NATIONAL RESEARCH COUNCIL
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS
2101 Constitution Avenue Washington, D.C. 20418

MANUFACTURING STUDIES BOARD

OFFICE LOCATION
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2100 PENNSYLVANIA AVENUE, N.W.
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May 7, 1987

Dr. Bruce D. Merrifield
Assistant Secretary for Productivity,
Technology and Innovation
U.S. Department of Commerce
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Bruce:

Attached is information about the study I mentioned to you at Frank Press' garden party,

Rapid Prototyping Facilities in the U.S. Manufacturing Research Community.

The prospectus was approved by the National Research Council's Governing Board on January 20, 1987. A proposal was submitted to NSF in February and then withdrawn because Mike Wozny and his staff has not decided how to handle the entire area. Our attempts to find funding elsewhere have not been successful. Do you have any ideas?

Best regards.

Sincerely,

Kerstin

Kerstin B. Pollack
Director, Program Development

c: George Kuper

Attachment

NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL
COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS
MANUFACTURING STUDIES BOARD

Proposal for Support of a Study of Rapid Prototyping Facilities in the U.S. Manufacturing Research Community

SUMMARY

In response to an informal request of the Director, Design, Manufacturing, and Computer Integrated Engineering Division, National Science Foundation, the Manufacturing Studies Board of the National Research Council's Commission on Engineering and Technical Systems proposes to establish a committee to explore the feasibility, areas of application, and strategies for implementing rapid prototyping facilities in the U.S. manufacturing research community. This basic concept was endorsed and further study recommended by participants at a one-day workshop organized using National Research Council funds. The study committee will comprise experts in machined parts fabrication, advanced materials development and application, computer-integrated design and manufacturing, and small machine shop operations. The committee will identify and review existing efforts to provide rapid prototyping capabilities in other fields, including silicon foundries and their role in the semiconductor industry, assess the utility of providing such capabilities in a variety of fields with priorities suggested and benefits described, and outline the logistical/funding requirements for implementing such facilities. The committee will also assess relevant programs abroad such as the Technical High Schools at Aachen, Stuttgart, and Berlin in West Germany, the Norwegian remote factories, and MITI-sponsored programs in Japan. Estimated cost of the proposed one-year study is $150,000.

BACKGROUND

The concept of a silicon foundry was initially described by Dr. Carver Mead as a mechanism for producing custom designed integrated circuits. By allowing designs to be created at multiple locations and then telecommunicated to a central facility for fabrication, prototype semiconductors can be produced economically, allowing design engineers to test their concepts physically and functionally. This concept has been put into practice for the Very Large Scale Integration (VLSI) chip design community at a facility called MOSIS (Metal Oxide Semiconductor Implementation System) located at the University of Southern California. As stated in a recent National Research Council report, System Aspects of Cross-Disciplinary Engineering Research, pp. 14-15, this concept of a silicon foundry

> ...is a potentially useful...generic model of the system design process. It is applicable to other kinds of engineering problems beyond information processing. It

could be valuable in education because of the relatively small capital investment for the remote terminal equipment involved. Consideration should be given to creating smart design systems on the college campus for mechanical design, robotics, etc., along with corresponding foundries.

At a workshop organized by the Manufacturing Studies Board on October 29, 1986, a team of experts reviewed this foundry concept to ascertain if rapid prototyping facilities would be useful in other areas of application. The workshop participants (list of attendees attached) concluded that there is a large number of areas that could benefit from the implementation of rapid prototyping facilities. Manufacture of a variety of complex parts, such as robotic arms and sensor devices, as well as manufacturing using new materials and material modifications would be likely candidates for such fabrication facilities. Although VLSI foundries would be a useful model, they are not truly characteristic of how composites, ceramics, or metallic prototyping facilities could operate. Design rules in these applications are not as clearly defined as those for VLSI and the design must include a process plan that reflects characteristics of the prototyping facility. Consequently, implementing effective facilities that could provide researchers with rapid prototyping capabilities would require mechanisms to link designers more closely with the fabrication facilities than is common in the silicon foundry model.

In addition to the prototyping capabilities such facilities would provide, the workshop participants also discussed a number of other possible uses for such manufacturing facilities in the research community:

- stimulate definition of the science of design, the science of manufacturing, and the design-manufacturing integration process;
- actively demonstrate how existing manufacturing process technologies can be applied;
- serve as a focal point for American productivity improvement by physically demonstrating the benefits of advanced process technologies to engineers from industry who would have an opportunity to put the equipment through its paces prior to investing in it themselves; and
- serve as a mechanism to bring industry and academia closer on technical issues and approaches.

The workshop participants agreed that researchers in a large number of materials and technologies would benefit from facilities that could provide them with prototypes of new designs and demonstrate the applicability of new materials. Such fabrication facilities could also serve as a crucial resource in manufacturing process research, as well as provide important test beds for new process technologies. However, a careful assessment is needed to address pragmatic issues such as the feasibility of implementation, areas of greatest potential benefit, resource requirements, access, participants, and locations.

PROPOSED PLAN OF ACTION

The Manufacturing Studies Board of the National Research Council's Commission on Engineering and Technical Systems proposes to establish a committee to evaluate the feasibility, areas of application, and implementation strategies for rapid prototyping facilities in the U.S. manufacturing research community. The study will be conducted by a committee composed of approximately ten people with expertise in machined parts fabrication, advanced materials development and application, computer-integrated design and manufacturing, and small machine shop operations.

It is anticipated that the project will commence with a workshop designed to receive information from experts in a variety of relevant areas so that the committee can further define its scope of work and refine plans for the major components of the study. Participants in this workshop will be representatives from the public and private sectors with experience in developing science and technology policies and programs and planning implementation strategies; experts in advanced design and manufacturing technologies; and representatives of the potential user community--scientists and engineers expert in the research, development, and manufacture of U.S. products.

With the results of this workshop as background, the committee will conduct a series of site visits of relevant programs both in the United States and abroad to determine the goals of these programs, their mode of operation and sources of funds, and their effectiveness in achieving benefits for their constituencies. These programs would include the Automated Manufacturing Research Facility (AMRF) of the National Bureau of Standards, facilities at the state of Michigan's Industrial Technology Institute, demonstration centers of the Department of Defense' Integrated Computer-Aided Manufacturing (ICAM) program, MOSIS, and a number of relevant university initiatives in this country. Relevant models abroad might include the technical high schools in West Germany, the remote factories in Norway, and various facilities of MITI in Japan. Cases in which site visits prove infeasible would rely on written material and telephone conversations where practical.

This data-gathering effort will focus on aspects of each program that have been successful and identify those mechanisms that could usefully be transferred to the proposed prototype facilities. The committee will also talk to academic and industrial researchers and managers to determine the appropriate areas of application for the facilities, expectations among the proposed beneficiaries in universities and industry, and the amount of interest and potential resource commitment that could be expected from private industry to initiate the proposed facilities.

The committee will analyze the results of its research and prepare a report that will:

1) clarify the areas that would most benefit from rapid prototyping capabilities;
2) describe the physical requirements and technological capabilities needed for each area of application;
3) assess the potential role of rapid prototyping facilities in the area of manufacturing process technology research, development, and demonstration in the United States;
4) propose detailed strategies for implementing rapid prototype manufacturing facilities. These will include issues such as funding sources, equipment selection and updating, site selection, manning requirements, contractual relationships, access by designers and industry representatives, and oversight; and
5) present the results in sufficient detail to facilitate implementation of the strategies.

ANTICIPATED RESULTS

The committee will produce a report that contains strategies and options for the federal government to pursue in focusing and developing the rapid prototyping facilities concept. Based on the committee's analysis, the strategies, if implemented, are expected to initiate a process that will (1) provide design and materials researchers with the facilities to produce prototypes quickly and cost effectively; (2) allow manufacturing researchers to conduct effective studies of manufacturing processes and the integration of manufacturing functions; (3) hasten the development and implementation of advanced integrated design and manufacturing systems by providing an effective, functional test bed; and (4) improve the ability of workers, engineers, and managers to use these advanced systems effectively.

REPORTING

Reports resulting from these efforts will be prepared in sufficient quantity to ensure distribution to the sponsor, conference participants, and to other relevant parties in accordance with Academy policy. Reports may be made available to the public without restrictions.

ESTIMATE OF COSTS

The costs of this 12-month activity are estimated at $150,000, as shown in the attached estimate of costs.

TECHNOLOGY MARKETING COMPANY (TMC)

- o Not-for-profit company funded for 3 years; start-up costs repaid over 10 years
- o financial resources ultimately coming from product royalties, licences, etc.
- o provide exclusive rights to technology for restricted time (e.g., 5 years)
- o by being separate from government, marketing and selling become legitimate activities!
- o Success is measured by health of tech market company since it can only be successful if companies are sucessfullty utilizing government funded research.

Keith

Some additional ideas on entrepreneurial t^2 without costs to taxpayers.

- o compensation to T.M.C. employees comes from base salary and .5% royalty bonus paid proportionally to all employees of T.M.C.
- o any remaining cash at year end goes to venture fund which T.M.C. can use to fund enterprises to "such" technology from labs; no equity stake but repaid based upon product royalties (e.g., 2.5 times investment repaid in 3-5 years)
- o for government alone it must be possible to create a government tech marketing center alongside all major laboratories--e.g., III, Johnson Space Center, JPL, etc.
- o to stimulate participation by government employees, 1% royalties should be paid quarterly to originator of technology within government; tech market has responsibility for paying royalties
- o no constraints on royalties paid to T.M.C.; salaries and expenses are not constrained by government restrictions--cannot make profit however.

MINUTES

BOARD ROOM MEETING

JUNE 30, 1987

- NEEDS
- SUGGESTIONS
- ISSUES
- TECH TREK

NEEDS

- KNOWLEDGE OF STATE-OF-THE-ART TECHNOLOGY (e.g., NSF ERCs)
- "OFF THE SHELF" TECHNOLOGY (e.g., NBS AMRF)
- TECHNICAL ASSISTANCE (e.g., JPL RIMTECH)
- MANAGEMENT ADVICE (e.g., STATE "INCUBATORS")
- RESOURCE INVESTMENT (e.g., VENTURE CAPITALISTS)

SUGGESTIONS

- BOLD VISIONS
  - DOMINATE KNOWLEDGE-BASED MFG.
  - ENERGY INDEPENDENCE
  - EXPLORATION OF SOLAR SYSTEM
  - SCIENCE AND TECH. EDUC. AND CONTINUING EDUC.
  - INCREASE NAT'L PLANNING/COMMITMENT HORIZON

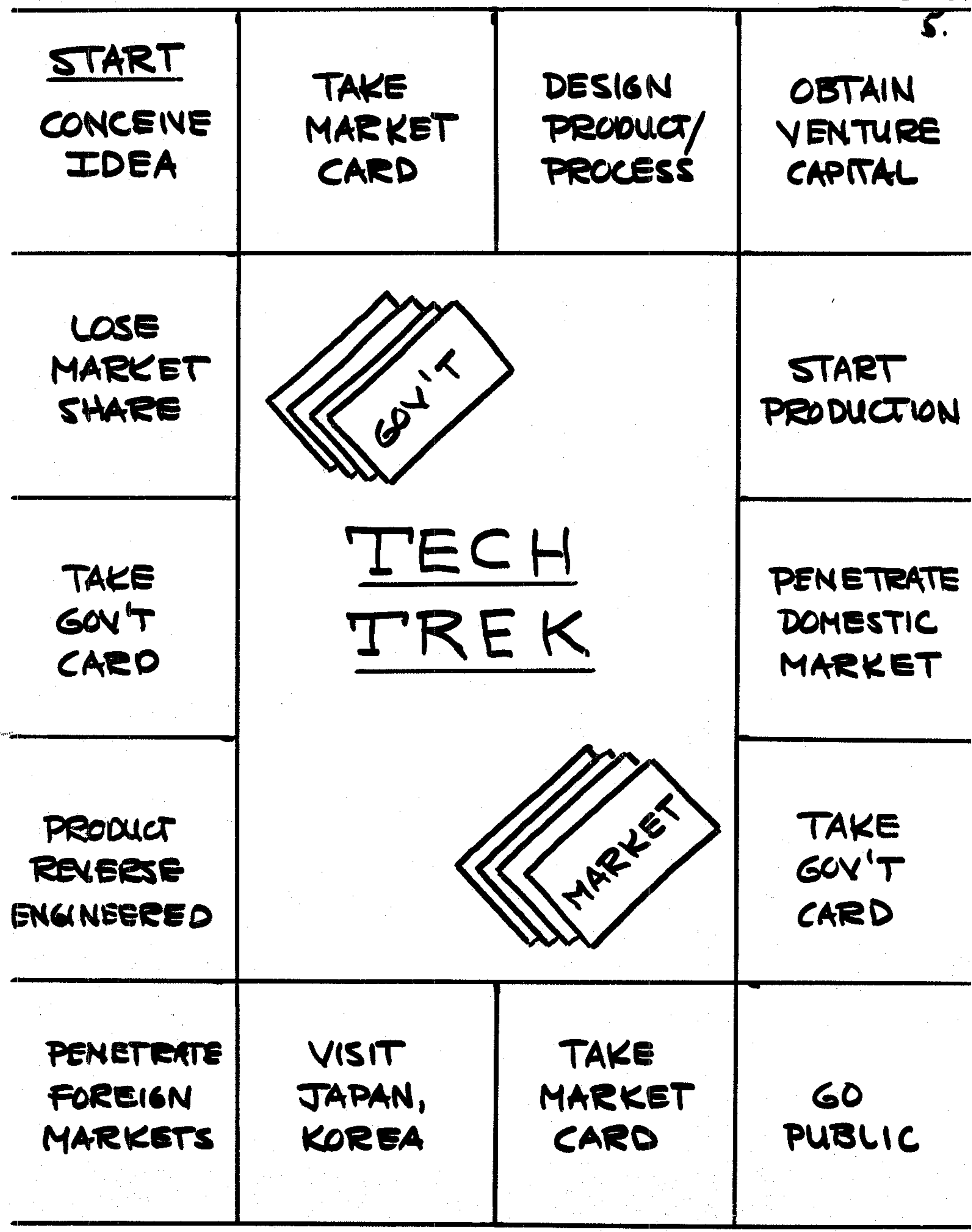
- MAJOR CHANGES
  - <u>FORMAL</u> INTERMEDIARY INSTITUTIONS BETWEEN GOV'T AND INDUSTRY (e.g., TECHNOLOGY EXTENSION SERVICE, TECHNOLOGY SOURCING)
  - FOSTER INDUSTRY-CONTROLLED CONSORTIA AMONG GOV'T AND MULTIPLE INDUSTRY MEMBERS
  - PROVIDE INFRASTRUCTURE, INCENTIVES, ETC. THAT FOSTER PEOPLE MOVING AMONG INSTITUTIONS

- MINOR CHANGES
  - FLUID DATA BASES AND NETWORKING (e.g., PLUMBING)
  - SUGGESTIONS OF OTHER GROUPS

ISSUES

- CAN A GOV'T AGENCY BE EXPECTED TO DO A GREAT DEAL OF TECH. TRANSFER IF ITS MISSION IS SOMETHING ELSE?
- HOW MUCH GOV'T TECHNOLOGY DEVELOPMENT FOR NON-CIVILIAN PURPOSES CAN BE TRANSFERRED WITHOUT MAJOR ADDITIONAL COSTS?
- WHAT ARE THESE COSTS?

B.R. 5.


START
CONCEIVE IDEA
TAKE MARKET CARD
DESIGN PRODUCT/ PROCESS
OBTAIN VENTURE CAPITAL
LOSE MARKET SHARE
GOV'T
START PRODUCTION
TECH TREK
TAKE GOV'T CARD
PENETRATE DOMESTIC MARKET
PRODUCT REVERSE ENGINEERED
MARKET
TAKE GOV'T CARD
PENETRATE FOREIGN MARKETS
VISIT JAPAN, KOREA
TAKE MARKET CARD
GO PUBLIC

Laughlin Group
L.G.
1

SUMMARY

6/30/87

Problem:
<u>How To Bridge The gap</u> ?

A.

— SHIFTS IN AUTHORITY —

B.

— MOVEMENT OF PEOPLE —

C.

— MOVEMENT OF INFORMATION —

(A) SHIFTS in AUTHORITY/RESPONSIBILITY

- Authorize Lab-Level "deal-making"
  - enter into contracts with outside parties
  - provide services at negotiated fees

"within overall funding allocations & to extent permitted by law..."

(B) MOVEMENT of PEOPLE

- Provide T&L monies
- Provide sabbatical opportunity/incentive → in industry
- Provide 1-day/week "consulting" (researcher owns results)
- Reward system:
  - quantify T^2 activity accomplishments (build in performance standards)
  - TTU "goal" = 10% of time (ind'l eng.)
- Revise managerial habits: advocate T^2
- Incentives for 'guided' continuing' education (ind sites)
- SBIR type program for Lab researchers
- Ind'l "talent scouts" on short-term stay @ Labs
  - info back to industry / • use retired execs?
- Dual appointments @ Lab & univ
- "Account execs" for each industry appointed @ Labs
  - champions/intermediaries (not new layer of mngrs)

(C) MOVEMENT of INFORMATION

- Provide "value added" information services (package for need

SUMMARY

6.30.87

- FINE TUNING OR Global Change?
- RECOMMENDATIONS NOT CONSENSUS

STRUCTURE

- Establish mission to include COMMERCIALIZATION / "WEALTH CREATION"
- UNDER CURRENT LEGISLATION, MANAGEMENT STRUCTURE TO SUPPORT COOPERATION CAN BE established.
- AUTHORITY should be delegated to LAB DIRECTORS AND PROGRAM MANAGERS TO IMPLEMENT THE MANAGEMENT STRUCTURE
  (NASA RECOMMENDATION IN SYSTEM)
  (DEALMAKERS)
- PATENT PROCESS should respond to T² objectives
- LINK NASA CENTERS / FED. LABS MORE CLOSELY TO STATE PROGRAMS
- JOINT GENERIC R&D POOLS
- DECENTRALIZE

STRUCTURE

- High level Policy Council FOR NASA.

- LABS should structure for industry outreach.

RESOURCES

- INTERMEDIARY ORGANIZATIONS
  - Require fedl. contractors and univ. grantees to use some funds for "ARCH" types
  - Redirect NASA Technology Application funds to joint state/fedl. labs, intermediaries
- Labs should have access to discretionary funds:
  - Tech. Transfer
  - R&D (at least optional)
  - Revise T^2 Act to permit royalties to support
- Establish programs encouraging "up front" contribution from industry.
- Expand/enhance "Management of Technology" education [illegible]

Resources

- EDUCATE / ORGANIZE KEY ORGANIZA.

i.e.
- CORETECH
- Bus / Higher ED Forum
- Competitiveness Council

METHODS / TOOLS

- MARKETING PROGRAM TO LAB DIRECTORS
  - new tools, MODELS
  - AAAS, NAS
- REWARD structure

FURTHER Study

- Mgt. IMPLICATIONS OF <u>LAB GOVERNANCE</u> (PRIV/UNIV vs. Fed)

- INDUSTRY ASSOCIATIONS AS LAB MANAGER

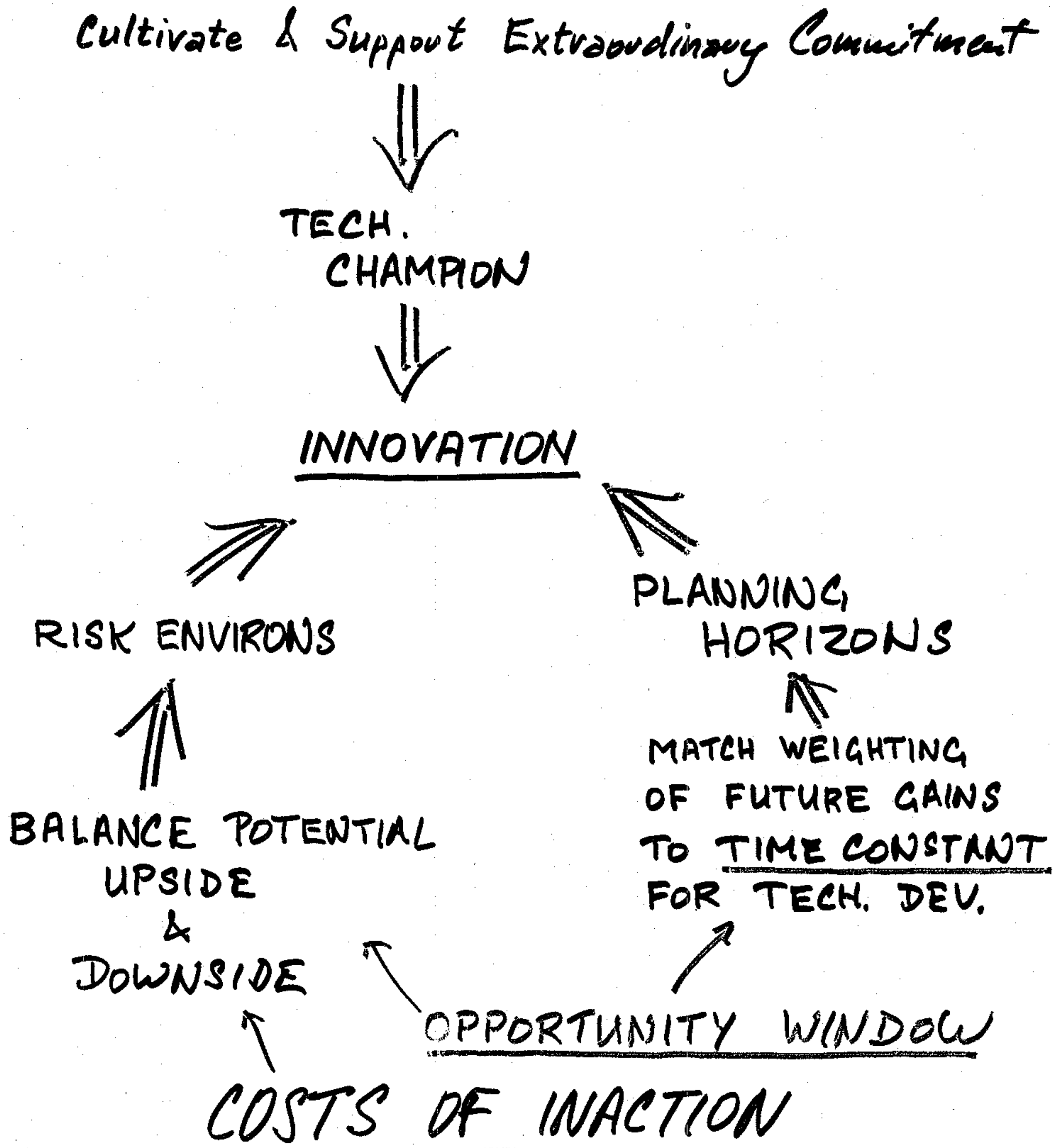
- MORE BRAINSTORMING

- INertia IN LAB Mgt.

- LACK OF knowledge in industry of Fed'l lab activities.

- REWARD STRUCTURE

ASPECTS OF TECH. IMPLEMENTATION



Potential "application" —
the INNOVATION using the
TECHNOLOGY is DRAWN or
"SUCKED FORTH" by the
prevailing environment and
the subsequent users.

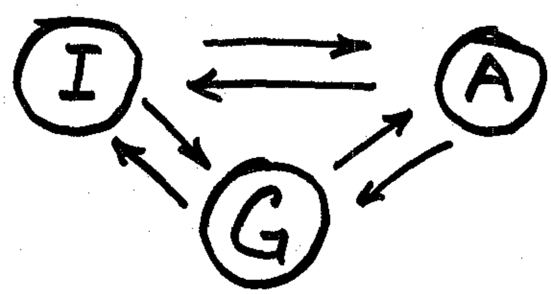
THUS available TECH's must be
configured, recognizable and
visible to potential users.

6/87

THINGS TO DO :

People exchange programs

EXAMINE BARRIERS / INCENTIVES



I – may lose people, career disruption, re-entry problems.....

ALL – funding vagaries, M&L, overhead .....

NEED long term institutional relationships

NEED MAJOR PLUMBING SYSTEMS TO HANDLE T^2 FLOWS PROPERLY (not "passes"!)

6/5

THINGS TO DO —

- Hire / Appoint **INTERMEDIARIES** or **BROKERS**

  Outside people to manage, and promote **EXTENSION SERVICES**

  (Examples ASU, NASA pubs. ....)

- Deliver TECH. incomplete to permit "acquirer" to adapt and **OWN**

- Share pieces of "the action", recognition .....

  CHECK MEASUREMENT / REWARDS STRUCTURES

KG 6/8/

THINGS TO DO —

- Graduate students are good T^2 **BUT** U.S. Nationals need support to compete with industry offers at BS level (GI Bill was excellent T^2)

BUT NASA not like NBS

.... maybe need emphasis to a secondary T^2 mission ?

NASA has done excellently with AERONAUTICS work and their relationships with that community.

H 6/87

IN GENERAL

Successes were often <u>closely mission oriented</u> at discovery.

.... used lots of resource X

.... took lots of time X

Adopted by acknowledged "peer" groups. X

Need hindsight to appreciate X

\+ LONG TERM PERSPECTIVE X

D Re-examine "plumbing", flow and PIPELINE analogies.

JY 6/82

PROPOSED SYSTEM FOR MANAGING TECHNOLOGY IN FEDERAL LABORATORIES

Technology management--treating the knowledge that results from research and development as an asset to be identified, protected if appropriate, and transferred to those who may use it most effectively.

This Proposed System was developed to help agencies and laboratories implement the Federal Technology Transfer Act of 1986 in Government-operated laboratories. It is a preliminary guide and may be expanded and improved as others contribute.

Developed by

Federal Technology Management Division
Office of Economic Affairs
U.S. Department of Commerce

May, 1987

For further information
or to contribute call or write

Norman Latker, (202) 377-0659 or
T. J. (Tip) Parker, (202) 377-8100

U.S. Department of Commerce, Room H-4837
Washington, DC 20230

PROPOSED SYSTEM FOR MANAGING TECHNOLOGY IN FEDERAL LABORATORIES

PART 1

Part 1a. Background

The Federal Government funds or performs about half of all the research and development done in the United States today. Much of this effort is to meet unique, Government needs, particularly for the military establishment. But it is increasingly evident that the future of the country also depends on how well the results of all U.S. R&D are used by U.S. industry to advance the economy. For example, in a world of intensifying economic competition based on new technologies, the Federal R&D budget is about the same as Japan's total R&D expenditures, but nearly all of their R&D is to develop products for domestic use and export.

Federal laboratories have always transferred the discoveries and technologies they produce to meet the needs of their R&D sponsors. These laboratories have made major contributions to Man's knowledge, created technologies used in products and services the public depends on today, trained outstanding researchers, and led the world in many fields.

Recently, however, has there been Government-wide emphasis on increasing interactions between Federal laboratories and U.S. industry to benefit both the economy and the laboratories. Since 1980, a series of related statutes has been enacted to help promote industry/laboratory interaction. Briefly, these are:

- P.L. 96-480 -- which included provisions to encourage transfer of technology to State and local governments and the private sector.

- P.L. 96-517 -- which allowed small business and nonprofit organizations to own and license the inventions they create with Federal R&D funding. This Act was applied to some nonprofit organizations that operate Federal laboratories for Federal agencies under contract and also authorized the agencies to issue exclusive licenses on patented inventions they own.

- P.L. 98-620 -- which amended P.L. 96-517 by ensuring that most small business and nonprofit contractors that operate Federally-owned laboratories have the right to own and manage their inventions.

- P.L. 98-622 -- which provided a low cost way for an inventor or Federal agency to protect the royalty-free right to use an invention by filing a Statutory Invention Registration with the Patent Office.

- P.L. 99-502 -- which allows Government-operated laboratories to make cooperative research and development agreements with industry, license their inventions, share royalties with inventors, and use royalties for a variety of other purposes.

On April 10, President Reagan signed Executive Order 12591, which directs Federal agencies to encourage and facilitate technology transfer and collaboration of their laboratories with the private sector by implementing Public Laws 96-517, 98-620 and 99-502. The Order also directs agencies to comply with his 1983 Patent Policy Memorandum which applies to laboratories run by for-profit contractors.

An objective of these new policies is to require Government laboratories to manage the technology they produce as an asset. This paper proposes a system for managing technology that laboratories may use as a guide in developing their own internal processes. Part 1 of the paper describes the flow and logic of the system, while Part 2 (beginning on page 10) provides additional considerations and suggestions for implementation.

Part 1b. An Idealized Plan

While there are many forms of technology transfer, this paper concentrates on two--collaboration with other organizations and management of patentable inventions in Government-operated laboratories. The proposed system of actions and decisions has been developed as a basis for discussion. The system is intended to operate on a decentralized basis with agencies determining how far down the organization to delegate authorities.

The schematic chart titled "Managing Technology in a Government-Operated Laboratory" that follows Part 1 shows the kinds of decisions that we believe will lead to the best use of the new authorities. This is a generalized presentation that considers domestic patents only, applies to unclassified work only, and omits some details. The system emphasizes laboratory/industry cooperation and patent licensing because of the new authorities. It is not intended to detract from the wide range of other typical laboratory interactions such as publication of papers, consultation, and personnel exchanges.

Each rectangle in the chart represents a work step or series of actions, while each oval indicates a decision step. While the chart does not indicate who should make each decision, we believe that by identifying and describing them, agencies or laboratories will recognize the need to designate who should contribute and who should have the authority to make each decision. Regardless of who makes a decision, the chart assumes the necessary close cooperation among:

- Laboratory researchers and scientists
- Research managers
- Technology transfer officers
- Patent attorneys

The chart has three points of entry. The first follows Step 1 when a proposal for a cooperative R&D project is received from outside the laboratory. The second is Step 2 when an internal proposal for a laboratory project is being initiated. The third is Step 15 PRELIMINARY VALUE SCREEN, where when the laboratory makes a preliminary decision on whether an employee's discovery or idea may be a valuable and patentable invention.

The chart has ten triangles that say "end." This means the end of what the chart is intended to show -- not the end of activity for the laboratory, an employee, the technology transfer officer, or a patent attorney.

Part 1c. Step-by-Step Explanation

Step 1, LABORATORY SOLICITS COOPERATORS. A laboratory may encourage outside proposals for cooperative R&D projects. The chart shows R&D proposals being received in response to this encouragement but omits the obvious evaluation and decision steps that would preceed a cooperative project.

> (Part 2a, <u>Techniques for Finding R&D Cooperators and Licensees</u> discusses ways to publicize a laboratory's interest in undertaking cooperative R&D projects; page 10.)

Step 2, PROJECT INITIATION--CONSIDER MEANS OF COMMUNICATING AND TRANSFERRING RESULTS. This is the first large rectangle. When a new R&D project is being considered, it is normal to think about how the results of a project will be communicated to the sponsor as well as deciding whether or not the project should be funded. With the new authorities, labs should also ask at this stage whether the project may have commercial potential and whether a private sector organization be might interested in helping or cooperating on the project. A related question is whether the project can be modified to meet the original sponsor's needs and increase its interest for a private sector organization. The chart compresses these considerations into two decisions. Step 2-A, LABORATORY WILL FUND? YES leads to Step 2-B, SEEK COOPERATOR? If 2-B is YES, the laboratory will seek a cooperator. If NO, the laboratory will proceed to do the work on its own.

Taking advantage of the commercial potential and possibility of R&D cooperation at an early stage may have several benefits for the laboratory, including:

- The sooner a commercializing firm becomes involved in developing a technology, the greater the chances of commercial success.

- The private sector may supplement Federal funds for conducting laboratory R&D.

- Other parties may bring knowledge and expertise to the project that increase its chances of meeting the Government sponsor's needs.

- Working with outsiders can enrichen the job of laboratory staff in many ways.

If the R&D project is expected to lead to an item the Government will purchase, there may be an opportunity to expand the market for the item. This can spread both the development and manufacturing costs among private as well as Government users, thus lowering the total cost to the Government.

Step 3, DECIDE HOW TO FIND COOPERATOR. If the project appears to have commercial potential and may be of interest to a cooperator, the next step is to decide how to find one.

(Part 2b. Techniques for Finding R&D Cooperators and Licensees discusses some ways this can be done; page 10.)

Step 4, SEEK COOPERATOR. This involves carrying out the plan for finding a cooperator.

Step 5, FIND COOPERATOR? NO. (If YES, go to Step 7)

Step 6, LABORATORY CONTINUE THE PROJECT? The decision at Step 2-B to proceed may have been conditioned on finding a cooperator. If none is found, the laboratory will have to decide whether or not to proceed on its own.

Step 7, RESOLVE CONFLICTS OF INTEREST. If a cooperator is found, before an agreement is executed, it is necessary to ensure that conditions which might lead to an apparent or real conflict of interest are identified and provided for.

(Part 2a. Conflict of Interest discusses a number of aspects of conflict of interest, including situations where the term is sometimes missused; page 16.)

Step 8, NEGOTIATE AND EXECUTE AGREEMENT. Under P.L. 99-502, cooperative R&D agreements are not procurement contracts, grants, or cooperative agreements as these instruments have been established by the Federal Grant and Cooperative Agreement Act. As a result, neither the Federal Acquisition Regulation nor

Government-wide assistance policies apply. This gives labs wide latitude to negotiate terms and conditions with cooperators that meet the needs of the particular parties. Model agreements are being developed as a point of departure to assist labs in developing the agreements they may need.

A prime objective of some cooperative R&D projects may be to produce inventions that can lead to marketable products. In other cases, inventions may be a possible outcome but not an objective or perhaps not even likely. Since it is often impossible to anticipate when an invention will occur, it is best to assume that any R&D project has a chance of producing one, and the rights to a resulting invention should be established in the agreement.

Step 9, CONDUCT COOPERATIVE PROJECT.

(Part 2b. Types of R&D Cooperation suggests different types of shared projects that labs may find beneficial;page 12.)

Step 10, MAKE INVENTIONS. An oversimplification that includes all of the steps necessary to identify, describe, and protect an invention.

Step 11, TRANSFER TECHNOLOGY PER AGREEMENT. This is where the results of the project are divvied up among the original sponsor, the cooperating partner, the lab, and individual investigators in accordance with the agreement. It includes project reports, rights to publish, demonstration models, and patent rights if any.

Step 12, RECEIVE AND DISTRIBUTE ROYALTIES. Agencies must follow the statutory requirements and select among the options for using royalties the Government receives from licensed or assigned inventions.

Step 13, LABORATORY PERFORMS WORK. Going back to Step 2, if a project is not seen as having cooperative R&D potential, or the lab was unable to find a cooperator (Step 6), the lab will consider the merits of the proposal and decide whether or not to do the work on its own just as it has always done. If it goes ahead, a lab employee may report a discovery or an idea that could be an invention.

Step 14, EMPLOYEE DONATES IDEA. Under the new law, a Government employee may voluntarily assign an invention that may be entirely unrelated to his or her job. This is to give employees an opportunity to have their ideas evaluated, patented, and managed by a laboratory if the lab agrees. It is also to provide an additional source of ideas to laboratories and the Government which might otherwise just die for lack of follow-up.

Step 15, PRELIMINARY VALUE SCREEN. Most employee ideas will not turn out to have significant potential. This two-part evaluation step is designed to be a quick and low-cost process for sorting those which may have significant value from those which have little promise. The first question (Step 15-A, COMMERCIAL/GOVERNMENT VALUE SEEN?) involves technological, economic, and managerial questions. The Government may anticipate using the idea and need defensive protection even if there does not appear to be any commercial potential. If there is reason to believe the idea or discovery may be of commercial value or of use to the Government, the second part (Step 15-B, PATENTIBLE?) should be performed by a patent attorney to provide advice on what type of patent protection may be obtainable. If this Preliminary Value Screen indicates the idea may have commercial potential or value to the Government and be patentable, the employee is considered to have made an invention.

This step will involve the employee, the technology transfer officer, the person designated by the laboratory for conducting the screening process, individuals who may be members of a screening committee, a patent attorney, and perhaps others. Significant thought should go into how a laboratory will organize and conduct this step which should include the content and flow of invention reports, confidentiality agreements, and controls.

(Part 2c. Determining the Value of a Technology outlines factors and approaches to evaluating technology; page 14.)

Step 16, COORDINATE PUBLICATION WITH PATENTING. It may be desirable to publish a paper on the discovery or idea. Publication is entirely consistent with patenting, but done prematurely, publication can destroy the opportunity to obtain a patent. In addition, "publication" has a special meaning in patent law. The inventor should be advised on how to coordinate the timing of discussions of the technology and publications with domestic and perhaps foreign patent applications.

Step 17, WORK RELATED? Executive Order 10096 sets the policies and the rights of the Government and its employees to employee inventions. A test is whether the invention was work related or made in the course of regular assigned duties. If YES, the invention should be examined more extensively for possible commercial value.

Step 18, DONATED BY EMPLOYEE? NO. (If YES, go to Step 20)

Step 19, LET EMPLOYEE KEEP. If the invention was not work related, and not donated by the employee, the Government has no interest in it and the employee should allowed to keep it.

Step 20, SIGNIFICANT COMMERCIAL VALUE SEEN? YES. If the invention is work related or has been donated by the employee and it has passed the Preliminary Value Screen, its commercial potential should be evaluated more extensively. Although a small step on the chart, determining commercial value can be a complex process. (If NO, go to Step 33.)

(See Part 2c, "Determining the Value of a Technology"; page 14.)

Step 21, APPLY FOR PATENT. The laboratory should apply for a patent on an idea or discovery of an employee to which the Government has rights, that appears to be patentable, and that appears to have significant commercial value. While the Government has obtained thousands of patents, few of them were obtained primarily for commercial use. The laboratory needs to ensure that the application is designed to produce a strong and licensable patent.

Step 22, ADDITIONAL DEVELOPMENT NEEDED? YES. The idea may need additional development, either to meet Government needs or to make it more attractive for promotion and licensing.

Step 23, COOPERATIVE DEVELOPMENT POTENTIAL? YES.

Step 24, SEEK LICENSEE/DEVELOPER. To be done if it appears that a cooperator might be found to help develop the invention. In many cases, a cooperator with established market interests or understanding will want to amend the patent application and obtain a stronger patent.

(See Part 2a. Techniques for Finding R&D Cooperators and Licensees;page 10.)

Step 25, FIND LICENSEE/DEVELOPER? YES. If a licensee/developer is found, the logic of the chart flows back to Step 7 for creating a cooperative R&D project.

Step 26, LABORATORY WILL DEVELOP? YES. If the invention does not appear likely to interest a cooperator, or if one cannot be found, the lab must decide whether to continue development on its own, or obtain a patent and try to license it.

Step 27, LABORATORY DEVELOPS.

Step 28, OBTAIN PATENT. Regardless of whether or not the lab continues development, if the idea still appears to have commercial potential, the lab will continue to persue a patent.

Step 29, FIND LICENSEE.

(See Part 2a. Techniques for Finding R&D Cooperators and Licensees; page 10.)

Step 30, RESOLVE CONFLICTS OF INTEREST. The degree of involvement that a laboratory employee inventor may have in the follow-on development and commercialization of an invention must be decided. This should be considered before the laboratory enters into negotiations with a potential licensee, recognizing that the licensee's wishes must also be considered. (

(See Part 2d. Conflicts of Interest, page 16.)

Step 31, NEGOTIATE AND EXECUTE LICENSE. Under the new law, laboratories may be delegated authority to negotiate their own licenses. Once the lab has decided to seek a patent, it should start looking for a licensee. If one is found before the patent is issued, the licensee may want to amend and the strengthen the patent application in relation to a specific product.

Step 32, HELP DEVELOP PER LICENSE. Extensive development is usually required to convert an invention into a marketable product, and often the inventor or the originating lab can make unique contributions. The new law allows laboratories to include in their licenses, provisions for the laboratory or the inventor to contribute to further development and commercialization of the invention. Although not shown on the chart, the license might actually be a cooperative R&D agreement which could lead to additional, follow-on inventions. In this case, the logic flow would be from Step 32 back to the cooperative agreement activities beginning at Step 7.

Step 33, EMPLOYEE WANTS? YES. The new law says that an employee will be allowed to keep his or her invention that the Government has a right to own, but has decided not to patent or commercialize. Since the employee may believe the invention has more value than the Government recognizes, this serves as a backstop to prevent destroying the invention's commercial value.

Step 34, GOVERNMENT PROTECTION NEEDED? YES. In the past, the Government obtained most of its patents to protect its royalty-free right to use inventions it had funded. The Government will continue to need this protection for many inventions regardless of their commercial value.

Step 35, LET EMPLOYEE KEEP. The employee should be allowed to keep the invention on the condition that the Government will retain a royalty free right of use.

Step 36, HELP PATENT WITH GOVT. USE LICENSE. Had the employee not wanted the invention, and had the Government decided to file a Statutory Invention Disclosure, (see Step 40) the Government would have incurred filing and attorney costs. Thus, it is equitable for the lab to help the employee obtain a patent where the Government retains a royalty-free use license. The help could include actual filing of the patent for the employee or paying a fair share of the costs.

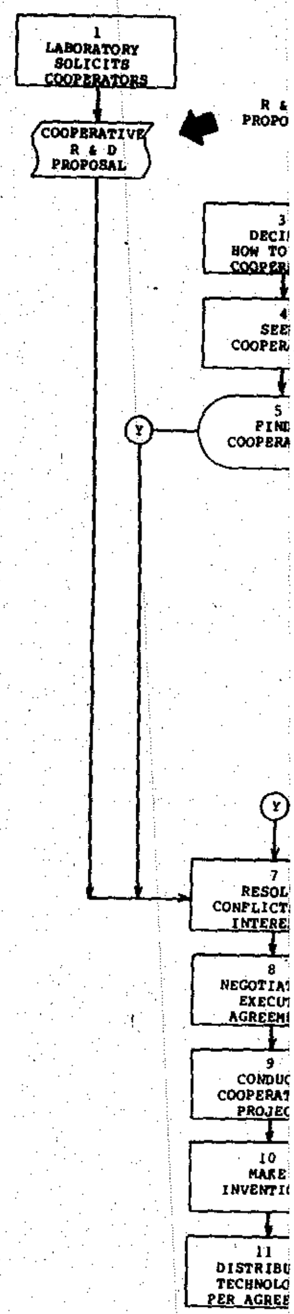
Step 37, LET THE EMPLOYEE KEEP. If the Government sees no use of its own to protect, the employee should be allowed to keep the invention without giving the Government a license.

Step 38, GOVERNMENT PROTECTION NEEDED? YES. If the employee does not want an invention that the Govenment does not intend to patent, then the Government should decide whether it needs to protect its royalty-free right of use. This is the same decision as Step 34, but the actions taken are different.

Step 39, PUBLICATION ADEQUATE? YES. Once an idea or discovery has been published, statutory bars to patenting take effect. After prescribed periods, the bars prevent anyone from obtaining a patent, and the idea or discovery can be used freely. Thus, publication may provide the use protection the Government needs, and where adequate, publication is also the cheapest form of protection.

Step 40, STATUTORY INVENTION REGISTRATION. P.L. 98-622 allows an inventor or the Government to register an invention with the Patent Office without obtaining a regular patent. By this process (called a SIR), the invention is put into the public domain for anyone to use freely. It serves the Government's purpose of protecting the right of free use. It takes effect sooner than a publication, which may be important for rapidly moving fields of technology. A SIR costs less than a patent but more than a simple publication.

Step 41, PUBLISH.


1
LABORATORY
SOLICITS
COOPERATORS
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PROJEC
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MAKE
INVENTIO
11
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TECHNOLO
PER AGREE

PART 2

Part 2a. <u>Techniques for Finding R&D Cooperators and Licensees</u>

Close cooperation between a Federal laboratory and a commercial firm is a type of relationship that is foreign to the culture of most Government employees and managers. They have legitimate concerns that relationships with the private sector both be fair and appear fair. An attribute of the industrial culture, however, is to maintain secrecy around actions that may affect future products. Much of the trick in establishing cooperative R&D agreements and patent licenses is to bridge the two cultures. The way a laboratory decides whom to accept as cooperating party is important to both the appearance and actuality of fairness. This is particularly true where the industry partner will obtain a degree of exclusivity in the results. Labs will have to exercise some ingenuity in organizing their opening gambits, but here are a few ideas.

There are three primary avenues by which a laboratory and a private sector firm might be brought together in a cooperative R&D agreement. These are through:

- o A firm's desire or willingness for the laboratory to aid in further development and commercialization of a laboratory invention.
- o The laboratory's efforts to find a cooperator to participate in research or in developing a particular technology.
- o A firm's request to establish a cooperative project for research or development of a particular technology.

A. If the cooperation stems from an existing laboratory invention, there are three major ways to ensure fairness.

(1) Advertising the invention as available for licensing through NTIS publications, agency fliers, and industry contacts, or use of intermediaries, and other dissemination techniques that expose the invention to possible licensees.

(2) The Federal patent licensing regulation (37 C.F.R. Ch. IV based on 35 U.S.C.208), establishes a process for determining the best potential licensee for a Government-owned invention and includes a <u>Federal Register</u> publication requirement for exclusive and partially exclusive licenses. While cumbersome and at times self defeating, the regulation provides for a selection process that is perceived as fair.

(3) Use of a technology management intermediary (such as NTIS, Reseach Corporation, or for-profit technology brokers)

to approach industry for the laboratory. In general, these services work best for inventions that have an obvious market value and require relatively little additional development.

B. If the laboratory tries to find a collaborator to help conduct research or develop a technology for which no property rights have yet been established, there are several factors and approaches to consider.

(1) While procurement rules do not apply to cooperative R&D agreements, the feeling of need for an open process comes from the requirement for competitive procurements. There is, however, provision for sole source procurement of R&D that involves unique ideas and when it makes sense to deal directly with those who have the ideas. This view might guide the entering into cooperative R&D agreements but labs should be sure to have recorded justifications of their actions.

(2) A lab could publish notices that it is seeking a cooperating party. It could use the Federal Register as a formality, but scientific, professional, and trade journals and associations would probably be more effective.

(3) Depending on the structure of the industry, the lab could contact the firms it believes most likely to be interested and negotiate with those that respond.

(4) The lab could organize the project in conjunction with a university or unit of State or local government as a partner or intermediary. Allowing the partner or intermediary to select the company or companies could remove the choice from the laboratory. This may be useful where lower levels of government or universities are more able to establish relationships with industry that are closer than arms-length. The partner or intermediary may not, however, be able or willing to evaluate the technical capabilities of a potential R&D cooperator, however.

(5) The lab could list its search with the FLC, NTIS, and other intermediaries who could direct candidates to the lab.

C. Handling cases where a firm approaches the laboratory with a request to collaborate in research or in developing a technology on which the Government holds no patents, can be divided into two time periods.

- Requests received before the lab makes a general announcement of its willingness to enter into cooperative R&D agreements, and o Requests received after the lab has made an announcement.

(1) It appears that a laboratory can announce its willingness to consider cooperative R&D agreement proposals in fields of science or technology, to be acted on at the lab's convenience. The announcement can provide for a first-come, first-considered selection process, or one that accumulates proposals for a while and then picks the most desirable. The announcement could offer confidentiality for the proposals and present the general agreement terms the lab would offer and require. Once a lab makes this sort of announcement, and follows a rational selection process, it would probably have met the requirements for both actual and apparent fairness. With the general announcement made in advance, no additional publication should be needed for a specific agreement.

(2) The problem may be greater if a proposal is received that leads to a cooperative R&D agreement before an announcement is made. This may be primarily a start-up problem, but it could occur any time a firm offers a proposal in a field not covered by a lab's announcement. It would be good if the company would agree to a public notice of the proposed agreement. But possibilities of delays, actions by competitors, and publicity may lead a company to reject the idea. Many labs have service for others programs that make lab facilities available to companies for proprietary work. The policies on deciding who can participate in these programs may be a useful and realistic precedent. It may also be possible to work though a university or local government intermediary to remove the selection onus from the laboratory. Finally, the view discussed above (2(a)), that R&D aggreements don't fit the normal openness mold of procurement might be applied.

Part 2b. <u>Types of R&D Cooperation</u>

The range of different types of cooperative R&D projects, in order of increasing complexity includes the following.

A. <u>Parallel Efforts</u>. Probably the simplest type of cooperative R&D project that a laboratory may undertake would consist of parallel but separate work by the lab and the cooperator, with agreement to exchange results. This would not involve joint or shared management, mingling of resources, or the likelihood of inventions made jointly by laboratory employees and non-Federal co-inventors. Since the cooperator would not be a party to the work done by the lab, there would be no provision under existing law to restrict public access to the results produced by the lab. If restricted access is important to some aspects of the project, such as creation of computer software that the non-Federal party desires to Copyright, the work should be divided so that the non-Federal party develops and controls those aspects.

B. Facilities Sharing. Either party might agree to provide the use of equipment or facilities to a joint project. For example, either party might provide an environment to test equipment developed by the other party under the agreement. Under such agreements, there would be minimal mingling of resources, but there may need to be provisions covering damage to and disposition of the shared facilities and the equipment being tested.

C. Personnel Sharing. Next up the complexity scale, would be where either the laboratory or the cooperator would provide the services of personnel to pursue an agreed program of work, perhaps at the other's site. This could occur under a patent license where the lab agrees to allow the inventor to assist the licensee with advice or other types of assistance in transforming the invention into a product. Or, it could result from a company requesting the opportunity for one or more of its employees to assist a particular Federal laboratory employee in the conduct of a particular line of work. Under these situations, there would be little or no mingling of resources other than personnel time, but co-inventions involving the non-Federal employees might be a distinct possibility.

D. Industry Funding. A firm might be willing supplement the funding of work undertaken by the laboratory. In their simpler forms, these agreements would include an explicit and predetermined statement of work that is not likely to change, so there would be minimal sharing of decision-making responsibility. Industry funding agreements may require provisions listing the types of laboratory costs that will be allowable and how the costs will be reported. In laboratories whose accounting systems are slow to report, special records may have to be kept to track the use of non-Federal funds.

E. Shared Management. Probably the most complex type of cooperative R&D arrangement would involve a project with significant unknowns and where it is necessary to provide for mutual sharing of the project direction responsibilities. The agreements for these projects need to provide for the management and decision making process. Perhaps the best approach to developing such a project is for the lab and cooperator to work out in technical terms, the initial direction of work, the preliminary decision points, the possible alternatives that may be followed as a result of the decisions, and other significant anticipated or possible events. The formal agreement for the project would then be drafted after the strategy for conducting the project has been outlined.

Part 2c. Determining the Value of a Technology

This paper will not attempt to replicate the many books and articles in print and being written about evaluating technologies, but there are some points of particular relevance to Federal laboratories.

A. Basis for a Technology's Value. For our purposes, technology is knowledge resulting from R&D, of how to achieve a desired physical. The value of the technology is basically the value of the result minus the cost of achieving the result.

Sometimes, the value of a technology is directly related to the number of people or firms who have access to it and can use it. To achieve its greatest value, such technology should be put into the public domain through publications, meetings, etc., and distributed through technology dissemination programs, consultants such as Agricultural Extension Agents, and education programs.

At the other extreme, the value of a technology may be inversely related to the number of people or firms that have access to it and can use it. This is often the case with an invention, where a significant capital investment is needed to bring the invention to market by the first firm to use it, but where other firms if allowed, might bring similar or improved products to market without having to repeat the investment. The key is protecting the first firm's capital investment by restricting other firms' ability to copy. Simply put, this is what a patent does.

Perhaps the clearest example is a new medicine, where millions of dollars must be spent by the developing firm on testing and obtaining pre-market approvals. A firm making a direct copy would be spared much of this investment, would have lower costs to recover, and could sell at a lower cost. Without confidence that copying would be restricted, no firm would make the initial investment, and the medicine would not come to market. Thus if anyone were allowed to use the technology necessary to make the medicine, the medicine would never be made and its practical value to the public and the economy would be zero.

A body of technology might include elements with both types of value. This could occur, for example in a field of measurement, where an part of the technology consists of data that should be widely publicized. Another part of the technology might be needed to make special measurement equipment and would require a significant developmental investment before the equipment becomes available to those who need to make the actual measurements.

Finally, the value of a technology may stem primarily from its usefulness to the Government. In such cases, the Government may need to protect its right to use the technology it created without having to pay royalties to others who may claim it as their invention. In the past, most Government patents were obtained to gain this protection.

Step 2 on the system chart requires a prediction of the value of the technology that a new project is most likely to produce. Step 15 requires a preliminary evaluation of a discovery or idea. In both steps, the distinctions just described must be applied to each particular case.

B. <u>Intellectual Property</u>. The way to protect the rights of one party to use a technology while controlling the opportunity for others to use it is through identifying and protecting the technology as intellectual property. Normally this is done today to protect an investment in developing the technology and bringing it to market. It is done primarily through:

- o Patents,
- o Copyrights, and
- o Technical data kept in confidence.

Conversely, the way to ensure that anyone including the Government can use a technology is to deliberately destroy any intellectual property value it might have by putting it in the public domain through publication or some other means. Unfortunately, it is easy to accidentially destroy the intellectual property value of a technology that should be protected. In part, Steps 2 and 15 should lead to a deliberate decision on protection, publication, or a combination of the two.

C. <u>Commodities vs. Differentiated Products</u> The goods traded by the world's economies tend to be either commodities or differentiated products. The markets for commodities (e.g. iron, wheat, and oil) are usually very competitive and there is little a single producer can do to increase his profitability. The markets for differentiated products (e.g. medicines, special devices, and computer programs) allow a single producer much more opportunity to influence his profitability.

Technology is used by producers of both commodities and differentiated products. However, technology in the form of intellectual property is often the basic ingredient necessary to create a differentiated product. If many producers could use a new technology, the product would soon become a commodity.

This distinction is important when evaluating a technology. An objective of most nations that have or aspire to have modern industrial economies is to increase the a portion of their economy dedicated to differentiated products, while reducing dependence on commodities.

D. The Evaluation Process. Evaluating an idea or discovery can be time consuming and costly. A laboratory can conserve its resources by using a multi-step evaluation process, highlighted on the system chart as Steps 15 and 20. Step 15, the PRELIMINARY VALUE SCREEN, is intended to be a weeding process to reduce the number of ideas under consideration to those which appear to have the best potential. The three primary purposes of to this Step are to obtain preliminary indications of:

- What the technology will actually do and how well it will do it from a technical standpoint,
- Identify what the market or markets may be for the technology, including its ability to meet a Government need, and
- Whether it can and should be protected as intellectual property.

If the all three indications are positive, then the lab is justified in spending more resources for additional evaluation. This is what Step 20 is to indicate. The contiuing evaluation may be analytical or it may be done by an actual market test.

If the invention will be used in a commercial product, the sooner a firm is involved in the development process, the more likely the chances of ultimate success. Once a patent application has been filed, the lab can start to seek a licensee. This is the market test approach. The analytical approach is needed if the lab has to do preliminary market and cost projections to interest a potential licensee.

The point is to work gradually into the evaluation process, committing or not committing additional resources on a controlled basis as knowledge is gained.

Part 2d. Conflict of Interest

Conflict of interest is often mentioned in conjunction with technology management by laboratories. While this paper is not to provide legal advice, there are indications that the term is frequently used incorrectly. Three different situations are often confused, but need to be recognized and handled separately:

A. Conflict of interest. A legal conflict of interest situation is probably one that:

- Is prohibited by Federal statute,
- Allows a Federal employee to commit the Government or Government resources including the employee's work time,

without prior approval or subsequent management review, and

o May lead to personal benefit for the employee.

Most conflict of interest statutes were written before enactment of the Federal Technology Transfer Act and were based on the concepts that a Federal/industry relationship should be arm's-length and a Federal employee could serve only one master. These statutes must be applied in light of the new relationships Congress intended under the Act.

Agency regulations written before the Act that do not provide for Federal employees having relationships with more than one organization may need to be revised. While unheard of in most agencies, such arrangements have long been accepted and promoted by at least two. In addition, implementation of the Act requires agency regulations to accommodate the technological innovation process as it is used in the United States economy. This means that the public good may best be served by special treatment for innovating firms and restricted access to the technology on which a new product is based.

B. Congruence of interest, is a situation anticipated by the Act, where, for example, a laboratory employee inventor is allowed to contribute to and directly benefit from the commercialization of the invention where the employee can make a unique contribution that is in the interest of both the laboratory and a private firm. Patent licenses, cooperative R&D agreements, and employee ownership of inventions not managed by the laboratory are types of hand-in-hand congruence of interest situations which are fundamentally different from the arms-length relationships toward which the conflict-of-interest statutes were directed.

Congruence of interest situations are more like partnerships than typical Government/private sector, arms-length relationships, and the agreements establishing them should be similar to partnership agreements. In many cases, relationships between firms and laboratory employees that would result in conflict of interest situations if the employees acted on their own, can become congruence of interest through agreements between the laboratories and the firms.

C. Conflict of committment, or the competing demands for resources. This can arise, for example, when the services of an investigator are desired both to aid commercialization of a technology and to perform other laboratory work. If it arises, it is a management problem, not a legal conflict of interest issue. It should be solved on the basis of the laboratory's priorities, including its mission committments, commercialization objectives, desires to accommodate its staff, and the value of the technology.

The most difficult aspect of this for many to accept will probably be the fundamentally new types of relationships the Act permits. The Act was designed to bridge between what have formerly been two entirely separate cultures--industry and Government research. The bridge may involve co-work, co-management, co-acceptance of risks, and co-enjoyment of rewards. While some employees of a few agencies, particularly Agriculture and the VA have experience in these types of relationships, for most Government people, it they will be entirely new. As such, the Act is plastic and waiting to be molded in the wisest and most imaginative ways that can be created.

One way an agency could approach this gradually, would be to develop preliminary policies or a statement of intent for the basic types of inventor participation in commercialization that the agency will normally allow. It could establish a review and approval process for proposals of types of participation that go beyond. The organizational levels that could approve more extensive participation should probably correspond with those that make or approve research project funding decisions for a laboratory. These levels will probably also be involved with decisions to approve cooperative R&D projects.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Productivity, Technology and Innovation
Washington, D.C. 20230

(202) 377-1984

MAY 14

Ms. Kerstin B. Pollack
Director, Program Development
National Research Council
Commission on Engineering and Technical Systems
2101 Constitution Avenue, N.W.
Washington, DC 20418

Dear Kerstin,

The "Rapid Prototyping" study proposal is excellent and most timely. The NSF response, however, certainly is frustrating. (Studying what to study is guaranteed to miss the window of opportunity.)

The only other possibility is the Economic Development Administration (EDA) which has some interest in this area. Their guidelines, however, specify that whatever they fund must relate to disadvantaged areas (Appalachia etc.). Senator Byrd of West Virginia (see attached) is promoting flexible manufacturing at Morgantown, Charleston and Huntington.

Perhaps the proposal could be refocused on Appalachian areas and Jim Huggins (Byrd's Aide), alerted to support it. Then a direct request to EDA Assistant Secretary Orson Swindle might work.

Hope this is helpful.

Regards,

Bruce

D. Bruce Merrifield

Enclosure

News From U.S. Senator **Robert C. Byrd** West Virginia
Phone (202) 224-3904

Remarks By U.S. Senator Robert C. Byrd, D-W.Va.
Software Valley Headquarters Opening Ceremony
Morgantown, West Virginia
May 2, 1987

THE ESTABLISHMENT OF A SOFTWARE VALLEY HEADQUARTERS BUILDING AND THE APPOINTMENT OF AN EXECUTIVE DIRECTOR ARE IMPORTANT MILESTONES IN THE EVOLUTION OF SOFTWARE VALLEY.

AFTER LEARNING OF THIS CONCEPT AND RECOGNIZING ITS IMPORTANCE IN SUPPLYING FUTURE JOBS AND ECONOMIC GROWTH FOR WEST VIRGINIA, I DEVELOPED AND BEGAN SPONSORING THE SOFTWARE VALLEY INITIATIVE TO CREATE A HIGH-TECH ENVIRONMENT. THIS HIGH-TECH ENVIRONMENT WILL ASSIST WEST VIRGINIA BUSINESSES BY MAKING THEM MORE COMPETITIVE IN THE WORLD MARKETS, AND ATTRACT ADDITIONAL BUSINESS INTO THE STATE.

BUT, WE SHOULD LABOR UNDER NO ILLUSIONS ABOUT WEST VIRGINIA'S ECONOMIC FUTURE. THAT FUTURE WILL DEPEND, IN LARGE PART, ON WHAT WE DELIBERATELY DO TO DIVERSIFY OUR INDUSTRIAL AND BUSINESS FOUNDATION.

A FEW YEARS AGO, MANY WEST VIRGINIANS MAY HAVE THOUGHT THAT SUCH DIVERSITY WAS UNNECESSARY. FOR MORE THAN ONE HUNDRED YEARS, WEST VIRGINIA WAS A CHAMPION IN HEAVY INDUSTRY. COAL, STEEL, CHEMICALS, OIL AND NATURAL GAS, TIMBER, AND MANUFACTURING -- THOSE INDUSTRIES MADE AN ENVIABLE BASE BY ANY YARDSTICK.

BUT, WE LIVE TODAY IN A CHANGED AND CHANGING INTERNATIONAL TRADE AND ECONOMIC SITUATION. WEST VIRGINIANS AND OTHER AMERICANS ARE NOW COMPETING AGAINST FOREIGN INDUSTRIES AND FOREIGN COUNTRIES, MANY OF WHICH DID NOT EXIST A GENERATION AGO.

WE HAVE TO FIGHT BACK -- TO WIDEN AND DEEPEN WEST VIRGINIA'S ECONOMIC BASE IN CREATIVE WAYS THAT MIGHT NOT HAVE BEEN OPTIONS A DECADE AGO. ALSO, THE LEADERS OF THIS STATE IN GOVERNMENT, BUSINESS, EDUCATION, AND LABOR HAVE A RESPONSIBILITY TO DO EVERYTHING POSSIBLE TO PROVIDE AN ECONOMIC FUTURE FOR WEST VIRGINIA'S NEXT GENERATION. THAT IS WHAT SOFTWARE VALLEY IS ALL ABOUT.

LESS THAN 700 DAYS AGO, IN JULY 1985, THE FIRST SOFTWARE VALLEY CONFERENCE WAS HELD. THE PURPOSE OF THAT MEETING WAS TO IDENTIFY THE RESOURCES WITHIN WEST VIRGINIA THROUGH WHICH A HIGH-TECH ENVIRONMENT COULD BE DEVELOPED. THE FIRST ACCOMPLISHMENTS, GOALS AND AGREEMENTS GENERATED TOWARD THE CREATION OF THIS ENVIRONMENT WERE ANNOUNCED BY THE SOFTWARE VALLEY CORPORATION, ASSOCIATED COMPANIES, AND WVU AT "SOFTWARE VALLEY II," HELD IN NOVEMBER 1985.

LIEUTENANT GENERAL JAMES ABRAHAMSON, DIRECTOR OF THE STRATEGIC DEFENSE INITIATIVE ORGANIZATION, ADDRESSED THE SOFTWARE NEEDS OF THE "STAR WARS" PROGRAM AT "SOFTWARE VALLEY III" IN MAY 1986. THAT CONFERENCE ADDRESSED ISSUES FACING START-UP COMPANIES AND SMALL BUSINESS, INCLUDING FINDING SEED, VENTURE, AND EXPANSION CAPITAL AND FORMULATING BUSINESS PLANS.

ENSURING THAT THE HIGH-TECH ENVIRONMENT WOULD BE DEVELOPED STATEWIDE THROUGH THE SOFTWARE VALLEY MOVEMENT WAS A TOPIC OF "SOFTWARE VALLEY IV," HELD LAST OCTOBER. EIGHTY DAYS AGO, AT "SOFTWARE VALLEY V," ANNOUNCEMENTS WERE MADE WHICH DEMONSTRATED THE FIRST SIGNIFICANT ECONOMIC BENEFITS OF THE HIGH-TECH ENVIRONMENT THE SOFTWARE VALLEY MOVEMENT IS CREATING. THOSE ANNOUNCEMENTS INCLUDED THE ESTABLISHMENT OF BELL ATLANTIC TECHNICAL VENTURES IN MORGANTOWN AND A CONTRACT OF OVER $2 MILLION DOLLARS BETWEEN SIEMENS SWITCHING CORPORATION AND WVU. WE ALSO ANNOUNCED THAT IBM WOULD BE PROVIDING AN EXECUTIVE DIRECTOR FOR SOFTWARE VALLEY -- MR. BOB VERHOTZ -- WHOM WE HAVE BEEN PLEASED TO INTRODUCE TODAY. ALSO AT SOFTWARE VALLEY V, WE WERE ABLE TO DISCUSS THE COOPERATIVE RESEARCH AGREEMENT BETWEEN CARNEGIE-MELLON UNIVERSITY AND WVU, ANNOUNCE HARRIS CORPORATION'S DONATION OF A MILLION DOLLARS WORTH OF COMPUTER EQUIPMENT, AND HEAR NASA'S ADMINISTRATOR DESCRIBE THE ESTABLISHMENT OF A RECON FACILITY TERMINAL IN MORGANTOWN.

IN ADDITION TO THE SOFTWARE VALLEY CONFERENCES, I CO-SPONSORED A NATIONAL ADA EXPO CONFERENCE, ADA EXPO '86, WITH THE SOFTWARE VALLEY CORPORATION IN CHARLESTON LAST NOVEMBER; AND WE WILL BE CO-SPONSORING ADA EXPO '87 IN BOSTON THIS DECEMBER. MORE THAN 80 CORPORATIONS DISPLAYED PRODUCTS AT ADA EXPO '86, AT WHICH SECRETARY OF DEFENSE CASPAR WEINBERGER REITERATED THE COMMITMENT OF THE DEPARTMENT OF DEFENSE TO THE ADA SOFTWARE LANGUAGE. THE ADA EXPO'S PROVIDE NATIONAL RECOGNITION OF OUR EFFORTS AND PROVIDE OPPORTUNITIES FOR THE NATION'S BUSINESSES TO TAKE ADVANTAGE OF THE HIGH-TECH ENVIRONMENT BEING CREATED IN WEST VIRGINIA. SOFTWARE VALLEY IS INDEED ON THE MAP.

* * * * * * * * * * * *

THIS IS A MEMORABLE DAY IN SOFTWARE VALLEY'S HISTORY. WE HAVE AN OUTSTANDING FACILITY TO HOUSE OUR SOFTWARE VALLEY OFFICE AND TRAINING CENTER, AND AN ENTHUSIASTIC EXECUTIVE ON-BOARD TO DIRECT OUR MOVEMENT.

THOSE OF US WHO HAVE BEEN INVOLVED WITH THIS ENTERPRISE FROM THE BEGINNING ARE VERY HAPPY TODAY. AS I MENTIONED EARLIER, THIS DAY IS AN IMPORTANT MILESTONE. BUT, WE HAVE A LONG WAY TO GO BEFORE ALL OF OUR GOALS ARE ACHIEVED. THE SOFTWARE VALLEY MOVEMENT IS DEDICATED TO THE PROMOTION OF RESEARCH, EDUCATION, AND THE DEVELOPMENT OF ADVANCED TECHNOLOGY INDUSTRIES IN WEST VIRGINIA. THE SOFTWARE VALLEY MOVEMENT AND ITS ASSOCIATED SMALL BUSINESS NETWORK HAVE BECOME A STRATEGIC PART OF OUR STATE'S FUTURE ECONOMIC DEVELOPMENT. AT THE SOFTWARE VALLEY V CONFERENCE, DR. BUCKLEW ANNOUNCED THE ESTABLISHMENT OF WVU'S NEW UNIVERSITY-INDUSTRY RESEARCH AND DEVELOPMENT CENTER TO HELP DEVELOP SOFTWARE FOR WEST VIRGINIA'S TRADITIONAL INDUSTRIES. THAT WAS A GIANT STEP FORWARD. BUT, IT IS

JUST THE BEGINNING OF HIGH TECHNOLOGY ADVANCES THAT THE SOFTWARE VALLEY MOVEMENT WILL BRING ABOUT IN WEST VIRGINIA.

IN THE COMING MONTHS, I PLAN TO SPEAK OUT ABOUT THE PRESENT AND FUTURE ADVANTAGES OF FLEXIBLE AUTOMATED MANUFACTURING. ACCEPTANCE AND WIDE USE OF FLEXIBLE AUTOMATED MANUFACTURING SYSTEMS IN THIS COUNTRY COULD POSSIBLY PRODUCE AMERICA'S SECOND INDUSTRIAL REVOLUTION. PRESENTLY, I AM WORKING WITH WEST VIRGINIA UNIVERSITY, MARSHALL UNIVERSITY, AND THE WEST VIRGINIA BOARD OF REGENTS ON PROPOSALS FOR THE DEVELOPMENT OF FLEXIBLE AUTOMATED MANUFACTURING MODELS IN JOINT COOPERATION WITH WEST VIRGINIA INDUSTRIES. THE MODELS WOULD BE "TEACHING FACTORIES" FOR INSTITUTIONS OF HIGHER EDUCATION, AND OPERATING MODEL MANUFACTURING SHOPS FOR PRIVATE SECTOR FIRMS. THIS, OF COURSE, IS THE NEXT LOGICAL STEP IN SOFTWARE VALLEY'S PROGRESSION. FLEXIBLE MANUFACTURING FACTORIES OF THE FUTURE -- WHICH USE ROBOTICS -- ARE RUN WITH THE ASSISTANCE OF COMPUTERS AND SOFTWARE. CHANCELLOR THOMAS COLE OF THE WEST VIRGINIA BOARD OF REGENTS IS VERY INTERESTED IN THIS TECHNOLOGY, WHICH IS AVAILABLE TODAY. DR. DAVE POWERS, BOARD OF REGENTS VICE CHANCELLOR FOR ACADEMICS, HAS ASKED THAT I ARRANGE A BRIEFING ON THIS SUBJECT MATTER FOR INTERESTED COLLEGE PRESIDENTS IN CHARLESTON.

IN THE PAST, AUTOMATION WAS LIMITED TO MASS PRODUCTION WITH DEDICATED MACHINES OR TRANSFER LINES. THESE ACHIEVE ECONOMICS OF SCALE BY MACHINING A FEW DIFFERENT PARTS IN LARGE QUANTITIES. TODAY, WITH RAPIDLY SHIFTING CONSUMER PREFERENCES, GROWING DEMAND FOR PRODUCT DIVERSIFICATION, WORLDWIDE COMPETITION IN VIRTUALLY EVERY SECTOR, AND CONTINUOUS ADVANCES IN COMPUTER TECHNOLOGY A DIFFERENT MANUFACTURING PROCESS -- AUTOMATED FLEXIBLE MANUFACTURING -- IS BEING ADOPTED. FLEXIBLE MANUFACTURING SYSTEMS ALLOW COMPANIES TO ACHIEVE ECONOMICS OF SCALE AND SCOPE IN A BATCH PRODUCTION ENVIRONMENT. ECONOMICS OF SCOPE EXIST WHERE THE SYSTEM CAN PRODUCE MULTIPLE PARTS IN VARIOUS COMBINATIONS CHEAPER THAN COULD BE DONE SEPARATELY. ALSO, FLEXIBLE AUTOMATED MANUFACTURING SYSTEMS CAN BE TIME-SHARED BY SEVERAL MEDIUM-SIZE OR SMALL COMPANIES, THEREBY CUTTING INVESTMENT, BUT INCREASING PRODUCTIVITY.

JOHN NAISBITT SAID IN MEGATRENDS THAT "...THE TRANSITION FROM AN INDUSTRIAL TO AN INFORMATION SOCIETY DOES NOT MEAN MANUFACTURING WILL CEASE TO EXIST OR BECOME UNIMPORTANT...IN THE INFORMATION AGE, THE FOCUS OF MANUFACTURING WILL SHIFT FROM PHYSICAL TO MORE INTELLECTUAL FUNCTIONS ON WHICH PHYSICAL DEPENDS." THIS IS WHAT FLEXIBLE MANUFACTURING SYSTEMS ARE ALL ABOUT -- ORGANIZING THE MANUFACTURING PROCESS TO ACHIEVE ECONOMICS OF SCALE AND SCOPE. THIS IS OUR FUTURE, OUR COMPETITIVENESS IN THE WORLD MARKETPLACE MAY WELL DEPEND ON IT.

AT THIS TIME I WOULD LIKE TO ASK FOR THE SOFTWARE VALLEY CORPORATION BOARD MEMBERS AND THE SOFTWARE VALLEY FOUNDATION BOARD MEMBERS TO COME FORWARD FOR RECOGNITION.

LADIES AND GENTLEMEN, THIS CONCLUDES OUR PROGRAM. THANK YOU FOR COMING AND I LOOK FORWARD TO SEEING YOU AT SOFTWARE VALLEY VI.

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MEMORANDUM

To: L. W. Miles

From: J. J. Karnowski/Norm Latker/Mike Behar

Date: December 15, 1988

Subject: TIC Meeting - December 8 & 9, 1988

This memorandum summarizes Latker's, Behar's and my thoughts on the subject meeting. Those in attendance were Daphne Lambright, Susan Saibara, Richard Carlin, Mike Behar, Norm Latker, and myself. I will try to recap the meeting in four broad areas:

1. a review of the marketing surveys completed, the planned marketing surveys, meetings of the focus group, and an overall plan for implementing the marketing effort;

2. the status of the software and data base;

3. a strategic plan timetable;

4. miscellaneous items of significance.

A Review of the Marketing Study, Plan, et al.

Dr. Lambright reviewed the results of the telephone survey she completed with 27 universities. In general she had an excellent reception.

One of the problems she initially encountered was there are three or four individuals at each university who were involved in technology exchange or management program. Latker concurred with this and indicated that he is in the process of completion of a directory of the top 150 universities in the United States. This is being conducted by himself and Dr. Liverman at a rate of 10 universities per day per individual. Since the subject is complex, it is important that someone knowledgeable prepares this directory. Latker's findings thus far indicate that there are three distinct individuals at each university involved in technology management:

- o the head of the research department who directs the research program;

o an individual who is responsible for technology transfer, usually in this function is the patenting functions and also the licensing function;

o an individual who is responsible for seeking sponsored research or government grants.

It is expected that Latker and Liverman will have completed this directory by the end of this year. Latker feels that this is an important step in the marketing study process. The end product will be a creation of a directory for research activities at the largest 150-200 universities in the USA. This in itself will be an excellent product and should be a part of the TIC data base.

It is intended that this directory will be used for the university mail survey. Latker indicated that the mailed survey should go to both the individual responsible for technology transfer and the individual responsible for sponsored research or grants at the university.

It is planned that Dr. Lambright will summarize the results of this telephone survey, but the following are the major items which were discussed at the meeting:

o the universities have tight staff and financial budgets, thus this causes a limitation in technology transfer;

o second to the budget problem, the universities felt marketing the technology was their biggest problem. Approximately 50% of the technology exchange person's time was developing contacts with industry. They felt in general that they do not have a good list of target companies which they could avail their research to.

Along these lines, there is a Utah project that we must get more information on. Apparently, this is a list of companies that defines a contact in what technologies these companies are interested in. It is sold only to universities and it is a "Not for Profit" organization. The price is approximately $2,000.00 and is sold on a floppy disc and operates on a MS/DOS. Approximately 1/3 of the universities were aware of this project although none of the universities contacted mentioned they had purchased the Utah project.

o The universities were asked if they would consider purchasing a software program to manage technology. All of them indicated that there was a requirement, and about 50% of them were considering purchasing software and the other 50% had some form of an internally developed software program to manage their technology (usually on Lotus 1,2,3.)

The only named competitor seeking this business is Rodman. Apparently Rodman has a number of packages which address the various aspects of technology management. I think it would be well to:

1. look at the packages and determine the pricing;

2. obtain some insight into the number of customers Rodman has;

3. determine the capabilities of the software package.

As I indicated at the outset, Lambright felt the tele survey went well;consequently, based upon our findings, Behar will revise the form to be used in the mail survey and Latker will complete the aforementioned mailing list. Consequently, in January we should have our mail program to the universities underway.

Corporate Telephone Survey

The next item discussed was the corporate telephone survey. We reviewed in detail the three or four page survey that Mike Behar prepared. With a few small corrections the team agreed with the format of the survey. Behar will correct and send to Lambright/Saibara for handling. Mike is working on a list (a short list) of corporations that Lambright and Susan could call before Christmas. This will give us a flavor of the corporate survey so that if anything has to be revised, it can be revised immediately.

University Focus Group - January 23

A meeting with the University Focus Group was tentatively set for the week of January 23, 1989. A number of things must be completed before now and then. The following is a rough timetable.

o First week of January select and notify a group of universities which would attend. The group will consist of a cross-section of large and small universities in the NYC area. The meeting could take place at a large conference room or a board room in MacMillan in New York City.

At the Focus Group meeting we intend to address the following:

1. A demonstration of our off-line system, a demonstration of our on-line system, and a preview of the "University Alliance Package."

The "University Alliance for Technology Management" would be an organization that would be for universities and would be comparable to the MIT program and the Stanford program. Behar envisions that this Alliance would offer a large list of products and services. Some of the most important are as follows:

- marketing assistance;
- newsletters;
- the corp tech type list of contacts in industry by various technology;
- conferences;
- advertising in Scientific America and other magazines which would give the universities much needed exposure;
- the possibility of using USET for technology exchange; —
- an off-line technology management system;
- an on-line technology management system which would "guarantee" a certain number of corporate subscribers, and provide the university with SBIR data, information on grants and foundations;
- access to other information about technology;
- etc., etc., etc.

A significant effort in the next several weeks will be necessary to formalize what the universities would gain from such an Alliance. This must be done and agreed to prior to the January 23, 1988 meeting.

If the exposure and services offered to the university are perceived as significant, Behar feels a charge in the range of $25,000 to join would be possible, with an annual fee for continuing services.

Latker indicated that SUPA would consider the "Alliance Concept" a threat. Consequently, we somehow get SUPA's support in order to make the Alliance successful. Latker indicated that it will be very difficult to get SUPA to endorse the Alliance because of his experience with the publication effort for SUPA by Pergamon Journals. However, we should brainstorm to see how we can get SUPA to be an ally of the Alliance. (?

Once the university focus group is completed, we would intend to follow this up with a corporate focus group, as we expect the telephone survey and mail survey to be completed in the January/February timeframe. Consequently, I expect we would be looking for a February corporate focus group meeting.

After we have completed the university focus group, it is important that we finalize our alliance marketing plan in pricing; obviously, this is a key element in our business plan. Ideally, we would like to have 10 or maybe 20 universities committed to the Alliance program prior to a mass marketing effort. We would hope to have 100 to 150 universities in the Alliance.

Abstract Data from Universities

Susan Saibara reported on her task to obtain abstracts from universities. The effort was very successful with over 200 abstracts obtained from the universities contacted. (See attached report.) Latker has asked Lambright to develop a plan to collect abstracts on a continuous basis. Latker feels this is an excellent source of technology which (once we have—a professional, organized plan) could be incorporated into the on-line system.

Government Laboratories

Although it was not discussed in detail, it was agreed that we must develop in parallel a plan to address the Government Laboratory Market. We have a strong champion in Ron Hart, as he is a key individual technology exchange within the Government Lab circles and also is in the process of setting up a Bio Tech corporation with 13-15 aggressive bio tech firms being initial members. (This, I understand, would be similar to the computer consortium in Austin, Texas). The consortium would rent the NCTR facilities for their research.

The announcement of this consortium was to be this week; however, this was delayed for one month, which benefits us, insofar as Hart had planned to demonstrate the TIC off-line technology management system. We were not ready. With the month delay, Carlin feels he will be able to put together a first class demonstration package. In my mind, this has a high priority. The consortium members would be excellent candidates for the Corporate Survey and Corporate Focus Group.

I think it is important that in the next few weeks decide on a rough framework of a strategy for the Government Lab business, meet with Ron Hart to bounce it off him, solicit his support.

Status of Software

The following aspects of the software program were reviewed;

- on-line Mac system;
- on-line IBM compatible system;
- off-line system;

- data base - what is contains now and what it will eventually contain.

On-Line System

Carlin indicated that the Mac on-line system will be completed by the end of January 1989. It will take approximately 90 days to convert the Mac system to an IBM compatible system (May 1989). We would be able to demonstrate the Mac version on-line package with the information which would be on the data base as of 1/30/89. The following is a list of information that we intend to have in the initial data base.

- University Directory
- SBIR
- NCTR (partial)
- NTIS
- UTC Technology (150)
- University Directory
- Others as defined by Norm Latker

Carlin indicated that the multiple keyword search feature, wild card feature and the hyper text would be operative. Also Rick Hoseltine will have completed the software link to "ORBIT" the data bases.

With the key features of the system operative and a rather comprehensive data base, Latker feels we would have an impressive system to demonstrate.

Off-Line System

Carlin indicated that the "first phase" of the off-line system would be completed in 90 days. The off-line system that Carlin invisions "long term" would be a mini on-line system incorporating to some extent the search features of the on-line system ... some of which will be incorporated in the next 90 days.

I think it is important that we have Carlin write a short paper on the specs of the off-line system, i.e., hardware required, specific capabilities of the software, and report in writing the capability and the time frame for completion for both Phase I and Phase II. Also, is the NCTR off-line considered to be the standard package? When will the NCTR package be done? Standard package completion and features?

We discussed at length various aspects of the on-line/off-line system and concluded the following.

o the off-line system cannot be networked. Consequently, the off-line system could not be used in a USET environment where multiple computer access is required. (We would use on-line). Would also possibly eliminate a customer like the California Consortium that Wootten will head up. (Nine universities and two government labs.

The single station is more than likely OK for small and medium size universities. (Bill, this partially answers your question regarding an off-line system running our data base software. Carlin indicates that hardware is not a barrier; however, there is a software barrier regarding the graphics interface to DOS and, of course, the lack of standard networking capabilities).

Again, I think it is important for Carlin to document the exact limitations and capabilities of what we will have in 90 days for an on-line package and longer term.

<u>Miscellaneous Items for Consideration</u>

o TIC, ORBIT, BBI, Synergy & Overlap - There is obviously a great deal of overlap between TIC & ORBIT. Also BBI has conferencing capabilities which would be an important part of the planned Alliance. It is important that the three businesses be considered in developing an overall strategic plan.

o Competitive analysis - Latker has done some work in this area.

o Pricing - Price Differential - Government Lab's versus universities, small versus large universities.

o Get Rodman's package.

o Carlin as a resource for other Maxwell companies, i.e., MDL, ORBIT.

o Cottage Technology Exchange "industry" strategy for USET, TIC.

o Meeting with Hart - Government Lab strategy.

o Demonstration for Hart's Bio Tech Consortium announcement.

o Hart's off-line system - Hart wants system to be interactive. This is a problem. Is interactive capability do-able at low cost? Is interactive feature important?

- Is Carlin's technology usable at MDC? Other Maxwell Divisions? It might be well to get a technology type from MDC to look at Carlin's system.

- Latker should define what is going to be on the data base and who is responsible for collection.

- The optical scanning equipment works well

Time Table for Development of a Strategic Business Plan

All of the group indicated that it is extremely important to develop a plan, with specific guidelines, responsibilities, and deadlines. Each member of the team must know what other members are doing, and also communicate to the group his or her progress, problems and/or developments. Attached is rough pert chart which schedules the major items to be completed, underlining each item. There are, I am sure, a number of sub tasks. It is important that we reach general agreement on the tasks to be done, the timeframe, and last, the individual or individuals responsible.

The driving force behind this model is having a product to announce in May of 1989....That month SUPA, the Government Lab Consortium, and the Annual National On-Line Organization have major conferences. All would lend themselves to product demos and announcements.

In my mind, the development of a pert chart plan is the key element in the ultimate development of a strategic business plan.

[illegible]

	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ARKET SURVEY							
Universities							
Tele Survey	----						
Mail Survey	----	----					
*Focus Group (wk. 1/23)		--					
Corporations							
Tele Survey	----	----					
Mail Survey		----					
Focus Group			----				
Government Labs							
Marketing Strategy		----	----				
INALIZATION OF STRATEGIC PLAN				----	----		
° The "Alliance" Package			----	----			
° Finalization of Data Base Contents - Plan for Implementation			----	----			
° The Fed Lab Package				----			
° Pricing Labs, Corp., Universities				----	----		
° Intergration of Orbit, BBI, TIC, USET			----	----			
° Marketing Plan People Resource - Literature				----	----		
° Competitive Analysis			----	----			
° USET Strategy							
" Financial Plan				----	----		
° Commitment of Corp. Universities, Labs & Corp.			----	----			
RODUCT ANNOUNCEMENT							
SUPA						----	
Fed Lab Consortium						----	
On Line Conference						----	
Direct Mailing					----	----	
OFTWARE DEVELOPMENT							
"MAC" On Line Demo		----					
Documentation, Test, Debug		----	----	----			
IBM Compatible			----	----	----		
Test, Debug, Documentation					----	----	
Off Line System							
Test, Debug Documentation	----	----	----	----			
Completion of NCTR Data Base	----	----	----	----			