's chair, the report's purpose and recommendation, and the actions which resulted from the report's recommendations. Only the substantive recommendations are included in these summaries. In some, if not most cases, the resulting actions cannot be directly attributed to the particular report under review, but, rather to a series of reports. Also, the estimations of the resulting actions are somewhat qualitative.

# FEDERAL COORDINATING COUNCIL FOR SCIENCE, ENGINEERING AND TECHNOLOGY FUNDING WORKING GROUP REPORT ON FUNDING RECOMMENDATIONS OF THE FEDERAL LABORATORY REVIEW PANEL

**Prepared:**

"FCCSET Funding Group Report" prepared by the FCCSET Funding Working Group, an interagency group, chaired by Dr. Robert B. Oswald, U.S. Army, in May 1984.

**Purpose:**

To maximize the implementation of the Federal Laboratory Review Panel (Packard Report) recommendations.

**Recommendations:**

- OMB should recommend that Congress appropriate funding for research and development on a predictable two-year basis so that staffing levels and research activities at Federal laboratories can be properly planned.

- Congress should include funds for the Federal civilian pay raise in the appropriations bill.

- Congress should conduct the budget process for the Federal laboratories once every two years to review, authorize and appropriate funds for a two-year cycle for research and development effort. The two-year cycle is to be submitted to Congress on each odd year requesting budget authority for two appropriations, the upcoming even year and the following odd year. The justification for each year will request funds to be available for two years for obligation purposes.

**Results:**

- DoD and Congress moving toward two year funding cycle.

# PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL

## Task Force Report in Research & Development

Prepared:

"Grace Task Force Report" prepared as part of the President's Private Sector Survey on Cost Control. R&D Task Force co-chaired by Dave Packard and others in 1982/3.

Purpose:

To identify opportunities for increased efficiency and reduced cost and to identify areas where managerial accountability could be enhanced and to suggest improvements.

Recommendations:

- Form additional centers of excellence for R&D research.
- Form a lab evaluation team at OSD level to review program overlap; lab staffing, facilities and equipment; mission and research congruency; and technical effectiveness.
- Examine benefits of consolidating labs.
- Give lab directors more control over how budget is used.
- Create scientific/technical personnel system independent of the Civil Service system.
- Establish guidelines for classifying labs and reclassify.
- Remove exemptions of R&D from applications of OMB Circular A-76. (Determination of whether work should be done in-house or contracted.)

Results:

- Provided support to changing the personnel system.

# FEDERAL LABORATORY REVIEW PANEL

Prepared:

"Packard Report" prepared by White House Science Council's Federal Laboratory Review Panel chaired by Dave Packard for OSTP in 1982/3.

Purpose:

To review lab missions, identify any systematic impediments to performance and determine whether return on investment is optional.

Recommendations:

- Re-examine labs missions and redefine as necessary in clear terms to guide agencies and labs in setting goals so that performance can be evaluated. Size of labs to be determined by its mission and quality of work.
- Create a scientific/technical personnel system independent of current Civil Service personnel systems. GOCO labs to have independent salary administration.
- Authorize funding for R&D on a predictable multi-year basis so that staffing and research activities can be properly planned. Devote 5 - 10% of annual funding to programs at lab director's discretion.
- Provide external oversight function for each lab. Rely on peer review process for funding basic research.
- Hold lab director accountable for quality, relevance and productivity. Appoint director for finite term with option of extending or abbreviating.
- Encourage access to lab facilities by universities and industry. Exchange knowledge and personnel. Provide for collaborative projects. Simplify procurement process.
- Give lab director flexibility in contracting.

Results:

- Provided support for changing the personnel system.
- Some missions were refined.
- External oversight functions were created.
- DoD and Congress moving to two-year funding cycle.
- 6.1 and 6.2 funding is predictable. Flexibility provided to lab director.
- Technical interchange between labs, universities and industry encouraged.

0335f/12

# USDRE INDEPENDENT REVIEW OF DoD LABORATORIES

**Prepared:**

"Hermann Report" prepared by Bob Hermann for Dick DeLauer (USDRE) in 1981/2.

**Purpose:**

To evaluate long term health of labs and identify actions needed.

**Recommendations:**

- Upgrade personnel practices.
- Streamline procurement practices.
- Modestly increase the rate of modernization of facilities and equipment.
- Improve university relationships.
- Establish external advisory groups for the laboratories.
- Establish an effectiveness review process for the laboratories.
- Improve industrial visibility of laboratory activities.
- Develop an operational concept basis for guiding technology development.
- Expand laboratory relationships with operational forces.
- Strengthen Services logistics R/D programs.
- Expand critical technology demonstrations.
- Establish a defense center for research in simulation.
- Form an electronic warfare techniques development center.
- Establish a formal command and control research program and center.

**Results:**

- University relationships improved.
- External oversight groups created.
- Logistics R&D programs strengthened.
- Technology demonstration (6.3A) program increased.

# UNIVERSITY RESPONSIVENESS TO NATIONAL SECURITY REQUIREMENTS

Prepared:

"Bennett Report" prepared by DSB Task Force chaired by Ivan Bennett in 1981/2 in response to House Armed Services Committee request.

Purpose:

To assess the capacity of U.S. universities to support national security requirements.

Recommendations:

- o Funding for research, equipment and facilities
  - Increase funding to universities to accommodate real sustained growth. Target critical programmatic needs plus facilities and equipment.
  - Encourage IR&D for industry support of universities.
- o Manpower and training
  - Award additional graduate fellowships, U.S. citizens only.
  - Continue graduate student assistantships.
  - Increase funding to ROTC programs.
- o Export control
  - Work the "scientific communications and national defense" issue in consultation with universities.
- o Other
  - Establish a DoD-University Forum.
  - Simplify acquisition process for procuring basic research from universities.
  - Strengthen foreign language and area study programs.
  - Coordinate university support with other federal agencies.
  - Promote closer ties between faculty members and FCRC's and people exchanges with labs.
  - Publicize DoD research interests and programs and availability of fellowships, scholarships, etc.

Results:

- DoD-University Forum created.
- Funding to universities increased. University Research Initiative and University Research Instrumentation Program established.
- Industry IR&D support to universities made a factor in establishing IR&D ceilings.
- Additional fellowships and assistantships approved.
- Policy on "scientific communications and national defense" formulated. Technical paper review process established.
- Procurement of 6.1 from universities simplified.

# 1981 DSB SUMMER STUDY PANEL ON TECHNOLOGY BASE

Prepared:

"Heilmeier Report" prepared by Defense Science Board Summer Study chaired by George Heilmeier in 1981 for USDRE.

Purpose:

To assess the health of the U.S. national defense technology base, within and outside the Government. It addressed these questions:

- What technologies are critical? At what level should they be funded?
- Is the technology transition process adequate?
- Are universities responsive to national security?
- Is the relationship with the basic research community adequate?
- Are the personnel resources adequate to provide defense technology?

Recommendations:

- Technology
  - Formulate vertically integrated technology base programs with "fenced" funding in several technical areas.
  - Direct the military departments and DARPA to use the investment strategy catechism in technology base planning.
  - Allocate resources to the Services and all levels of the technology base on a consistent scenario oriented basis.
  - Adopt a technology prioritization and investment strategy approach based on the figure of merit used in this study.
  - Increase and decrease funding in several specific areas.
  - Review general areas of activity suitable for de-emphasis.
- Transition
  - Create an Advanced Projects Agency to quantify maturity of emerging technology; to conduct "test marketing" experiments; and to be populated by personnel in the Services.
  - Require technology insertion plans.

- University
  - Increase 6.1 performed by universities by 25% in real growth over the next three years but be selective.
  - Direct the DAR Committee to revise current procurement policies and regulations to help universities.
  - Work the "scientific communications and national defense" problem.
  - Create a DoD thrust to upgrade equipment in universities.

- General
  - Direct that the NOSC and NWC personnel experiment be implemented for DoD Laboratories.
  - Designate lead laboratories in generic technology base areas.
  - Authorize the Services to each establish 100 graduate fellowships per year in areas of interest to DoD.
  - Establish a mechanism to ensure coordination of system technology base programs with the rest of the DoD technology base activity.
  - Direct the Services to review DARPA programs over $30M for potential future military applications, operational needs and transition plans.

**Results**:

- The "Top 17" technologies list used in guiding investment.
- Technology strategy plans developed.
- DoD funding to universities increased.
- Policy and implementation procedures for research reporting developed.
- DoD-University Research Instrumentation Program implemented.

# DoD LABORATORY MANAGEMENT TASK FORCE

**Prepared:**

"Lab Management Task Force Report" prepared by senior lab, human resources and comptroller representatives from OSD, Army, Navy and Air Force for Arden Bement, DUSD (R&AT), in 1980.

**Purpose:**

To assess institutional problems, determine whether negative controls were common to all Services labs and recommend improvement.

**Recommendations:**

- o Personnel & Management
  - Stabilize lab manpower ceilings.
  - Repeal congressionally mandated "high grade" manpower reductions, salary scale limits and travel restrictions.
  - Minimize repetitive, overlapping, randomly scheduled inspections and audits.
- o Facilities and Equipment
  - Establish lab facilities modernization policy at about $70M per year per Service for 10 years.
  - Establish lab equipment modernization policy to permit depreciation charges and spend at least $25 - $30M per year per Service for 10 years.
- o Procurement and Acquisition
  - Raise Determinations and Findings (D&F) limit to $1M, use "class" D&F's and reduce institutional reviews.
  - Provide dedicated R&D contracting for labs, raise funding ceiling and increase flexibility in small purchases.
  - Implement a financial management system which provides the labs working capital and a "buyer-seller" relationship.
  - Identify and address remaining barriers to good management, provide follow-through and monitor progress.

**Results:**

- o D&F limit raised to $1M; Air Force and Navy chose not to implement the flexibility.
- o Flexibility provided for small purchases.

0335f/18

# FEDERAL COORDINATING COUNCIL FOR SCIENCE, ENGINEERING AND TECHNOLOGY REPORT OF THE COMMITTEE ON APPLICATION OF OMB CIRCULAR A-76 TO R&D

Prepared:

"Griffen Report" prepared by the FCCSET Ad Hoc Interagency Committee on the Application of OMB Circular A-76 to R&D, chaired by Gerald D. Griffen, Deputy Director, Kennedy Space Center, for Dr. Frank Press, Director OSTP, and James Currie, Acting Administrator, Office of Federal Procurement Policy in 1979.

Purpose:

To study the issues and recommend guidelines for consistent and uniform agency implementation of OMB Circular No. A-76 -- "Policies for Acquiring Commercial or Industrial Products and Services Needed by Government."

Conclusions and Recommendations:

- Federal managers should seek to provide necessary Government research and development activities at the lowest possible cost.
- Federal managers must exercise their discretionary governmental authority in selecting the proper mix of internal and contract performers for R&D.
- Each agency should prepare an R&D approach.
- No additional mechanisms for the review of R&D management approaches need to be created.
- Delete all references to in-house core capability in A-76.
- Revise paragraph 7 of A-76, which addresses the interagency use of excess products and services, to make it clear that it does not refer to the interagency use of governmental functions.

Results:

- OMB Circular A-76 caused numerous internal studies, however, no major perturbations on tech base management occurred.

# INSTITUTIONAL BARRIERS ON DoD LABORATORIES

**Prepared:**

"Institutional Barriers Report" prepared by Service senior laboratory representatives for Ruth Davis, DUSD (R&AT), in 1979.

**Purpose:**

To examine barriers to effective performance by in-house laboratories.

**Recommendation:**

It is recommended that "...a single control mechanism be adopted to govern the level of internal laboratory operation." Establish a dollar ceiling for civilian salaries for each laboratory and give the lab director authority and responsibility for operating within this ceiling.

**Results:**

- Implemented as a test at two Navy laboratories - Naval Weapons Center - China Lake and Naval Ocean Systems Center.
- SECDEF directed establishment of DoD Laboratory Management Task Force (LMTF) chaired by DUSD (R&AT).

# REPORT OF THE ACQUISITION CYCLE TASK FORCE
# DEFENSE SCIENCE BOARD 1977 SUMMER STUDY

**Prepared:**

"DeLauer Report" prepared by the Acquisition Cycle Task Force of the Defense Science Board for the Office of the Under Secretary of Defense for Research and Engineering in 1978.

**Purpose:**

To analyze the cause for the lengthening trend of the Acquisition cycle.

**Recommendations:**

- Limit the number of major weapon systems to those the U.S. can afford to develop and deploy on the most cost-effective time scale.
- Preclude the further institutionalization of the procurement process in such areas as the unwarranted utilization of prototypes and the arbitrary prohibition of a reasonable degree of concurrency where appropriate.
- Demand that the acquisition strategy for a particular program provide for the level of flexibility and program stability that is suitable.
- Insist that the upgrading and improvement of an existing system be thoroughly examined before approval of a new system development effort.
- Insure that the procuring Service is prepared to make the commitment to procure and deploy a system before approval to enter full-scale development is given at DSARC II.
- Require that each DSARC decision be a combined programmatic and budgeting review milestone within the limits of DoD statutory authority.
- Provide for adequate statistical cost margins for the undefined but to-be-expected contingencies and engineering changes which will be incurred in every program.

**Results:**

- Applied primarily to updating the DSARC process pertaining to Engineering Development and Procurement.

# DSB TASK FORCE IN FEDERAL CONTRACT RESEARCH CENTER UTILIZATION

**Prepared:**

"FCRC Report" prepared by DSB Task Force chaired by Bob Duffy for Mal Currie, DDR&E, in 1975/6.

**Purpose:**

To assess the DoD - FCRC relationship and recommend steps that could be taken to improve the short and long term posture of the DoD with respect to FCRC utilization.

**Recommendations:**

- Endorsed DoD policy in use of FCRC's.
- Recommended no changes in functions being performed.
- University FCRC's should be managed by applying defense focus to their work.
- Study and Analysis FCRCs need line item support concept of management - do not place management control at too low an organizational level.
- MITRE and Aerospace should be managed in their single-contract mode by the Commanders of ESD & SAMSO.
- Management of FCRC's should be through an annual report of stewardship and not by Congressional ceiling on internal operating costs.
- Some percentage of total volume should be devoted to FCRC initiated research and planning.
- FCRCs should systematically plan technological renewal.
- Diversification should be reviewed annually by the sponsoring agency.
- Staff salary should move with the market.
- Total size of the FCRC family is reasonable and appropriate.
- FCRC's should not be permitted to competitively respond to RFP's.

**Results:**

- Assisted the DDR&E in supporting the FCRCs to the Congress.

# THE DoD MEDICAL AND HUMAN RESOURCES LABORATORY UTILIZATION STUDY

**Prepared:**

"Medical and Human Resources Lab Utilization Report" prepared by Cols. John McCambridge and Stanley White for John Allen (DD/R&AT), in 1975/6.

**Purpose:**

To determine requirements for the in-house labs, assess the labs' capabilities, identify excess capability or where R&D should be contracted and define a program to upgrade the quality of the labs.

**Recommendations:**

- Joint planning be done for defined, bounded, technical areas and areas of interdependency be selected on a case by case basis.
- Army be established as lead Service for all medical and human resources tech base R&D associated with helicopter operations.
- Air Force lead a tri-Service study on requirements for all facilities in acceleration, vibration and impact.
- Non-tech base work be funded from appropriate sources.
- Navy make several small organizational realignments.

**Results:**

- Joint Services planning of medical and human factors R&D initiated in 1981.
- Army designated lead Service in several areas.
- Facilities study accomplished - nothing changed.
- Reimbursement policy instituted.
- Navy made the organizational realignments.

# DSB SUMMER STUDY ON TECHNOLOGY BASE STRATEGY

**Prepared:**

"Rasmussen Report" prepared by Defense Science Board Summer Study Task Force on Technology Base Strategy, chaired by Norm Rasmussen for the DDR&E (Mal Currie) in 1975.

**Purpose:**

To provide DDR&E with an independent assessment on how well funding resources were allocated among the many technical areas of the technology base.

**Noted Problem Areas:**

- Complicated and layered management structure over the DoD in-house laboratories.
- Inertia to change protects and supports investment in low priority endeavors rather than encourages orderly shifts to higher payoff potential.
- Fragmentation of fields of endeavor between many organizational units.
- Tendency of the tech base to be isolated from system developer and operational forces.

**Commended:**

- Selective use of block funding.
- Increased contract to in-house funding ratio.
- Army reorganization plans to establish integrated Development Centers which include laboratories.
- Studies which assess the impact and cost effectiveness of investment in specific areas.

**Recommended:**

- Funding increases in specific areas.
- Funding decreases in specific areas.
- Integration and focus on specific areas where better return on investment seems possible.
- Continuing tech base prioritization and coordination processes.
- Senior management levels in OSD and Services be concerned with proper mix and general scope of investments rather than detailed approval of work to be done.

**Results:**

- Supported trends toward block funding.
- Supported contract to in-house funding ratio.
- Supported investment strategy reviews as a viable management technique.
- Provided the basis for reallocation of funding to various technical areas.

# THE DoD LABORATORY UTILIZATION STUDY

Prepared:

"Allen Lab Utilization Report" prepared by John Allen, DDR&AT, for Mal Currie, DDR&E, in 1974/5.

Purpose:

To evaluate DoD labs' capability, what they should do, how much they should do, relations with industry and universities, priorities on specific technologies, and levels of effort.

Recommendations:

- Realign Army's 33 labs into six mission-oriented development centers and four corporate labs.
- Continue toward "single program element funding" in Army labs.
- Planning and management of Navy 6.1, 6.2 and 6.3A be under a single command (Chief of Naval Research and Technology).
- Air Force 6.1 be shifted to predominantly contract. Aerospace Research Laboratories (AF's only 6.1 type lab) be phased out. Create a $C^3$ lab.
- Army develop system for financial control of in-house expenditures, develop a formal planning process for tech base and spell out program approval authority, and develop an R&D career pattern for officers.
- Navy eliminate redundancy in functional platform mission assignments, eliminate tech base fragmentation, control individual lab size and in-house/contract ratio, and obtain better use of officers in labs.
- Air Force pay people working on non-tech base projects from other than tech base funds and control size of labs.
- Labs prepare Technology Assessment Annex for Decision Coordinating Papers and Program Memoranda.
- Operate labs by specifying only maximum allowable in-house funding - leave mix and number of people to lab director.
- Terminate low priority efforts to reduce number of in-house people working in tech base. Savings to be applied to new starts in contract program.
- Reduce people in the DoD lab system (present strength is about 56,000) by 10 to 15% in FY 76 and 77.

Results:

- Reversed 10 year downward trend in funding to science and technology program; directed significant "above inflation" increases.
- Removed about 7,000 lab manpower positions from tech base funding; directed that funding be diverted to universities and industry.
- Closed some DoD labs.
- Established the 6.3A (Advanced Technology Demonstration) category of funding.
- Initiated post-Vietnam DoD contact with universities.

# TASK GROUP ON DEFENSE IN-HOUSE LABORATORIES

Prepared:

"Glass Report" prepared by Ed Glass and OSD, Army, Navy and Air Force in 1971 for DEPSECDEF Packard and DDR&E Johnny Foster including a JASON report (which was chaired by Hal Lewis.)

Purpose:

To review conclusions and recommendations of the Blue Ribbon Defense Panel (Fitzhugh Panel) which reported that Defense labs are less productive and less useful than they should be because:

- Lack of proximity to real problems and lack of influence.
- Poor functional alignment.
- No R&D chain of command from bench to policy level.
- Lack of imaginative, highly motivated leadership.
- Inadequate resources.
- Poor coupling between 6.1, 6.2 and 6.3 within and between labs.
- Too much job-shopping, fragmented technical programs.
- Fragmentation of authority because of overlaying staff.
- Poor quality managerial and technical personnel.

Fitzhugh Panel recommended:

- ARPA be delegated responsibility for all 6.1 and 6.2.
- ARPA and Defense Test Agency determine which in-house labs and T&E centers are essential with goal of eliminating nonessential and consolidating the remainder.
- Consider whether labs and centers should be GOCO.

Recommendations:

o Roles & Performance

- Define roles and missions; designate a particular area for each lab to assume responsibility for technology advancement and application.
- Advocate in-house labs to build working models and simulations of systems.
- Provide flexibility and encourage new initiatives in Advanced Technology Demonstrations.
- Establish advisory groups of lab people and other experts to provide independent advice to SPO directors, reported up the management chain.
- Expand roles of labs to be program managers for programs where creative uses outweigh administrative and system complexity.
- Provide for labs to do field evaluation of hardware.

- People Problem
  - Provide lab director authority and flexibility to "hire & fire."
  - Select best qualified person for lab directors - military or civilian - approved by Service Assistant Secretary.
  - Provide for strong R&D officer programs and stabilize assignments to labs.
  - Streamline personnel management system for hiring, retirements, adverse actions, etc.

- Administrative Reforms
  - Remove manpower ceilings - manage by fund ceilings.
  - Provide flexibility and raise funding authority for facilities programs, including modifications.
  - Exempt ADP equipment for RDT&E from stringent approval reviews.
  - Reduce burden of audits, inspections and reviews.
  - Give lab directors more control over procurement. Provide special procurement procedures for RDT&E.
  - Provide lab directors flexibility in financial reprogramming. Use single program element funding.
  - Exempt 6.1 and 6.2 from deferral process.

- Restructuring RDT&E Organization
  - Designate lead labs in Services.
  - Accommodate greater inter-Service use of lab facilities, staffing and cross-Service consolidation of RDT&E activities.

<u>Results</u>:

- Missions of labs more optimally focused.
- Initiated 6.3A program in FY74, not to be done in-house.
- Funding ceilings on facilities programs raised.
- ADP equipment for RDT&E reviewed in different management chain.
- Some financial reprogramming authority provided at lab director level.

## DEPARTMENT OF DEFENSE IN-HOUSE LABORATORIES: REPORT OF THE DEFENSE SCIENCE BOARD TASK FORCE

**Prepared:**

"Sheingold Report" prepared in 1966 by the Defense Science Board Task Force on DoD In-House Laboratories, chaired by Leonard Sheingold for the Director of Defense Research and Engineering, Dr. Foster.

**Purpose:**

To determine the necessary steps to be taken to improve the effectiveness of the laboratories in high-priority research and development areas.

**Recommendations:**

- Each Military Department prepare plans by 1 January 1967 for action that will markedly increase the participation of its laboratories in planning for weapons systems.
- Combine laboratory resources into a new weapons center.
- The Navy by 1 January 1967 conduct the required planning for establishing the first weapons center.
- Establish an OSD committee to determine the steps necessary to provide laboratory directors with appropriate controls over facilities, manpower and funding resources.

**Results:**

- Navy established weapons centers.

## SUMMARIES BY TECHNOLOGY BASE MANAGEMENT AREA

The following are summaries of the recommendations of the various reports grouped by the following technology base management areas:

- Science and Technology Strategy
- Personnel
- Management/Organization Initiatives
- Funding
- Peer Review/Performance
- Facilities and Equipment
- University/Industry/Services Interaction
- Technology Transfer
- Contracting

An assessment of the actions resulting from the recommendations is also provided. The degree of implementation of the recommendations is subjective.

## SCIENCE AND TECHNOLOGY STRATEGY

Many of the reports addressed the allocation of priority (and funding) to the various technologies in the science and technology program. The recommendations stressed closer consideration of operational needs in planning, the adoption of a modernized technology investment strategy technique and the designation of lead laboratories for specific technologies. Joint planning in defined areas and the creation of vertically integrated programs with fenced funding were also recommended. Closer interaction between DARPA and the Services was recommended as an avenue of joint planning. Specific programmatic recommendations included strengthening logistics R&D programs and establishing R&D centers in simulation, electronic warfare and $C^3$. Several reports over the years recommended expansion of the 6.3A Advanced Technology Demonstration Program.

As a result of these recommendations, logistics R&D was strengthened, and the 6.3A Technology Demonstration program was created in 1975 and increased to $1.7B in 1987. The Heilmeier "Top 17" Technologies List was used to guide investment. Lead laboratories were established in several select technologies. The Forecast II, Air Land Battle Environment, and Army 2000 are examples of studies performed to link operational needs to planning and to guide technology investment. Finally, the VHSIC and MIMIC programs are examples of limited vertically integrated programs that utilize "fenced" funding.

## PERSONNEL

Most of the reports made major recommendations which focus on personnel issues. These include recommendations to define each laboratory's mission, to select the best qualified person as Lab Director--whether military or civilian--and give him the responsibility, flexibility, and authority to perform the mission and "hire and fire." Surprisingly, the reports made few specific recommendations concerning the quality of laboratory personnel at other than the director level. The reports also recommended creating a separate scientist and engineer personnel system and directing that the Naval Ocean Systems Center and Naval Weapons Center personnel management technique be implemented DoD wide.

Over the past several years, there has been concerted action on the part of OSD and the Services to change the "personnel system." To date, however, few significant changes have occurred. This inaction is probably because the political difficulty of implementation is too great. There has been a trend toward selecting the best qualified person (military or civilian) to be lab director. However, there appears to be continued requirement for sufficient tenure to assure scientific program stability.

## MANAGEMENT/ORGANIZATION INITIATIVES

Numerous recommendations were made to improve Tech Base management and organization. Almost all the reports addressed this area. Major recommendations included initiatives to give lab directors more authority and responsibility, to streamline the organizational structure of the tech base, and to raise productivity. Productivity would be raised by achieving a better balance of the tech base program across performers, by adopting a more cooperative and efficient use of human and material resources, and by reducing the number of audits, inspections and reviews. Finally, there were recommendations to establish advisory groups that would provide independent advice to SPO directors; to increase labs' participation in weapons system planning; and, to endorse DoD's FCRC Policy.

These recommendations have resulted in a better balancing of in-house laboratory manpower paid by the tech base program, the confirmation of continued FCRC operations, and the provision of tech base advice in the DAB process.

## FUNDING

Higher funding of the technology base is a perennial concern of the reports reviewed. These recommendations are generally expressed as a need for increased funding levels in several specific technologies (e.g., the Heilmeier Report) or for various "causes" (e.g., Bennett Report on University Responsiveness). The Packard Report of 1982 and the FCCSET Funding Group Report of 1984 recommended that funding be appropriated for research and development on a predictable two-year basis so that staffing levels and research activities at Federal laboratories can be more optimally planned.

DoD and Congress are moving closer to adopting a two-year budget cycle. Funding for various high priority technologies was increased. Funding levels in the 6.1 and 6.3A programs are increasing; 6.2 funding has remained level.

## PEER REVIEW AND PERFORMANCE

Little was said about the peer review process and resulting performance. The Packard Report viewed current oversight as an excessive amount of reporting and paperwork (stressing measurable criteria such as time and cost), but inadequate scrutiny of the quality and relevance of the laboratories' activities. The Packard Report recommended that the competitive peer review process for funding basic research be further adopted to ensure quality and relevance of research.

As a result of the Packard Report, additional peer review panels have been formed for the DoD laboratories.

## FACILITIES AND EQUIPMENT

Some of the more recent reports noted the need for modernization of facilities and equipment and this may indicate an emerging trend. Better provision of university and industry access to lab facilities, as well as upgrading university equipment, are two recommendations that have been stressed as priority concerns. The DoD Laboratory Management Task Force report of 1980 (Bement Report) recommended the establishment of in-house laboratory facility and equipment modernization policies amounting to some $300 million per year. Finally, there were recommendations to provide flexibility by raising lab director funding authority for facilities and equipment.

The Defense University Research Instrumentation Program was created as a result of these recommendations. This program was initiated in FY 83, and provided $150 million over five years for university research equipment. The Bement Report recommendation for the establishment of in-house laboratory facility and equipment modernization policies has not been implemented.

## UNIVERSITIES/INDUSTRY/SERVICES INTERACTION

A number of studies noted the dependence of a healthy Defense Technology Base upon the interaction and cooperation of the Services with the R&D community in the university and industry sectors. The major recommendations with regard to this interaction included creating additional university-based centers of R&D excellence, awarding additional graduate fellowships, establishing a DoD-University Forum, and continued dialogue and work for resolving the tension between the advantages of open scientific communications and the imperatives of national interest.

Over the past few years, these recommendations have been acted upon. Industry interacting with universities was made a factor in determining IR&D ceilings. A DoD-University Forum was created to foster a dialogue with universities. A DoD-University Research Initiative and an instrumentation program were established and funding to universities was increased. A scientific paper review and publishing policy was formulated to add clarity to the dilemma of scientific communications and national defense.

## TECHNOLOGY TRANSFER

There were major concerns over the inadequacy of flowing knowledge from the laboratory to the field and from universities to government/industry and vice versa. The recommendations were usually stated very broadly and include provisions for collaborative projects between DoD, universities and industry and provisions for easier and increased exchange of knowledge and personnel among the three sectors.

These recommendations assisted in the deliberations leading to the passage of the Federal Technology Transfer Act of 1986 which encourages the use of Federal government developed technology by state and local governments and by the private sector.

# CONTRACTING

Proposals and recommendations on the broad subject of contracting have become prominent in recent reviews. The review of seven of the last eight reports expressed a general concern with streamlining procurement practices. The prime concern has been the lengthy procurement process which is costly and substantially delays the development of new technology. The major recommendation was to treat science and technology procurement differently from other procurement.

Another specific recommendation was the need to raise the "Determination and Findings" limits. This is the dollar ceiling, which if exceeded, requires Service Secretarial approval prior to contracting. Raising this ceiling would provide lab directors more latitude and reduce the administrative burden of reapproving procurements.

Some streamlining of the contracting process has been provided for the 6.1 and 6.2 programs. Though not fully implemented, the D&F limit has been raised to $1 million. The Competition in Contracting Act (CICA) initially created significant unintentional delays in Technology Base contracting, however, recent interpretations of CICA are easing contracting 6.1 and 6.2.

## CONCLUSIONS

The review of 21 years of studies of the Department of Defense Science and Technology Program yields a significant list of major recommendations concerned with a broad range of technology base management areas including Science and Technology Strategy, Personnel, Management and Organization, Funding, Peer Review, Facilities and Equipment, University/Industry/Services Interaction, Technology Transfer, and Contracting. Many of the recommendations of these reports have been implemented and have led to considerable beneficial changes within the DoD Technology Base. Other recommendations have not come to fruition.

Several major recommendations have led to actions taken to address the particular situation in question. Significant steps have been taken to provide proper balance between technology base performers, and to implement greater interaction between DoD and universities, including the creation of a DoD-University Forum and the establishment of major programs for funding university research and equipment. Additionally, 6.3A Advanced Technology Demonstrations were established in 1975 and grew to $1.7B (excluding SDI) in 1987. Formal peer review processes were established to provide for excellence and relevance. The Federal Technology Transfer Act became law in 1986. Finally, two-year budget cycles are being implemented in the 1988-89 budget cycle.

0335f/40

Several major recommendations remain open to further action. The Technology Base organization and management structure and the contracting practices need streamlining. The recommendations to select the "best qualified" lab director (military or civilian), to provide programmatic stability, and to give more authority and responsibility to lab directors need additional attention. The recommendation to create a separate scientist and engineer personnel system resulting from efforts to address long term problems of personnel quality and retention has not been implemented. The recommendations to designate lead laboratories with specific technology missions and to pursue joint Services planning need further work.