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***Commercialization of Los Alamos National
Laboratory Technologies via Small Businesses***

**The Final Report of Los Alamos
Contract No. 4790L0013-9Z, Volume 2:**

***Appendices for "Study of Concept for Model System
for Commercializing Technology from
Los Alamos National Laboratory"***

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MASTER

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Acronyms

ALO	Albuquerque Liaison Office
AM	Administrative Manual
ANL	Argonne National Laboratory
ARCH	Argonne/Chicago Development Corporation
ATP	DOC's Advanced Technology Program
CAD	Computer Aided Design
CADET	Center for Applied Development of Environmental Technology
CAE	Computer Aided Engineering
CATD	Ames Laboratory's Center for Advanced Technology Development
CATV	Cable Access Television
CBD	Commerce Business Daily
CEDRA	Center for Economic Development Research and Assistance
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
COI	Conflict of Interest
CRADA	Cooperative Research and Development Agreement
CRI	Cell Robotics, Inc.
DEC	Digital Equipment Corporation
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EL	Entrepreneurial Leave
EPRI	Electrical Power Research Institute
ES&H	Environmental Safety and Health
ESTSC	DOE's Energy Science and Technology Software Center
FED	Field Emission Transmitter
FOO	Fairness of Opportunity
G&A	General and Administrative
GAO	Government Accounting Office
GOCO	Government-owned Contractor-operated
HIPPI	High-speed Interactive Parallel Processing Interconnection
IAO	Industrial Applications Office
IG	Inspector General
IP	Intellectual Property
IPI	International Presence Index
IPO	Los Alamos' Industrial Partnership Office

IPRT	Institute for Physical Research and Technology
ISMA	Industrial Staff Member Agreement
ITDC	ANL's Industrial Development Center
LANL	Los Alamos National Laboratory
LS	Life Sciences
LWOP	Leave Without Pay
M&O	Management and Operating
MCC	Microelectronics and Computer Technology Corporation
MCI	Manufacturing Competitiveness Index
MIT	Massachusetts Institute of Technology
MMES	Martin Marietta Energy Systems
MVI	MCC Ventures, Inc.
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Agency
NIH	National Institute of Health
NMRDI	New Mexico Research and Development Institute
OCI	Organizational Conflict of Interest
OEM	Original Equipment Manufacturer
ORNL	Oak Ridge National Laboratory
OTT	MMES's Office of Technology Transfer
PI	Principal Investigator
PIA	Proprietary Information Agreement
R&D	Research and Development
RREDC	Rio Rancho Economic Development Corporation
SAR	Stock Appreciation Rights
SBIR	Small Business Innovation Research Program
SOW	Statement of Work
TCRD	Tennessee Center for Research and Development
TIC	Tennessee Innovation Center
TRADE	Tri-Area Association for Economic Development
TRV	Tennessee Resource Valley
TVA	Tennessee Valley Authority
TVC	Technology Ventures Corporation
UC	University of California
UNM	University of New Mexico
UPI	University Patents, Inc.
VAR	Value Added Reseller

Appendix A. Summary Information on the Joint MCC/Los Alamos Technology Conference

**New Frontiers of Technology Commercialization:
Principles and Practice of Commercializing Technology through Small
Businesses**

**March 7 & 8, 1994
Sweeney Convention Center - Santa Fe, NM**

**Co-hosted by Los Alamos National Laboratory
and MCC (Microelectronics and Computer Technology Corporation)**

On March 7 and 8, 1994, Los Alamos National Laboratory and MCC (Microelectronics and Computer Technology Corporation) co-hosted one of the largest conferences ever held at the Sweeney Convention Center in Santa Fe, NM. The conference brought together entrepreneurs, technologists, investment professionals, and others with an interest in enterprise creation to explore issues involved in developing new technology-based businesses. Twenty-six distinguished speakers from New Mexico and throughout the U.S. offered valuable insight on all aspects of technology transfer to attendees from Los Alamos and Sandia National Laboratories, and members of the New Mexican economic community. Summary items relating to the conference are as follows:

1. Copies of the Speaker Presentations: As of March 28, 1994, we have all but three sets of the Speaker slide presentations. We expect to have a complete set by March 31 (Attachment A). Following is the status of each presentation:

SESSION ONE

Mr. Carl D. Carman, General Partner, Hill, Carman, Kirby & Washing	Not yet available
Mr. Berry Cash, General Partner, InterWest Partners	No slides were used
Mr. Joseph C. Aragona, Partner, Austin Ventures, L.P.	Enclosed
Mr. John Stockton, President, Tamarack Storage Devices, Inc.	Enclosed

SESSION TWO

Ms. Robin Rather, Director of Emerging Technologies, IntelliQuest, Inc.	Enclosed
Dr. Wilmer R. Bottoms, Senior V.P., Patricof & Co. Ventures, Inc.	Not yet available
Dr. John Chapman, President, Strategic Research, Inc.	Enclosed

SESSION THREE

Dr. Gary L. Seawright, Founder, Amtech Systems, Inc.	Not available
Dr. Ron Lohrding, President/CEO, Cell Robotics, Inc.	Not yet available
Mr. David L. Durgin, President, Quatro Capital Corporation	Enclosed
Dr. James D. Keeler, Chief Technical Officer, Pavilion Technologies	Enclosed

SESSION FOUR

Mr. John Shoch, General Partner, Asset Management Co.	No slides were used
Mr. Christopher L. Davis, Partner, O'Sullivan Graev & Karabell	No slides were used - His speech is enclosed and was distributed at the conference
Mr. Harvey Corn, CPA, Principle, Harvey Corn & Co.	No slides were used
Mr. Jerry Brown, Principle, Brown Venture Associates	No slides were used
Mr. Ralph Bachenheimer, Managing Director, S.N. Phelps & Co.	Enclosed

DAY TWO

Mr. Bill Garcia, Cabinet Secretary, State of NM Economic Devel. Dept.	No slides were used
Ms. Laura Kilcrease, Director, Austin Technology Incubator	Enclosed
Mr. Chuck Wellborn, Partner, Modrall Law	One slide used - Enclosed
Mr. Bill Enloe, President/CEO, Los Alamos Nat'l Bank	No slides were used
Mr. Randy Grissom, Director, NM Small Bus. Devel. Center	
Mr. Jim Greenwood, Exec. Dir., Economic Development Corporation	Enclosed
Mr. Sherman McCorkle, President, Technology Ventures Corporation	
Dr. Tom Hendricks substituted for Mr. McCorkle	Enclosed
Mr. John R. Grizz Deal, Director, New Mexico Technology Consortium	Enclosed
Mr. Richard Reisinger, Director, Tech. Assis. Ofc., U of NM	Enclosed
Dr. Tom Tumolillo, President, New Mexico, INC.	Enclosed

2. Copies of handouts distributed at the conference (Attachment B):

- Agenda
- Conference Committee and Speaker Biographies
- Conference Scratch Pad - for taking notes
- Two Speaker Presentations - Jim Greenwood, Los Alamos Economic Development Corporation & Chris Davis, O'Sullivan Grave & Karabell (also included in the Speaker Presentations in item 1.)
- Brochures given to MCC by Gene Stark, Los Alamos, to distribute at the conference:
 - Los Alamos Small Business Initiative - Industrial Partnership Office ... the Bridge between Los Alamos and Industry
 - Los Alamos Technology Transfer Mechanisms
 - TRADE (Tri-Area Assoc. for Economic Development, North Central New Mexico, A Vision for the Future

2. Attendee list (Attachment C): A list is enclosed of all registrations sorted by company. A Mac disk with the FileMaker Pro database was delivered to Steve Girrens, Los Alamos on March 16. Following are a few statistics:

- 454 registrations (368 people attended, 86 no-shows)
- 121 Los Alamos attendees
- 29 Sandia National Laboratory attendees
- About 200 people attended the second day (this was a rough count of the room)

3. Evaluations: A copy of the form distributed at the conference is enclosed (Attachment D). Keith Pallesen, Los Alamos, approved the form on site before distribution. We received about 150 responses, and the originals were sent to Steve Girrens on March 16. An initial survey of the feedback is as follows:

- 88% said the conference met their expectations and was useful.
- about 5 to 6 noted that it exceeded their expectations.
- Almost 50% returned the form—a very high percentage rate for an evaluation form.

4. Video: MCC is in the process of editing the original footage.

6. Press Coverage: MCC wrote and distributed a press release prior to the conference and is collecting clippings from articles written about the conference. We do not have all of the articles at this date, but a copy of the Washington Technology article of March 10 is enclosed (Attachment

E). Bill Stotesbery, representing MCC's Communications Department, provided on-site press relations at the conference. Following is a list of press representatives attending:

- Larry Spohn, Albuquerque Tribune
- Bob Quick, New Mexican
- Stephen Shanklind, Los Alamos Monitor
- John Fleck, Albuquerque Journal
- KRQE-TV
- KOB-TV
- Esther Smith, Washington Technology

6. Brochure/Invitation: A sample is enclosed (Attachment F). The two-color brochure was distributed via internal mail to Los Alamos employees, and via U.S. mail to other mailing lists obtained from the New Mexican economic community.

Appendix B. Comparison of New Mexico Infrastructure to Other Areas

Real estate professionals say the three most important issues associated with the purchase of a property are “location, location, and location,” and in new business formation that same issue is of similar importance. A major factor in the success or failure of any attempt to establish a new business—high-technology, or not—is the environment within which that effort takes place. Businesses flourish best within an environment which provides ready access to their needs for staff, facilities, support services, and customers. Starting any new business is a risky proposition, at best, and without access to a strong infrastructure, few emerging businesses will prosper.

This appendix describes the strengths and weaknesses of Los Alamos/New Mexico in attracting and retaining new businesses.

B.1 Factors of Importance to New High-Technology Businesses

This assessment began with a review of recent literature on the formation and operation of small businesses. A number of studies (some annual, others one-of-a-kind) identified places within the U.S. where high-technology businesses are flourishing. The MVI Review Team used the factors identified in these surveys to assess the merit of Los Alamos/New Mexico as a potential high-tech area, comparing New Mexico to existing centers of high-tech businesses.

Following are excerpts from a number of the articles dealing with the general issue of business formation.

“The Best Cities for Business, *Fortune*, November 4, 1991:

“...cost has become far more important than it was in the Eighties. ...the best cities are those offering the best *value*.” “Cost containment with an emphasis on quality [is] an imperative.”

“The attributes executives most demand in a city are simple and sensible. They are, in order: a flexible, high-quality work force; proximity to markets; a strong local pro-business attitude; a good public education system; convenient air service to key cities; costs (housing, labor, facilities, and taxes); an efficient highway system; a whole host of intangibles amounting to ‘quality of life.’”

This *Fortune* study listed Austin, Charlotte, Boston, and the Bay Area as good locations for starting new businesses. No city in New Mexico was cited among the 50 U.S. cities in the 1991 listing.¹

“What’s Their Secret?,” *Fortune*, November 4, 1991:

“The people who live in these hotshot locales see nothing unusual about their success and are puzzled... In Ohio and Arkansas the term ‘work ethic’ comes up often, while in Oregon you’re more likely to hear about quality of life. In all three, locals cite such mundane but important elements as affordable housing and a vibrant middle class.”

¹ The annual *Fortune* study of metropolitan areas wherein business formation is best initiated has been done by Moran Stahl & Boyer, a national relocation consulting firm. The MVI Review Team contacted the staff members of that firm who were involved in the most recent *Fortune* studies, asking if MS&B had additional information on any city in New Mexico. However, because even Albuquerque, the largest metropolitan area in New Mexico, falls below the threshold for consideration, this information was unavailable.

“California Faces the Goodbye Wave,” *Fortune*, November 4, 1991:

“...a troubling wave is sweeping California—the goodbye wave. It’s sighted everywhere, as disgruntled residents and businesses pack up and leave in search of a better life. Wilford D. Goldbold, CEO of Zero Corp., which makes bases and cabinets for the electronics industry, calculates he can cut health care costs 50% and workers’ compensation costs over 60% by moving 450 jobs from the suburbs of Los Angeles to Salt Lake City. He’s not alone. A survey last year [1990] found that 14% of companies polled planned to leave the state. Another 41% planned to expand outside California. Drawn like vultures, officials from Arizona, Nevada, Oklahoma, and other states are swooping down on California, hoping to snatch away other businesses.”

This article lists several things which California was doing to stop the loss of business, including: privatizing public services to cut tax costs, making a virtue of the state’s multi-cultural diversity, trimming state-created environmental red tape, and improving worker training.

“The Best Cities for Business,” *Fortune*, November 2, 1992:²

“Still newer are Orlando and Denver where tourism, technology, and transportation support increasingly global business communities.

“Seattle’s manufacturing competitiveness, measured by work force sophistication, value added, and technology content, is powerful. Combine it with the natural resource base and the city is heading toward ... an ‘international franchise.’” Factors listed are: transportation; “grade A” research universities, and medical centers that can spin off businesses and anchor technologies that attract global customers; an infrastructure capable of delivering sophisticated services; and quality of life.

“The Bay area’s mix of high tech, high finance, and high culture has always attracted Asian businesses.”

Among the top areas in the 1992 study, the Raleigh-Durham area has an “International Presence Index” (IPI) of 92 and a “Manufacturing Competitiveness Index” (MCI) of 138. It ranked sixth. Austin had an IPI of 67 and an MCI of 124. Boston had an IPI of 117 and an MCI of 100. The Bay Area (specifically San Jose) had an IPI of 92 and an MCI of 119. As of 1991, no city from New Mexico was listed.

“The Best Places in America to Own a Business,” *INC.*, August, 1992:

This article comments on the difficulty of comparing locations (a low local tax rate might be good, but not if it results in a weak public education system, for example, and locations offering inducements such as tax abatements “usually have some reason for it.”). It cites access to customers and suppliers, a large pool of specially skilled workers, a variety of supportive institutions such as training schools, good public education, and an “appealing” quality of life, as aspects to be considered in

2 The 1992 *Fortune* study by Moran Stahl & Boyer surveyed 900 executives, gathering data on population, costs, the labor force, social conflict, transport, and more. Two indices were developed: the manufacturing competitiveness index measured the change in manufacturing employment, wages, exports, value added per worker, and high-technology employment; the international presence index reflected the number of foreign banks, consulates, and service firms, plus employment by foreign-owned companies.

selecting the site for a new business. The effective local support agencies (COSE, the Cleveland Growth Association's Council of Smaller Enterprises, and the Council for Entrepreneurial Development in the Research Triangle were mentioned), was also a factor to be considered for small businesses.

"The Best Cities for Knowledgeable Workers," *Fortune*, November 15, 1993.

This study ranked U.S. cities based on their environment for innovation, costs, quality of work force, access to capital, and "many other factors." As in the two previous years, no New Mexico city was included in the survey.

"US businesses, especially those whose success depends on staying atop new technologies and processes, increasingly want to be where hot new ideas are percolating." "...several older cities of the North are rich in the brain power that employers increasingly need."

"Executives consistently say the most important factor in choosing a business Location is the quality of the work force—and the key workers of tomorrow will surely be the knowledge workers."

"Austin has become one of America's most vibrant centers of business innovation; it might have finished higher in our executive survey if more business people knew about it. More soon will."

Other factors mentioned in the article included: effective, positive interaction between academia and business; state-provided startup monies for research centers; availability of multimedia communications networks; low-cost, laid-back lifestyle; local university with a strong research program and healthy cooperation between business, academia, and government; optimism; highly educated work force; low costs [again]..."

"Smaller companies even closer to the leading edge.. were attracted by the UT [The University of Texas at Austin] incubator..." which was said to produce a "steady flow of new ideas and products (eight solvent high-tech businesses)..."

Based on the above references plus the combined experience of the MVI Review Team with regard to new-business start-ups, the following factors have been selected for consideration in assessing the strengths and weaknesses of the infrastructure at Los Alamos and in other areas of New Mexico for supporting new high-technology businesses:³

1. Workforce (highly educated, flexible, high quality; entrepreneurial talent; technical, financial, marketing, and managerial know-how).
2. Proximity to markets (effective highway system, convenient air service to key cities).
3. Public education system (K-12 and universities).
4. Interaction between government, business, and academia (strong local pro-business attitude).
5. Costs of doing business (housing, labor, facilities, taxes, fees, cost-of-living).
6. Access to capital (local venture expertise; state-provided startup monies).
7. Access to emerging technologies (universities and research facilities).
8. Technical support services and equipment.

³ The ordering of these factors is not meant to imply a weighting of relative importance.

9. Communication facilities (including networked access to the National Information Infrastructure, multimedia).
10. Quality of life (environment, medical services, recreational facilities, crime rates, diversity).

These factors are used to assess the Los Alamos and New Mexico infrastructure in the following two subsections. The concluding subsection of this appendix compares that assessment to the infrastructure of three highly regarded areas of high-technology activity: Boston, the Research Triangle, and the Silicon Valley.

B.2 Assessment of the Los Alamos Infrastructure

B.2.1 Workforce

The Los Alamos area boasts one of the finest complements of experienced scientists and engineers in the world. Los Alamos' staff has extremely strong credentials in key areas of mathematics, computer science and engineering, environmental science, physics, chemistry, and materials science. Unfortunately, because Los Alamos has operated as a government-supported research center focused largely on defense-related topics for most of its institutional lifetime, few of these individuals have experience in the formation or operation of commercial business enterprises. The differences between doing academic-style research (with fairly certain funding coming from DOE) and creating and operating a commercial enterprise in the competitive international high-technology marketplace are quite significant. This lack of managerial, marketing, and financial know-how among those individuals is a drawback with regard to forming new small businesses based on technologies developed within Los Alamos.⁴ To be more effective, the scientific and engineering community available in Los Alamos needs to be complemented by an expanded community of individuals with experience in high-technology commercialization (see also Appendix B.2.4).

Another critical factor, as noted in Section 5 and Appendix E, is that existing Los Alamos and DOE policies often make it very difficult for current or past Los Alamos employees to participate in start-up ventures. This factor appears to limit the effective availability of the technical workforce in the Los Alamos area to commercialize Laboratory technology.

Business leaders and Los Alamos employees agree that Los Alamos lacks the entrepreneurial expertise necessary to commercialize Laboratory technology. As a result, active recruitment of individuals with the skills needed to spin-out new technologies is taking place successfully. It is vital that this active recruitment continue.

As is the case in Los Alamos, pockets of strong scientific and technical expertise exist throughout the state; Santa Fe and Rio Rancho are excellent examples. New companies have generally sought location in one of these high-tech communities. Overall, the ability of New Mexico's workforce to support new high-tech businesses is fairly average.

B.2.2 Proximity to Markets

New Mexico, being fairly remote from the industrial centers of the Northeast and West, is not in great proximity to essential markets and major manufacturing centers, although it does offer fairly

⁴ At some variance to this conclusion is a comment in a recent *Forbes* article on Los Alamos, "Fallout," *Forbes*, December 6, 1993, pp. 158-159, which stated that, "...ex-lab employees are forming their own high-tech businesses in unprecedented numbers..." The MVI review found few examples of such businesses (see Section 4.3). An explanation of this difference is the further *Forbes* statement that, "Many [of these businesses] are one-person consultancies specializing in arcane areas like cryogenic engineering." The MVI review has not considered one-person consultancies to be an effective vehicle for commercializing Los Alamos technologies, at least not on a major scale.

easy access to California and Arizona. This relative remoteness of Los Alamos limits its attractiveness to new businesses. Air service between Los Alamos and Albuquerque (the state's transportation hub) is limited, and highway travel takes almost two hours. Furthermore, Albuquerque, despite fairly frequent air service to California and Phoenix, is not a major transportation hub. Since few small companies can afford to operate their own airplanes, this limits Los Alamos' ability to lure both new businesses and the people who start them. By expanding direct commercial airline flight access into Albuquerque, New Mexico can potentially fulfill the transportation needs of local business.

B.2.3 Public Education System

The public education system in the Los Alamos area is among the best in the United States. Los Alamos Public Schools operates five elementary schools, one middle school, and one high school with about 3500 students system-wide. Many teachers in Los Alamos have earned advanced degrees (2% have doctorates, 50% have master's degrees, and 46% have advanced studies past their undergraduate degrees). Nearly 75% of Los Alamos high-school graduates go on to college.⁵

The quality of Los Alamos public schools is a positive factor both in training the workforce in the area and in recruiting technical and/or managerial staff to Los Alamos.

On a state-wide basis, the public education system of New Mexico is not very strong. As is the case in Los Alamos, areas with very strong school systems do exist, and private schools are generally available to those who can afford them. The New Mexico averages in all areas of the 3rd-grade Iowa Test of Basic Skills in 1991-92 were at 41-percentile or below, and a quarter of adults in New Mexico have less than a high school education. On the other hand, New Mexico also has one of the highest percentages of residents with four years of college or more.⁶

B.2.4 Interaction Between Government, Business, and Academia

The political climate in New Mexico is generally pro-business. This is especially true in the state's high-tech centers such as Rio Rancho. Local business-development agencies such as Albuquerque Economic Development, Inc., and the Rio Rancho Economic Development Corporation (RREDC) provide ready assistance to companies seeking to relocate to, expand in, or start businesses in those areas. RREDC offers inducements such as tax credits, an assurance of county revenue bonds, expedited environmental approvals, employee-training funds, and even a special electric rate as inducements to new businesses. As one recent newspaper article stated it, "Rio Rancho's appeal is its wealth in inexpensive land and an ambitious economic development team."⁷ Given communities such as Rio Rancho, New Mexico has been able to attract high-technology companies for the past decade.

Community-wide support for new-business formation in Los Alamos is quite strong. Los Alamos Economic Development Corporation focuses on creating, retaining, and expanding businesses formed around Los Alamos technology, operating business incubators, counseling and training businesses and prospective entrepreneurs. In addition, the Los Alamos Economic Development Corporation and Los Alamos Ventures also offer a mechanism for uniting community support for new companies. Given proper resolution of the issues cited in Section 5, this group would very likely be able to provide useful assistance to new companies interested in locating or relocating to the Los Alamos area. However, the lack of significant local resources for venture capitalization is a potential problem.

5 The *Forbes* "Fallout" article states that, "Perks for [Los Alamos] National Laboratory employees include ... a first-class public school system."

6 The State of New Mexico ranks 14th in number of residents with four years of college or more according to the U.S. Bureau of the Census "Current Population Survey."

7 "Cities United," *Austin American-Statesman*, September 7, 1993, page C1 (Business section).

The "land-locked" nature of the area immediately surrounding the Los Alamos National Laboratory is another limiting factor in that land held by DOE, land within neighboring Native American reservations, and the terrain in that region all combine to restrict the amount of suitable land available for new business facilities. One approach to solving this problem would be for DOE to consider releasing land for an industrial development park.

B.2.5 Costs of Doing Business

New Mexico costs are generally at or below national averages. The combined state and local tax rates are also fairly low. The state creates a favorable tax environment for businesses through tax exemptions, credits and incentives for corporations.

The cost of living in the Los Alamos area is reasonably low, as is the tax rate (for example, New Mexico does not use local property taxes to support its public education system). Rental rates for business locations are moderate, although such space is limited. However, added costs for transportation will offset some of these benefits given Los Alamos' remoteness.

B.2.6 Access to Capital

As mentioned above, a limiting factor in the Los Alamos area is the lack of locally available sources for venture capital. In addition, little local expertise is available in the venture process.

Although there are no venture capital companies based in the State of New Mexico, state authorities and individuals within the Los Alamos community are actively working to attract venture capitalists. According to the Business Start-Up and Financing Task Force Joint Economic Development Report, "Recent efforts to make it easier for entrepreneurial New Mexico companies to work with federal scientific resources are encouraging; [and] new paradigms for access and cooperation must continue to be developed."⁸ This implies that some activities are underway that relate directly to the commercialization of technologies from both Los Alamos and Sandia, although the MVI review team was unable to identify any such efforts which have been directed into the Los Alamos area.

As is the case in most states, New Mexico has established a number of programs intended to support business growth. Among those initiatives are "High-Tech Jobs for New Mexico: A Call for State Action," a 1992 report to the Governor from the Governor's Technical Excellence Committee. Another is the previously cited report from the Business Start-Up and Financing Task Force. These reports and others have issued calls for state funding of new-business initiatives. Unfortunately, the Task Force report included the comment that, "Business assistance programs in New Mexico have surprisingly little business sector involvement."

The state's high-tech communities, such as Rio Rancho, have been more effective than the state as a whole in generating economic incentives for new business formation. Rio Rancho, working with Albuquerque, the state, and local agencies, was able to assemble a \$1B industrial revenue bond package to support business development.

The New Mexico Small Business Development Center produces an excellent publication, "Starting Out: A Guide to Creating Your Own New Mexico Business," which lists a number of support agencies and potential funding sources for new businesses. These agencies are not directed solely toward high-technology businesses, however, and many of the cited sources for potential funding are highly restricted in their scope.⁹

8 Business Start-Up and Financing Task Force, "Joint Economic Development Initiative Report," obtained from Dr. Ken Walters, Robert O. Anderson School of Management, The University of New Mexico, Albuquerque.

9 Another excellent example of a state's pursuit of new businesses is found in "Iowa: Your Guide to Doing Business," available from the Iowa Department of Economic Development in Des Moines. It cites as strengths

An expanded state-financed program for providing seed funding for new high-technology businesses willing to locate to or set up in New Mexico would seem to be something the political leadership in the state should consider, especially given the presence of both Sandia and Los Alamos therein.

As with any assessment, this report provides only a snapshot of a changing situation. With regard to support for commercial development in New Mexico, for example, several new initiatives were reported during the MCC/Los Alamos Workshop on Commercialization (see Appendix A). These include the Technology Ventures Corporation (a new Martin Marietta program to facilitate extracting technology out of Sandia and Los Alamos for commercialization), the New Mexico Small Business Development Center (a state agency created in 1992 to help entrepreneurs acquire the skills they need to establish and run their businesses from "positions of knowledge and informed decision making"); and New Mexico, Inc. (a consortium formed to create and retain jobs within the manufacturing and advanced technology sectors of the New Mexico economy). New Mexico, Inc. is funded, in part, through the Manufacturing Extension Program of the U.S. Department of Commerce.

B.2.7 Access to Emerging Technologies

Both Sandia and Los Alamos offer access to high technologies, although from the somewhat restricted national laboratory setting. The University of New Mexico (UNM) also offers technological research activities, although none of its programs has yet achieved national stature. New Mexico houses a number of existing high-technology corporations such as Intel, Motorola Ceramic Products, Honeywell Defense and Ceramics Systems, Martin Marietta, and Digital Equipment Corporation.

Los Alamos National Laboratory provides a wealth of technological information within the Los Alamos area. The issues cited in Section 5 have, in most cases, limited opportunities for entrepreneurs to commercialize those technologies, but the technologies are available.

While many universities welcome individuals or companies seeking to commercialize technologies, the environment at Los Alamos appears to be far less "user friendly" than that of the more progressive U.S. universities. Faced with daunting issues such as OCI, COI, FOO, indemnification, and more, entrepreneurs will continue to look outside the Laboratory for other sources of emerging technologies despite the rich technical portfolio available at Los Alamos.

B.2.8 Technical Support Services and Equipment

As the state's technological center, Albuquerque offers a wide variety of support services, and similar services are available in the high-technology communities, such as Rio Rancho. The Los Alamos area appears to offer only limited support services for emerging high-technology operations. A review of the 1992/93 Santa Fe/Los Alamos telephone directory, for example, showed no Computer-Aided Design and Engineering (CAD/CAE) services, only one electronic engineering consulting firm in Los Alamos and one in Santa Fe, four machine shops in Los Alamos, and no firms under "Computers - Software and Services." If these support services are not available, small companies will be forced to establish them in-house, usually at a higher cost since the costs will not be shared with other users.

Support services available through Los Alamos National Laboratory's User Facility Agreements can help mitigate the shortfall of necessary support services, and should be considered an important part of the expanded programs of the Los Alamos IPO.

in Iowa such factors as low workers' compensation costs, excellent education, highly trained job force, and low health-care costs.

B.2.9 Communication Facilities

New Mexico enjoys adequate institutional access to multimedia communications through innovative facilities such as New Mexico Technet, New Mexico Inc., and the University of New Mexico. However, there is no commitment to expand this access through the upgrade of public network/access facilities at this time.

In spite of telephone central office upgrades by US WEST (LEC), and anticipated plant reconstruction of the CATV system serving Albuquerque, it appears likely that this will lead to actual infrastructure enhancement without a better definition of applications and services that might be transported over the network(s).

While statewide access to the Internet is growing, capital commitment for the construction of local portions of the National Information Infrastructure is below that observed in areas such as California and the northeastern United States. There have been no announcements supporting broadband access and delivery in the state of New Mexico.

Business and political leaders in the state are committed to deploying and using advanced communications to improve the business climate in New Mexico.

Access to communication facilities in Los Alamos, driven by the needs of the Laboratory, appears to be excellent, including access to Internet. New businesses will need Los Alamos' assistance in obtaining necessary access to these advanced communication technologies.

B.2.10 Quality of Life

A relatively low cost of living, mild climate, and abundance of indoor and outdoor recreational activities make the quality of life in the state one of New Mexico's major assets.

Primarily because of the existence of the national laboratories and popular tourist attractions, there is a significant variance among New Mexico towns and cities in cost of living, per capita income, unemployment, etc. For example, Los Alamos' cost of living has recently been rated by the American Chamber of Commerce Researchers Association (ACCRA) to rank at about 115% of the national average cost of living index. However, Albuquerque, the state's largest metropolitan area is ranked at 99% of the national average index. To place this in a national perspective, a comparison with other high-technology cities suggests that Los Alamos is not far out of line.

While living in a fairly remote, mountainous area subject to cold winters is not for everyone, for many people, Los Alamos offers an excellent living situation. The area offers extensive recreational facilities, including skiing in Los Alamos and nearby Santa Fe, a low crime rate, and capable medical facilities. Los Alamos residents have the highest incomes in the state, with a personal per capita income of \$29,315.¹⁰ The past treatment of nuclear materials in the area, however, led Forbes to comment that, "With homes in Los Alamos starting at only \$60,000, local government is now touting the town as an ideal retirement place. This may be a hard sell. Winters at 7400 feet above sea level are pretty cold (average January low: 18 degrees), and some think of the whole area as one big toxic-waste dump. The lab has acknowledged more than 2000 hazardous sites on its grounds alone."¹¹

B.3 Comparison with Other Areas

On a per-capita basis, New Mexico generates about as many successful new businesses (as well as failures) as other areas such as North Carolina (the home of the Research Triangle) and Boston. However, it falls somewhat below California in both counts. These three areas are generally

¹⁰ U.S. Bureau of Economic Analysis "Survey of Current Business," April 1993.

¹¹ "Fallout," *Forbes*, December 6, 1993.

considered leading centers for high-technology business formation. New Mexico, despite its wealth in national laboratories, is not especially known for generating new high-technology businesses.

A major factor which distinguishes areas such as Silicon Valley from others when it comes to high-technology business formation is the ready availability of individuals experienced in all areas of starting and operating such businesses. A recent article stated that "Silicon Valley is still the best business incubator around...The Valley's most enduring strength: a concentration of technical, marketing, financial, and managerial know-how that can't be matched anywhere...Scores of venture capitalists...scores of consulting firms: chip designers, software writers, manufacturing experts, industrial designers, and marketing consultants...a positive mental attitude...A massive base of talent and know-how...two universities...a high tolerance for failure ... There's market research on anything you want..."¹² This ready access to expertise, coupled with a fairly open society in which engineers and scientists feel free to move from one company to another, is a major source for the growth of high-technology businesses not only in California but in North Carolina and Massachusetts, as well.¹³

Another factor which appears to differentiate these areas from New Mexico is the presence of well-funded state- and local-level initiatives aimed at supporting business development. For example, North Carolina (under Governor James Hunt) established a well-funded program centered around the Research Triangle area to foster high technologies. As a result, the Triangle has blossomed from a rural setting near Cary, NC, to a major center for advanced research, development, and directly-linked commercialization.

Another factor observed more strongly outside of New Mexico is the presence of an "anchor" institution which drives much of the high-technology growth in the areas. In Boston, it has been the Massachusetts Institute of Technology (MIT) and its associated laboratories which have received significant levels of federal funding for research and development. Unlike the national laboratories, however, those institutions were not subjected to issues such as OCI, COI, or FOO, and, as a result, quickly built close working relationships with industrial entrepreneurs who wanted to take technologies from the university setting into the business setting. Similarly, the presence of Stanford and the University of California at Berkeley has been a major force in Silicon Valley, in part because of UCB's strong interest in applied R&D, as well as its preference for open exploitation of technologies developed by its faculty and students.

One problem that New Mexico faces in seeking high-technology business growth is the simple critical mass problem. Until a sufficiently strong corps of high-technology industries has been formed within the state, the creation of new businesses is less likely. In high technology, as in many other areas, the rich get richer. If, however, the two major high-technology assets of the state can be freed to better work with emerging industries, then New Mexico can expect significant acceleration in its economic growth.

B.4 Conclusions

All told, the present Los Alamos situation with regard to commercializing Laboratory technologies is a mixture of favorable and unfavorable aspects. On the plus side are the strength of the Los

12 Heavenly Valley, *Business Week*, 1993 "Enterprise" edition.

13 Silicon Valley is not without its problems, however. The *Business Week* article also stated that, "A group of business leaders launched Joint Venture Silicon Valley to address these problems (suburban sprawl, traffic, smog, housing costs, high labor rates, net loss of 40k manufacturing jobs). Its mission: to make sure the infrastructure for creating new companies remains intact and to try to deal with some of the quality-of-life issues—before the Valley suffers a brain drain to places like Austin and Seattle...What continues to worry Valley residents and high-tech executives are the rising costs and quality-of-life issues...Universities are feeling the pinch [of]...funding cuts, especially on defense."

Alamos technology base, the technical skills of the Los Alamos staff, the quality facilities within the Laboratory, the quality of life in the area, and the interest of both the community and the Laboratory in seeing commercialization happen in the area. On the negative side is the lack of experience in commercialization within the Laboratory and the community, the relative isolation of Los Alamos, the existing Los Alamos/DOE policies and procedures relating to technology transfer, and the limited availability of supporting services and land for development. Taken together, however, the situation seems to be improving (to a large part through Los Alamos' IPO efforts), and opportunities for additional improvement seem readily available.

Statewide, New Mexico has several communities which have been very effective in recruiting high-technology businesses, and growth in that sector appears to be steadily improving. New initiatives such as the Small Business Development Center, Technology Ventures, Inc., and New Mexico, Inc., are major steps in the right direction. If coupled with a steady stream of support funding for technology maturation and new company incubation, the State of New Mexico should move into the high-technology inner circle along with California, Massachusetts, and North Carolina within the next several years. Improved technology commercialization from Los Alamos and Sandia can clearly play a major role in such a transition.

Appendix C. A Typical Licensing Agreement

THIS LICENSING AGREEMENT ("Agreement"), made this _____ day of _____, 19--, by and between the Technology Development Laboratory (hereinafter called "Licensor") and Start-up Inc., a New Mexico corporation (hereinafter called "Licensee").

WITNESSETH:

WHEREAS, Licensor represents and warrants that it is the owner of all right, title and interest in and to the patent and patent applications listed in Schedule A, [and expects to file additional applications for patents,] including a patent application now in the U.S. Patent Office (all of which are hereinafter called the Patents); and

WHEREAS, Licensee desires to secure an exclusive, worldwide license to make, use, and sell products embodying the Patents and to practice the invention disclosed in the Patents, including the right to sub license thereunder, and Licensor is willing to grant the same upon the terms and conditions as set forth herein;

NOW THEREFORE, in consideration of the mutual covenants and undertakings of the parties, it is hereby agreed as follows:

(1) Grant of License.

Licensor hereby grants to Licensee, its subsidiaries, and affiliates, the sole and exclusive, worldwide right and license (including the right to sub license) to make, have made, use, and sell Products and to practice the invention covered by the claims of the Patents listed in Schedule A.

(2) Royalty.

Licensee shall pay to Licensor _____ percent (_____ %) of Net Sales of the Products by Licensee, its subsidiaries and affiliates up to but not in excess of a total of _____ dollars (\$ _____). From and after the payment of _____ dollars (\$ _____) by Licensee to Licensor, Licensee shall have a royalty-free license to make, have made, use, and sell the Products. Net Sales, as used herein, shall mean the total invoiced amount of all sales made by Licensee to either OEM or end user customers, less cash and trade discounts, returns, allowances, free goods and replacements, taxes applicable to such sales, and governmental charges assumed and delivery charges borne by Licensee. If Net Sales of the Products do not exceed the amounts shown in attached Schedule B the license shall become non-exclusive and the Licensor shall have the right to license other parties to make, use, and sell products and to practice the invention disclosed in the Patents.

(3) Payment Terms.

Payments hereunder shall be made by Licensee within sixty (60) days after the end of each calendar quarter. Payment shall be accompanied by a report of the Net Sales of the Products and the computation of Royalty due thereon for the preceding calendar quarter. [At the election of the Licensee, Royalty payments due on sales made during the first twenty-four (24) months of this agreement may be deferred and paid either in a single payment or in quarterly payments over the following twenty-four months with quarterly interest paid on any outstanding balances at the rate of eight percent (8%) per annum].

(4) Records.

Licensee shall keep accurate records of Net Sales for a period not to exceed [e.g., two (2) years], unless in dispute, in which event they shall be kept until said dispute is settled, and such records shall be open during reasonable business hours at the place where such records are customarily kept, for examination by an independent certified public accountant selected by Licensor and acceptable to Licensee, for the purpose of verifying the accuracy of such Net Sales reported to

Licensors and payment due thereon. Said accountant shall not disclose any information that he may thereby obtain other than that necessary for the purpose of enabling Licensor to determine the accuracy of such reports and payments made in connection therewith.

(5) Conflicting Patents.

If someone other than Licensor secures patent protection in the United States for the Products, or for another similar product, so that Licensee cannot in its judgment economically or legally make or sell the Products, or if Licensee is unable to obtain an effective New U.S. Patent Application for the Products, then Licensee shall have the right to terminate this Agreement by notice to Licensor in writing.

(6) Termination by Licensor.

Licensee shall have the right to cancel this Agreement at any time upon three (3) months notice in writing to Licensor.

(7) Indemnity for Infringement.

Licensor hereby indemnifies and holds Licensee, its subsidiaries, affiliates and sub-licensees harmless against any and all actions, suits, claims or demands whatsoever, including the costs and expenses connected therewith, which any of them may incur or become liable to pay by reason of any claim, suit or demand for infringement of patent because of the manufacture, use, or sale of the Product, provided Licensor shall be promptly notified of any such action, suit, claim or demand.

(8) Term.

The term of this Agreement shall be for the life of the last to expire of the Patents listed on Schedule A, and any modification, extension, or reissue thereof.

(9) Default.

In the event that the Licensee defaults or breaches any of the provisions of this Agreement or fails to account for or to pay to Licensor any of the royalties becoming due and payable to him hereunder, Licensor reserves the right to cancel the license hereby granted upon sixty (60) day written notice to the Licensee; provided, however, that if the Licensee, within the sixty (60) day period referred to, cures the default or breach, the license herein granted shall continue in full force and effect until its normal expiration date in accordance with its terms. Upon termination of this Agreement for any reason, the Licensee shall immediately pay to Licensor all royalties which shall have accrued on or prior to the effective date of termination, regardless of whether such royalties would otherwise be due and payable on or prior to that date.

(10) Waiver.

No waiver by Licensor of any covenant or condition of this Agreement shall be effective for any purpose whatsoever, unless in writing signed by Licensor's duly authorized officer.

(11) Bankruptcy.

In the event of any adjudication of bankruptcy or of insolvency under any statute for the relief of debtors or the appointment of a receiver by a court of competent jurisdiction, or the assignment for the benefit of creditors or levy of execution directly involving the Licensee, this Agreement shall thereupon terminate.

(12) Notices.

Notices under this Agreement shall be sent to the following addresses:

To Licensor at

To Licensee at

(13) Successors and Assigns.

This Agreement shall be binding and shall inure to the benefit of the parties and to their heirs, successors, and assigns.

(14) No Assignment.

Neither party shall have the right to assign this Agreement, in whole or in part, without prior written approval of the other, provided, however, that Licensee shall have the right to assign this Agreement, in whole or in part, at any time to one of its divisions, subdivisions or affiliates. Licensor shall have the right, upon written notice to Licensee, to assign the collection of royalties hereunder, but in no event shall Licensee be obligated to deal with more than one (1) party in the payment of said royalties.

(15) Applicable Law.

All matters affecting the interpretation, form, validity, and performance of this Agreement shall be decided under the laws of the State of New Mexico.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the day and year first above written.

Technology Development Laboratory, "Licensor"

By:
Authorized Officer

Start-up Inc., "Licensee"

By:
Authorized Officer

Appendix D. Technology Screening Guidelines

This appendix contains an interview guide and discussion outline for use in the identification and initial *technical and business* screening of technologies or other project content which may have commercial potential.

One of the first steps in developing a selection of technologies for commercial spin-out is to identify and develop a database on those items which should be screened for commercial viability. The following outline identifies the information which needs to be collected on the technical content of each item that will be passed through the initial screening process. This list of required information relates only to the technology and technical content—another set of questions describes the market and other business information required to complete an initial screening.

D.1 Technology Screening Information Requirements

1. Description of the technology, in layman's terms:
 - Basic scientific principles involved in the technology: what can it do; how does it work?
 - Technical advantages compared to similar or alternative technologies
 - Relation to other technologies that might benefit or be enhanced by this technology.
2. Background on the work done to-date:
 - How/why this technology was developed?
 - Time and resources devoted: including approximately how much has been spent and who provided the funding
 - Original objective of the program (if different than the current objective).
 - Current status: what can be demonstrated; what embodiments exist; can performance be measured?
3. Possible products and/or applications which could be developed out of this technology (if some are known):
 - Describe possible commercial products and/or services: fields of use; specific applications.
 - What significant problems or needs could be satisfied; what are the expected benefits/advantages?
 - Cost/performance compared to current methods/products.
4. Resources currently available to continue work if funding is, or could be made available:
 - Available technical talent.
 - Other required resources.
5. Status of intellectual property:
 - Do lab technical notebooks exist?
 - Has submission been made to IPO; action taken and current status?
 - Patent(s) or copyright(s): issued and/or applications?
 - Have any of the results of this work been published, discussed at technical or other meetings, or otherwise released to the public?
6. List of any outside commercial organizations that have evidenced an interest; the current status and what the nature of their interest was or is.

7. Requirements to complete development, and/or resolve technical deficiencies or uncertainties:
 - What additional work needs to be done, what will it cost, how much time is required, what could be demonstrated, and/or how much could performance be improved?
 - What major unresolved problems exist; what will it take to resolve them? Are there any serious technical problems (e.g., that could stop successful development)? Have possible solutions been identified?
8. Plans for continued development; status of sponsorship and funding.

“Technology” is used here in the most general sense. Candidates for screening should include: technologies; business or product ideas related to technologies; elements of programs; and product or systems concepts developed out of, but possibly not directly related to, an ongoing program.

D.2 Screening Technologies: Initial Market and Business Evaluation

The following is a list of those factors to be taken into consideration in doing an initial business screen of Los Alamos’ technologies and product concepts.

1. Market size and growth trends: the estimated size of the potential market in end user dollars and/or units or installations, and projected growth and opportunities for additional growth.
2. Market characteristics:
 - Ease of access; ability to penetrate.
 - Extent of business potential: total business or more limited (e.g., system, product or component).
 - Potential for repeat business/ongoing revenue stream (e.g.; razor vs. razor blades).
 - Sales cycle.
 - Complexity of sales story.
3. Customers and customer characteristics:
 - Concentration.
 - Revenue potential per customer.
 - Estimated willingness to accept and/or to change.
 - Customer economics: pay-off profile.
 - Importance to the customers’ business success.
4. Competition:
 - Direct competitors (existing and potential): number, size and resources; business strategy; concentration; ability to respond to new threats.
 - Indirect competition.
5. Sustainable competitive advantage (degree of incremental value added).
6. Capital investment required and net cash profile.
7. Marketing requirements:
 - Suitability of available channels.
 - Pricing flexibility.
 - Support and customer service requirements

8. Anticipated risks, uncertainties and issues:

- Government regulation.
- Access to international markets.
- Undesirable social connotations or effects.

9. Possible strategic options/planning latitude (including possible partnering arrangements).

D.3 Other Comments On Screening: Locating and Classifying Los Alamos Technologies

No suitable catalog or database exists describing Los Alamos technologies. The work being done by Linda Witherspoon is a start, but it is oriented more toward the identification and description of technical resources rather than covering technical content and potential commercial applications information. Also, while plans are to expand this effort to cover the entire lab, the present data covers mainly environmental-related material. In addition, the depth and quality of information sought, along with the existing skepticism of many Los Alamos staff members, probably requires that a personal, face-to-face exchange take place to secure the necessary data.

With the lack of even a rudimentary central database, the identification process will likely depend on a networking activity, asking each individual interviewed to name additional PIs whom he believes to have technology that should be included in the screening process.

As data is accumulated, there will be opportunities to refine the identification and information collection process. Depending on the number of items and the volume of usable information which emerges, collection might be modified to be a two-step process: first, collecting some basic information by telephone, by written submission, and/or by direct data entry, followed by interviews of those who appear to be more noteworthy.

Another matter which will arise is the balance of resources and time between broad, possibly even exhaustive, search and screening activities, as opposed to devoting attention to evaluating and developing those technologies which have been identified and which, on cursory examination, appear to have significant commercial potential. Not knowing what is going to emerge once the search begins, it is very difficult to suggest any guidance. Instead, this will be the subject of judgment as the process proceeds. In the interest of attempting to demonstrate the spin-off process, if an attractive opportunity is identified, some substantial resources should be committed to carrying it forward as fast as reasonably possible, and reducing the resources devoted to general search and screening.

D.4 Other Comments

- Make use of the most qualified experts, whether they be from inside Los Alamos or outside, whenever possible. Often finding and making use of an individual with deep experience in the market or application areas being targeted by a technology can be the quickest and most efficient way to gain the necessary knowledge—and can avoid the later embarrassment of learning that months of investigation have been spent without realizing some key fact that either makes or totally invalidates the targeted opportunity. Money spent on external consultants is often the least expensive way to produce the needed information, and to make sure that the correct conclusion is reached.
- Maintain the broadest possible perspective in the screening process. Try not to become focused on one application or a single industry too early in the process. Sometimes good commercial fits are not immediately apparent and may not emerge until late in the screening process. Likewise, do not give up too soon.

If the technology is believed to have significant value, but does not show a ready fit with the expected industry or application, look at other areas before discarding.

- Go through the whole screening process one time quickly. Use multiple passes with increasing levels of detail rather than trying to completely answer all questions the first time through. Identify where the major areas of concern or uncertainty are that will either confirm or kill the benefit of continuing the screening process, and then focus more attention on those areas. Conserve efforts for where they will produce the greatest results—spend time only on those opportunities where the apparent market and/or economic opportunity warrants it.
- Depersonalize the screening process. Separate the screening from any individual's professional motives, and try to insure that the outcome does not imply anything about the technical qualifications or business judgment of the inventor/champion.
- If the technology in question is relatively far along in the maturation process and is close to some product embodiment, it might be advisable to establish some type of collaborative arrangement with one or more potential customers or investors. The knowledge and interest of these organizations would be used to speed the evaluation process, and to begin to better define the specifications of potential products using the input of prospective early adopters. However, it is important that an adequate, viable business and/or product definition has been developed and can be effectively presented before attempting to enlist the help of outside commercial organizations.

Appendix E. Summaries of Specific DOE/UC/Los Alamos Documents

During the review process, the MVI Review Team was provided with over 90 documents believed by Los Alamos to be relevant to the commercialization activities currently underway at the Laboratory (these are listed in Appendix E.1). As stated in Section 5, the review of those documents was the major source for the identification of the key issues relating to technology commercialization at Los Alamos.

This appendix summarizes, on a document-by-document basis, the findings of the MVI Review Team which resulted from their study of the documents. This appendix contains a detailed review of those documents that directly define and impact the commercialization process at Los Alamos. With the exception of Appendix E.2, which discusses the Prime Contract between the University of California and DOE, each of the following document reviews focuses on the following issues:

- I. A basic description of the document.
- II. The effect of the document on intellectual property rights and technology transfer.
- III. The funding/costing implications of the document for small businesses.
- IV. The effect of the document on legal liabilities.
- V. The relation of the document to internal Los Alamos issues.

Each review concludes with a summary of the implications found by the MVI Review Team of the document on the commercialization of Los Alamos technologies by small businesses.

E.1 List of Documents Provided by Los Alamos for Review

- 1) Left blank intentionally
- 2) Left blank intentionally
- 3) University of California Contract Between The United States of America and The Regents of the University of California for Management of the Los Alamos National Laboratory
- 4) OCI
 - A) Course Outline - DOE's Organizational Conflicts of Interest System
 - B) OCI Narrative - Source of Organizational Conflicts of Interest (OCI) Requirements
 - C) Coal Slurry Pipeline Articles
 - The Battle Over Coal Slurry, Wall Street Journal - 12/8/75
 - Coal Slurry Pipelines Face Key Hurdle This Week in Fight for Eminent Domain, Wall Street Journal - 5/18/76
 - Letter from Comptroller General, Elmer B. Staats, dated 4/22/76
 - D) Course Viewgraphs
- 5) DOE's Statutes
 - PUB. L. 95-39, Energy Research Act, dated 6/3
 - PUB. L. 95-70, Federal Energy Act, dated 7/21
- 6) DEAR 909.570-3
- 7) DEAR 952.209-70 - OCI Solicitation Provision
- 8) DEAR 952.209-71 - OCI General Clause
- 9) DEAR 952.209-72 - OCI Special Clause

- 10) DOE Order 4220.4 - OCI Processing Procedures, dated 5/19/86
- 11) DOE Form 2030.1 - Pre-Procurement Fact Sheet
- 12) DOE Form 2030.2 - OCI Abstract
- 13) Sample Federal Register Publications
- 14) Fax from Michael Stevenson to Brian Kushner, dated 8/18/93, OCI Procedures
- 15) Case Study Statements of Work
- 16) Funds-In Agreements with the U.S. DOE for Services Provided by the Los Alamos National Laboratory
 - Sample Letter with respect to Work for Others Agreement
 - Exhibit 1, Content and Format of the Statement of Work (SOW)
 - Reimbursable (Funds-in) Agreement Face Page, ALF 4300.2, dated 3/89
- 17) Patents Sections from LANL's Administrative Manual
 - Section AM713, dated 8/9/91
 - Section OPM-8-16, dated April 1991
- 18) Patents - Patent Listing (sample of pages out of binder)
- 19) LANL's Inventor Awards (Inventor Awards Ceremony - FY92)
- 20) LANL's Model CRADA, dated 7/93
- 21) Patent, Trademark, and Copyright Laws, 1993 Edition (35 U.S.C. S188, 200-212)
- 22) LANL's Organization Chart, dated 7/1/92
- 3) Left blank intentionally
- 24) Left blank intentionally
- 25) LANL's Technical Consulting Services Agreement, dated 6/93
- 26) Record of Invention, DOE Form GC-213
- 27) Patent Listing, dated 12/11/84 to 08/04/92
- 28) Restructuring the Department of Energy
- 29) LANL Evaluation Report, dated August 26, 1992
- 30) Industrial Partnership Center - Alliances with Industry, IPC-93-0044
- 31) Industrial Partnerships - The Future by Kay V. Adams, dated 8/9/93
- 32) Industrial Partnership Center - IPC Mission - IPC-93
- 33) The Bridge between Los Alamos and Industry - Summer 1993

- 34) The Bridge between Los Alamos and Industry - Autumn 1993
- 35) The Bridge between Los Alamos and Industry - Winter 1993
- 36) LANL Small Business Initiative
- 37) Alliances with Industry: A New Way of Doing Business by Kay V. Adams
- 38) Technology Innovation - Chapter 63, Sections 3701-3715
- 39) UC Royalty Form, dated 10/26/92
- 40) DOE Order 2200.6A, dated 1/7/93
- 41) DOE Order 4300.2B, dated 7/16/91
- 42) DOE Order 5800.1AP, dated 10/20/93
- 43) Superconductivity Agreement, dated 10/26/93
- 44) Exclusive Patent License Agreement, revised 9/15/92
- 45) Non-Exclusive Patent License Agreement, Revision 8/26/92
- 46) Development License Agreement, dated 1/27/93
- 47) Exclusive Computer Software Agreement, Revision 3/8/93
- 48) LANL Model CRADA (duplicate, but not dated)
- 49) Funds-In Agreement (duplicate)
- 50) Industrial Staff Member Agreement, revised 2/7/83
- 51) Technical Consulting Services Agreement, dated 6/93
- 52) User Facility Agreement
- 53) Proprietary User Facility Agreement, Revised 9/15/92
- 54) Outside Employment Policy, dated September 27, 1991
- 55) Entrepreneurial Leave Policy, dated February 28, 1991
- 56) UC Business and Finance Bulletin RMP-7, dated November 1, 1985
- 57) UC Business and Finance Bulletin RMP-8, dated July 8, 1992
- 58) UC Conflict of Interest Requirements, draft October 13, 1993
- 59) Overview and Issues, LANL Presentation, October 14-15, 1993
- 60) DOE Organization Chart (one page) with names (November 1993)

- 61) Left blank intentionally
- 62) Changes and Challenges at the Department of Energy Laboratories (draft, dated October 1, 1993)
- 63) Left blank intentionally
- 64) Left blank intentionally
- 65) Left blank intentionally
- 66) Licensee Selection Criteria (2 pages) - dated November 18, 1993
- 67) UC Access
- 68) Knowledge Express Phone Number
- 69) Brochure - High Tech Jobs for New Mexico: A Call for State Action - 1992
- 70) Draft copy - "Equity" Bulletin - dated 10-8-93
- 71) Left blank intentionally
- 72) Article - Massachusetts Company Forms Venture-Capital Arm at INEL
- 73) Article - Fallout, Forbes - December 6, 1993
- 74) DOE-Approved CRADA Language and Guidance - October 1993
- 75) Department of Energy Work for Nonfederal Partners - December 1993
- 76) Supplemental Guidelines for Using the Department of Energy Small Business CRADA - December 10, 1993
- 77) Organizational Conflicts of Interest Checklist (Form 911) - LANL7/91
- 78) Business Assessment Questions
- 79) CADET Technology Screen (pp. 1, 4-9, ii) - April 1, 1993
- 80) Business Creation From Technology (Class at INEL)
- 81) CADET Technology Screen
- 82) UC Conflict of Interest
- 83) Technology Transfer Policy Guidance
- 84) 1992 DOE Defense Critical Technology Plan
- 85) Partnerships for Global Competitiveness July 29, 1993
- 86) Option Agreement, dated 8/93

- 87) Instructions for Completing a Proprietary Information Agreement, dated 2/93
- 88) New Program Opportunities for Small Businesses
- 89) Leave Without Pay Policy, dated September 29, 1989
- 90) Potential Guidelines on Conflicts of Interest, Memo from Steve Girrens
- 91) COI Definitions

E.2 The Prime Contract (No. W-7405-Eng-36, Mod No. M 359)

Readers should note that this review is primarily from the viewpoint of the applicability of this contract to the technology transfer from Los Alamos to new, small businesses. Please also note that in some cases items in the Articles and clauses were noted as being applicable to small business, but no further comment was made.

Purpose of this Document: This is the prime contract between the University of California (University), the operator of the Los Alamos National Laboratory (Los Alamos), and the government. This prime contract establishes the policies and procedures that govern the day-to-day operation of the Laboratory. It should be noted that all of the personnel who "work for the Laboratory" are either employees of the University or are contractors.

Article I.

This article points out the requirement for and importance of the University acting to transfer research and technology to the private sector, stating that, "In addition, the Laboratory performs the important function of fostering the rapid and effective transfer of unclassified research and technology to the private sector, in order to improve the nation's ability to compete economically." The fourth paragraph of Article I also states that Los Alamos research must not be "in competition with the private sector." Despite that provision, cases have been cited during the MVI review wherein a business has licensed a Los Alamos technology and the Laboratory has continued to develop the technology. Then, when a second company licenses the more advanced technology, the Laboratory could be seen as being directly competitive to the private sector (i.e., the originally licensing company). Los Alamos needs to recognize this fact and include appropriate provisions in their licensing documents to allow the original licensing company to receive revisions and extensions to the technology.

Article III. Clause 1 - Statement of Work

One of the six bullets which describe, in general, the purpose of the contract states that, "Performance of technology transfer and work for others including programs designed to enhance U.S. competitiveness in the global economy...". The University clearly has the responsibility to transfer the technologies created at Los Alamos. There is no more singularly effective way to create new jobs and thus enhance U.S. competitiveness than to transfer such technologies to new, small businesses.

Article III. Clause 004 - Work for Others

Under this article, Los Alamos may perform non-DOE funded work for others as long as the work:

- 1) Either relates to the Laboratory's mission or is within special capabilities of the Laboratory,
- 2) Is in accordance with all applicable policies, and,
- 3) Is consistent with the Prime Contract.

The University may continue to fund such work for up to 90 days when there is a lapse in funding from the external sponsor.

Article VI. Clause 9 - Technology Transfer

The allowed technology transfer activities are intended to:

- 1) Enhance U.S. competitiveness in service of the national economic interest,
- 2) Benefit the public through commercially effective utilization of technological advances, and,
- 3) Maintain an enhanced national security.

Article VII. Clause 8 - Cost Accounting Standards

Note 3 of this article deals with the requirement for indemnification, stating that the questions of whether or not to include an indemnification clause in other agreements, "are matters for negotiation and agreement between the University and the subcontractor." In MVI's discussions with DOE personnel, however, they have unanimously stated that indemnification is not one of the issues that the University will negotiate, even though (as pointed out in Section 5), the potential liability that such indemnification introduces for small businesses may affect their ability to obtain venture capital. If this clause is applicable to technology transfer, and it appears that it is since it is included in current Los Alamos licensing agreements, then it would seem that the University is being unnecessarily conservative in their interpretation and application of the indemnification clauses.

Article VII. Clause 17 - Organizational Conflict of Interest

d) Subcontracts

The Contracting Officer can decide to allow a subcontract even with conflict of interest if it is decided "that despite the existence of a conflict of interest the award is in the best interest of the government."

Article VIII. Clause 12 - Utilization of Small Disadvantaged Business (Concerns (FAR 52.219-8)

a) This part of the article references the policy of the U.S. that small business "shall have the maximum practicable opportunity to participate in performing contracts...". This clause should apply to technology transfer and should give the University the right to provide flexibility to the technology transfer process.

Article XII. Clause 1 - Patent Rights

b)1) Under this clause, the University owns all patents produced at Los Alamos. However, for any "Subject Invention in which the University obtains title the Federal Government shall have a non-exclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the U.S. the Subject Invention throughout the world." Thus, even though a small company obtains an exclusive license, the government always has the right to utilize the patent independently of that license. This option to bypass the license potentially increases the difficulty a small business may have in obtaining funding from capital sources since they normally expect (demand?) that their investments be protected by exclusivity. Since the requirement that the government and University retain a non-exclusive license for government purposes is mandated by statute, this requirement may not be readily changeable, but it must be recognized that it is another possible roadblock to a new business seeking to commercialize a Los Alamos technology.

c)1) The University is required by this clause of Article XII to have procedures in place to assure that Subject Inventions are promptly identified and disclosed (typically within less than six months). This clause also includes the requirement for maintenance of laboratory notebooks. During MVI discussions with Los Alamos personnel, however, most of them stated that they had never heard of the concept of keeping a laboratory notebook, nor were they aware of any policy that they had to follow in disclosing inventions. It should be noted that

the patent section of the Los Alamos Administrative Manual explicitly describes procedures for maintaining notebooks and outlines the policy for disclosing inventions.

g)1) This clause states that the subcontractor shall retain rights to inventions.

Article XII. Clause 2 Patent Indemnification

“Except as authorized by the Contracting Officer, the University shall obtain patent indemnification from subcontractors.” Again, in order to make the technology transfer process work via small businesses, the DOE needs to consider enabling small businesses in their funding pursuit by removing this requirement.

Article XII. Clause 7 - Rights in Data

b)1) The government automatically owns all technical data and computer software first produced by the University in performance of this contract. The University may copy and use the software.

b)2) The University can assert copyright and has the right to withhold its Limited rights Data and Restricted Computer Software.

i) In order for the University to assert copyright for computer software, the University must furnish to the DOE centralized software distribution and control point, 1) an abstract, 2) source code, 3) object code and minimal support documentation. The University shall require its licensee to supply minimal support documentation within six months of license issuance.

In general, during the first five years, the government has a paid up, non-exclusive, irrevocable, worldwide license and can reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the government. This is renewable for two more five-year periods (15 years overall).

After the five-year periods, the government has all of the above, plus it can permit others to do so. In other words, when the last of the five-year periods has expired, the government can still prepare derivative works and make the total software part of the public domain. They also can allow others, such as contractors/subcontractors to do the same.

As noted in Section 5, the items in this clause make it very difficult for a small business to get funding and also to operate (i.e., must supply documentation to the centralized software distribution point). Even after the small business has been successful in obtaining a license, it still must worry about what the government is going to do. Also, while the small business is trying to put all of its energies into making the company successful and augment the software that it has received from the government, it must provide this centralized distribution point with documentation. Due to the above requirements, the small business cannot provide 100% assurance to its investors that the software will not be distributed to others (or why else would it be sent to a centralized distribution point?) and must ensure that they meet the six-month milestone of supplying their own developed documentation to this same distribution point. Although distribution is supposed to be limited to government personnel and used for government purposes only, it is generally recognized that once software is distributed, the probability of it not being protected increases substantially.

Article XII, Clause 11 - Technology Transfer

This clause applies only to Laboratory Technology transfer activities.

b)1) Technology transfer is established as a mission of the Laboratory.

b)2) The University shall conduct technology transfer activities with the clear intent of providing benefit from Federal research to U.S. industrial competitiveness.

d)8) Technology transfer to a current employee or anyone who has been a Los Alamos employee within the past two years or to a company in which he or she is a principal CAN OCCUR with the approval of the Contracting Officer.

e) Fairness of Opportunity

This part of the Prime Contract is fairly succinct (two sentences) with regards to Fairness of Opportunity requirements. It states that, "In conducting its technology transfer activities, the University shall prepare procedures and take reasonable measures to ensure widespread notice of availability of technologies suited for transfer and opportunities for exclusive licensing and joint research arrangements." This relates to technologies that Los Alamos has decided are ready for transfer. This clause also states that, "The requirement to widely disseminate the availability of technology transfer opportunities does not apply to specific applications originated outside the laboratory." During MVI discussions with Los Alamos personnel, it was concluded that unless the individual or company learns about technology through the public domain, current Los Alamos policy requires that the technology be advertised before any license could be considered. In addition, this clause states that if an individual or company came to Los Alamos with a new application, that it would not have to be advertised.

f) U.S. Industrial Competitiveness

This clause is sometimes referred to as the "substantial US manufacturing clause."

1) In its licensing and assignments to Los Alamos' Intellectual Property, the University shall give preference in such manners as to enhance the accrual of economic and technological benefits to the U.S. domestic economy. Consideration must be given to:

- 1) Design and development performed in U.S. and U.S. manufacture,
- 2) Whether the licensee has a business unit in the U.S., and,
- 3) Whether significant economic and technical benefits flow to U.S.

Also, if licensing to an entity under control of foreign company or government, does the foreign government enter into cooperative R&D and licensing agreements, and does it have policies to protect U.S. Intellectual Property rights?

In MVI discussions with Los Alamos personnel it was learned that their application of these particular guidelines appear to be reasonable and not overly restrictive. Also, to the best of our knowledge, Los Alamos has never terminated a license due solely to breach of this clause.

g) Indemnification

The University must obtain indemnification for both the University and the government.

II. Technology Transfer - CRADAs

c)1) The University may exempt from the Freedom of Information Act data produced as a result of a CRADA for up to five years.

Appendix A.

IX Leave without Pay

Leaves without pay can be granted by a division leader for up to six months. For leaves of more than 12 months, the Director must approve.

A. Personal Leave - "A personal leave for temporary employment outside the laboratory may be approved provided that the outside work is in the interest of public service and/or will be beneficial to the laboratory upon the employee's return".

Considering the dearth of industrial experience that exists within Los Alamos, it would seem that any experience with new businesses would be extremely beneficial to Los Alamos as it tries to fulfill its technology-transfer mission.

E.3 Documents Relating to Patent Policies and Procedures

Basic Document Information: Four of the reviewed documents relate to Los Alamos policies and procedures for patenting and other forms of protection for intellectual property.

The LANL Administrative Manual

The patent sections of this manual instruct Los Alamos employees on recording information in laboratory notebooks and disclosing inventions.

The University of California Royalty Form

The UC royalty form describes the policy the University of California uses for allocating royalties. It is a two-page document.

Record of Invention- DOE Form GC-213

The Department of Energy record of invention is a disclosure form used by Los Alamos researchers for disclosing information about their invention. It includes a description of potential commercial applications of the invention.

Intellectual Property/Technology Transfer Issues: Intellectual property management is a critical factor in enabling successful technology transfer.¹⁴ Intellectual property consists of inventions, patent applications, patents, copyrights, mask works, trade secrets, know-how and trademarks. In order to successfully manage and protect intellectual property in any research institution, a formal system for recording and protecting intellectual property must be instituted. Los Alamos has a system for protecting intellectual property once it is defined as an invention and proceeds through the process of being formally protected through patents or copyrights. However, implementation of the policy is difficult to maintain and some lab technology may not obtain proper intellectual property protection.

A key element to thoroughly protecting intellectual property includes rigorously maintaining lab notebooks and making sure that proprietary information, which may be the basis of intellectual property, is not inadvertently released to the public domain through discussions, seminars, presentations or publications in technical journals. Premature disclosure can lead to loss of patent rights. The Los Alamos Administrative Manual states that researchers must send a written description of the potential invention to the patent department of the Los Alamos IPO before publishing any information about technology.¹⁵ It specifically lists the kinds of activities that can lead to premature disclosure. However, this policy does not appear to be enforced rigorously, and many Los Alamos researchers appear to have a tendency to publish as soon as they have valuable information worth publishing.

The Administrative Manual also outlines specific procedures for maintaining laboratory notebooks.¹⁶ These guidelines are contained in two paragraphs and include requiring a witness sign

14 Center for Applied Development of Environmental Technology, Intellectual Property Management Plan, CADET, January 1993, pg. 2.

15 Patent sections from Los Alamos Laboratories Administrative Manual, pg. 2.

16 *Ibid.*, pg. 3.

the notebook entries at the end of each day. Based on conversations with lab employees, many of whom were not aware of the notebook maintenance policy, it appears this policy is not enforced at Los Alamos.

Due to the above circumstances observed, it seems clear that intellectual property at Los Alamos may be at risk. Valuable proprietary information is sometimes released to the public domain before it has been formally protected and this information does not have the necessary laboratory notebook protection to secure the patent rights.

Intellectual property is one of the key "values" of a newly forming business. Without the proper intellectual property foundation, an entrepreneur will have much more difficulty building and capitalizing a successful company. Specifically, potential investors often use the value derived from intellectual property as part of their risk/benefit analysis. The weaker the intellectual property foundation, the less likely an investor will risk putting capital into the business. In some cases, public domain technology has given rise to successful business ventures.¹⁷ However these were unique circumstances and constitute an exception to the majority of situations. Clearly, it is critical that the Los Alamos vigilantly protect and keep proprietary, all intellectual property as it is developed and commercialized.

The Department of Energy Record of invention which is used for disclosing new inventions, requires that principal investigators describe the commercial potential of their inventions. The ideas the principal investigator develops regarding the commercial potential of the invented technology are quite valuable, since the inventor fully understands the technology's capabilities. These initial ideas could be leveraged if made available to market experts who could judge the commercial value and viability of those ideas. Establishing a mechanism for making that information available to the entrepreneurial community will increase the likelihood the PI's commercial idea will be explored. One way to accomplish this would be to include the "commercial potential" section of the Record of Invention in the technology database.

Proper management of intellectual property is critical at research institutions because the natural motivation of the researcher is to publish work results as quickly as possible rather than to protect it. In the world of research, publications are a critical mark of success. Researchers are therefore more motivated to publish papers than to make sure all administrative and legal requirements for protecting their ideas have been met. Thus, the requirement for protecting intellectual property is at odds with the goals and motivations of the research community, even though this same community recognizes the importance of protecting their work. For example, if the disclosure process becomes lengthy and complex, which could potentially delay publications on the subject, a researcher will have little motivation to contact the Los Alamos IPO at all. These conflicting forces must be managed successfully to meet both the objective of protecting the intellectual property, and publishing research results in a timely manner.

Educating the research community and providing incentives for disclosing ideas would help Los Alamos better control laboratory notebook maintenance and prevent the premature disclosure of valuable intellectual property. Providing incentives for the obtainment of patents and successful technology transfer would contribute to increasing employee motivation for obtaining patent protection.¹⁸ These techniques are used by large companies that share similar intellectual property management challenges.¹⁹ Educating the researchers through seminars and internal training sessions would greatly increase control over intellectual property. Offering cash incentives for patents or even timely disclosure of information could increase the motivation for researchers to work

17 One example are companies that have spun out of the HIPPI technology.

18 Most laboratory contractors have established an employee awards program for innovation and technology transfer, Section 3-3 U.S. Department of Energy Technology Transfer Handbook, December, 1993.

19 Whiting, Rick, "Protecting the Power of the Idea," *Electronic Business*, February 24, 1992, pg. 25.

cooperatively with the IPO. Finally, the above activities all depend on increased funding to support them.

If a company learns of an infringement of a patent it licenses, the University will undertake some activities to halt the infringement, and may or may not elect to prosecute the infringing party.²⁰ Thus, a company with an exclusive license must be prepared to litigate for patent infringement. The costs of the litigation can be deducted from the royalty payments normally paid to the University. Nevertheless, a small business would not have the resources to conduct patent infringement litigation. If patent infringement does occur, and another company directly competes with the small business licensee, the licensee will have almost no practical means to defend its intellectual property rights nor its products and market share.

Funding/Costing: Intellectual property protection activities such as prosecuting patents, are limited by available funds. These activities are time consuming and complex and require a large staff. If the IPO budget permitted it, all valuable inventions, trademarks, software and other technology would be recorded and protected. However, given the limited funding and staff, the Los Alamos IPO must limit the number of patent applications to prosecute. Increased funding would allow Los Alamos to better implement the intellectual property policies that already exist.

Internal Los Alamos Issues: Decisions regarding which technologies to patent are made by an internal committee entitled the Intellectual Property Review Board. The criteria for selecting which intellectual property to patent includes commercialization and dual-benefit applications. Dual-benefit criteria have a high priority because those technologies could assist the laboratories in fulfilling their programmatic missions, while at the same time having applications that could be used in commercial domains.

The implication for potential commercialization efforts is that some commercially viable technologies may not be given patent protection because they do not have sufficient dual-benefit characteristics or applications. Conversely, dual-benefit technologies may be patented even if they lack commercial applications and potential.

One potential way to address this problem would be to develop a policy to identify and protect intellectual property that has commercial potential even if it is lacking dual-benefit potential. This problem is not currently critical, because Los Alamos possesses a good number of patented technologies with commercial potential. However, in the long term, more support for commercially viable inventions will be needed.

Summary: Because intellectual property protection is the critical foundation for technology transfer and small business creation, Los Alamos must vigilantly implement the intellectual property policies already in place. Though education and increased focus on commercially viable technology, the Laboratory will increase its ability to control the intellectual property developed by its researchers.

The difficulty of managing and maintaining intellectual property policies is a problem faced not only by the federal research laboratories, but by industry as well. Large electronics firms, which generate technology through their research divisions, often have difficulty controlling intellectual property for many of the same reasons faced by Los Alamos.²¹ Researchers and engineers are rarely trained to recognize which information should be protected as intellectual property. Implementing such programs is difficult, only a few major companies have implemented formal programs for identifying and protecting their intellectual property. However, as the number of patent-related lawsuits increases and because intellectual property is an important weapon in the

20 Exclusive Patent License Agreement, 9/15/92, Clause 15.2-4, page 11.

21 Whiting, Rick, "Protecting the Power of the Idea," *Electronic Business*, February 24, 1992, pg. 25.

battle over market share, especially in the electronics industry, companies will be forced to institute better systems of protecting intellectual property. As Los Alamos moves toward bringing its technology to the marketplace through technology transfer, it will need to consider the demand these changes will place on its current system for protecting its intellectual property.

E.4 Documents Relating to Licensing

The licensing process at Los Alamos is described in a document entitled Narrative for Licensing Guidelines Flowchart. This document clearly outlines the timeline and steps involved in all Los Alamos licensing activities. The licensing policy appears to emphasize identification of the “best licensing candidate” for exploiting Los Alamos technologies. An advertisement is typically placed in the CBD to achieve a widespread notice of the technology’s availability. Once a commercialization opportunity has been identified by a potential exclusive licensee and it does not appear that the opportunity has been widely advertised, the licensing office within the IPO will develop mailing lists to other potential licensees (competitors) and hold seminars explaining the potential opportunity, a process designed to generate interest in the license and to solicit commercialization plans from which the best candidate will be chosen. This approach makes sense if the goal is to get the best business plan possible. These activities are referred to as Fairness of Opportunity activities and are specified in the Prime Contract.

This approach, however, does not support the needs of small and new companies that are struggling to turn a good idea into a business. Many of these small businesses may not be able to compete with the financing and customer base large companies can offer in their business plans, and despite identifying the commercial possibilities for a Los Alamos technology in the first place, may subsequently lose in the competition to produce the “best” business plan. Somehow, then, Los Alamos must find a solution to these seemingly contradictory agendas: wanting to get the best licensee possible for a technology while seeking to support small business creation. This problem may not be as bad as it seems since current practices result in over 60% of licenses being awarded to small businesses.

One way to address this problem could be to give small and new businesses the opportunity to present their business plans before advertising the opportunity to other interested parties. If the business plans do not meet Los Alamos licensing selection criteria, the Los Alamos IPO could work with the small business to improve its plan and resolve some of the issues identified by the licensing officer involved. If the new or small business simply cannot provide a viable business plan, then Los Alamos would be justified in soliciting business plans from other companies or entrepreneurs in an effort to create the best opportunity to successfully commercialize the technology.²²

E.4.1 The Exclusive Patent License Agreement

Basic Document Information: The exclusive license allows a licensee to obtain certain exclusive rights for the commercial development, manufacture, use and sale of the identified technology.

Intellectual Property/Technology Transfer Issues: Although the exclusive license grants rights to make, use, or sell the licensed technology to only to one licensee, the U.S. Government retains the right to use the technology for government purposes. This means the Government could license the technology to a contractor to make a product that would be used for government purposes. The Government could elect to ask a subcontractor to make a product based on the licensed technology and which would compete with the licensee’s product. Under those circumstances, the exclusive licensee could lose access to a significant market. It is unlikely that these circumstances would arise, however, because the government would be more likely to work with its licensee. Even so,

²² This problem may not be as bad as it sounds since current practice results in over 60% of licenses being awarded to small businesses.

the fact that the licensee does not have entirely exclusive access to the technology, increases the risks associated with a business based on that technology.

When the licensed technology is based on a software copyright, Los Alamos retains all rights to derivations or improvements of that work.²³ Thus, if the licensee improves the technology, it must give those improvements back to the University, which could subsequently license them to any competitor.

Freedom of Information laws and fairness of opportunity rules could provide a competitor means to access information about the improvements. Because the exclusive software license requires the licensee to provide all software to the ESTSC, it follows that improvements to the software can be acquired by the same center through the UC. If the a competitor gains access to only general information about the improvements, that company could use this knowledge to enhance its own competitive advantage. For example, the competitor could better assess which potential products the original licensee may be developing based on the improvements. These kinds of "holes" in the licensee's intellectual property rights create a level of risk that is higher than the norm in the business community. Thus, these risks put businesses licensing with the laboratories at a disadvantage that their competitors do not face, which makes it harder for them to succeed in the competitive marketplace.

Technical services are discussed in the background statement of the license.²⁴ This section states that Los Alamos will provide the know-how in the form of consultation with University personnel and access to pertinent technical data in the possession of the University to the extent necessary to implement the License Agreement. Although this implies that Los Alamos will supply these services, there is no specification how much technical support the licensee can expect. Given that Los Alamos has a small business technical assistance program (as part of the IPO) complete with specific agreements and funding arrangements to support technical assistance, this phrase could be reasonably interpreted to mean Los Alamos will allow its technical staff to answer any questions the licensee may have regarding the technology. It is unlikely provide a licensee with on site technical support.

Because successful technology transfer occurs through people, it would facilitate the commercialization process to allow the license agreement to enable technical support arrangements as well, rather than requiring the licensee to obtain a separate technical assistance agreement and to pass through the technical assistance program. However, because technical assistance would require Los Alamos to fund the Laboratory employee's time, the process becomes more complex and it is unlikely technical consulting would be bundled together with the exclusive licensing rights.

Funding/Costing: The exclusive license is the most expensive license to obtain in that the licensee must pay for its exclusive control of a technology. For a new or small business, financing a large license fee could be difficult. The Industrial Partnership Office has indicated that in the past, the up front fee can be negotiated and payment deferred. This flexibility will assist small and new companies in conserving their capital resources during the critical early stages of a commercialization effort.

Legal Liabilities: The license requires total indemnification of the University of California and the U.S. government and recognizes that the U.S. government has standard rights to the technology, but cannot be held accountable for any liability associated with the technology. These indemnification requirements represent a large burden for a small or new business. Even if it is unlikely a

23 Federal copyright laws state that an author of an original work retains rights to derivations of that original work. If the licensee modifies the work, UC retains rights to those modifications. Memo from Jerome Garcia to MCC, January 26, 1994.

24 Exclusive Patent License Agreement, revised 9/15/92, pg. 1.

lawsuit would arise, it cannot be predicted with certainty that this would not be the case. Thus, this clause puts the licensee at risk. For small businesses this is particularly burdensome, because they do not have the resources to pay for litigation.

Internal Los Alamos Issues: One of the greatest difficulties associated with the exclusive license has been the time it takes to negotiate. Because the license is exclusive, the licensing office typically initiates fairness of access activities to advertise the technology. Once the activities are completed, the negotiation process is begun. Finally, the license may be required to be approved by the Department of Energy which significantly delays the execution process. Given that small businesses need to move quickly to get the license and begin making the product, these delays can be very costly. Delays also occur when the potential licensee attempts to negotiate more favorable terms in the license agreement, or more favorable wording in one of the agreements that typically accompany the licensing process.

The exclusive license contains a U.S. manufacturing preference clause that requires products that result from the license, and that are sold in the United States, to be manufactured substantially in the United States. Although this appears not to be a problem with commercialization of Los Alamos National Laboratory technologies, because most small businesses commercializing lab technologies are likely to market their products primarily in the United States. However, given the increased multinational nature of business transactions this requirement could be problematic in the future, as most are U.S. based. However, with the success of the North American Free Trade Agreement (NAFTA), and the proximity of New Mexico to Mexico, some small businesses may wish to manufacture in Mexico, in which case, this provision would become a barrier to a small business.

E.4.2 Differences between the UC Exclusive License and a Typical Industry Exclusive License

Appendix C includes an example of an exclusive license typically used by industry for licensing technology. There are a number of key differences between this license and the UC exclusive license agreement. The industry exclusive license indemnifies and holds harmless the licensee (the start-up company or the entrepreneur in the case of a new venture) against any lawsuits filed by a third party against the licensee based on patent infringement caused by the licensee's use of the patent. The only requirement stated is that licensee notify the licensor immediately of any infringement claims.

The UC exclusive license does not have licensee indemnification clause. Its indemnification requirements are quite the opposite. Clause 14.2 states, "The University makes no representation or warranty that the Licensed Products or Licensed methods will not infringe any patent or other proprietary right." This is followed by clause 14.4a which states, "Nothing in this License Agreement shall be construed as a warranty or representation by the University as to the validity or scope of the University's Patent Rights."

The position of the licensor in the industry exclusive licensing agreement reflects a willingness to accept some risk into the licensing effort. The licensor is willing to take on the risk that patent infringement may occur. The company's willingness to do so may be based on significant patent search activities which have demonstrated a minimal risk of infringement. The University does not take this position and avoids any implication of risk in the licensing activity. In addition to the patent infringement language, the product liability indemnification clause and other qualifying statements make this evident.²⁵ The University position in licensing is understandable given that it

²⁵ Clause 14.3 states: "In no event will the University be liable for any incidental, special, or consequential damages resulting from exercise of this license or the use of licensed products or licensed methods."

is a not-for-profit institution. However, this position is a significant deviation from how most companies license their technologies.

The University of California license also contains a number of clauses that simply do not exist in the industry licensing agreement. The product liability indemnification, the substantial U.S. manufacturing, the government purpose license rights and Government march in rights all qualify and modify in some way, the licensee's exclusive rights to use the licensed technology.

E.4.3 Exclusive Computer Software License Agreement

Basic Document Information: This document provides a "fill in the blank" template for executing software license agreements between a potential licensee and the UC.

Intellectual Property: The purpose of this agreement is to make explicit the terms under which IP rights are transferred from the UC to a licensee. The agreement is only applicable to computer software. The terms include the type of license (exclusive, non-exclusive, field of use etc.) which is being transferred, the duration of the license, the fees and royalties that will be due the UC and the schedule which governs their payment, reporting required by the licensee, conditions for termination, etc.

Any license issued under this agreement includes provisions which limit or place requirements on the licensee's actions. For example, the licenses include a clause which requires the UC to favor US businesses. The agreement also includes a UC march-in rights clause. In addition, the agreement prevents UC employees (or former employees) from serving as principals in the licensee's company, and precludes sublicensing by the licensee without written permission from the UC.

Section 15, Warranties and Disclaimers by the UC, disclaim any warranty that the software to be licensed does not infringe other existing copyrights or patents. Thus it is the licensee's responsibility to perform any due diligence necessary to provide protection against infringement suits that might arise.

Finally, the licensee is required to provide on demand, any enhancements made to the software. These enhancements include derivative works, documentation, and extensions, among others.

Funding/Costing: The agreement contains three sections which pertain directly to the cost to the licensee of the license. These are paragraph 3, license fee, paragraph 4, earned royalties, and paragraph 5 annual minimum royalty. In each case, the amount of these fees and royalties are to be negotiated between UC and the licensee. The licensee cannot be controlled by foreign funding. Also, the licensee agrees to bear the burden of any costs of documenting undocumented software and of transferring that documentation to the ESTSC.

Two other paragraphs, 7. Books and Records, and 21. Late Payments, address the UC's rights to due diligence to determine if the royalty payments are in agreement with the revenue stream the licensee derives from the license and the resolution of late payments which includes 10% annual interest paid in addition to any royalties due the UC. Specifically, the UC can require the licensee to allow its auditors access to all company books, records etc. which pertain to revenues generated by products and include the licensed technologies, or, as an alternate, the licensee can hire an independent auditor.

Legal Liabilities: The product indemnification language which appears in many of the UC agreements is contained in this agreement as well. In addition, paragraph 17. Infringement, outlines the responsibilities of the UC and the licensee to take action to protect IP rights. Each is required to notify the other of evidence of infringement by third parties. The UC reserves the right

to join (and control) suites brought against third parties by the licensee and also the right not to join in such lawsuits.

Internal Los Alamos Issues: Los Alamos must seek approval from the DOE to allow UC to assign copyright of the software to the licensee.

Summary: The requirements placed on the licensee by this agreement are potentially onerous and the protection for IP provided under the agreement are minimal. It is surprising that companies willingly enter into this agreement unchanged.

E.4.4 The Non-Exclusive Patent License Agreement

Basic Document Information: The non-exclusive license allows the licensee to make or practice the technology licensed throughout the world. The non-exclusive license does not require Fairness of Opportunity activities, because anyone could negotiate a non-exclusive license. Thus, it can be executed in a more timely fashion than the exclusive license.

Intellectual Property/Technology Transfer Issues: The non-exclusive license can be used for purposes of starting a new business. However, because the license does not give exclusivity to the entrepreneur, it increases the amount of risk associated with the start-up. This risk can be mitigated by a number of circumstantial factors. For example, if the technology is relatively new, there is the possibility that potential competitors are not aware of its existence. Because Los Alamos would not advertise the technology explicitly to competitors, since the entrepreneur only wants a non-exclusive license, the start-up might get just enough of a competitive edge to beat competitors to the market and establish market share. Additionally, depending on the application the start-up wishes to pursue, the unique talents of the entrepreneur's business idea and technical expertise could provide enough of a competitive edge to outweigh the disadvantage of not having exclusivity.

Nevertheless, in the world of financing, and especially venture capital financing, a prospective business that brings an exclusive license to the bargaining table will almost always have a greater chance of being capitalized than a company that brings only a non-exclusive license.²⁶

Funding/Costing: A key advantage of the non-exclusive license is the fact that they are not very expensive. License fees can range from \$1,000 up. Because new businesses have few cash resources, these licenses are much more affordable for these entrepreneurs. The valuable cash resource can be used for other critical activities of the start-up.

Los Alamos works with new and small businesses to arrange a license fee and royalty structure that best complements the needs of the new business start-up, in order to increase the chances of success of the commercialization effort. This policy reflects the Laboratory's goal of increasing access to useful technology rather than trying to obtain large license fees.

Legal Liabilities: The license requires total indemnification of the University of California and the U.S. government and recognizes that the U.S. government has standard rights to the technology, but cannot be held accountable for any liability associated with the technology.

Indemnification requirements represent a large burden for a small or new business. Even if it is unlikely a lawsuit would arise, it cannot be predicted with certainty that this would not be the case.

²⁶ Many of the venture capitalists who spoke at a conference entitled "New Frontiers of Technology Commercialization," March 8-9, 1994 in Santa Fe, New Mexico, explicitly stated they always preferred to invest in start-ups that have exclusive licenses to the technology.

Thus, this clause puts the licensee at risk. For small businesses this is particularly burdensome, because they do not have the resources to pay for litigation.

Internal Los Alamos Issues: The non-exclusive license contains a U.S. manufacturing preference clause that requires products that result from the license, and that are sold in the United States, to be manufactured substantially in the United States. Although this does not appear to be a problem with commercialization of Los Alamos Lab technologies, because most small businesses commercializing lab technologies are likely to market their products primarily in the United States. However, given the increased multinational nature of business transactions this requirement could be problematic in the future. For example, large multinational companies whose products are sold in the United States but are manufactured by overseas divisions would violate their license agreements. However, large companies have more resources available to use for responding to this problem should it arise.

Reports on the progress of the commercialization process are required. This could be a burden depending on how demanding Los Alamos chooses to be and whether any report requirements would include proprietary information.

E.4.5 Draft Development License Agreement (1/27/93)

Basic Document Information: The development license allows the licensee to investigate the commercial potential of a technology while maintaining the option, for up to two years, to negotiate an exclusive license for that technology. Exclusivity is maintained during the commercial potential exploration period, because no one else can have access to the technology while the licensee holds the license. The licensee pays an up front option fee for this protection. Los Alamos has issued a number of development licenses in the last two years.

Intellectual Property/Technology Transfer Issues: The risk associated with the development license is that the licensee is not guaranteed it will receive an exclusive license. The terms of the contract state that the option provides the licensee the opportunity to "negotiate" for an exclusive license. Although in all likelihood, the licensee would be in the best position to obtain the exclusive license, there is no guarantee that the licensee would actually receive the exclusive license. A further risk is involved, because depending on how the Fairness of Opportunity requirements are interpreted by the laboratories, the licensing office may decide to advertise in mailing lists and hold seminars to discuss the licensing of the technology.

Current Los Alamos policy addresses all fairness of opportunity requirements prior to signing the developmental license agreement. The information derived from this investment would have been made available to other licensees throughout this process. Once this would occur, interested competitors who have a larger capital investment potential may appear to be in the best position to successfully commercialize the technology in question. Even though some maturation work was accomplished by another company, good business practice may dictate that Los Alamos give the exclusive license to the best candidate. Thus, the commercial potential investigation costs would be paid for by the entrepreneur, and the benefit derived by another company.

If these circumstances were to arise, the new company would likely fail and its investors would become wary of further investments in start-ups based on Los Alamos technology. They would have received no benefit for investing in commercial exploration of the Laboratory's technology. The degree of risk involved is, in all likelihood, very remote. Nevertheless, in the world of investment, all risks must be examined. Because new businesses are created through risk/benefit investments, these risks adversely impact the new business creation process.

The development license is a critical mechanism for exploring the commercial potential of a Los Alamos technology. Since the majority of lab technologies were not developed with markets and

commercial applications in mind, these technologies are not sufficiently mature to serve as the basis of a new or small business. Maturing these technologies is a critical part of making commercialization successful and the license creates a means to do so.

The development license could be used to mature a technology that is not yet ready for commercialization. Even though the agreement does not specifically state that it can be used to mature and develop technologies, maturation activities would appear to fall within the scope of "exploring the commercial potential" of a technology. Such activities would include further testing of the technology and developing prototypes among other things. However, the problem with this approach is that significant investments must go into the maturation phase, with a certain amount of risk involved. Small start-ups and small businesses are not in a position to pay for those kinds of activities. Large companies are clearly better able to explore the commercial potential of technologies, because they can afford to mature the technologies.

Although technology maturation is problematic, given that the majority of Los Alamos technologies are not ready to be commercialized without further development, funds must be expended to engineer those technologies for the marketplace which would increase the chance of successfully commercializing these technologies.

The license states that nothing in the agreement will be construed to constitute an agreement to furnish know-how, technical assistance, or technical data that is necessary to the transfer of the technology for the purpose of implementing the license. Indirectly, the document appears to say that the know-how, technical assistance and technical data necessary to transfer the licensed technology will be furnished. The exclusive license has a similar clause that additionally affirms the University will provide the know-how in the form of consultation with University personnel and access to pertinent technical data in the possession of the University to the extent necessary to implement the License Agreement. Technical support is a key element of any technology transfer activities. The individuals who have extensive experience with the technology have critical knowledge both for the maturation and use of licensed lab technology which must be transferred to the licensees.

In order to help a small or new business achieve success in a high tech endeavor, Los Alamos must assure technical assistance and transfer of know-how. Many of the licensing documents systematically decline any guarantee to transfer know-how. To address this problem, Los Alamos could include in all applicable agreements that the transfer of know-how will be assured. This would be preferential in having to negotiate another kind of instrument either to have consultation of the principal investigator or other general technical support.

The Small Business Technical Assistance Agreements (includes the Extended Small Business Technical Assistance Agreement) recently developed at Los Alamos could fulfill some of the technical and know-how needs of the small or new business. However, one limitation of this program is that a small business can only receive one technical assistance agreement per year. This is not enough to ensure successful resolution of technical problems arising from the lack of expertise of the new business.

To our knowledge, there is not a formal technical support program at Los Alamos to ensure that licensees obtain the required know-how to implement their license. The small business initiative does provide for technical support, but it is not tied to the licensing process.

Funding/Costing: Payment for the option fee must be made within 30 days of the execution of the development license agreement. The amount of this fee is not specified in the document, which may mean it is negotiable. A large option fee could represent an obstacle for a new business.

Legal Liabilities: The license requires total indemnification of the University of California and the U.S. Government and recognizes that the U.S. Government has standard rights to the technology, but cannot be held accountable for any liability associated with the technology.

Indemnification requirements represent a large burden for a small or new business. Even if it is unlikely a lawsuit would arise, it cannot be predicted with certainty that this would not be the case. Thus, this clause puts the licensee at risk. For small businesses this is particularly burdensome, because they do not have the resources to pay for litigation or liability insurance.

Internal Los Alamos Issues: Lack of internal funds for maturing technology presents a significant roadblock to transferring technologies to start-up companies. The technologies are not mature enough for these companies to build a business upon. There is too much risk associated with them to secure the kind of capitalization necessary to start the business and to develop the technology. Conversely, the Laboratory has maintained a consistent policy of not providing funds to mature technology. Without resolution to this problem a significant gap will remain between what Los Alamos can offer in terms of technology, and the kinds of technologies needed to successfully build businesses. In this gap lies one of the explanations for lack of start-up companies resulting from Laboratory technologies in the last 6 to 8 years.

E.4.6 Instructions for Completing a Proprietary Information Agreement

Basic Document Information: The PIA is a self-contained, model agreement form which is executed between Los Alamos and commercial organizations. It is intended to protect proprietary information which may be exchanged between Los Alamos and the commercial organization only. The flow of information may be bilateral, or one way only.

There are thirteen paragraphs in the agreement. If the commercial organization agrees to the language in these paragraphs without change, the agreement can be executed quickly. Any changes to the model form require review and approval by the Los Alamos legal staff.

Intellectual Property: The protection of IP is one of the agreement's primary purposes. Information which is disclosed under a PIA must be held in confidence for three years unless the information becomes known to the recipient through some other legal channel and is not restricted by that source. Any information disclosed under a PIA must be in writing and be clearly marked as proprietary, i.e., conversations are not protected unless they are reduced to writing and marked as proprietary.

Funding/Costing: There are no direct costs associated with a PIA. Any costs which are incurred by either party as part of the PIA activity, e.g., producing, transferring, receiving, protecting proprietary information will be the responsibility of the party incurring the costs.

Legal Liabilities: Conditions and exclusions contained in the body of the PIA agreement take precedence over any legends or markings that may appear on any written material that is disclosed under the PIA. That is, the PIA cannot be extended, amended, or altered solely by including additional provisions in the warnings that appear on the information that is disclosed. In addition, the parties to the PIA are allowed to make internal use of disclosed information only so long as the PIA is in force. Either party may request that the PIA be terminated, and that the other party destroy or return all proprietary information that was disclosed.

Internal Los Alamos Issues: Any additions, changes, deletions, etc. to the model Los Alamos PIA must be reviewed and approved by the Los Alamos legal staff before they can execute the agreement. A company which prefers to use its own PIA may experience delays in executing the agreement as a result.

Summary: Small businesses should have no problems adopting the model Los Alamos PIA. The three year interval of protection should be adequate to forgo any concerns a small business may have about its IP becoming public and exploited by its competitors.

E.5 Documents Relating to Research and Development/Technology Transfer

E.5.1 CRADAs

The Cooperative Research and Development Agreement (CRADA) was created in 1980 under the Stevenson-Wydler Technology Innovation Act.²⁷ This mechanism was established to encourage increased interaction between the private sector and the Federal laboratories. The government-owned, contractor-operated (GOCO) laboratories were not allowed to engage in CRADAs until 1989 when the National Competitiveness Technology Transfer Act of 1989 granted GOCO federal laboratories the possibility to enter into CRADAs.²⁸ Although CRADAs were created to facilitate technology transfer, these mechanisms were quickly bogged down in administrative red tape which prolonged the execution process as long as 2 years.²⁹ The DOE responded to this problem by creating a modular CRADA and a small business CRADA both of which are designed to streamline the technology transfer process.

Basic Document Information:

Los Alamos uses several types of CRADAs, including the Modular CRADA, the Small Business CRADA, and the Option Agreement. A brief description of each follows:

Modular CRADA:

The modular CRADA was created as a means to facilitate the CRADA process, by giving optional clauses and providing clear guidance to the private sector explaining the DOE requirements. This document is marked by a flexibility that was not present in the earlier versions of the CRADA. This flexibility reflects the increased understanding and sensitivity by the DOE to the needs of the industrial sector. Examples of this flexibility are the multiple options and industrial partner can choose from for any given clause. For example, Article XIV: Reporting Inventions has three options from which the industrial partner can choose. The options are still subject to DOE approval, but the pre-approved choices facilitates the negotiation process.

Small Business CRADA:

The small business CRADA is a streamlined form that requires the industrial partner to accept all clauses in the document. Technically, the CRADA is pre-approved, which is why it can be executed quickly. In practice, however, the DOE does become involved at some point with the small business CRADA approval process. If the industrial partner wishes to change any clause, the CRADA becomes a modular CRADA which is subject to DOE approval.

Option Agreement dated 8/93:

The option agreement describes the licensing of intellectual property resulting from the CRADA. It gives the industrial partner an optional first right to negotiate for an exclusive or field use license to the UC owned intellectual property developed under the CRADA.

These CRADA were created as a mechanism to facilitate technology transfer from the laboratories to industry. However, given the structure of the agreements, it is clear that it is not readily appli-

27 P.L. 96-480.

28 Technology Innovation, Chapter 63, U.S.C. Annotated, Prepared for the Federal Laboratory consortium for Technology Transfer, by West Publishing Company, St. Paul, Minnesota, 1991, Pg. 10.

29 Hearing before the Subcommittee on Regulation, Business Opportunities and Energy of the Committee of Small Business, House of Representatives, 102nd Congress, December 4, 1992, Improving Technology Transfer Programs at Department of Energy Laboratories.

cable to the creation of new businesses. This is because it requires that the business participate in the research by paying the laboratories for work to be performed. Small and new businesses simply do not have the funds to pay for research and development. In Congressional testimony, this point was brought up by the Director of Sandia National Laboratories. "Many small businesses do not have the financial resources to enter into CRADAs. Furthermore, many of the technical problems encountered by small businesses do not require a full CRADA, but rather can be solved through technical assistance or information sharing."

The CRADA allows a non-government industrial partner to enter into a cooperative research agreement with the federal government. The industrial partner pays for its portion of the work performed; the government pays for its part of the work performed. Both parties have access to the non proprietary research results. This instrument allows resources to be leveraged.

Intellectual Property/Technology Transfer Issues: Three kinds of intellectual property can be produced under a CRADA: University-owned, participant-owned, and jointly-owned.

Protected CRADA information:

The parties can each designate information developed by their employees as protected CRADA information. The protected CRADA information will not be disclosed for a period of time agreed upon by parties. These provisions are standard and acceptable; the party who pays for the work retains the right to the intellectual property generated by the work.

CRADA-Generated Information

Each party may assert copyright in any of their Generated Information. The Government has a royalty-free, non-exclusive, irrevocable worldwide copyright license to reproduce, prepare derivative works, distribute copies to the public all copyrightable works produced in performance of this CRADA subject to the restrictions the CRADA places on publication of Proprietary Information and Protected CRADA Information. Because the industrial partner may retain some rights to this information, the Government non-exclusive rights are not problematic.

Copyrighted Computer Software

DOE has the right to request the University and the Participant to grant a non-exclusive, partially exclusive, or exclusive license to a responsible applicant upon terms that are reasonable under the circumstances provided such grant does not cause a termination of any licensee's right to use the copyrighted computer software. DOE can override any objections to the DOE licensing if DOE can show that the owner is not satisfactorily pursuing commercialization of the copyrighted computer software. This could be a problem for a small business, depending on the definition of actively pursuing commercialization. However, we know of no circumstances where DOE has exercised this right.

Owner of copyright will provide to DOE's Energy Science and Technology Software Center (ESTSC) the minimum information and support documentation to enable a competent user to understand and use the software.

Inventions:

Each party owns title to subject inventions made solely by its employees or agents. If that party does not elect to retain title, then other party has first option to acquire rights to the title through assignment of the title.

Subject inventions for which no patent applications is filed or issued patents are not maintained.

Government retains a non-exclusive, non-transferable, irrevocable, paid-up license to practice or to have practiced for on behalf of the United States every Subject Invention under this CRADA throughout the world.

Small Business CRADAs have their own defined intellectual property rights. The small business CRADA cannot be used for any work related to software. Because software intellectual property rights are complicated and challenging, it is understandable that the Department of Energy would wish to review the CRADA prior to granting its approval. However, this limitation may have the effect of preventing many CRADA activities with small businesses to be carried out under the Small Business CRADA. Many successful start-ups are based on software rather than hardware.³⁰ If the CRADA cannot be used for software-based activities, no software based start-ups will be able to benefit from the streamlined Small Business CRADA process and will be bogged down by the time consuming DOE approval process required under the modular CRADA.

Intellectual Property Rights under the Option Agreement include:

University-owned IP:

The University grants the participant a "first right to negotiate an exclusive license" to the University's intellectual property as well as a non-exclusive license.

Participant-owned IP:

The participant grants the University a non-exclusive license to participant-owned intellectual property and reiterates that the Government retains a non-exclusive right as well. The small business would only own its "protected CRADA information." Joint information or inventions are owned jointly.

Funding/Costing: Both parties to the agreement pay for the work performed. Advanced payment is negotiable. Lack of funding to pay for work performed is one main reason why new and small businesses may not be able to use the CRADA mechanism for technology transfer and commercialization.

First, in order to establish a CRADA, the small business must identify a department that wishes to perform and fund the work. Given that funds are scarce at the Laboratory, this activity could take much time and effort. An entrepreneur starting up a business cannot afford that kind of time.

The small business initiative program may be able to use some of its funding for small business CRADAs which would at least facilitate the internal lab funding part of the CRADA. Even if this problem were resolved, the small businesses would still have the problem of generating outside funding to perform its part of the CRADA statement of work.

Legal Liabilities: Prior to the creation of the modular CRADA, all CRADAs required the industrial participant to indemnify the government and the University of California against all liability including product liability. Indemnification means that in the case of a lawsuit against the Government and the University of California, the industrial partner would pay all costs and damages arising from that action. This contractual requirement poses an excessive burden on small businesses. Although in practice, product liability suits are unlikely to occur, the small business is still under a heavy legal obligation which may impact the attractiveness of that business to a potential investor. On the other hand, the potential investor may perceive the risk as relatively small compared to the potential gain to be made by that business.

The modular CRADA has five different clauses from which the industrial partner must choose to address indemnification. These include:

30 "How To Get Money from Venture Capitalists," Stephen W. Quickel, *Electronic Business*, July 1993, pg. 109.

1. Use of a Hold Harmless provision. The participant agrees to hold the Government and the Contractor harmless for all damages, except damages resulting from their own negligence, which arise from work done under the CRADA. This provision is an improvement over previous CRADAs because it reduces some of the risk associated with indemnification. A potential investor will perceive less investment risk in an enterprise that does not have a contractual obligation to indemnify the Government and the University of California and will be more likely to invest in that new business.
2. Assumption of Responsibility by Contractor and/or Participant for Product Liability Claims. The fact that the CRADA allows the contractor to assume some of the potential liability for products made as a result of the CRADA reduces risk associated with the small or new business.
3. State Agencies as a CRADA Participant. This section does not apply to laboratory commercialization with small and new businesses.
4. Indemnification by Third Party. This clause would allow the Contractor to flow down to its licensees or transferees indemnification of the Participant from product liability. Essentially this is indemnification for commercialization efforts by a third party, using the CRADA generated intellectual property. This protects the participant from incurring liability from the activities of third parties. It does not apply to commercialization activities of the small or new businesses.
5. Purchase of Product Liability Insurance. The participant may purchase product liability to protect the Government or the Contractor against product liability claims. Product liability insurance costs would be an added drain on scarce cash resources in new and small businesses. As a result, this clause, although it provides an option to direct indemnification, still creates a disincentive for a small or new business to enter into an agreement.

While the modular CRADA provides a number of options for a small business for product liability indemnification, the fundamental requirement is still present. The Government and the Contractor do not want any financial burden placed upon them in the case of product liability arising out of their technologies. If the University of California agrees to option 2, and will accept some liability, then the obstacles for small business use of this agreement will be reduced.

It is important to stress that these options reflect the willingness of the Government and the Contractor to try to work on the problems that have prevented technology transfer in the past. However, the CRADA requirements are more compatible with the resources of large companies, and do not necessarily ease the burden for small businesses.

The small business CRADA was created for the purpose of alleviating the complexity of the modular CRADA and reduce the processing time such that small and new businesses could successfully utilize the CRADA for technology transfer. The indemnification clause of this agreement uses the hold harmless option, which requires no indemnification of the Government nor the University of California.

Internal Los Alamos Issues: The modular CRADA must be approved by the Department of Energy. The time to process may be reduced with comparison to previous CRADA processing time (up to two years) but DOE approval lengthens the execution time.

The CRADA requires that the Laboratory and the industrial partner write a joint work statement. The statement of work may take a long time to negotiate and to receive approval. At one point, 11 signatures were required just to approve the statement of work. Now only four signatures are required, but it can still be a lengthy process. Because of the complex guidelines and the approval requirement, the statement of work can significantly delay the CRADA process.

E.5.2 DOE Work for Non-Federal Partners, dated December 1993 and Marked "Draft"

Basic Document Information: This document contains many features found in other agreements which specify policy governing DOE work for others, such as the User Facility Agreement or a CRADA. The document contains six major components. The first provides background, purpose, scope, a description of the processes to be followed (including a detailed flow graph). The other five components are attachments of other documents required to execute the agreement: a modular agreement, transmittal letter for the modular agreement, a process checklist, certification and summary of the project, and a statement of considerations.

The first (background) component makes it clear that the purpose of this agreement is to streamline the procedures which allow Los Alamos to do work for outside partners. The two key features which distinguish this agreement are more favorable intellectual property rights, and a reimbursement policy which recognizes and ameliorates the weak cash position under which most small businesses operate under.

Intellectual Property Rights: Ownership of intellectual property is divided into two classes which are (1) patent rights and (2) technical data. The patent rights are covered in the attachment titled "Class Waiver." The technical data rights (which includes copyrights, e.g., software) are covered by clauses embedded in the modular agreement. Each will be discussed below.

Class Waiver (patent rights) - The class waiver explicitly excludes inventions which are covered by the other forms of agreement supporting work for non federal partners, e.g., User Facility (and Proprietary User Facility) Agreements. It also excludes inventions which might be made under a work agreement where the work to be done is sufficiently within the DOE's programmatic mission to justify support of the work, all or in part, with direct program funding.

We interpreted this exclusion to mean that patent rights are not automatically waived to the non-federal partner when the subject inventions might have been made by Los Alamos as a result of ongoing programmatic work. Rights to such inventions must be negotiated separately.

The waiver recognizes two classes of inventions: (1) those made by employees of the non-federal partner, and (2) those made by employees of the operating contractor (Los Alamos). The first class is waived to the partner. The second class is waived to the UC. However, UC cannot grant an exclusive license for its inventions without written approval from the DOE patent counsel.

In all cases, the government retains (1) rights to an irrevocable paid-up license to practice or have practiced (by contractors) whatever technology is invented and (2) march in rights.

Technical Data Rights (copyrights) - This section of the modular agreement deals both with data that either participant brings to the project, or data that is generated under the project. Data that is brought to the project by either party and is marked as proprietary will be

protected by both parties and data that is generated under the project by either party and is marked as proprietary will also be protected by both parties.

Ownership of copyrights will be negotiated between the partner and the UC. There is no guidance provided in the modular agreement to focus on these negotiations. However, the government retains non-exclusive rights to any copyright material which is not assigned to the partner as a result of the negotiations, e.g., is not accepted by the UC as either proprietary information or protected work for non-federal partners which belongs to the partner.

Funding/Costing: This agreement, like its predecessors, is intended to cover work that is fully reimbursable. The partner is expected to pay all of Los Alamos' expenses which arise from work done under the agreement. There are two features of this agreement which have a positive effect on small business participation: (1) the contractor can waive the "added factor" and "depreciation" costs and (2) the advance payment requirement present in other agreements is modified to allow a more reasonable payment schedule.

The options in the modular agreement all require the partner to provide some advance payment. The total cost of the project may be reimbursed incrementally over the entire duration of the project. The contractor can waive certain costs mentioned above, however the contractor is required to make a "clear and compelling argument" to the DOE which justifies the waiver. The argument must make clear why the waiver is "in the best interest of the DOE."

Legal Liabilities: The indemnity and product liability section of the agreement contains both a general indemnity against any damages which arise out of the work and a product liability indemnity section. The product liability clauses include a "hold harmless" option which may appear more favorable to businesses, however, a "hold harmless" is not defined in the agreement.

In addition, the partner must indemnify the government and the UC against any patent infringement suits which might arise due to work done under the agreement.

Internal Los Alamos Issues: The contractor (Los Alamos) must complete a checklist as part of the process of entering into the agreement. Part of that requirement includes documentation of the decision process which governed each stage of the deliberations. The checklist includes twenty-three items. DOE's headquarters may have to review and concur on six of these items. The DOE field office may have to review and concur with another ten of these items.

It is almost certain that the requirement that sixteen concurring opinions from DOE personnel will add substantially to the duration of these negotiations. Many of the items can be addressed without undue delay however. Those that would seem to most likely to require undue effort are: (1) a waiver of overhead and depreciation costs, (2) documentation that private facilities do not exist which could perform the work, (3) intellectual property rights, (4) conflict of interest mitigation, and (5) environmental safety and health (ES&H) issues.

Summary: This agreement is intended to streamline the procedures required for the UC/Los Alamos to enter into a work-for-others contract. It places a significant documentation and justification burden on Los Alamos management. It fails to adequately address the cash shortage issues faced by most new or small businesses. It explicitly excludes joint projects which are intended to transfer Los Alamos technology developed under the DOE programmatic mission, e.g., existing Los Alamos technology. If the intent of the DOE is to transfer those existing technologies into the public sector, this agreement does not seem to be the first choice.

E.5.3 The Funds-In Agreement

Basic Document Information: The Funds-in agreement applies to work performed by the DOE or its facility paid for by a non-Government Sponsor. The work is performed by the Laboratory using laboratory facilities. This agreement requires a number of different forms which can delay its execution. These forms include:

- A letter from Los Alamos to DOE officer requesting support for the project
- Funds-in Agreement Coordination/Approval Document
- Statement of Work
- Cost Estimate of Materials and Services
- Waiver of Depreciation and DOE Organizational Overhead Costs

The statement of work agreement must receive internal Los Alamos approval. Depending on the work to be performed, and the program division that will perform the work, approval of the statement of work can delay the approval process.

Intellectual Property/Technology Transfer Issues: Funds-in agreements are not likely to be used in the new business creation process. This technology transfer mechanism is not compatible with the needs of start-ups—it is costly, requires up-front payment, and it is difficult to negotiate. Costs are derived from DOE overhead taxes and the expense of work performed by the Laboratory. Although the new business will more than likely need the Laboratory to perform technology maturation activities, it will not use the funds in agreement to perform these tasks.

The Government has March-in Rights which, under certain circumstances, allow it to require the Sponsor, an assignee, or exclusive licensee of a Sponsor Invention to grant a non-exclusive, partially exclusive or exclusive license in any field of use to a reasonable applicant or applicants. Although this Government right only arises under very specific circumstances, most notably if the Sponsor is not actively commercializing the technology, this clause is problematic. The Sponsor is paying for the work to be performed by the Government, and yet the Government is claiming some significant rights. This is far from standard industry practices and could act as a deterrent to small businesses.

Under this agreement the Government retains rights to use, disclose and duplicate for any purpose whatsoever, and have others do so, all technical data first produced or used in the performance of work under this Agreement. Although the Sponsor can keep proprietary data, and is responsible for designating the data proprietary, the Government still retains access to information paid for by the Sponsor. Additionally, the Government can challenge the Sponsors determination that certain data are proprietary. None of these requirements is a show-stopper in itself, but together they demonstrate the fact that doing business with the Government in this capacity is complicated and puts burdensome requirements on the Sponsor who is paying for the work initially. In the competitive world, a sub-contractor with those kinds of requirements would not make it to the bidding stage.

In terms of market or application it appears the Sponsor has exclusive application since it would have elected to retain all rights. However, the Government also has some sublicense rights which could mean that it could license to a competitor.

The Government puts some restrictions to where the product using inventions developed under this agreement can be manufactured. The sponsor or assignee cannot grant exclusive right-to-use or sell any Sponsor or Subject Invention in the U.S. unless that person or entity agrees that any products embodying the Sponsor or Subject Invention will be manufactured substantially in the

U.S. There are a couple of exceptions including proof that manufacture in the U.S. is not commercially feasible.

Funding/Costing: The key funding issue is the fact that the Department of Energy imposes a 27% tax on all funds. This implies that for every dollar spent paid to the government, the industrial partner only receives \$0.73 worth of work. Additionally, this agreement does not allow the industrial partner to leverage any DOE funding to increase the value of the project. The Sponsor must advance all payments, unless the estimated period of performance exceeds 90 days or \$25,000, in which case, the funds may be advanced incrementally. All costing is done according to DOE costing policies.

Legal Liabilities: The Sponsor must agree to indemnify the government for:

- ALL liability including costs and expenses incurred resulting from the Sponsor's use or disclosure of any information in whatever form;
- ALL liability to any person inducing the Sponsor for injury or death to persons or destruction of property except, if the injury, death or property destruction are a result of Government negligence; and
- ALL liability, including costs, for infringement of any U.S. patent or copyright arising out of any acts required or directed by the Sponsor to be performed under the agreement to the extent to which these acts are not normally performed at the facility.

Internal Los Alamos Issues: The approval process for the funds-in agreement is lengthy and complex. It requires approval from the DOE program officer, Los Alamos' Performing Management and Operating Contractor, DOE contracting officer. The statement of work will also require internal division approval. The management of the division to perform the work must make sure the work is compatible with the program mission and that staff and equipment is available. All of these requirements could make the approval process quite lengthy.

E.5.4 Los Alamos' Technical Consulting Services Agreement

Basic Document Information:³¹ The Technical Consulting Services Agreement provides the ground rules under which Los Alamos provides consulting services to businesses on a non-cost recovery basis.

Intellectual Property: The transfer of intellectual property is not the intent of this agreement. Knowledge about IP (how to use, operate, or enhance) may be transferred from Los Alamos employees to the recipients. Any IP developed by Los Alamos employees under conduct of this agreement remains the property of the UC. The UC does agree to confer a non-transferable, non-exclusive, paid up license to the sponsor for inventions made by Los Alamos employees under the agreement. The sponsor retains rights to all IP developed by its employees under the agreement.

Funding/Costs: Paragraph 11(a) states "The University and the Requestor shall each bear their own expenses in connection with all activities conducted under this Agreement." In paragraph 1, the UC agrees to "exert its best efforts to provide useful assistance ... but reserves the right to terminate the assistance at its sole discretion."

31 It should be noted that Los Alamos has a collection of services intended specifically for small businesses which also includes a technical consulting assistance program. That program includes both a small (< \$5K) and extended (\$5K to \$300K) technical assistance agreement which are not discussed here.

Legal Liabilities: This form of assistance is available only to U.S. owned businesses that operate substantially in the U.S. Conflict of interest prevent companies whose officers, directors or managers are UC employees (or have been within the past two years) from executing this agreement. As a result, new businesses which are brought into existence by former Los Alamos employees are precluded from obtaining consulting from Los Alamos under this agreement.

The requestor must release from liability (indemnify) the UC against any losses resulting from the requestor's use of the information or assistance provided by the UC. This includes indemnification for product liability.

Internal Los Alamos Issues: The Laboratory reserves the right to choose the people who provide services, the times that those services are provided, and acknowledges that they will not be provided in a way that conflicts with programmatic missions and responsibilities. While the current internal Los Alamos budget may be sufficient to meet the demand for these services, a flurry of small business startups each needing consulting services might quickly exhaust the funds available.

Summary: Small businesses will probably elect to pursue the similar agreements which exist under the small business assistance program first. Those small businesses which are attempting to commercialize Los Alamos technologies are very likely to include former UC employees among their management team and thus be disqualified for this form of agreement.

E.5.5 User Facility and Proprietary User Facility Agreements

Basic Document Information: These agreements provide a mechanism which allows private companies to purchase services, or access to facilities available from Los Alamos. The main differences between these two forms of agreement are the extent to which the sponsor must indemnify the government, the costs to the sponsor, and protection of proprietary information.

Intellectual Property: Both User Facility agreements give all rights to inventions made under the agreement to the sponsor. The government does retain rights to a non-exclusive, paid up license to practice or have practiced any invention made under the agreement. It is assumed here that the term "or have practiced" means that the government can provide the technology to any government contractor. This provision may be particularly threatening to small businesses who expect to develop technology through this agreement and who have targeted the government and its contractors as the primary market for its products. In addition, the government retains the right to seek ownership of any IP the sponsor chooses not to protect.

Finally, the government retains march-in rights (the right to require the sponsor to grant exclusive license for inventions made under the agreement) if the sponsor chooses not to pursue commercialization of those technologies to the satisfaction of the government. The sponsor is required to document all inventions and to provide the written documentation to the government. This documentation includes descriptions of the inventions as well as any instruments filed as part of the IP protection process.

Funding/Costing: Under both agreements, the sponsor is required to pay in advance all costs incurred by the Laboratory as a result of the agreement. In the case of the User Facility Agreement, the DOE depreciation and administrative overhead costs have been waived. The intent of both agreements is that Los Alamos obtain full cost recovery for the work done.

Legal Liabilities: The sponsor company agrees to release the University, the government, Los Alamos, DOE, etc., for any liability resulting from injury to the sponsor's personnel or damage to the sponsor's equipment which is not due to the fault of any of those parties. In addition, for a Proprietary User Facility Agreement, the sponsor agrees to indemnify the government, etc. against

any liability resulting from patent infringement which arises due to actions taken by or requested of the UC by the sponsor.

Under the Proprietary Agreement, the DOE and Los Alamos agree to hold as proprietary all information clearly marked by the sponsor as proprietary. The government reserves to challenge the proprietary status of any information so marked by the sponsor.

Internal Los Alamos Issues: Los Alamos is protected from Trojan horses by the provision which states that any technology, proprietary or otherwise which the sponsor does not remove from the facility once the agreement is terminated will become the property of the University.

Summary: The requirements that costs be fully recovered by Los Alamos and that recovery occur up front could be serious impediments to small businesses. Many such businesses survive through payment by equity, or through promise of payment at some future date once profitability has been established. In addition, the intellectual property provisions which allow the government to retain non-exclusive rights to practice or have practiced any subject inventions may discourage some small businesses from using this form of agreement.

E.5.6 Industrial Staff Member Agreement (ISMA)

Basic Document Information: The Industrial Staff Member Agreement (ISMA) provides a mechanism under which a commercial company can assign employees to Los Alamos. During the course of the agreement, the company pays all salary, benefits, etc. that the employee receives. Los Alamos provides office space, secretarial support, and other infrastructure items. The ISMA is a self-contained, model document. It includes all provisions under which the agreement is made, and "fill-in-the-blank" sections for describing the particular individuals, companies, duration, etc. of the agreement.

Intellectual Property: The UC retains ownership (all rights to) any inventions conceived or implemented by the industrial staff member under this agreement. Also, the government retains rights to all technical data produced by the industrial staff member or Los Alamos employees during the course of the agreement. The industrial staff member's parent company is entitled to obtain a revocable, non-exclusive, paid-up license to the inventions. In addition, the industrial staff member's company may request greater rights to inventions under the provisions of 41 CFR (Code of Federal Regulations) 9-9.109.6.

Funding/Costing: The sponsoring company pays all costs for salary, benefits, etc. that are received by the industrial staff member during the course of this agreement. In addition, the sponsor pays all travel, relocation etc. costs associated with the agreement. Los Alamos will provide the usual infrastructure support for the industrial staff member during the course of the assignment to Los Alamos, e.g., office, phone, office supplies, secretarial support, and computing resources.

Legal Liabilities: The industrial staff member is required to follow all guidelines imposed on other Los Alamos staff whether they originate from Los Alamos, UC, DOE policy or statute. The sponsoring company must indemnify UC and DOE against any losses which arise from use by the sponsor of information derived under the agreement.

Article X, Examination of Records, allows the Comptroller General of the USA access to "any pertinent books, documents, papers, records, etc. of the employer involving records related to the agreement."

Internal Los Alamos Issues: The industrial staff member is managed in the same way as other Los Alamos staff who are part of the organization hosting the visit. The industrial staff member's

assignments during the tenure of his visit must be approved by his Los Alamos manager. A slot for the industrial staff member must be created and some interview process is required. In addition, in some cases it may be necessary for the industrial staff member to obtain the appropriate DOE clearance.

Since no statement of work is associated with this agreement, it is assumed that the purpose of the visit, the assignments, etc., will be negotiated informally and perhaps documented by an attached letter of intent. No provisions exist explicitly in the agreement for addressing the issue of work assignment other than Article XI which deals with the general concept of disputes.

Summary: The ISMA could be a useful mechanism that a small business could exploit for learning about Los Alamos technologies which are targets of a potential transfer and commercialization. There is a danger that long lead times may be involved, especially if a clearance is required. The lack of any costs required of the sponsor, e.g., such as the CRADA matching funds, might appear attractive to a small company in which the industrial staff member candidate might be willing to accept equity in lieu of cash.

E.5.7 Outside Employment Policy, Entrepreneurial Leave Policy, Leave Without Pay Policy

Basic Document Information: These three documents are extracts from the Payroll Regulations section of Administrative Manual (AM) 318 which covers Leave Without Pay (LWOP) issues. This section of AM 318 covers all LWOP conditions and alternatives, e.g., medical, pregnancy, programmatic, and entrepreneurial leave for either a short or long term basis.

Intellectual Property: Intellectual property issues do not arise under this policy unless the employee is requesting Entrepreneurial Leave. In that instance, the employee is required to obtain approval of the leave from the Industrial Applications Office (IAO) in addition to the line and administrative division approvals which are required to ensure that the employee understands all pertinent IP issues, e.g. ownership, licensing procedures etc.

Funding/Costing: None of the LWOP options (programmatic, entrepreneurial leave, personal, medical) include a commitment of funds by the employee or by Los Alamos, other than the usual severance/sick/vacation pay due the employee. Some options exist which allow the employee to continue insurance coverage at his/her own expense under the Los Alamos policies.

Legal Liabilities: No legal responsibilities are incurred by either the employee or Los Alamos other than the usual ones which accompany the voluntary exit of an employee from Los Alamos.

Internal Los Alamos Issues: An employee who accepts any of the LWOP options, including entrepreneurial leave, does so at the risk of losing the position from which they are taking leave. Some options exist in which the line organization can retain the full-time slot vacated by the employee for a limited time period, but that alone does not guarantee a successful return by the employee to Los Alamos.

Summary: Los Alamos has no satisfactory policy for encouraging employees to participate in technology transfer by either temporary or permanent leave. The existing policies provide the minimal protection possible, i.e., there may or may not be a position to return to. No financial support for the employee during the leave period is described in this section of AM 318. In addition, conflict of interest issues could prevent the employee from deriving benefit through equity in the company he/she helped found if any exclusive Los Alamos licenses are to be sought by the company.

E.6 Documents Relating to DOE Policy and Guidance

E.6.1 Partnerships for Global Competitiveness: A Draft Strategic Plan

Basic Document Information: This document defines the focus of the Department of Energy Technology Partnerships programs and was written by the Secretary of Energy Hazel O'Leary in July 1993. This strategy consists of a five point vision. To implement the vision, the Department has defined 20 goals (see the table on the next page). In order to reach the vision and goals, the Department has established a set of 12 initiatives. The objective and deadlines of the 12 initiatives are outlined in the "Status of Strategic Plan Initiatives."

Technology Rights and Restrictions: Although the document makes no specific reference to technology rights and restrictions, some of the vision and goal statements will facilitate easier access to departmental intellectual property. Vision statement 3 states "We must make it easier for industry to access Departmental technology and resources and facilities."

Under these 20 strategies, there are 12 specific implementing initiatives. These twelve initiatives fall under 3 headings.

1. Streamlining the Process
2. Planning for Success
3. Reaching Small business

The initiatives that will benefit new small businesses logically fall under heading 3. However, initiatives for streamlining the process also include creating a Small Business CRADA. This has been accomplished and is discussed in an earlier portion of this appendix.

Initiatives developed as a part of "Planning for Success" are fairly high-level department activities that will not directly benefit small and new businesses. These initiatives include increasing industry participation on the Secretary of Energy's Advisory Board.

The third set of initiatives "Reaching small businesses" has three major activities:

1. Issue policy guidance on including the provision of technical assistance to small businesses in the mission of Departmental facilities. This initiative has been quite successful at Los Alamos, which has a specific program for supplying technical assistance to small businesses.
2. Include Departmental resources of Department of Commerce Manufacturing and outreach.
3. Examine all technology transfer mechanisms and issue a simplified, standardized CRADA (the Small Business CRADA).

These activities are currently underway. The technical assistance program has been implemented at Los Alamos. Small businesses can contact the Small Business program for technical assistance. If necessary a lab employee will go off site to the small business for up to a week, at no charge, to help the company resolve the problem. In essence, this allows the small business to have free consulting services, something most small businesses could not afford. This program is described in more detail below.

Main Goals of the Draft Strategic Plan				
Change Culture	Optimize Technology Transfer Process	Facilitate Access to Resources	Market Pull to Develop and Guide Technology	Develop Integrated Program Plans with Industry and Govt.
Customer focus	Reliable technology partnership funding across all department programs	Develop consistent, reliable, standard, fair policies	Involve industry at all stage of department programs	Integrate technology transfer early into department R&D program planning
Technology transfer integrated in all activities including performance	Reduce technology agreement execution time	Educate industry as to resources available	Develop with industry set of performance measures	Select with industry integrated industrial sector and technology areas for large partnerships
All program elements in are developed of uniform technology transfer policies	Consistent processes to reduce administrative burden and increase industry acceptance	Balanced portfolio of technology partnerships so full range of technologies is represented	Pursue partnerships with industrial alliances	Integrated technology transfer plan across department programs
Technology transfer as department wide, cross agency team effort with recommendations for team accomplishments	Develop new, quicker mechanisms for technology transfer	Balanced portfolio of industry partners, optimal representation of industry	Partner with networks for reaching small businesses	
	Make sure smaller deals are less complex than larger ones			

E.7 Documents Describing Relevant Los Alamos Programs

E.7.1 New Program Opportunities for Small Businesses

Basic Document Information: The Small Business Initiative is a Los Alamos program within the Industrial Partnership Office that focuses on assistance to Small Businesses. This program sets itself apart from other technology transfer programs in that it has a pool of funds directed toward implementing technology transfer for small businesses only.

This program also implements the Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer Program as mandated by statute. Technical assistance is provided through Technical Assistance Agreements, Extended Technical Assistance Agreements and Small Business CRADAs. Technical assistance can either be through consulting with Los Alamos employees or using Laboratory facilities (User Facility Agreements).

Intellectual Property/Technology Transfer: The documents and programs described in this section all contribute to transferring technology and know-how out of the laboratories.

These documents contain conditions such as some form of indemnification, Government Purpose license rights for certain intellectual property generated under these agreements.

The Small Business partnership program is another element of the small business initiative. These partnerships usually take the form of Small Business CRADAs. The intended audience of this program are established small businesses. The program does not seem to apply to entrepreneurs who have not yet set up their business. This is evidenced in the memorandum from Sue Fennimore to Pete Lyons which calls for proposals for small business partnerships, it asks for "the description of the small business, information on the company history with the technology of interest as well as staff costs and in-kind contribution of the small business."³²

While none of these requirements explicitly excludes entrepreneurs, it is fairly evident that the intended applicant to this program would be a small business. In order to encourage entrepreneurs to apply, if that were the intention of the program, separate guidelines with detailed instructions for entrepreneurs better enable entrepreneurs to take advantage of this program. Nevertheless, Cell Robotics is a lab spin-off that entered into a Small Business CRADA under this program.

Funding/Costing: The Small Business Initiative can contribute critical funds and support to small and new businesses. The technical assistance program can contribute \$5,000 in the form of 40 hours of a Los Alamos employee's salary time toward resolving technical problems for small businesses.

Summary: This program creates a number of technology transfer opportunities for small businesses and, through a variety of mechanisms, it is actively pursuing creating partnerships with small businesses. The only question relative to this program is its future. It is not certain how much funding will be allocated in the next few years to the laboratory-specific small business assistance activities. This program is small, and focused and has much potential of increasing technology transfer through small businesses.

E.8 Additional Documents

E.8.1 Draft Copy Equity Bulletin, dated 10/8/93

Basic Document Information: This document outlines the UC's position on accepting equity in exchange for rights to patentable intellectual property. It contains guidelines governing the nego-

³² Memorandum from Sue Fennimore to Pete Lyons, December 10, 1993 included in "New Program Opportunities for Small Business."

tiations which accompany any licensing procedure and for distribution of any stock or other equity instruments which are accepted by the UC.

Intellectual Property: The purpose of this set of guidelines is to delineate the policy of the UC for accepting equity in a company in exchange for patentable intellectual property. It specifically excludes intellectual property which is protected by copyrights, trademarks, etc.

Funding/Costing: Funding issues enter into this policy document in Sections VI.b, c, d which outlines the UC's policy for determining whether to require cash or to accept equity in exchange for IP. It also occurs in Section X. which describes disposition of the stock or other equity. The policy in its current form excludes acceptance of equity in lieu of royalties or reimbursement for patent costs. The general guidelines encourage the licensing officer to obtain as much cash as possible, and to accept equity in the form only of stock, options, or warrants (with stock being the preferred instrument).

Legal Liabilities: Section I includes references to policies, statutes, standing orders, etc. of the UC or of the state of California which affect the way in which the UC can do business. No new legal liabilities or responsibilities are introduced in this document. It only binds the UC licensing process to follow existing law and policy. Those statutes and policies are not included in either the document or in this review.

Internal Los Alamos Issues: This document appears to allow Los Alamos to accept equity in partial payment of technology transfer of IP which is patentable. The UC's position on acceptance of equity appears to allow or at least not completely preclude the PI or inventor from holding a financial interest in the potential licensee however, any such condition must be disclosed by the PI for review by the campus Chancellor (which we assume means the Laboratory Director when the PI is employed by Los Alamos).

Summary: This policy is clearly a step in the right direction so far as small or new businesses are concerned. While the equity policy does not allow for acceptance of equity in exchange for license fees or patent costs, Los Alamos already has in place policies and procedures for deferring those costs until such time as the licensee is financially stable.

Extension of this policy to allow Los Alamos to accept equity in lieu of cash for other services provided by Los Alamos to small or new businesses, e.g., User Facility Agreement, Small Business CRADA, Work for Non-Federal Partners would provide a significant improvement in the ability of these businesses to successfully commercialize Los Alamos technologies and could provide a substantially larger return to Los Alamos in the long run.

Since IP that is protected by copyright is not covered by this form of agreement, it does not apply to software. In many (if not most) cases, Los Alamos' IP includes at least a component of software. It is not clear how a package of technologies, some of which are patented and others copyrighted, can be licensed under the new equity policy.

Appendix F. Bibliography

Hearing before the Committee on Small Business, United States Senate, 101st Congress, March 8, 1990, Technology Transfer and Challenges Facing Small Business.

Hearing before the Subcommittee on Regulation, Business Opportunities and Energy of the Committee of Small Business, House of Representatives, 101st Congress, October 5, 1989, Obstacles to Technology Transfer and Commercialization at Federal Laboratories.

Hearing before the Subcommittee on Regulation, Business Opportunities and Energy of the Committee of Small Business, House of Representatives, 102nd Congress, December 4, 1992, Improving Technology Transfer Programs at Department of Energy Laboratories.

William P. Barrett, "Fallout," *Forbes*, December 6, 1993, pg. 158.

Small Business Incubator Handbook: A Guide for Start-up and Management, U.S. Small Business Administration, Office of Private Sector Initiatives, Washington, D.C., March 1986.

Stephen W. Quickel, "How To Get Money from Venture Capitalists," *Electronic Business*, July 1993, pg. 109.

William M. Watkins, Business Aspects of Technology Transfer: Marketing and Acquisition, Noyes Publications, New Jersey, 1990.

Commercialization of Federally Funded R&D: A Guide to Technology Transfer from the Federal Laboratories, Committee on Commerce, Science, and Transportation, U.S. Senate, October 4, 1988.

Raymond W. Smilor and Michael Doud Gill, Jr., The New Business Incubator: Liking Talent, Technology, Capital, and Know-How, Lexington Books, Lexington Mass, 1986.

Technology Commercialization and Competitiveness, IC2 Institute, The University of Texas at Austin, Austin, Texas, 1990.

Technology Transfer: Federal Efforts to Enhance the Competitiveness of Small Manufacturers, Report to the Ranking Minority Member, Committee on Small Business, United States General Accounting Office, Washington D.C., 1992. GAO/RCED-92-30 Technology Transfer.

Karl J. Dakin and Jennifer Lindsey, Technology Transfer: Financing and Commercializing the High Tech Product or Service: From Research to Roll Out, Probus Publishing Company, Chicago, Illinois, 1991.

George Young, Venture Capital in High-Tech Companies: The Electronics Industry Perspective, Development Capital Corporation, Quorum Books, Westport, Connecticut, 1985.

Albuquerque Date Book, City of Albuquerque, Planning Department

The date book is a statistical abstract that provides population, housing, and economic information for the Albuquerque area, as well as education, government finance, public services, land use, zoning, and statistical comparisons with other southwestern cities.

Community Survey (3 pages each) for the following communities in the State: Alamogordo, Clovis, Deming, Espanola, Grants, Farmington, Las Cruces, Rio Rancho, and Roswell. Data included in the survey covers the population, nearest Metropolitan city, climate, education,

housing, banks and credit unions, utility providers, transportation, taxes, agriculture, medical, labor, and miscellaneous economic information.

County Business Patterns (1991), New Mexico, U.S. Bureau of the Census, U.S. Government Printing Office, Washington, DC 20402.

The report includes state- and county-level mid-March employment, first quarter and annual payrolls, total number of establishments, and the number of establishments by employment-sized class.

Directory of New Mexico Manufacturers (1992-1993), Published by the Center for Economic Development Research & Assistance (CEDRA), College of Business Administration and Economics at New Mexico State University.

P.O. Box 30001, Dept. 3CR
Las Cruces, NM 88003-0001
Telephone: 505/646-6315
Facsimile: 505/646-6155
Price \$50.00
Pages: 244

Environment Contact List for New Mexico

Rodey, Dickason, Sloan, Akin & Robb
Albuquerque Plaza, Suite 2200
201 Third Street, N.W.
P.O. Box 1888
Albuquerque, NM 87103
Telephone: 505/765-5900
Pages: 28

HIGH TECH New Mexico (November 1990)
Compiled by the New Mexico Business Journal
Lists over 350 high-technology companies
Pages: 8

Economic Development Finance Programs (April 1993)
Prepared by the New Mexico Economic Development Department
P.O. Box 30001, Dept. 3CR
Las Cruces, NM 88003-0001
Telephone: 505/646-6315
Facsimile: 505/646-6155
Pages: 14
Describes 34 State, Federal, and Local finance programs

Legal Aspects of Doing Business in New Mexico: A Handbook for Commerce and Investment, Prepared by Sherman & Howard and Economic Development Department of the State of New Mexico.

Sherman & Howard
633 17th Street, Suite 3000
Denver, CO 80202
Telephone: 303/297-2900
Facsimile: 303/298-0904

This book was prepared for non-New Mexico-based businesses or individuals that are considering making investment or doing business in New Mexico. Its purpose is to provide a general introduction to the laws and regulations which provide the framework for the establishment and main-

tenance of a business enterprise in the State. The Appendix includes a list of New Mexico agencies available to investors and businesses.

Pages: 216

New Mexico: America's Land of Enchantment (brochure), Published by the New Mexico Economic Development Department.

1100 St. Francis Drive

P.O. Box 20003

Santa Fe, NM 8 7503

Telephone: 505/827-0300

Facsimile: 505/827-0407

Pages: 16

This brochure explores business opportunities in New Mexico, covering business environment, workforce readiness, State assistance to businesses, technology, employment, transportation, and the infrastructure.

New Mexico: America's Land of Enchantment (Book), Published by the New Mexico Economic Development Department.

1100 St. Francis Drive

P.O. Box 20003

Santa Fe, NM 87503

Telephone: 505/827-0300

Facsimile: 505/827-0407

Pages: 129

This book explores New Mexico's business and lifestyle environment, including tax rates, transportation systems, quality of life, and other criteria to make informed business decisions. Issues covered include environment, enterprise, technology, international trade, education and work force training, and the New Mexico business landscape.

New Mexico Corporate Site Selection Handbook

New Mexico Economic Development Department

1100 St. Francis Drive

Santa Fe, New Mexico 87503

Telephone: 800/374-3061

The handbook examines the quality of life, business assistance and finance, taxation, business licensing process, education/job training/labor force, and technology development and incentives in the State of New Mexico.

Pages: 115

New Mexico Labor Market Review

New Mexico Department of Labor

Economic Research & Analysis

P.O. Box 1928

Albuquerque, NM 87103

Telephone: 505/841-8645

Pages: 21

New Mexico Technologies

Provides an overview of technology transfer in New Mexico. Technologies include aerospace, automotive, electronics, and chemical processing. It reviews success stories such as SCB Technologies, The TIDE Company, and Radiant Technologies.

Pages: 7

New Mexico Technology Enterprise Forum: Statewide Directory of Technology-Related Organizations

New Mexico Economic Development Department

1100 St. Francis Drive

Santa Fe, New Mexico 87503

Telephone: 800/374-3061

Facsimile: 505/827-0407

Pages: 29

This includes information on key State and Federal technology-related organizations, centers for technical excellence, university organizations, vocational/technical schools, and other supporting organizations, including economic and industrial development, research, and educational organizations.

Starting Out: A Guide to Creating Your Own New Mexico Business

The New Mexico Small Business Development Center

P.O. Box 4187

Santa Fe, NM 87502-4187

Telephone: 800/281-7232

In Santa Fe: 505/438-1362

Pages: 44

Urban Growth Projections for Albuquerque and Vicinity (1992-2002), Prepared by the Bureau of Business and Economic Research for the City of Albuquerque Planning Department, March 1993. Contains annual projections for the Albuquerque study area of population, employment, and housing by Planning Information Area (PIA).

Wages in New Mexico (1993), Presented by the New Mexico Economic Development Department

Prepared by the Bureau of Economic Research and Analysis

New Mexico Department of Labor

Bureau of Economic Research and Analysis

P.O. Box 1928

Albuquerque, NM 87103

Telephone: 505/841-8645

Pages: 110

**Appendix G. Detailed Information on the Joint MCC/Los Alamos
Technology Conference**



Los Alamos, N. Mexico Building Partnerships

MCC Brings Private Sector into Tech-Transfer Act

By Esther Smith
EDITOR-AT-LARGE

SANTA FE — New Mexico pulled out all the stops for a statewide technology commercialization meeting March 6-7, organized by Los Alamos National Laboratories and MCC Ventures to expand on their partnership in encouraging entrepreneurship for local economic impact.

With strong support from New Mexico's top political figures, the meeting drew 350 attendees from around the state, including many small-business people, as well as national technology-transfer mavens.

Gov. Bruce King said the state had laid the foundation to promote technology-based business. "Keep in mind it's very much a work-in-progress," the governor said. "But we will be a full partner in every aspect."

New Mexico Sen. Jeff Bingaman, the keynote speaker, warned that "Overall, the national labs have not had the track record in spinning off companies that we all have hoped and continue to expect in the future." Since passage of the National Technology Transfer Act, there have been some successes in industrial partnerships, he said.

"But it's clear we need to move beyond that both for the future of the labs and to see more private-sector jobs created.

"The issue is to use the resources of the labs to create jobs," Bingaman said.

"The future of our labs will be shaped by their ability to build a corporate customer base for tech transfer and demonstrate the value of technology to create jobs in the private sector."

Because of its large base in federally funded technology, it is critical for New Mexico to understand the "fundamental shift" that is occurring in technology policy, Bingaman said, noting that more than any other part of the federal enterprise, the laboratories are challenged.

They could emerge as a "defacto science and technology agency," the senator proposed, with national consensus for the need to maintain robust multiprogram, multidiscipline national institutions.

New Mexico Rep. Bill Richardson, a member of the House leadership and a proponent of the North American Free Trade Agreement, cosponsors a bill to expand the role of national laboratories in new fields to ensure, the congressman said, they will "play a vital role in the economic competitiveness of the future."

Also doing his part for the cause was Los Alamos Director

Sig Hecker, unable to attend the event in order to participate in the March 6 inaugural meeting of Energy Secretary Hazel O'Leary's new task force on the future of the national labs, headed by Motorola executive Bob Galvin. "When a commission like that is set up," said Hecker deputy Peter Lyons, "we all pay a great deal of attention to it."

The lab's partnership with

MCC Ventures could be the key to the transition from a spinoff model to a partnership model for technology transfer, Bingaman said.

An activity of the Microelectronics and Computer Technology Corp. of Austin, MCC Ventures is applying its know-how to assist corporate formation springing from Los Alamos technologies. A hallmark of MCC's simi-

lar activities in Austin relates to providing access to MCC member companies as customers for small companies.

"MCC has been a pioneer in trying new approaches and in finding what works," said Bingaman.

During a subsequent speech, MCC President Craig Fields said he expected results in three years that would include three to five new companies formed with jobs created, and an inflow of venture capital into New Mexico.

The Texas factor met with a fair amount of skepticism. One attendee questioned Bingaman on whether MCC would influence the export of technology from New Mexico, and asked what the state development organizations would do to exploit technology within New Mexico to benefit the people of the state.

Bingaman said it is a concern he shares, but that he sees MCC as a facilitator in retaining jobs in New Mexico.



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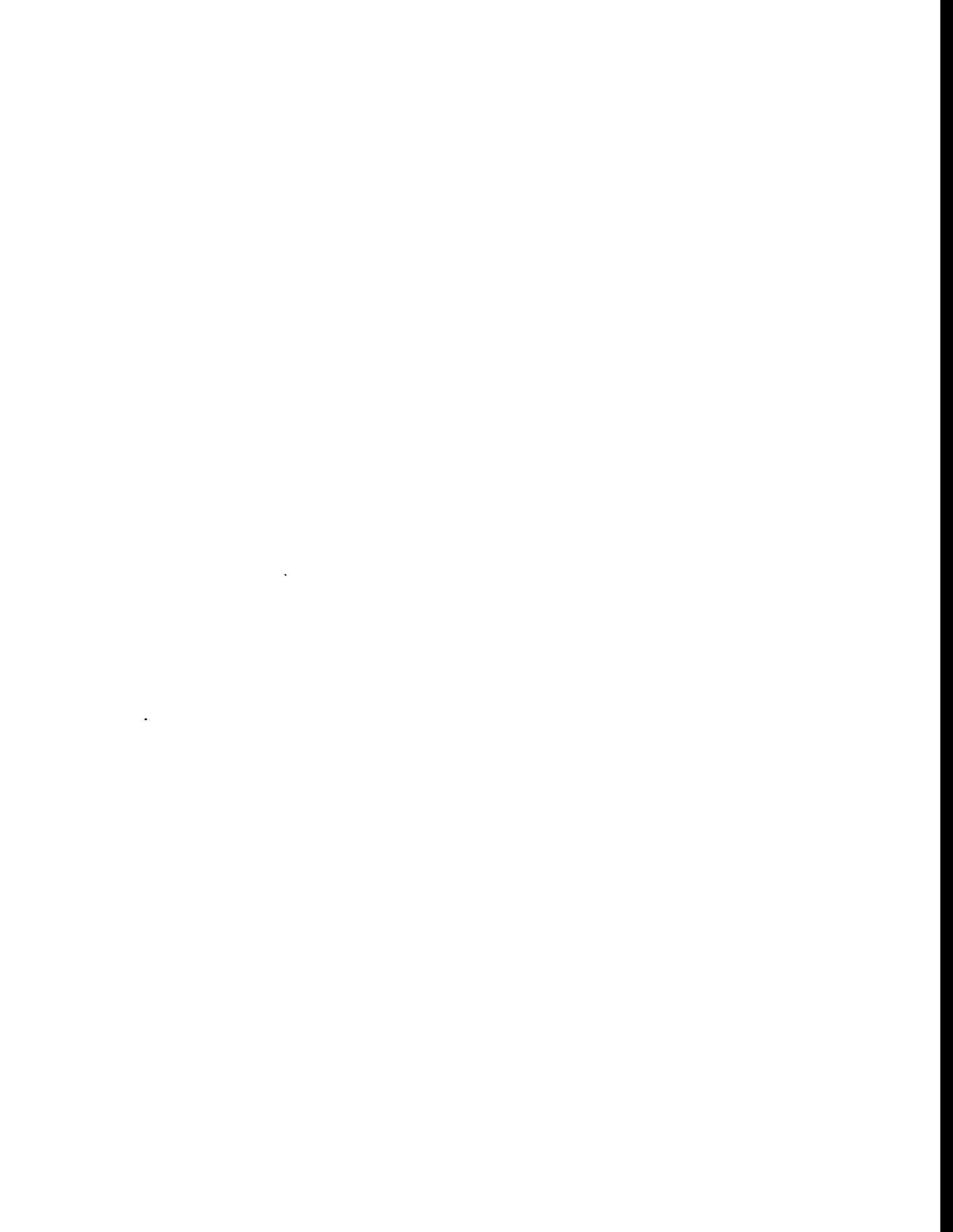
State Economy Topic of Conference

A conference on New Frontiers of Technology Commercialization: Principles and Practice of Commercializing Technology Through Small Business will be held March 7 and 8 at the Sweeney Convention Center in Santa Fe.

Cosponsors of the conference are Los Alamos National Laboratory and Microelectronics and Computer Technology Corporation/MCC

Ventures Inc.

Conference organizers say event is geared for people interested in the economic future of eastern New Mexico such as labor





New Frontiers of Technology Commercialization

March 7 & 8, 1994 - Santa Fe, New Mexico

Survey and Questionnaire

1. Did the conference meet your expectations? Yes
No
2. Were the sessions, in general,... useful
not useful
3. Was this conference... too short
about right
too long
4. Were the presentations... too short
about right
too long

5. Please rate the following presentations on a scale of 1 to 10 (1=poor, 10=exceptional):

Session One: What Do Investors and Entrepreneurs Look For in Deciding To Get Involved/Invest In a New Technology-Based Business

1 2 3 4 5 6 7 8 9 10

Session Two: Current and Future Technology-Based Market Opportunities: What Are The Attractive New and/or Existing Markets Where Technology Can Make a Major Difference

1 2 3 4 5 6 7 8 9 10

Session Three: Success Stories: Successful Businesses Created With Institutionally Developed Technology

1 2 3 4 5 6 7 8 9 10

Session Four: Forming a New Technology-Based Business: A Series of "How To" Presentations

1 2 3 4 5 6 7 8 9 10

Session Five: Resources Available to Early Stage Companies in New Mexico

1 2 3 4 5 6 7 8 9 10

6. What attracted you to the New Frontiers of Technology Commercialization Conference?

7. How did you hear about the New Frontiers of Technology Commercialization Conference?

8. Specific Comments or Suggestions:

Please return this form to registration desk at end of Conference - Thank You!





NEW FRONTIERS OF TECHNOLOGY COMMERCIALIZATION:
PRINCIPLES AND PRACTICE OF COMMERCIALIZING TECHNOLOGY
THROUGH SMALL BUSINESSES

MARCH 7- 8, 1994

Sweeney Convention Center
201 West Marcy, Santa Fe, N.M.

This conference is offered free of charge on an invitation-only basis to Los Alamos employees and members of the Northern New Mexican economic community. Registration for the conference will be accepted on a first-come, first-served basis due to limited space. If you are interested in attending, you must complete this form and fax it to the conference coordinator by March 1, 1994:

Vicki Newton - MCC Organizing Committee, FAX #512-338-3898

Name: _____ Title: _____

Organization: _____

Division: _____

Address: _____

Phone: () _____ FAX: () _____ E-mail _____

_____ I will attend the Monday evening, March 7th, reception at the Eldorado Hotel.

_____ I have special dietary considerations as follows: (Please complete this so we can accommodate you at all meals.)

_____ I have made a hotel reservation at the _____

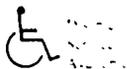
Conference Hotel - The Eldorado, Santa Fe

To make your stay as comfortable and convenient as possible, the conference has a block of rooms for attendees at the Eldorado Hotel, 309 W. San Francisco St., Santa Fe. The Eldorado is the only AAA four-diamond hotel in Santa Fe and has offered the special rate of \$75/night for single or double occupancy. Located in the heart of town just two blocks from the Sweeney Conference Center and one block from the historic Plaza, the hotel is the ideal base from which to explore the many superb galleries and museums of Santa Fe.

To reserve a room with the special rate, please call the Eldorado reservation desk at 800-955-4455 or 505-988-4455 and ask for the Los Alamos/MCC Conference room block. To insure availability, make reservations by February 10, 1994. With a 72-hour notice, there is no cancellation fee.

Meals and Special Reception

A complimentary Continental Breakfast (7:30 a.m.) and lunch on March 7 will be provided at the Sweeney Center. You are also invited to attend a special reception from 5:30 - 7:00 the evening of March 7 at the Eldorado Hotel.



For more information, call Vicki Newton, 512-338-3242





Additional Recommended Hotels
(ask for Los Alamos/MCC rate)

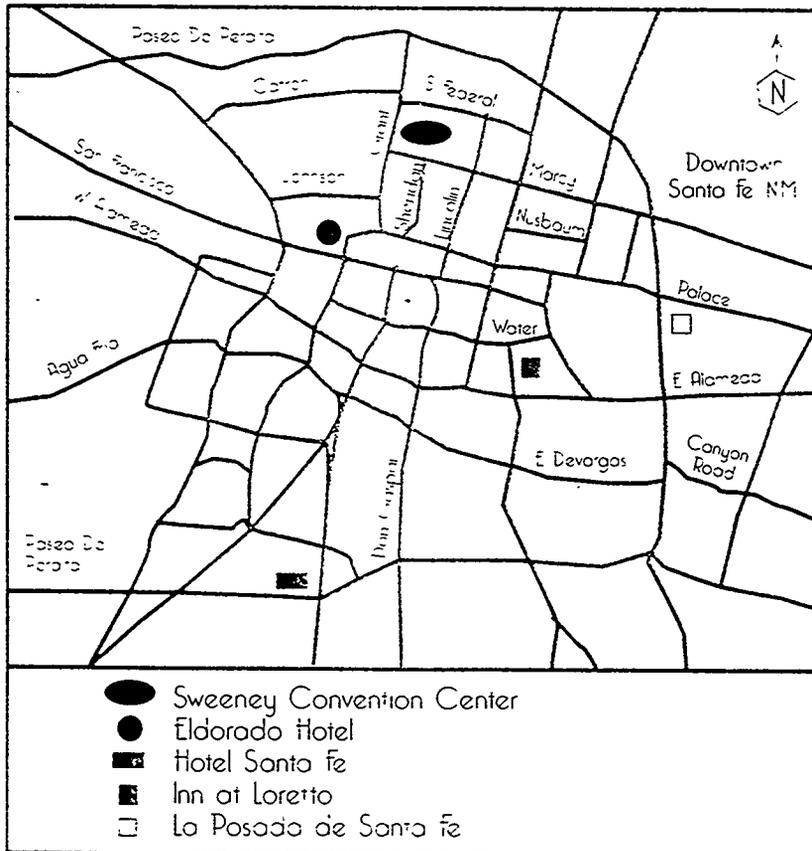
La Posada de Santa Fe. 800-727-5276. Room Rate: \$72 Single/Double
Hotel Santa Fe. 800-825-9876. Room Rate: \$69 Single/Double
Inn at Loretto. 800-727-5531. Room Rate: \$90/\$105 Single/Double

Transportation

For attendees flying into Albuquerque, the "Shuttle Jack" is a non-stop bus service that offers transportation to and from Santa Fe. Shuttle Jack will drop off and pick up at the Eldorado Hotel and the Inn at Loretto. Call 800-452-2665 for required reservations and an exact schedule. Driving time is 70 minutes from the airport to the Eldorado, and the cost is \$22 each way.

Ski Packages

For those interested in skiing opportunities in the Santa Fe area, call 800-776-SNOW. Lodging & Ski Packages are available.



NEW FRONTIERS OF TECHNOLOGY COMMERCIALIZATION: PRINCIPLES AND PRACTICE OF COMMERCIALIZING TECHNOLOGY THROUGH SMALL BUSINESSES

Conference Overview

Small business is the engine of economic growth and the wellspring of innovation. Small businesses are the largest source of new jobs in the United States, and agile, aggressive small businesses are at the cutting edge of technology development.

New Mexico has a rich base of technology in its national laboratories, universities, and corporations. But New Mexico faces significant challenges in the creation of new enterprises to commercialize technology.

"New Frontiers of Technology Commercialization" will bring together entrepreneurs, technologists, investment professionals, and others with an interest in enterprise creation, from New Mexico and throughout the nation, to explore issues involved in developing new technology-based businesses.

Topics to be explored include:

- What technologies are investors and experienced entrepreneurs searching for?
- What criteria do investment professionals use to guide their investment decisions? What makes a technology "investable"?
- What are the legal and structural considerations in forming a technology-based business? What are the critical success elements in creating a new enterprise?
- What kinds of regional support and assistance are available to the prospective entrepreneur in New Mexico?



Frontiers of Technology Commercialization offers Participants:

• A Depth of Experience:

From venture capitalists, private investors, entrepreneurs and a full range of professionals providing support to emerging businesses.

• Success Stories:

From technologists, entrepreneurs and investors who have launched successful technology-based enterprises.

• Market Insight:

From professionals with internationally recognized reputations in market research, technology analysis, and technology commercialization.

• Information That Will be Invaluable to New Mexico Entrepreneurs

The State's leading experts will present specific resources available to the State's entrepreneurs and technology developers.

• An Opportunity for Interaction and Involvement:

Sessions are designed to maximize interaction between participants and presenters.

Who Should Attend?

New Frontiers Conference?

Anyone with an interest in the economic future of Northern New Mexico — laboratory technologists, technical or academic leaders, business leaders, financial specialists and investors, and entrepreneurs.

Confirmed or Invited Speakers:

The Honorable Jeff Bingaman
U.S. Senator, State of New Mexico

The Honorable Bill Richardson²
Member of Congress, State of New Mexico

The Honorable Bruce King¹
Governor, State of New Mexico

Dr. Sig Hecker
Director, Los Alamos National Laboratory

Dr. Craig Fields
Chairman and CEO, Microelectronics and
Computer Technology Corp. (MCC)

Venture Investors and Financial Specialists

Joe Aragona, Austin Ventures¹
Ralph Bachemheimer, S.N. Phelps & Associates
Barry Cash, InterWest Partners
Carl Cannon, Hill Cannon & Washington
John Shoch, Asset Management

Entrepreneurs

David Dargen, President, Quatro Corporation
Ron Lording, CEO, Cell Robotics
Ron Kiedesel, CEO, Pavilion Technologies, Inc.
John Stockton, CEO, Tamarack Storage Devices
Gary Seawright, Founder, Amtech

New Enterprise Practitioners

William E. Garcia, Secretary, New Mexico
Economic Development Department,
Kevin Murphy, Chairman, New Mexico
Industry Network Corporation
Chuck Welborn, Partner, Modrall Law

¹Invited





About Los Alamos National Laboratory

Los Alamos National Laboratory, one of the premier multidisciplinary, multiprogram laboratories in the nation, is operated by the University of California for the Department of Energy. Its primary mission is to apply science and engineering capabilities to problems of national security. In support of this mission, it conducts extensive research in such varied fields as energy, nuclear safeguards and security, biomedical science, computational science, environmental protection and cleanup, and materials science.

For most of the Laboratory's fifty years in science and engineering, it has shared the results of its research with industry. This sharing has benefited industry and brought industrial innovation into its national-scope science and technology programs. National leadership has mandated stronger laboratory collaboration with American industry, nationally to strengthen U.S. global competitiveness, and locally to address regional economic development. The Laboratory has resolved to become a leader in industrial partnerships on a national scale, and to be a strong partner in economic development in northern New Mexico.

About MCC Ventures

MCC Ventures, Inc. (MVI) is a subsidiary of the Microelectronics and Computer Technology Corporation (MCC), one of the nation's leading technology development and commercialization organizations. MCC has almost 100 member organizations, including over 70 large North American corporations, spanning the spectrum of electronics and information systems technologies. MVI was created to accelerate the commercialization of MCC (and other) technologies by creating new companies and new strategic partnerships. The MVI strategy for technology transfer through enterprise creation has led to the creation of four new businesses ("spin-offs") with a current combined employment approaching 100; three other small innovative businesses have also been assisted.



CONFERENCE PROGRAM March 7, 1994 SWEENEY CONVENTION CENTER

7:30 A.M. Registration & Continental Breakfast

8:00 to 9:00

Welcome and Keynote
The Honorable Bruce King, Governor,
State of New Mexico
The Honorable Jeff Bingaman, U.S. Senator,
State of New Mexico

9:00 to 10:15

Panel Discussion
"Current and Future Technology Based Market
Opportunities"

10:15 to 12:15

"What Do Investors/Entrepreneurs Look for in
Deciding to Invest?"

12:15 to 1:30

Luncheon Speakers
Dr. Sig Hecker, Director, Los Alamos
National Laboratory
Dr. Camp Fields, Chairman and CEO, MCC

1:30 to 3:00

"Forming a New Technology-Based Business:
Critical Success Elements"

3:00 to 5:00

"Success Stories: Successful Businesses
Created Out of Institutionally Developed
Technology"

Reception 5:30 to 7:00 - Eldorado Hotel

March 8, 1994

8:00 A.M. to 8:45

Keynote: The Honorable Bill Richardson
Member of Congress, State of New Mexico

9:00 to 11:30

"Resources Available to Early Stage
Companies in New Mexico"

11:30 to 1:00

"Government Industry Partnerships"

*This conference is offered free of charge on an invitation only
basis to Los Alamos employees and members of the
Northern New Mexico economic community.*

*For More Information, Contact: Vicki Watson
Conference Coordinator, M2 18, 37-37
mail newton@ml.mcc.com*



NEW FRONTIERS OF TECHNOLOGY COMMERCIALIZATION: PRINCIPLES AND PRACTICE OF COMMERCIALIZING TECHNOLOGY THROUGH SMALL BUSINESSES

SWEENEY CONVENTION CENTER
SANTA FE, N.M.
MARCH 7 & 8, 1994

Cosponsored by

Los Alamos National Laboratory and
Microelectronics and Computer
Technology Corporation (MCC)/
MCC Ventures, Inc.





**New Frontiers of Technology Commercialization:
Principles and Practice of Commercializing Technology Through Small Businesses**

**March 7 & 8, 1994
Sweeney Convention Center - Santa Fe, NM**

AGENDA

DAY ONE

7:00- 8:00 Registration and Continental breakfast

PLENARY SESSION

8:00 - 8:15 *Introductions by Dr. Brian Kushner, MCC*
Welcome Remarks - Governor Bruce King
Welcome Remarks - Congressman Bill Richardson

8:15 - 9:00 **Keynote Address**
Federal Lab Challenges/Opportunities/Potential in a Post-Cold War World
Senator Jeff Bingaman

SESSION ONE

9:00 - 10:15 **What Do Investors and Entrepreneurs Look For in Deciding To Get Involved/
Invest in a New Technology-Based Business**
Moderator - Mr. Merlin D. Schulze, MCC

Presentations and discussion by:
Mr. Carl D. Carman, General Partner, Hill, Carman, Kirby & Washing
Mr. Berry Cash, General Partner, InterWest Partners
Mr. Joseph C. Aragona, Partner, Austin Ventures, L.P.
Mr. John Stockton, President, Tamarack Storage Devices, Inc.

10:15 - 10:45 Break

SESSION TWO

10:45 - 12:15 **Current and Future Technology-Based Market Opportunities: What Are The
Attractive New and/or Existing Markets Where Technology Can Make a Major
Difference**
Moderator - Dr. Brian G. Kushner, MCC

Presentations and discussion by:
Ms. Robin Rather, Director of Emerging Technologies, IntelliQuest, Inc.
Dr. Wilmer R. Bottoms, Senior V.P., Patricof & Co. Ventures, Inc.
Dr. John Chapman, President, Strategic Research, Inc.

DAY TWO

8:00 - 9:30

Resources Available to Early Stage Companies in New Mexico:
Moderator - Peter Lyons, LANL

Mr. Bill Garcia, Cabinet Secretary, State of NM Economic Devel. Dept.
Ms. Laura Kilcrease, Director, Austin Technology Incubator
Mr. Chuck Wellborn, Partner, Modrall Law
Mr. Bill Enloe, President/CEO, Los Alamos Nat'l Bank

9:30 - 10:00

Break

10:00 - 11:45

Continuation of Presentations and discussions by:
Mr. Randy Grissom, Director, NM Small Bus. Devel. Center
Mr. Jim Greenwood, Exec. Dir., Economic Development Corporation
Mr. Sherman McCorkle, President, Technology Ventures Corporation
Mr. John R. Grizz Deal, Director, New Mexico Technology Consortium
Mr. Richard Reisinger, Director, Tech. Assis. Ofc., U of NM
Dr. Tom Tumolillo, President, New Mexico, INC

11:45 - 12:00

WRAP-UP - *Peter Lyons, LANL*
Merlin Schulze, MCC





**New Frontiers of Technology Commercialization:
Principles and Practice of Commercializing Technology Through Small Businesses**

**March 7 & 8, 1994
Sweeney Convention Center - Santa Fe, NM**

**Conference Committee
&
Speaker
Biographies**





**New Frontiers of Technology Commercialization:
Principles and Practice of Commercializing Technology Through Small Businesses**

**March 7 & 8, 1994
Sweeney Convention Center - Santa Fe, NM**

**Co-Sponsored by
Los Alamos National Laboratory and
Microelectronics and Computer Technology Corporation (MCC)**

CONFERENCE COMMITTEE

Co-Chairmen

**Dr. Craig Fields, Chairman and CEO, MCC
Dr. Sig Hecker, Director, Los Alamos National Laboratories**

Program Committee

**Dr. Brian G. Kushner, Vice President and Director, Information Systems Division MCC
Mr. Steven Girrens, Project Director, IPO, Los Alamos National Laboratories
Mr. Peter Lyons, Director, IPO, Los Alamos National Laboratories
Mr. Joe Sims, Vice President Marketing, Information Systems Division, MCC
Mr. Merlin Schulze, Vice President MCC Ventures Inc.
Mr. Gregg Bemis, President, CFC International**

Logistics and Conference Management

**Ms. Meg Wilson, Vice President Business Development, MCC
Ms. Vicki Newton, Membership Services, MCC
Ms. Jean Stark, Protocol Officer, Los Alamos National Laboratories**

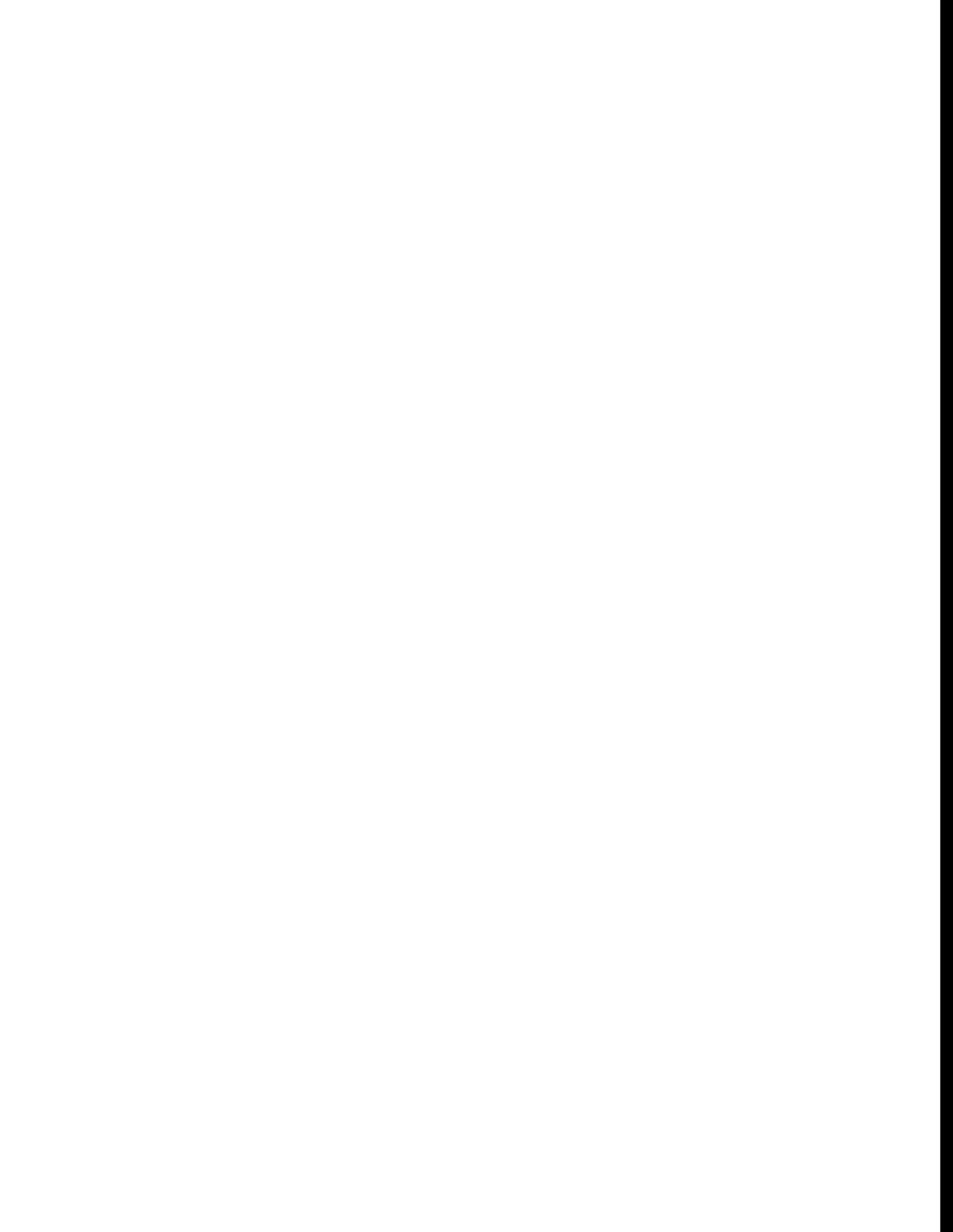




**New Frontiers of Technology Commercialization:
Principles and Practice of Commercializing Technology Through Small Businesses**

**March 7 & 8, 1994
Sweeney Convention Center - Santa Fe, NM**

Speaker Biographies



Joseph C. Aragona

Joseph C. Aragona, General Partner of Austin Ventures, joined the firm in 1982 and has 12 years of venture experience.

Mr. Aragona is currently a director of several portfolio companies, including Technology Works and Network Computing, Inc. He has investment experience in local area networks, data communications, telecommunications, software, semiconductor equipment, basic manufacturing and computer peripherals.

Mr. Aragona joined Austin Ventures from the Merchant Banking Division of the Bank of Boston, where he was involved in debt and venture capital financings. Prior to joining the Bank of Boston, he was a corporate lending officer with Chemical Bank in New York, providing credit and financial advisory services to privately held, middle-market companies.

Mr. Aragona received his Bachelor of Arts degree cum laude from Harvard College and his MBA from Harvard Business School.

Ralph J. Bachenheimer

Mr. Bachenheimer, Managing Director, S.N. Phelps & Co., has over thirty years experience in general, operational and financial management, acquisitions, divestitures, turnarounds and re-deployment of assets.

Prior to joining the firm, Mr. Bachenheimer was Managing Director and Partner of E.S. Jacobs & Company where he completed a number of successful leveraged buyouts and managed a number of ESJ-controlled companies. Among his previous positions, Mr. Bachenheimer served as Executive Vice President and Director, Corland Corporation, the holding company for Clint Murchison, Jr. Investments; Corporate Vice President, Genesco, Inc.; Vice President - Europe, International Standard Brands, Inc.; President and CEO, Indian Head Yarn Company; and Marketing Vice President, Iselin-Jefferson Company.

Mr. Bachenheimer also serves as a Director of various corporations.

He attended the University of Switzerland and Columbia University.

F. GREGG BEMIS, JR.

Since 1980, Mr. Bemis has been President of CFC International, a private investment banking and consulting firm which he founded in Santa Fe in 1980. CFC concentrates on assisting smaller, growing companies in obtaining financing and in developing and implementing plans designed to achieve continued long term growth. CFC specializes in acquisitions and has served a selection of both foreign and U.S.-headquartered clients in the purchase or sale of a variety of businesses. During these eight years, Mr. Bemis has also been an active investor in small, emerging growth businesses in the Southwest and has developed extensive contacts in the New Mexico business community. He currently serves as Chairman of the Ocean Corp. (underwater salvage and construction) and NMR Hemotest, Inc. (advanced clinical blood analysis system) and as President of Eyemetrics Inc. (digitally fitted, modular eyeware).

From 1974 to 1979, Mr. Bemis was corporate Vice President, Business Development of Combustion Engineering, Inc., responsible for all acquisition, merger, joint venture and divestment activities for this major energy systems company. During this period, he successfully completed nine transactions which added more than \$350 million in gross sales. In addition, he organized and supervised two technology-based outside investments.

In 1970, Mr. Bemis joined Riegel Paper Company as a corporate Vice President and General Manager of that company's Packaging Division. In early 1972, he participated in the spin-off of the Packaging and the Industrial Divisions of Riegel to form Rexham Corporation. From 1972 to 1973, he was President and Chief Operating Officer of Rexham where he solidified the management team and completed two additional acquisitions.

Prior to joining Riegel Paper, Mr. Bemis was President and owner of Oceonics, Inc., a personal venture capital firm in Boston, where he participated in helping to finance and manage five start-up and early stage businesses and served as a Director of Marine Digital Systems, President of Kinvarra Shipping Ltd. and Treasurer of the Boston Waterfront Development Corporation.

From 1954 to 1968, Mr. Bemis was with the Bemis Company, Inc., a diversified industrial company engaged mainly in packaging and related products, where he was directly involved with the establishment and implementation of growth programs which raised annual sales from \$125 million to over \$300 million. While at Bemis Company, he held a series of operating management responsibilities and completed 14 acquisitions. From 1962 to 1968, he was a corporate Vice President and director of the Machinery and Chemical Group which was built from acquisitions and the internal growth of the companies acquired and grew to over \$100 million in annual sales. During this period, Mr. Bemis also established the Company's European operations which covered seven countries, growing to \$17 million in sales by 1968.

WILMER R. BOTTOMS, Ph.D

Wilmer Bottoms is a General Partner and Senior Vice President of Patricof & Co. Ventures, Inc. Dr. Bottoms received a B.S. degree in Physics from Huntington College in Montgomery, Alabama, in 1965, and a Ph.D in Solid State Physics from Tulane in 1969.

In 1969, Dr. Bottoms began his career at Esso Research & Engineering as a Research Physicist. After six months, he accepted an appointment to the Electrical Engineering faculty at Princeton University, where he remained until 1976.

In 1976, Dr. Bottoms joined Varian Associates as Manager of Research and Development. After 18 months, he was promoted to General Manager of Varian's Extrinsic Division, which eventually grew into one of their four operating groups. In 1981, Dr. Bottoms was named the first President of the Semiconductor Equipment Group and Vice President of the Company.

At Varian, Dr. Bottoms managed the group's 2,600 employees in manufacturing, engineering, marketing, sales, finance and administration. Between 1982 and 1984, sales grew from \$100 million to \$250 million. Dr. Bottoms was also Chairman of the Board of a \$50 million Japanese subsidiary of Varian with 72 employees. He became Vice President of Corporate Development at Varian just prior to joint Patricof & Co. in 1984.

Dr. Bottoms has been appointed to a number of government committees and was Chairman of the Technical Advisory Committee to the U.S. Export Control Commission for Semiconductor Equipment and Materials. He currently serves as Chairman of the National Research Council Board on Assessment of NIST Programs.

Dr. Bottoms serves on the Boards of Directors of, Bolder Battery, Credence Systems Corporation Inc., Tessera Corporation, Microelectronic Packaging, and Protection One.

Jerome (Jerry) J. Brown

Jerry Brown entered the search business in 1988 after a very successful twenty year career at IBM and Texas Instruments where he attained Director/Vice President level positions. Jerry graduated from Brooklyn Polytechnic Institute in 1966 with a Bachelor's degree in systems engineering. Upon graduation, he joined IBM where he held various positions in engineering, Manufacturing and marketing. In his last position at IBM's Information Systems Group, he managed a group which successfully developed an interactive video-based product called Vision, which is now being marketed by IBM's Education Business Unit.

In 1983, Jerry was recruited by TI as Vice President of Sales and Marketing for their Data Systems Group where he was responsible for marketing TI's peripheral, computer, and software products, as well as managing their Government Business Units. TI had previously only hired two people at this level from outside the company in their fifty year history. At TI Jerry was responsible for providing a corporate systems integration strategy leveraging the strengths of the Semiconductor and Defense Electronics Groups. As part of this strategy, he formed a Knowledge Engineering consulting group which solved complex engineering problems utilizing tools such as LISP. This group was formed as a vehicle with which to market TI's Artificial Intelligence product lines. This highly successful group installed United Airlines, Gate Control System, at O'Hare Airport as well as the Hydrostatic Cooker Control System at Campbell Soup Corp. which are successful examples of expert systems.

In 1988, Jerry became a Partner at Venture Resources, and, in 1992, formed Brown Venture Associates. Jerry has been responsible for the successful placement of more than 50 C.E.O., Vice Presidents, and Directors in technology companies throughout the United States.

Brown Venture Associates, Inc.

The Charter of Brown Venture Associates, Inc. (BVA) is to recruit top management for venture backed technology companies. Brown Venture Associates is owned and operated by Jerry Brown. Having held Director and Vice President positions at IBM and Texas Instruments, Jerry brings a wealth of high level management experience and an excellent reputation and network to BVA. BVA is uniquely positioned to place the best quality people in dynamic growth companies.

BRIEF BIOGRAPHICAL SKETCH FOR CARL D. CARMAN

Carl D. Carman, Partner, founded The Masters Fund in October 1983. The Masters Fund is a \$12 million venture capital firm specializing in "seed" and first round investment opportunities in the computer services, hardware and software industries.

Prior to founding The Masters Fund, Carl participated in the funding of several other high technology companies including CXC Corporation in California, Alliant Computer Corporation in Massachusetts, Cadnetix Corporation and Graftek, Inc. both in Colorado.

Previously, Carl had extensive operational experience with venture-backed companies. In 1979, he joined NBI as Vice President of Research and Development and was responsible for all hardware and software development. In his last position at NBI, Carl was Executive Vice President and President of NBI International.

From 1973 to 1979 Carl was the Vice President of Engineering for Data General Corporation. Carl directed the development of a wide variety of products for the computer industry, including software, computer systems, printers, CRT terminals, disk drives, tape drives and micro-processors. Over 100 products were developed and introduced during this period. During Carl's tenure as Vice President of Research and Development, Data General's revenues grew from \$13 million to \$600 million annually.

From 1960 to 1972 Carl held various engineering and management positions at Inforex, Inc. and IBM.

Carl is a 1960 graduate from the University of Kentucky with a B.S. in Engineering.

H. Berry Cash
InterWest Partners

H. Berry Cash began his professional career at Texas Instruments in 1964, after completing three years in the Air Force, a B.S. in Electrical Engineering from Texas A&M University, and an MBA from Western Michigan University. In 1969, he co-founded Mostek Corporation where he was Vice President of Marketing until 1981. He began his own venture capital partnership in 1983, and then joined InterWest Partners, of Menlo Park, California, in 1986. Mr. Cash is Chairman of the Board of Cyrix Corporation and serves on the boards of ProNet, Inc., Cirrus Logic, Aurora and Convex Computer. He is also an advisor to Austin Ventures.

JOHN HAVEN CHAPMAN

Dr. Chapman has over 20 years experience in the computer and telecommunications industries. His industry experience has included executive positions at Xerox Corporation and Gartner Group. His responsibilities at Xerox included Office-of-the-Future programs, such as the Ethernet local area network.

Since 1985 Dr. Chapman has been President, Strategic Financing Corporation and Strategic Research Inc. He is involved in the development and financing of corporate enterprises. As an active member of Wall Street's Communications Technology Analysts Association, he regularly meets with executives worldwide to discuss corporate strategic objectives. Strategic Financing Corporation and Strategic Research Inc. are an outgrowth of his have successfully developed the telecommunications strategic planning service for Gartner Group and directed PaineWebber's telecommunications research. Strategic Financing Corporation and Strategic Research Inc. provide assistance in critical areas, such as market development, government policy and planning, and financing private and public enterprises.

Since 1983 he has been associated with the Center for Telecommunications and Information Studies at Columbia University, first as Executive Director and presently as a Research Fellow. This Center was established at Columbia University's Graduate School of Business to encourage independent research on economics and policy issues in telecommunications and information. It provides an international meeting ground for academic researchers, government policy makers, and private and non-profit sector experts.

Other positions held by Dr. Chapman in past years include: Director of Telecommunications Research, PaineWebber Inc.; Vice President, Gartner Group, Inc.; Vice President, Computer & Communications Industry Association; Member, Computer & Communications Task Force, U.S. Department of Justice; and Founder and Chairman, InfoTran Corporation, a firm engaged in the design of innovative systems and network architectures to support telecommunications requirements of users, institutions, municipalities, and government agencies.

Dr. Chapman has been a featured speaker at industry conferences on post-divestiture telecommunications alternatives, the long distance market, bypass technologies, information networks, and data security and privacy.

He earned B.S. Engineering and B.A. English degrees from Brown University; a J.D. Law from Boston University; an MBA, Management and Finance from University of Southern California; and M.Phil. and Ph.D. Business Economics and Public Policy degrees from Columbia University.

Harvey R. Corn
Harvey Corn and Company

Harvey R. Corn is a Certified Public Accountant with more than 20 years of experience with both large accounting firms such as Peat, Marwick, Mitchell & Co. and Coopers & Lybrand, and as the principal of his own firm, Harvey Corn and Company. He has specialized in all aspects of public accounting, including valuation of technology and service companies, and the preparation of projected financial information for private placement securities offerings in high technology.

Harvey has extensive continuing professional education hours in areas such as securities law, bankruptcy law negotiations methodology and other legal and management areas. His teaching experience includes numerous courses in taxation and federal bankruptcy law, and most recently, a presentation on valuation of minority interests in closely held businesses at the University of Texas at Austin School of Law Conference on Valuation of Assets in Bankruptcy.

He graduated from the University of Texas at Austin in 1970. He is a member of the American Institute of Certified Public Accountants, Texas Society of Certified Public Accountants, and the Austin Chapter of the Texas Society of Certified Public Accountants.

O'SULLIVAN GRAEV & KARABELL

Christopher Lane Davis

Christopher Davis is a partner in the law firm of O'Sullivan Graev & Karabell, in New York City. He specializes in corporate finance, focusing on matters relating to venture capital, partnership law, private equity investments, and technology transfer issues. In addition, he has been actively involved with the small business investment company program of the Small Business Administration.

Prior to becoming a partner at O'Sullivan Graev & Karabell, Mr. Davis was a Resident Counsel at The Ford Foundation, and began his legal career as an associate at Cravath, Swaine & Moore.

Mr. Davis was raised in Iowa City, Iowa, and attended college (B.A. 1970) and law school (J.D. 1973) at Yale University. He lives with his wife and son in Jersey City, New Jersey.

John R. Grizz Deal
Director
New Mexico Technology Consortium

John R. Grizz Deal is the President of Paradigm Concepts, Inc. and Director of the New Mexico Technology Consortium (NMTC). Paradigm Concepts, and its consumer products division lizardTech, hold several industrial technology licenses, including one from Los Alamos National Laboratory. Their consumer image compression products, Fast Eddie and Planet Color, are making huge waves in the multimedia development community. NMTC is a private, non-profit organization dedicated to information sharing and advocacy for New Mexico's technology-based small businesses.

Grizz holds graduate and undergraduate science degrees from Texas A&M University and has been an active and successful entrepreneur for the last 18 years. He is currently working on a novel about intrigue on the "information highway," set in Northern New Mexico.

David L. Durgin

Mr. Durgin is a seasoned entrepreneur and technology business executive with a 30 year track record of professional leadership, business development and management in both professional services and manufacturing companies. He has served in capacities from engineer to Chief Executive Officer in organizations ranging from a prestigious national laboratory to one of the world's most respected international consulting firms. Durgin is an electrical engineer by training with degrees from Capital College and New Mexico State University.

Mr. Durgin is a co-founder, Vice President and Director of Quatro Corporation. Quatro is a technology commercialization company that was formed in 1989 to acquire, productize, manufacture and market high technology concepts developed at New Mexico's national laboratories. At Quatro, Durgin is responsible for identifying and incubating technologies that have the potential to lead to major new business areas for the company. His activities have included the formation and management of an electronics manufacturing subsidiary, Cable Technology Corporation, which was subsequently merged with Quatro, and the leadership of an environmentally conscious factory design project that led to the formation of Ecocircuit Inc. Ecocircuit Inc. is a subsidiary of Quatro that was formed to construct, validate and proliferate Quatro's proprietary environmentally conscious factory design.

Prior to forming Quatro Corporation, Durgin was a Senior Partner with Booz Allen and Hamilton Inc. where he was the Managing Partner of the Defense and Energy Systems Division. During his eleven years at Booz Allen, he was one of the firm's leaders in expanding their technology consulting business and he developed a \$20M Division from scratch by acquiring major R&D and engineering contracts from the Department of Defense, NASA and several major aerospace companies. Durgin was a member of Booz Allen's Operating Council and served as a senior advisor to several DOD organizations. He retired from Booz Allen in 1990 to focus on developing Quatro Corporation.

Prior to becoming a partner at Booz Allen, Durgin was a Vice President with BDM Corporation, where he held various positions as one of that firm's leaders of its defense business expansion in Albuquerque, New Mexico. At BDM he was responsible for diverse defense system engineering and analysis programs, the management of a technical staff of 215 people and the expansion and management of the corporate R&D laboratory.

Earlier in his career, Durgin was a technical staff member at Sandia National Laboratories and the founder and head of two small electronic product design and manufacturing companies.

Mr. Durgin is a well known and respected business leader in New Mexico. He is recognized as an expert on technology-based economic development and has served in an advisory capacity to New Mexico's Governor and U.S. Senators on this subject. He was the founding CEO of New Mexico Industry Network Corporation and is the Chairman and President of the New Mexico Industry Development Corporation. Both these organizations are private sector-led, non-profit economic development companies. Durgin has been recognized as a Centennial Outstanding Alumni of New Mexico State University and serves as an advisor to the Dean of the College of Engineering. He is a Magna Cum Laude engineering graduate of NMSU and a member of numerous honor societies.

WILLIAM C. ENLOE

Bill Enloe is President and CEO of Los Alamos National Bank, as well as President and CEO of Trinity Capital Corporation. He has been very active in technology transfer and new start-up companies in Northern New Mexico, having participated in financing and obtaining venture capital funds for a number of companies. He has also consulted with many of these companies in the areas of business plans, management and market analysis. These companies include Amtech, Optomec, ICAMP, Los Alamos Diagnostics, Inc., Pulse Systems and Los Alamos Technical Associates, Inc.

Mr. Enloe currently serves on the Board of Directors of New Mexico, Inc., Quality New Mexico, Inc., Los Alamos Technical Associates, Inc., Los Alamos Community Development Committee, and the New Mexico Bankers Association, of which he is the immediate Past President. He is a member of the American Bankers Association Communications Council (and a past Board Member), the Governor's Technology Excellence Committee, the Governor's Business Advisory Council, and the County Council Advisory Committee. In addition, he is an advisory Board Member of the University of New Mexico, Los Alamos Branch, and the treasurer of the New Mexico Sailing Club.

In the past he has been active as a Board Member of the YMCA, Los Alamos Medical Center; Los Alamos Visiting Nurses; New Mexico First-New Mexico Town Halls; Los Alamos United Way; and Los Alamos Chamber of Commerce, of which he is a Past President. He was a member of the Committee Establishing Los Alamos Branch College; the American Bankers Association Products and Services Committee; Los Alamos Economic Development Committee to Establish Data Base for Los Alamos County; Los Alamos Hospital Long Range Planning committee; Los Alamos Committee to Establish Retirement Housing; Los Alamos Schools Committee Against Drug Abuse; and Rotary International. He has also served as the Los Alamos Chairman, Presidents Red Ribbon committee Against Drug Abuse, and is a Past President and Organizing Member of Los Alamos Economic Development Corp.

Mr. Enloe has been the recipient of numerous honors and awards, including the 1992 State, Regional and National Recipient SBA Financial Advocate of the Year; 1990 New Mexico Distinguished Public Service Award; 1989 Los Alamos Chamber of Commerce Citizen of the Year; 1987 Los Alamos Realtors Citizen of the Year; and the 1985 Los Alamos Chamber of Commerce Member of the Year.

Mr. Enloe received a B.S. degree in Economics from Eastern New Mexico University, and attended the Graduate School of Banking of the University of Colorado.

William E. (Bill) Garcia

Bill Garcia holds the position of Cabinet Secretary, N.M. Department of Economic Development, which he assumed in 1991. Prior to that, he served as President of the Association of Commerce and Industry (a business advocacy group); as Director-Public Affairs, Executive Department, US West, New Mexico; and as a district manager within US West. He also complete a tour of duty with the U.S. Army.

Bill has participated as a member or an officer of many organizations, including the Society of Association Executives; the Private Industry Council (where he served as Chairman from 1986-1990); the New Mexico Highlands University Alumni Association and University Foundation; and the Governor's Distinguished Public Services Awards Council. He is a Board member of New Mexico Technet, RioTech, and United Way of Santa Fe County.

Bill received a B.A. degree from New Mexico Highlands and an MBA from Arizona State University.

Jim Greenwood

Jim Greenwood has been Executive Director of the Los Alamos Economic Development Corporation (LAEDC) for the past 10 years. He also is Manager of the Los Alamos Small Business Center, which was the first business incubator developed in New Mexico and one of the first in the southwestern United States.

Mr. Greenwood is owner of a small consulting and business services firm, and has been an adjunct instructor at the University of New Mexico, where he taught computer science, marketing, and urban planning. He has served on the Region VI advisory board to the Small Business Administration, and is on the board of directors of the New Mexico Industrial Development Executives Association and the National Business Incubation Association. He is co-director of the Small Business Development Center at the University of New Mexico - Los Alamos Campus. He was the first alternate from New Mexico to the 1986 White House Conference on Small Business.

He holds a Masters Degree in City and Regional Planning from Harvard University and a Bachelor of Arts degree in economics from Pomona College. He is a native New Mexican, and is serving his second term on the Los Alamos County Council.

**James D. Keeler
Chief Technical Officer
Pavilion Technologies, Inc.**

James Keeler is a co-founder of Pavilion Technologies, responsible for the company's technical vision and for development and implementation of new technologies.

Dr. Keeler was most recently Senior Member of the Technical Staff in MCC's Neural Network Project. In that position, he had leadership responsibility for the development of the underlying technology and software licensed by MCC to Pavilion. He came to MCC in 1988, and developed and implemented the neural network control architectures successfully applied to process control problems at Eastman Chemical. He is jointly responsible for a patent on an innovative neural network algorithm for process prediction and control developed in conjunction with Dr. Hartman at MCC, and has co-authored six patent applications since co-founding Pavilion.

Dr. Keeler received a Bachelor of Science in Physics and Mathematics from the University of California, Davis with Highest Honors and earned the Departmental Citation in Mathematics while there. He received his Master of Science and Ph.D. in Physics from the University of California at San Diego; his dissertation was on collective phenomena in neural networks. He was also a Post Doctoral Fellow at Stanford University and a Consultant at NASA Ames.

He serves as a member of Pavilion's Board of Directors, and as Chairman of the company's Technical Advisory Board.

Laura J. Kilcrease

Ms. Kilcrease has more than 16 years experience in many aspects of high technology business, including hardware, software, and technology services. She was educated in the United Kingdom as a Chartered Management Accountant and earned her MBA at The University of Texas at Austin.

Her career includes tenure as a key member of Control Data Corporation's financial team. Her extensive international experience encompasses activities in Europe, the Pacific Rim and the United States. She has used her organizational and management skills in handling the acquisition, merger, and sale of major business units within large Fortune 100 companies and has also applied her talents in small start-up technology companies.

She currently serves as the director of Commercialization and Enterprise activities for the IC² Institute at The University of Texas at Austin. These activities include the Austin Software Council, the UT Austin Entrepreneurs' Council, the Texas Capital Network, the Austin Technology Incubator (ATI) and two NASA technology commercialization centers, one at the Ames Research Center in California and the other at the Johnson Space Center in Houston, Texas. She has provided the leadership for ATI, this innovative technology commercialization venture, since its inception in 1989.

With Kilcrease at the helm, ATI has nurtured more than 38 fledging companies, created more than 550 jobs, and brought in excess of \$60 million to the Austin community during its first four years of operation.

Kilcrease, who serves as a member of the Board of Directors of the National Business Incubation Association and is a founding member of the Texas Business Incubator Association, was the recipient of the *Inc. Magazine* 1991 Austin Entrepreneur of the Year and was honored in 1992 for outstanding leadership and achievement in entrepreneurship by the University YWCA in Austin.

Fall, 1993

Brian G. Kushner

Brian Kushner, Ph.D. serves as Vice President and Executive Director, Information Systems Division for MCC, and VP and Operating Officer for MCC VENTURES, Inc. In his position at MCC. Dr. Kushner is responsible for developing new business areas and products for the advanced technology consortium and all operations (programs, finances, planning, marketing and personnel) for the software and Ventures segments of MCC. Since joining MCC in 1992, he has been active in the creation of several small businesses spin-off and spin-ins.

Dr. Kushner's technical background is in advanced computing systems research and development, with specializations in information systems development, electronics, and opto-electronics. He received his B.S., M.S., and Ph.D. in Applied Physics (minor concentration in Electrical Engineering), all from Cornell University.

Prior to MCC, Dr. Kushner was with BDM International, Inc., a \$400 M Professional technical services firm. where he served as Vice President, Advanced Technology. In that capacity, he was responsible for BDM's contract sponsored research and development, including all advanced software and computing systems, materials process control, and sensors and optics R&D. Dr. Kushner also worked with several small businesses, assisting them in fundraising, securing government contracts and developing and executing business plans. He joined BDM in 1982 as a staff member.

Dr. Peter B. Lyons

Pete Lyons is currently the Director for Industrial Partnerships at the Los Alamos National Laboratory, appointed to that position in October 1993. In this position, he is responsible for all industrial interactions and industrial partnership activities conducted by the Laboratory. The Industrial Partnership Office is responsible for all industrial agreements and for Laboratory interactions with the Department of Commerce.

In 25 years at the Laboratory, Lyons has held a number of positions. In his previous assignment, he was Deputy Associate Director for Energy and Environment which included oversight of four technical divisions (Space Science and Technology, Earth and Environmental Sciences, Nuclear Technology and Engineering, Mechanical and Electrical Engineering), the Institute for Geophysics and Planetary Physics and all energy, environment, and technology transfer programs.

Since joining the Laboratory in 1969, Dr. Lyons has held a number of research and management positions including Group Leader for Fast Transient Plasma Diagnostics, Program Director for Nuclear Defense Research, and Deputy Associate Director for Defense Research and Applications. His research interests have focused on diagnostics of nuclear tests, inertial confinement fusion, and other high density plasmas. He has published widely on x-ray calibration systems and detection systems, development of high speed measurement and data transmission systems, and development of fiber optic systems and technologies. He has published well over 100 papers, holds three patents, and has chaired many national and international conferences. He has also served as chairman of the NATO Nuclear Efforts Task Group.

Prior to coming to Los Alamos he spent five years at the California Institute of Technology, he received his Bachelors in Physics/Math from the University of Arizona in 1964, and his Ph.D. in Nuclear Physics from the California Institute of Technology in 1969.

Lyons has been very active in community activities, including elected service for sixteen years on the Los Alamos School Board and six years on the University of New Mexico-Los Alamos Branch Advisory Board.



Biography on Ronald K. Lohrding, PhD

Ronald K. Lohrding, Ph.D., 52, has been President and Chief Executive Officer of Cell Robotics, Inc. for five years. He has previously had twenty years of accomplishments at the Los Alamos National Laboratory (LANL) as a Senior R&D manager. He was LANL's Assistant Director for Industrial and International Initiatives with the responsibility for technology transfer from LANL to the private sector. In addition, he has achieved the following:

- Served as technical advisor to the Western Governors on economic development;
- Led a US effort in the use of technology to support economic development in Central America and the Caribbean, and led a US delegation to examine the feasibility of a similar program for the independent island countries of the South Pacific;
- Assisted in the successful negotiations of joint international R&D agreements on "Hot Dry Rock Geothermal Energy" with NEDO and MITI of the Japanese Government;
- Was appointed to the Governor's Science and Technology Advisory Committee for the State of New Mexico;
- Served as a Research Fellow on Energy Policy at the Multiple National East-West Center and was a Visiting Professor, teaching Operations Research, in the Business School at the University of Hawaii;
- Served as the Director of the LANL Office of Environmental Policy;
- Led a US Department of Energy effort in examining the energy and environmental policy for the Mountain States;
- Led the LANL Statistics Group, Economics Group and was Deputy Associate Director for Environment and Bioscience; and,
- Before resigning to found Cell Robotics, Inc., was Program Director for Energy, Environment, and Technology programs (the non-weapons programs at LANL).

Dr. Lohrding received his PhD in Mathematical Statistics and Operations Research from Kansas State University.

Sherman McCorkle

Sherman McCorkle is President and Chief Operating Officer of Technology Ventures Corporation (TVC), a firm founded by Martin Marietta Corporation. TVC was incorporated September 22, 1993.

Prior to joining Martin Marietta, Sherman was President and Chief Executive Officer of Sunwest Credit Service Corporation, of which he was also the founder.

Earlier in his career, he was Senior Vice President and Director of Electronic Banking for Albuquerque National Bank.

He is a founder and originating member of Plus System Incorporated, the world's largest ATM company.

He has represented before Congress the American Financial Systems Association, the American Bankers Association, the International Consumer Credit Association, and served on the select committee for the United States Uniform Commercial Code.

Sherman has been active in economic development efforts in New Mexico for over twenty years and has served on the board of over two dozen civic and economic development organizations, including an extended term as Chairman of the Board of the Greater Albuquerque Chamber of Commerce.

ROBIN RATHER
IntelliQuest, Inc.

Robin Rather, Director of Emerging Technology Research, is responsible for the identification of trends in new markets, conducting technology adoption research, and developing forecasts. In the consulting area, she works closely with clients to support strategic planning and product development activities.

Ms. Rather is a frequent public speaker, and widely published author on topics including wireless networks, multimedia, FDDI, voice recognition and data compression systems. She has been quoted in such publications as NetworkWorld, Information Week, ComputerWorld, the Washington Post and Communications Week.

Prior to joining IntelliQuest, Ms. Rather was a director at International Data Corporation's Washington office where she was in charge of the future technology program and directed the company's primary research studies and consulting projects. During her five years at IDC, she worked with major computer and communications vendors, CIOs of large organizations and leading publishers. Previously, she was a strategic planner at Comsat, a program manager at a large urban cable system and served as a business planning consultant to a number of communications companies.

Ms. Rather received her BA cum laude from Tufts University.

Richard J. Reisinger

Richard J. Reisinger is the Director of the Technical Assistance Office, University of New Mexico, Albuquerque, New Mexico. He has previously served as Vice President, Osherow Siegel Capital Corporation; principal of Reisinger Consulting in Beaverton, Oregon; and in various positions during 20 years with Tektronix, Inc.

He is particularly experienced in the strategic management of the electronics manufacturing industry, with a high degree of skill in designing and implementing strategic and financial planning processes, in formulating mission and objectives statements, and in the development of marketing and competitive strategies.

Mr. Reisinger received his B.A. degree from the University of Washington, and an M.B.A. from the University of Portland.

MERLIN D. SCHULZE

Merlin Schulze, after serving as a consultant to the firm, has recently joined MCC Ventures as Vice President. His consulting firm, MDS Associates, has provided management and financial advice to technology-driven start-ups, and entrepreneurial corporate development and strategic planning assistance to large corporations. He is a director of Alimansky Capital Group Inc. where he specializes in providing financial advisory services to established middle-market and emerging growth companies.

In recent years, he has completed assignments for several Fortune 100 companies, including Amoco, Xerox, and PaineWebber Development Corp. He has worked with more than 20 start-ups, supplying a combination of management assistance and financial advisory services, and continues to provide ongoing help to certain of these early-stage companies. From 1988 to 1989, Mr. Schulze was the managing general partner of Pecos Venture Partners, a newly-formed Santa Fe, New Mexico-based venture capital firm established to invest in early stage, technology-based companies located in New Mexico and throughout the southwestern U.S.

From 1984 to 1988, he was a managing director of PaineWebber Capital, Inc., the venture capital and merchant banking subsidiary of the PaineWebber Group. He participated in organizing and managing a \$26 million fund, PaineWebber Ventures V, investing in early stage, technology-driven companies. In 1985 he led the development of PaineWebber's initial \$70 million R&D partnership fund which provided product development financing to both later stage private companies and larger public corporations, and concurrently served as vice president and director of PaineWebber Development Corp. In 1987, he assumed responsibility for an existing portfolio of 12 venture-type investments made by another PaineWebber unit, and participated in disposing of five of these investments for a new gain of \$10.4 million on \$10.3 million of invested capital. He also led the restructuring and re capitalization of a sixth company.

From 1964 to 1984, Mr. Schulze was with Xerox Corp., where he held a series of positions in the Business Products and Systems Division. As manager, corporate development, he led the acquisition of Diablo Systems, a venture start-up and developer of the first daisy-wheel printer. In 1976 he became one of six founders and a principal of Xerox Development Corp, (XDC), a wholly-owned subsidiary which organized and operated successful venture investment, new venture start-up and corporate development programs for Xerox. In 1981 Mr. Schulze led the formation of and then managed a corporate development department which carried on the venture capital investment activity and, on a reduced scale, continued to manage acquisitions, divestitures and joint ventures for Xerox. Over an eight year period, Mr. Schulze participated in or directed a venture portfolio of 25 investments, which by April, 1983, had provided a new realized gain of approximately \$40 million, with a residual portfolio valued at \$15 million, on a net capital investment of \$8.5 million, with only two realized losses. In addition, he participated in seven acquisitions, two divestitures, and two internal new business start-ups.

Before joining Xerox, Mr. Schulze was a consultant with Booz, Allen and Hamilton, Inc.. He holds an A.B. from Willamette University, and an M.B.A. with distinction, from Northwestern University, where he was a Himmelblau scholar.

GARY L. SEAWRIGHT, DVM, Ph.D.

BIOGRAPHY

Dr. Gary L. Seawright was the founding President and CEO of Amtech Corporation, which develops, manufactures and markets radio-frequency identification products for the transportation industries. Now a public company, Amtech employs over 400 people and has a market valuation of nearly \$500 million.

Dr. Seawright participated in the radio-frequency identification development project at the Los Alamos National Laboratory and led five key members of the research team in transferring the technology out of the Laboratory and into the private sector. During Amtech's formative years Dr. Seawright led the strategic planning and market development efforts that form the basis for Amtech's main line of business in the rail, intermodal, trucking, and toll-road industries.

During his professional career, Dr. Seawright has served as a Captain the U.S. Air Force, University Professor, Veterinary Medical Officer in the U.S. Department of Agriculture, and as a researcher, Project Leader and Program Manager at Los Alamos. He has conducted research and published papers in the fields of virology, microbial and diagnostic immunology, radio-telemetry, and biomedical and industrial applications of radio-frequency identification technology.

Dr. Seawright holds a Doctorate in Veterinary Medicine from Washington State University and a Ph.D. Degree in Virology from the University of Wisconsin.

Joseph D. Sims

Joe Sims is Vice President, of the Microelectronics and Computer Technology Corporation, a cooperative R&D enterprise serving the information technology industry. As Vice President of Marketing and Business Development for MCC's Information Systems Division (ISD), Mr. Sims is responsible for strategic marketing and sales of consortium projects, consulting services, and single client contracts. Mr. Sims also works closely with MCC's recently announced subsidiary, MCC Ventures Inc.

Prior to joining MCC, Mr. Sims was the Managing Partner in a successful marketing and management consulting firm, providing strategic planning and management services to high growth information technology companies. Mr. Sims has provided professional counsel and hands-on management expertise to corporations such as Advanced Micro Devices, Hughes, EDS, the University of Texas, and many start-up organizations.

Prior to founding JDS&A Consultants, Mr. Sims served as Vice President of Marketing for Nova Graphics International, an international developer of graphics software and interfaces. Mr. Sims was responsible for marketing and sales, as well as important strategic relationships including international marketing efforts with European, Australian, and Asian operations.

Mr. Sims previously served in several marketing and sales positions with information technology corporations including Petrocomp Systems, Inc. ("America's 155th Fastest Growing Private Company," Inc. Magazine 1985) and the Allied Texas Group. Mr. Sims began his career with the Xerox Corporation and attended Baylor University, receiving a Bachelors of Business Administration with concentrations in marketing and management.

Biographical Data

JOHN F. SHOCH

John F. Shoch received a B.A. degree in Political Science, and M.S. and Ph.D. degrees in Computer Science, from Stanford University.

He joined the Research Staff at the Xerox Palo Alto Research Center in 1971. Research interests included programming languages, local computer networks (such as the Ethernet), internetwork protocols, packet radio, "worm" programs, and other aspects of distributed systems. In addition, he has taught at Stanford University, and is a member of the ACM and the IEEE.

From 1980 to 1982 he served as Assistant to the President of the Xerox Corporation and Director of the Corporate Policy Committee.

From 1982 to 1985 he served as President of the Office Systems Division of Xerox.

In 1985 he became a General Partner at Asset Management Company, a venture capital firm located in Palo Alto. In 1987 he served as founding President of Conductus, Inc., a start-up company developing superconducting electronics. He now serves as Chairman or Director of a number of small high-technology firms.

JOHN F. STOCKTON

John Stockton is the President of Tamarack Storage Devices, Inc. a start-up company that is creating holographic data storage products. He holds a B.S. degree in Engineering Science with honors (1976) from the University of Texas at Austin.

His career, prior to starting Tamarack, has included a variety of technical and management positions at Applied Research Laboratories (ARL:UT), Motorola Inc., VLSI Technology, Inc. and MCC. At ARL:UT, he was a design engineer working on switch-mode power supplies and sonar test sets. At Motorola he was responsible for the Technical Marketing for the M68000 microprocessor family and later the M6805 family of single chip microcomputers. He later joined VLSI Technology to co-found the Logic Products Division, which became the PC Products division. At VLSI he directed the strategic marketing and technical development efforts for the creation of a family of PC/AT compatible chip sets. These chip sets were the basis for products offered by IBM, Dell, Tandy and several other major PC suppliers. This chip set business grew to over \$200M per year in revenue. Later at VLSI as a VLSI-Fellow, he was responsible for the ARM processor relationship between Apple Computer, VLSI Technology and Acorn/Olivetti U.K.. This effort resulted in the creation and venture funding of ARM Ltd., a U.K.-based design company focusing on the design of very low power consumption, high performance microprocessors. This ARM processor is the basis of Apple's Newton family of personal digital assistants recently announced in several computer trade journals.

At MCC John was the Technical Director of the High Value Electronics Division, responsible for new business initiatives. His short tenure in that position resulted in the creation of Tamarack Storage Devices, a spin-off company created using MCC talent and technology.

Erich Strebe

Erich Strebe works for the New Mexico Small Business Development Centers, where he coordinates STARS, the State Technology Assistance Resource System. STARS, which is primarily funded by the state's Economic Development Department, provides New Mexico businesses with access to business, technology and manufacturing information and assistance from a wide network of state and national organizations.

Mr. Strebe's background includes owning and managing a cable television construction company in the Chicago area. He spent four years as general manager of a high-tech company specializing in the automation of remote oil and gas fields. Before accepting his current position, he worked as a consultant in strategic and expansion planning for small and mid-size businesses. He also serves as president of the Board of director for La Montañita, one of the ten largest food cooperatives in the US.

Mr. Strebe holds an MBA degree from the University of New Mexico's Anderson School, and an undergraduate degree in general sciences from the New Mexico Institute of Mining and Technology.

Dr. Thomas A. Tumolillo

Dr. Thomas A. Tumolillo has recently been selected by the Board of Directors of New Mexico Industry Network Corporation (New Mexico INC) to be the organization's new interim President and Chief Executive Officer. Dr. Tumolillo brings nearly 30 years of high tech business experience to the position including hands-on experience in research and development, business development, financial and operational management.

Previously, Dr. Tumolillo was affiliated with an Albuquerque-based technology commercialization firm, Quatro Corporation, as an executive and a member of that firm's Board of Directors. He has taken a leave of absence from Quatro to become a full-time employee of New Mexico INC.

Prior to joining Quatro, Dr. Tumolillo was a Vice President with Kaman Sciences Corporation, a technology consulting company located in Colorado Springs, Colorado. At Kaman Sciences, he was responsible for strategic planning and business development including the management of the firm's marketing and proposal resources. Earlier in his career at Kaman Sciences, Dr. Tumolillo served as the company's Director of Science and Technology and was responsible for the management of 250 scientists and engineers.

Prior to joining Kaman, he was a Senior Scientist with several organizations and was an Assistant Professor of Physics with Kansas State University. Dr. Tumolillo is widely published, active in numerous professional organizations, and has a Ph.D. in physics from the University of Illinois.

**Charles L. Wellborn
Modrall, Sperling, Roehl, Harris & Sisk, P.A.**

Chuck Wellborn is a member of the firm of Modrall, Sperling, Roehl, Harris & Sisk, P.A. He is a corporate lawyer primarily representing technology-based companies.

He is a graduate of UNM and the UNM Law School and also has a Master of Laws degree in Corporation Law from NYU.

He is a past president of the Albuquerque Bar Association and the State Bar of New Mexico and has served on many boards and commission.

Currently, among other things, he is Vice-Chair of the Economic Forum in Albuquerque (composed of the leaders of the area's largest business, educational and governmental organizations), a member of the State Investment Council's Venture Capital Advisory Committee and a member of the task force which recently created the National center for Genome Resources in Santa Fe.





**Appendix H. ARCH: The Argonne National Laboratory/The
University of Chicago Development Corporation**

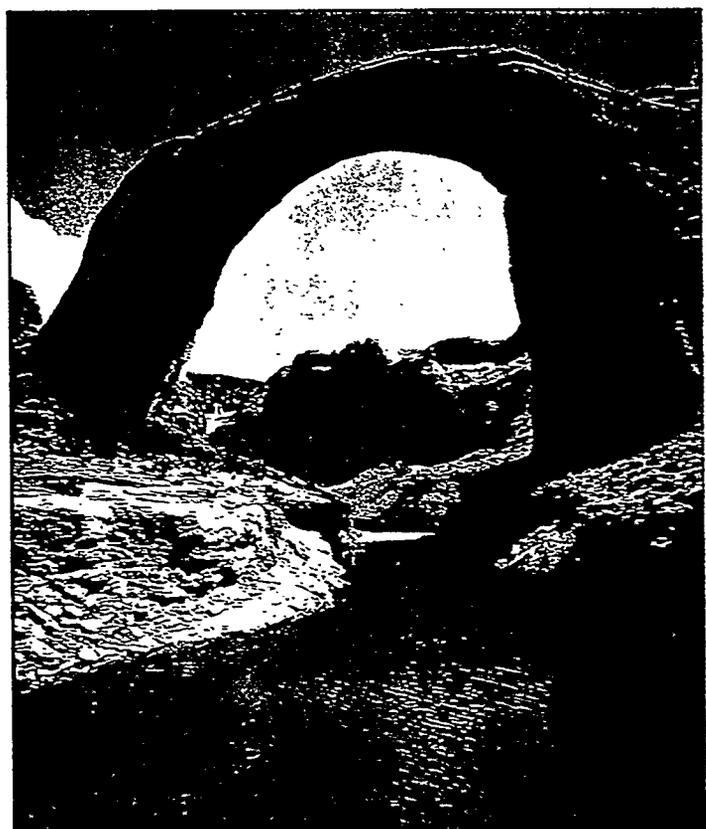




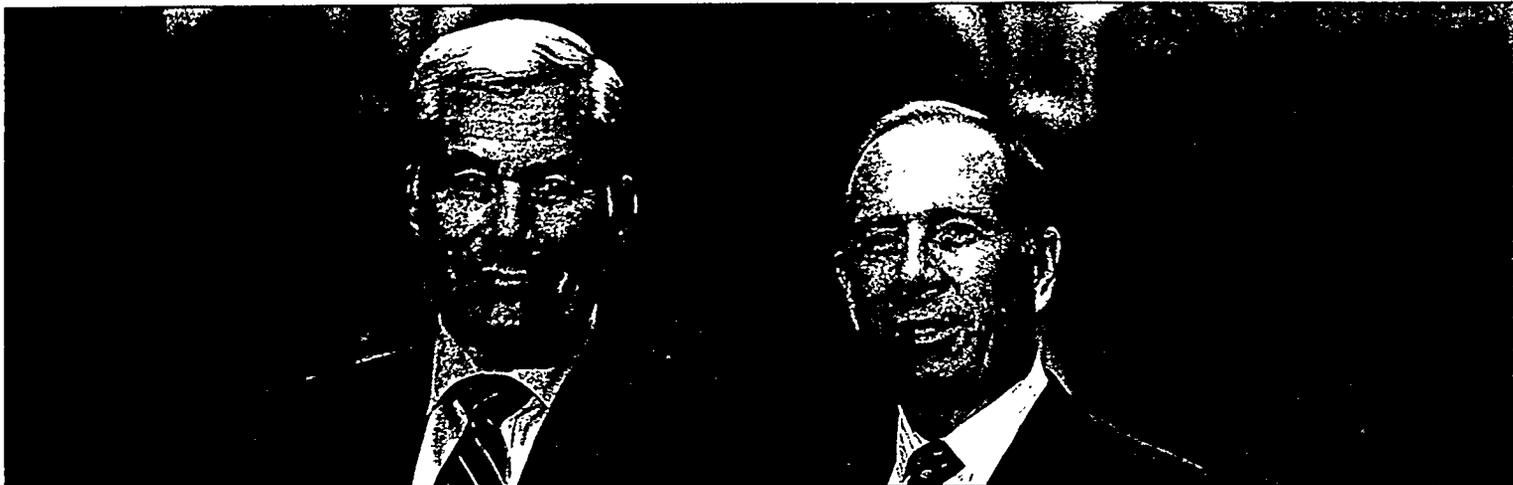
BRIDGING SCIENCE AND INDUSTRY



ARCH Development Corporation bridges the gulf that traditionally has existed between the worlds of science and industry. The ARCH staff works diligently to uncover new scientific ideas and inventions generated at Argonne National Laboratory and The University of Chicago — ideas which might otherwise remain buried in scientific papers or project reports. ARCH next invests to describe and clarify promising inventions, assess their market potential, and explore commercialization pathways. If an invention shows market potential, ARCH then proceeds to full-scale commercialization.



AN OVERVIEW



Steven Lazarus has been ARCH's CEO and President since 1986. He is a former Group Vice President with Baxter International and a former Deputy Assistant Secretary of Commerce for East-West Trade. He is a graduate of Dartmouth College and the Harvard Graduate School of Business Administration.

Four years old in October 1990, the Argonne National Laboratory/The University of Chicago (ARCH) Development Corporation was conceived as a unique mechanism to commercialize inventions arising from publicly funded research performed at the two institutions.

A not-for-profit affiliate corporation of The University of Chicago, ARCH is governed by a board of directors composed of nationally prominent business and academic leaders drawn from University officials and trustees and Argonne governors.

ARCH's primary mission is to bring the innovations of science and technology into the economic mainstream. ARCH strives to initiate new enterprises wherever possible, and employs all available commercialization methods, including joint ventures, traditional technology licensing, and various combinations of the three.

ARCH has two additional goals. It contributes educationally to the research and teaching purposes of The University of Chicago and Argonne National Laboratory. It also contributes significantly to the economic development of the Midwest by successfully demonstrating that the early identification and transfer of technology can be as productive for the Midcontinent as it has been on both the East and West coasts.

Working with the sharply different industrial, academic, and national laboratory cultures offers unique challenges. University scientists and industrial managers have different objectives and opportunities, different methods and different time frames. Historically, they have been suspicious of one another. Nevertheless, an important common interest exists among these groups. If scientific insight is to benefit society at large, it must be shepherded through the development, production, and distribution processes. To accomplish this goal, scientific and industrial effort must somehow be in harmony.

ARCH is an experiment. Each day it goes into the marketplace and seeks economically productive homes for ideas that have emerged from the laboratory. ARCH starts with a solution and seeks a problem to which that solution may be the answer. ARCH is part technology, part venture investment, part education, part mediation, and part translation. The end result is a workable combination of the vision and effort of people from different backgrounds and specialties.

Thomas L. Churchwell has been Vice President of ARCH since 1987. He is a former Vice President of Sales and Business Development of The NutraSweet Company. He is a graduate of DePauw University and holds a J.D. from Northwestern University.

THE SPIRIT OF EXPERIMENT



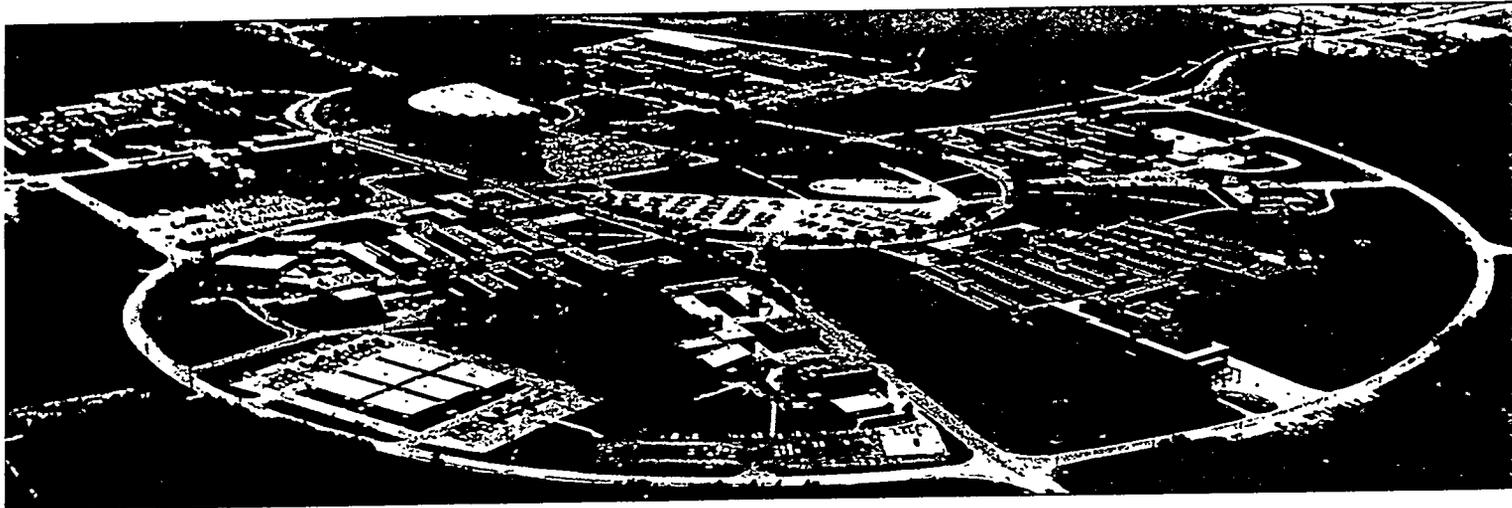
The University of Chicago, in Chicago's Hyde Park is one of the world's foremost centers of academic and research universities. More than 50 Nobel Prize winners have been associated with the University since its founding in 1893. The University's nationally renowned Graduate School of Business is the home of ARCH Development Corporation.

The United States spends approximately \$130 billion on research and development each year. The spending is oddly symmetrical. Half moves through the great industrial companies and research centers of the private sector, where commercialization is the goal. The other half moves through the national laboratories and research grant systems of the public sector, where commercial use is one of several competing goals.

In the late '70s and early '80s, the U.S. Congress became concerned about the relatively small commercial return from its federal research dollars. Lawmakers reasoned that increasing this return would strengthen the competitive position of the U.S. in international markets. First through the 1980 Bayh-Dole Act and its 1984 and 1986 amendments and the 1980 Stevenson-Wydler Technology Innovation Act, Congress established incentives for publicly funded scientists to commercialize their discoveries.

The legislation represented fundamental change in the R&D environment. For the first time, The University of Chicago, for decades the federal contractor with responsibility for operating Argonne National Laboratory, could take title to inventions conceived at Argonne and commercialize them exclusively. Importantly, the laws created strong financial incentives for the inventors themselves.

But changing the law was not enough. There has long existed a cultural barrier to technology transfer that, in the words of Dr. Walter E. Massey, Director-Designate of the National Science Foundation and a former Director of Argonne and Vice President for Research and for Argonne National Laboratory at The University of Chicago, is the "academic sensibility that research should not be subject to crass commercialization." Dr. Alan Schriesheim, formerly General Manager of the Exxon Engineering Technology Department and the current director of the laboratory, also was searching for ways to span the "development gap between invention and commercialization." After examining how dozens of other institutions handled technology transfer—and adopting ideas from many of them—Massey and Schriesheim drew the initial blueprint for ARCH. It was to be an entity "whose portfolio would contain all Argonne and University intellectual property except for certain inventions arising from sensitive national security work," Schriesheim says. "Argonne has a budget of \$350 million. The University of Chicago's research grant funding is funded at about \$110 million. So you have two prestigious competent institutions deploying nearly half a billion dollars in research annually. It would be reasonable to expect such research to produce a number of useful inventions."



A task force of University of Chicago Trustees and Argonne National Laboratory Governors developed the idea of ARCH further. Then John Gould, Dean of the University's Graduate School of Business, offered ARCH a home in the business school and suggested that the CEO of ARCH also serve as its Associate Dean .

"The momentum picked up when the business school was seen as a natural complement to ARCH," Gould says. "The concept of ARCH became not only one of technology transfer, but one of hands-on training for future entrepreneurs and business leaders."

Steven Lazarus, formerly Group Vice President of the Health Care Services Group of Baxter International and a former Deputy Assistant Secretary of Commerce for East-West Trade, was appointed as ARCH's CEO and President in late 1986. He was joined in 1987 by Thomas L. Churchwell, ARCH's Vice President, who had been Vice President of Sales and Vice President for Business Development at The NutraSweet Company and, previously, an executive with G.D. Searle & Co., American Hospital Supply Corporation, and the Coca-Cola Export Corporation.

Argonne National Laboratory, Argonne, Illinois, is operated by The University of Chicago for the U.S. Department of Energy. Its annual operating budget of \$350 million supports more than 200 projects in engineering, physics, advanced energy systems, biotechnology, and conservation. Argonne has been designated by the White House as the nation's Superconductivity Research Center for Applications.

*Dr. Walter E. Massey,
Director-Designate of
the National Science
Foundation and
currently Vice
President for
Research and for
Argonne National
Laboratory at The
University of Chicago*



*Dr. Alan Schriesheim
Director of Argonne
National Laboratory*

AN INNOVATIVE STRUCTURE



ARCH Development Corporation staff:

(Front row,
left to right):
Thomas L. Churchwell,
Steven Lazarus
(Back row,
left to right):
Rajni Arora,
Alice Evans,
Jennifer Simon,
Thomas M. Fitzpatrick,
Susar Kane,
Keith L. Crandell,
Robert T. Nelsen,
Aimee Wainwright,
and Neil Wyan.

ARCH sits within a great research university and a large national laboratory. Each has its own culture. The University environment tends to be more researcher-driven; the laboratory more program-driven. The challenges of commercialization, however, are common to both. In order to achieve the objectives of technology transfer, each institution must address the often varying interests of the scientific and commercial communities.

ARCH is a new type of intermediary organization containing elements from each community. Its object is to provide innovative ways to bridge the gap between science and industry.

ARCH starts with the hypothesis that creating a new enterprise is often a more effective approach to commercialization than traditional licensing. Furthermore, a strategy of enterprise creation attracts vital additional capital from regional and private sources. Such capital addresses a key historical problem associated with technology transfer of public sector science: namely, that it is frequently not recognizable as having commercial value until it is reduced to practice, a prototype produced, and marketability tested. There are few private funds available with which to accomplish this. Finally, a strategy that emphasizes new enterprise creation attracts a particularly energetic and creative class of management talent.

Keith L. Crandell

Mr. Crandell joined ARCH in January 1987 after entering the Graduate School of Business at The University of Chicago. While participating in the ARCH Associates Program,

he coordinated all aspects of the start-up of the HealthQual Systems Corporation. His projects include Illinois Superconductor Corporation, Nanophase Technologies Corporation, and EIChroM Industries. Mr. Crandell focuses on Argonne National Laboratory projects in the materials, chemicals, instrumentation, and software fields. He received a B.S. in Chemistry from St. Lawrence University and an M.S. in Chemistry from The University of Texas-Arlington. Prior to attending The University



of Chicago, Mr. Crandell worked for Hercules Incorporated for three years in technical sales.

Robert T. Nelsen

Mr. Nelsen joined ARCH in August 1987 as a Manager after graduating from the Graduate School of Business. His projects include NiOptics Corporation, Everyday Learning Corporation, AssessTek Corporation, and HealthQual Systems Corporation. Mr. Nelsen focuses on projects at The University of Chicago in biotechnology, medical products, and hazardous waste assessment and treatment. Mr. Nelsen serves as a director and advisor to several start-up corporations, including Optein, Inc. Seattle, WA. He received a B.S. in Biology and Economics from The University of Puget Sound and an M.B.A. from The University of Chicago Graduate School of Business.

THE ARCH TECHNOLOGY TRANSFER PROCESS

DISCOVERY

A scientist working at Argonne National Laboratory or The University of Chicago discovers a new phenomenon. The scientist does not judge the potential economic or commercial value of the discovery. But the scientist does formally disclose the invention to technology transfer specialists.



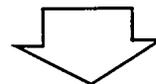
DISCLOSURE

Argonne's Office of Technology Transfer or the University's Director of Special Projects receives the disclosure. These offices advise ARCH of the invention/discovery. ARCH studies the invention to determine its commercial potential.



ELECTION

If ARCH sees commercial promise in the invention, ARCH formally elects to take title to it. Once ARCH takes title, it has the responsibility to protect and commercialize the invention.

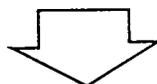
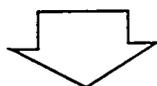


PROTECTION

ARCH takes responsibility for patenting the invention. Occasionally certain discoveries are not patented but rather maintained as "know-how."



COMMERCIALIZATION



LICENSING

Most inventions are candidates for licensing. ARCH volunteer Associates contact a variety of industrial companies that might be interested in the invention. ARCH staff members negotiate licensing agreements that usually involve initial and minimum payments and running royalties.

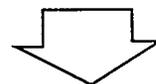
NEW ENTERPRISE CREATION

Occasionally an invention or group of inventions addresses or even creates a broad and growing market. When this is the case, ARCH begins testing the possibility of starting a new company.



DEVELOPMENT

Almost all laboratory or university inventions occur early in the research cycle. That means an invention must be developed substantially to make it comprehensible in a commercial environment and to reduce business risks. Early seed financing is used to support building a prototype, reduction to practice, initial market analysis, and first-draft business planning.



FIRST-ROUND INVESTMENT

A new company is ready for first-round investment once it has a core management team, crystallizes and test-markets its product(s), identifies its customers, eliminates or substantially reduces technical and/or market risks, and scales its production to pilot level. First-round venture investment is the litmus test of enterprise creation.



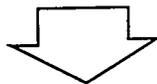
INCUBATION

Seed investment is used specifically to resolve key business risks inherent in an initial business concept. The use of "bum rate" of this fund is managed conservatively until the risks have been resolved. ARCH staff members serve as temporary general managers but give highest priority to recruiting a CEO with entrepreneurial drive. Milestones are carefully specified and monitored closely. The incubation period generally covers six to eighteen months.



SEED INVESTMENT

The ARCH staff prepares a final business plan and investment brief for the ARCH executive committee. Acting as the decision-making arm of the ARCH Venture Fund, the executive committee decides whether to make a seed investment. At the same time, ARCH personnel solicit investment from a third party. Sometimes the seed investment can be leveraged through national, state, and local technology development financing programs.



BUSINESS GROWTH PERIOD

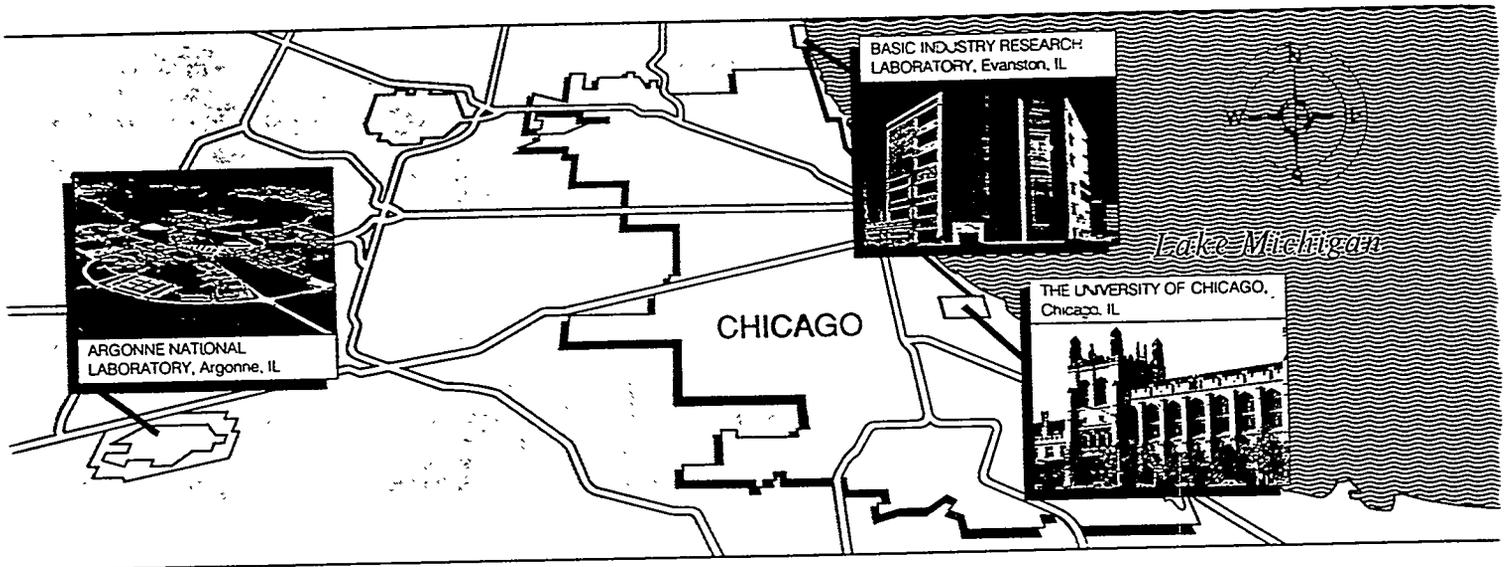
Once a company gets first-round investment, ARCH completes the shift of operation control to management, a process that has been occurring gradually during incubation. An ARCH staff member typically sits on the board of the company and stays active in operations from that vantage point. If a company's first-round venture investment is not achieved, ARCH changes the method of commercialization to joint venturing or licensing



EXIT STRATEGY

Most enterprises created by ARCH rest on basic scientific discoveries that ordinarily require five to seven years of commercial maturation before reaching full economic potential. ARCH manages against this characteristic and begins to develop strategies for financial exit during the incubation stage. This suggests an intent to rely more on sale to another entity than an initial public offering.

THE MIDCONTINENT REGION



ARCH's main headquarters are located in The University of Chicago's Walker Museum and at the Argonne National Laboratory. Several of the new companies founded by ARCH are situated in the Basic Industry Research Laboratory (BIRL) at Northwestern University's Research Park.

A RCH serves many constituencies. Its founders and directors seek a successful transfer of publicly funded research that will yield a successful economic return. At the same time, the University and laboratory researchers, the wellspring of all inventions, want effective and intelligent handling of their professional work.

But ARCH also lives in the Midcontinental region of the United States and is part of a wave of entrepreneurial activity that is in its earliest stages. At the state level, the Illinois Department of Commerce and Community Affairs has been supplemented with two new organizations, the Illinois Coalition and the Governor's Science Advisory Committee. These two groups helped pilot almost \$40 million worth of technology venture investment programs through the Illinois legislature during 1989 and 1990.

Illinois is experiencing the kind of entrepreneurial infrastructure development—venture-oriented financing partnerships, lawyers, accountants, bankers, real estate developers—seen years ago in Eastern Massachusetts (Route 128) and Northern California (Silicon Valley). Science parks and incubator facilities have now begun to emerge, and the region's unmatched university and national laboratory structure has begun to coalesce. Argonne National Laboratory, The University of Chicago, Northwestern University, and The University of Illinois today form the nation's only high-temperature superconductivity science and technology center, a program of the National Science Foundation. ARCH has established relationships with all of these entities. Several of the new companies founded by ARCH are housed in the Basic Industry Research Laboratory (BIRL) in Northwestern University's Research Park. ARCH also uses the Chicago Technology Park at The University of Illinois.

Further, ARCH has attracted investment from several other regional sources: two Chicago-based venture partnerships, Batterson, Johnson & Wang and Hayes & Griffith; the State of Illinois Business Investment Fund and DCCA Ventures; the Evanston Business Investment Corporation; and private investors. Finally, the ARCH Venture Fund, the \$9 million seed venture fund raised by ARCH, represents the most substantial amount of seed venture capital raised for investment in regional enterprise over the past several years.

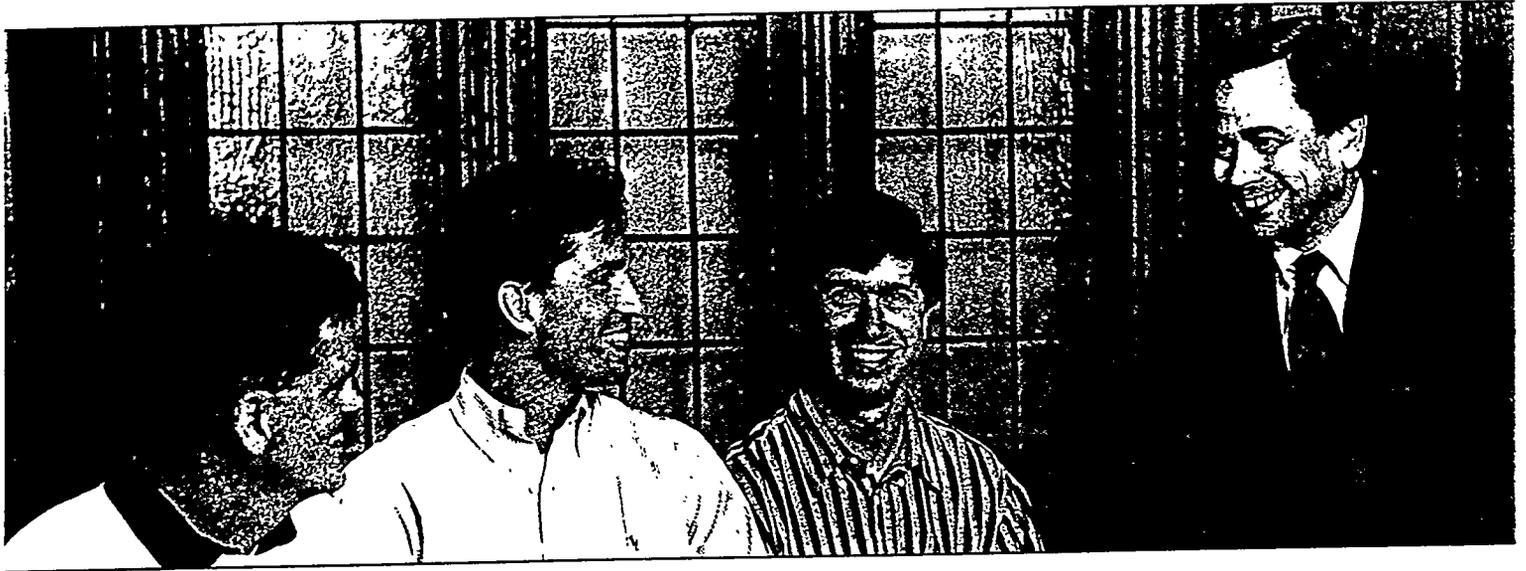
The ARCH Venture Fund

ARCH started with seed money from The University of Chicago and Argonne National Laboratory and then raised a fund with which to seed and nurture new enterprises. The new seed venture capital fund, called the ARCH Venture Fund Limited Partnership, began investing in April 1989.

The ARCH Venture Fund is the first venture capital fund simultaneously involving a national laboratory and a university. ARCH Development Corporation serves as the fund's general partner.

Fund capital is being invested to support early-stage, risk-reducing tasks for new companies. Approximately half the fund will be invested in 10 to 15 companies from 1989 to 1994. The remainder will be deployed for follow-on investments in the most promising of these companies over the following five years.

AN EDUCATION IN ENTREPRENEURSHIP



University of Chicago
Graduate School of
Business students
Erik Peterson,
Fred Karutz, and
Robert Pravder
discuss their respon-
sibilities as ARCH
Associates with Dean
John P. Gould

The University of Chicago Graduate School of Business gives ARCH one other major constituency and one other central purpose. With its primary home in the Graduate School of Business, ARCH is a vital component of the school's teaching and research programs. Between 25 and 50 members of each 500-person incoming class spend 10 to 40 hours a week volunteering as ARCH Associates. For the past three summers, four Associates have worked as ARCH interns under a grant from KPMG Peat Marwick. Five of the seven-person ARCH professional staff either recently graduated from the school or are currently enrolled. Several former Associates are today employees of new enterprises ARCH has helped start.

John P. Gould, Dean of the Graduate School of Business, is formulating plans for a center for business development and entrepreneurial studies that would use ARCH as a practical testing ground for academic and research work.

ARCH Associates are a unique subset of the student body. They typically have undergraduate or graduate scientific or technical degrees. They have worked for several years before returning to the University for their advanced degrees. They have the ability to interact with faculty, laboratory scientists, and inventors because of their scientific backgrounds and also because of their similarity to the postdoctoral students working in the laboratories.

The Associates have a high level of personal initiative; they want to explore, and they work well without supervision. They provide ARCH with an indispensable, low-cost workforce. ARCH in turn provides these exceptional students with valuable experience in business development and venture management. It is symbiosis in the best sense of the word.



From Business Students to Business Developers

With B.S. degrees from Northwestern University in Chemical Engineering and Biomedical Engineering, as well as business experience with The Liquid Air Company, Neil Wyant has progressed from ARCH Associate while finishing his M.B.A. to full-time ARCH Project Manager with responsibilities at Argonne National Laboratory.

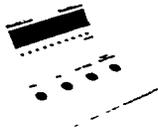
He worked initially on the Illinois Superconductor Corporation project, quantifying the market for its first product. Since joining ARCH full time, he has concentrated on identifying areas of technological excellence at Argonne and making connections with industry in order to build the Argonne licensing program.

Rajni Aneja is Mr. Wyant's counterpart with responsibilities at The University of Chicago. Ms. Aneja served as a 1990 summer intern in the ARCH program funded by Peat Marwick. After earning a B.S. with honors in Biochemistry from The University of London and an M.S. with honors in Biochemistry from Cornell University, Ms. Aneja worked for five years at Abbott Laboratories in product development for AIDS diagnostics and therapeutics. Ms. Aneja's projects currently concern the University's Divisions of Biological Sciences and Physical Sciences.

BRIDGES BEING BUILT

In three years, ARCH has evaluated over 500 inventions from researchers and scientists at the Argonne National Laboratory and The University of Chicago. More than 80 have been licensed to existing firms. Twenty-eight have been patented. Ninety more are the subject of patent applications. This scientific and technological "deal flow" has thus far been the source of seven new companies.

Introducing HealthQuiz Fast, Accurate Patient Evaluation.



HealthQuiz™ enhances the quality of your care.
HealthQuiz™
Advanced Assistant for Patient Evaluation

HealthQual Systems Corporation

Incorporated 9/23/87

HealthQual Systems Corporation (HSC) is a healthcare information systems company that assists healthcare providers in diagnosis and treatment planning. The company captures medical history information, accumulates it, integrates it with expert systems and other algorithms, and employs it as the "front end" of a patient record system that relates history, diagnosis, therapy, and outcome.

The HealthQuiz™ computer-assisted patient evaluation system is HealthQual's first product. HealthQuiz is a simple four-button (yes, no, I don't know, next question) laptop computer that poses a series of yes/no questions on an LCD screen. A patient takes the HealthQuiz, which employs patented internal branching logic in less than 10 minutes, and the

data are thereafter compiled and integrated with expert systems to produce recommendations to physicians and other providers.

The medical histories obtained through the HealthQuiz are used for diagnosis and treatment planning in the preoperative surgery setting. The University of Chicago and Johns Hopkins University are jointly developing a program for preventive healthcare screening. Another development project links the HealthQuiz medical history with patient diagnosis and therapy billing information. Thus, for the first time, such information is potentially available on a patient risk category basis by provider. Ultimately, use of the HealthQuiz to collect functional health status will permit the initiation of a comprehensive outcomes system.

The HealthQuiz was invented by Dr. Michael F. Roizen, Chairman of Anesthesiology and Critical Care at The University of Chicago Medical Center. George M. Levinson, formerly Vice President-Sales, Chemotherapy Division, Baxter International, is HealthQual's General Manager.



NiOptics Corporation

Incorporated 6/16/88

NiOptics is a high-technology optical manufacturing company that is positioned to become the world's leading supplier of maximum-efficiency optical compo-

nents and sub-systems. NiOptics has been strategically employing proprietary technology to solve mission-critical problems across a range of high-volume market applications, including fiber optics, computer display, office electronics, automotive lighting, lasers, defense, and solar energy. Initial NiOptics product development strategies have concentrated on a series of strategic alliances formed with major U.S. companies such as Eastman Kodak, Honeywell, Ford, Raynet, and Compaq—alliances which are likely to result in manufacturing supply contracts. On an annualized basis, NiOptics generates product development revenues from such early-stage corporate alliances at the \$1 million level, having reached \$350,000 in the first fiscal year. NiOptics expects to begin manufacturing operations during the first half of 1991.

The NiOptics success has derived partly from its proprietary position and technical expertise in ultra-high efficiency non-imaging optics technology, originally pioneered at The University of Chicago. Non-imaging optics is a new class of optics that concentrates light much more efficiently than conventional lenses and mirrors. NiOptics is able to apply this advantage to improve performance and reduce cost in product situations where light must be collected or delivered with highest possible efficiency, brightness, and uniformity.

NiOptics was formed by President and CEO Dr. Robert L. Holman and Dr. Roland Winston, Chairman of the Department of Physics at The University of Chicago. Dr. Holman was previously Director of Engineering with the Amphenol Corporation's Fiber Optic Products Division, Optoelectronics Program Director with Battelle Memorial Institute, and R&D Project Manager with Xerox Corporation. Dr. Winston, widely recognized as having pioneered the field of non-imaging optics,

remains Chairman, Department of Physics, The University of Chicago, and consults actively for NiOptics.



Everyday Learning Corporation

Incorporated 11/14/88

In 1983, The University of Chicago School Mathematics Project (UCSMP) began redesigning mathematics education based on research into the realities of how teachers teach and children learn. The consequence was a set of curricula and teacher development materials. Based on this fundamental research, Everyday Learning Corporation's mission is to introduce this revolutionary set of products into the marketplace. President and CEO Jo Anne Schiller, a former publishing consultant and executive with Science Research Associates and Deltak Training Corporation, has recruited a team of experts to accomplish this mission.

Everyday Learning currently publishes *K-3 MathTools for Teachers* and *Everyday Mathematics* curricula for kindergarten and first grade. The curriculum for second grade is being field tested by 1,500 second graders and 55 school districts during the 1990-91 school year, and the third grade curriculum is in development. Fourth through sixth grade products are in development and scheduled for publication in succeeding one-year intervals. The company's sales exceeded \$500,000 in its first full year of operation.



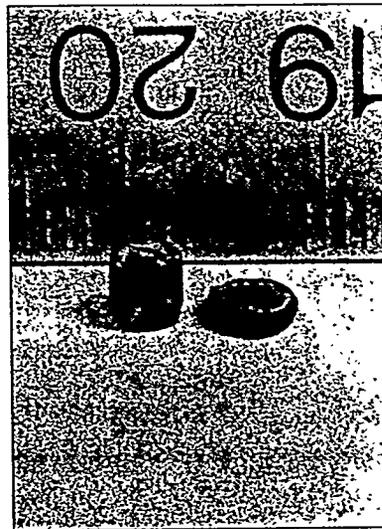
Illinois Superconductor Corporation

Incorporated 10/18/89

Illinois Superconductor Corporation's mission is to bring to market a commercial product exploiting high-temperature superconductivity. ISC's cryogenic level sensor accurately measures the level of liquid nitrogen used to preserve biological materials such as blood, semen, and organs. The sensor also is used to measure cryogenic liquid levels in the laboratory, and an aerospace version will be used in satellites and rockets. Other electronic and sensor products making use of the unique properties of superconducting materials are under development.

ISC commercializes proprietary technology resulting from its own invention and under exclusive license from Argonne National Laboratory and Northwestern University. Illinois Superconductor Corporation's research and manufacturing facilities are located in Evanston, Illinois, near the campus of Northwestern University. It is funded by the venture capital group of Batterson, Johnson & Wang, by the State of Illinois Technology Venture Investment Program, and by the ARCH Venture Fund.

The company's President and CEO is Ora E. Smith, formerly Vice President and Chief Marketing Officer of Conductus, Inc., a California-based superconducting electronics manufacturer.



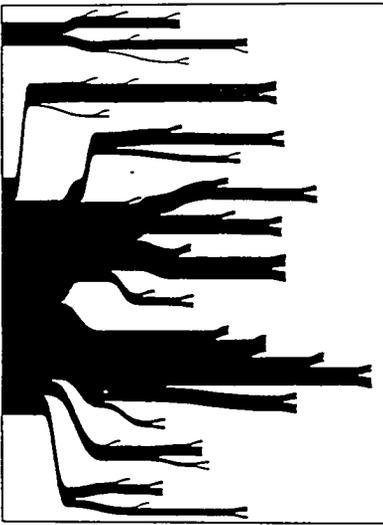
Nanophase Technologies Corporation

Incorporated 11/30/89

Nanophase Technologies Corporation was founded on work in materials science performed by Dr. Richard W. Siegel and other researchers at Argonne National Laboratory. The mission of the company is the development of a new technology to produce ultra-fine-grained metal and ceramic products.

Nanophase has an exclusive license for this technology and is negotiating additional licenses from other centers of excellence in ultrafine materials.

The company is perfecting processes for producing crystals that contain only a few thousand molecules. Large numbers of these crystals are compressed to form materials with grains only a few billionths of a meter, or nanometer, long. These nanophase materials include metals that are unusually ductile and composites that have new structural and electrical properties. The company is pursuing a range of electronic, optical, and chemical applications. James E. Moore, Ph.D., is the CEO and President of Nanophase Technologies Corporation. Previously he headed the optoelectronics strategy, mergers, and acquisitions efforts for Amoco Technology Company.



Information Arts, Inc.
Incorporated 12/5/89

Information Arts is a software company that uses computers to help information users cope with the information explosion by searching heterogeneous text data bases for underlying organization and patterns. This technology will form the basis of a new category of products designed to narrow the gap between masses of data and useful verbal information that can be extracted from it.

Information Arts was developed around the work of Dr. Scott Deerwester and his colleagues in the Textual Information Retrieval and Analysis Group of The University of Chicago School of Library Science. The company has developed a number of new techniques in storage, retrieval, real-time text processing, and textual analysis for marketing and business research. It will initially provide analytic services to large customers with currently unusable marketing data derived from customer comments.



EIChroM Industries, Inc.
Incorporated 2/7/90

EIChroM Industries is a separations chemistry company that uses proprietary extraction chromatographic and ion exchange resins to solve analytical and process-scale metals separations problems in the hazardous waste and other industries. EIChroM's •Spec line of analytical separations products is directed toward over 1,000 international analytical laboratories examining the impact of radioactivity on the environment. Sales are currently averaging \$5,000 to \$10,000 per month.

Drawing on the expertise of Dr. E. Philip Horwitz's Separations Group at Argonne National Laboratory, EIChroM is developing separation solutions for process-scale waste treatment and minimization problems. To date, EIChroM Industries has received nearly \$300,000 in state and federal support for its product development program.

Under the guidance of General Manager David M. Eino, a former ARCH Associate and professional staff member, the firm is exploring several product possibilities in the billion-dollar environmental remediation and waste management market. Research into extraction chromatographic materials for the removal of metals is under way in a Department of Energy-supported project integrating technology developed for the nation's nuclear defense program with innovative polymer science. EIChroM is producing a new ion-exchange resin to address the growing water and wastewater treatment market.

THE MOUSE THAT'S ROARING IN SUPERCONDUCTORS

SC has the edge in terms with a product that's ready for the market.

THIS BIOTECH STARTUP MAY HAVE TOO MANY STARS

How to get the most from the information in this special report.

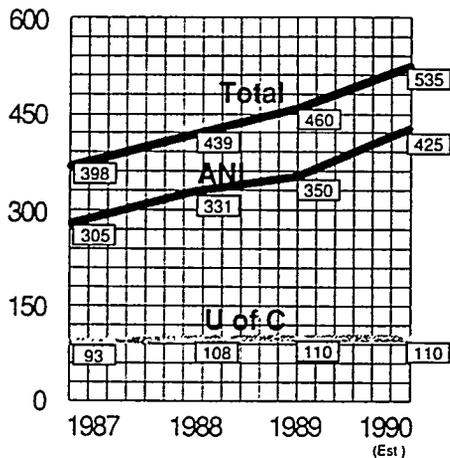
When It's Superconductor Corporation launched one of the first high-temperature superconductor devices on the market: Business Week provided coverage of the company, and ARCH Development Corporation in its April 30, 1990 issue

When It's Superconductor Corporation launched one of the first high-temperature superconductor devices on the market: Business Week provided coverage of the company, and ARCH Development Corporation in its April 30, 1990 issue

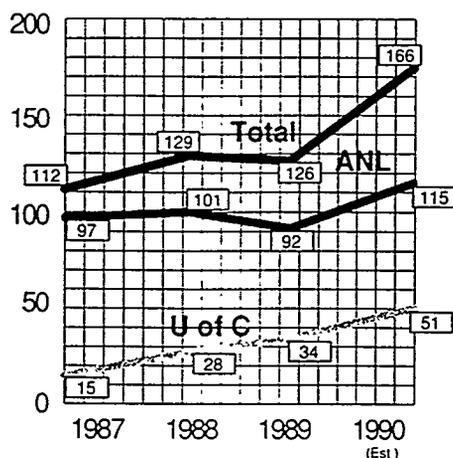
A FOUR-YEAR REVIEW

STATISTICS

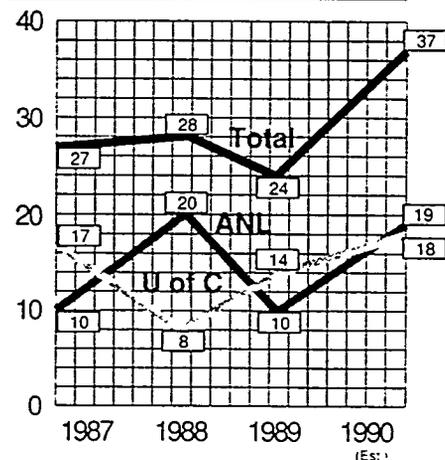
Basic Research Support (in million \$)



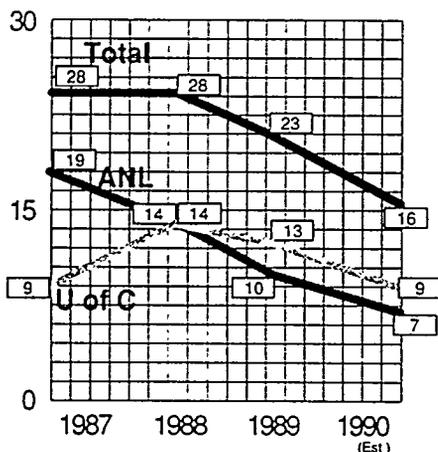
Invention Disclosures



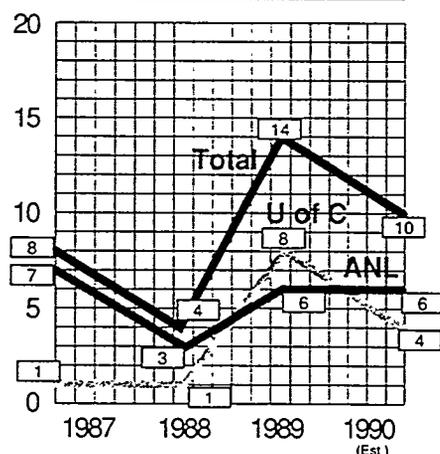
Inventions Elected



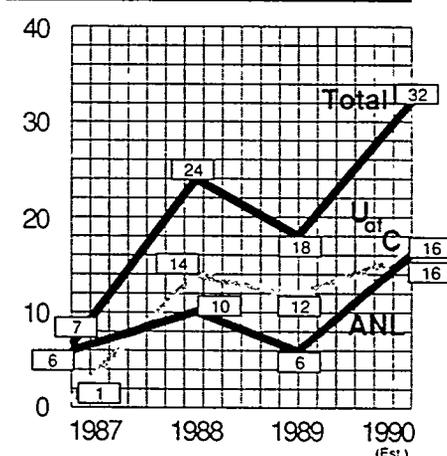
Patent Applications



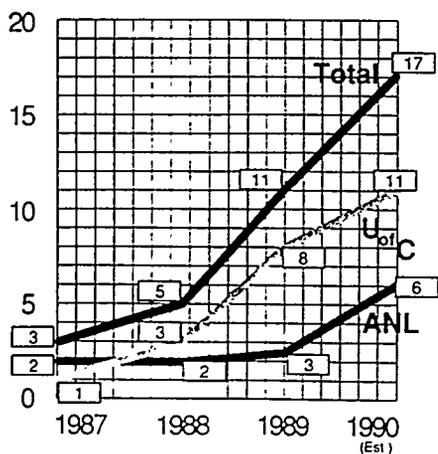
Patents Issued



Inventions Licensed



Number of License Agreements



Enterprises Formed

HealthQual Systems Corporation	9/23/87
NiOptics Corporation	6/16/88
Everyday Learning Corporation	11/14/88
Illinois Superconductor Corporation	10/18/89
Nanophase Technologies Corporation	11/30/89
Information Arts, Inc.	12/5/89
EIChroM Industries, Inc.	2/7/90

BOARD OF DIRECTORS



Thomas L. Churchwell
Vice President
ARCO Development
Corporation



Robert M. Halberstam
Vice Chairman of the
Board
Raychem Corporation



Richard M. Morrow
Chairman and CEO
Amoco Corporation



James S. Crown
General Partner
Henry Crown and
Company



Edgar D. Jannotta
Managing Partner
William Barland
Company



Alan Schriesheim
Director
Argonne National
Laboratory



Katherine P. Barlow
Vice President
Broadcasting Services
and Corporate
Development
New York Times
Company



Arthur Key
Managing Partner
Eli Enterprises Limited



Herbert D. Dear
The Dow Chemical
Company, Retired



Steven Lazarus
President and Chief
Executive Officer
ARCO Development
Corporation



Ringmar Douglass
Investment Banker



Frank W. Luescher
Chairman and
Chief Executive Officer
Inland Steel Industries



Thomas M. Fitzpatrick
Fitzpatrick Law Offices
Secretary Pro Tem



John P. Boyd
Dean of the Graduate
School of Business
The University of
Chicago



Walter E. Masse
Director Designate of
the National Science
Foundation and its
President
Research and
Argonne
National Laboratories
The University of
Chicago



Arthur M. Sussman
General Counsel
The University of Chicago
General Counsel

TEN KEY FACTS ABOUT ARCH

■ Independent organizational identity

As an affiliate corporation of The University of Chicago, ARCH has its own board of directors.

■ Not-for-profit status

The IRS recognizes ARCH as a 501 (c) (3) organization.

■ Links to the Graduate School of Business

ARCH relies heavily on a very capable volunteer student work force.

■ Orientation toward enterprise creation

Starting new enterprises is the primary aim, but ARCH also operates an effective licensing program.

■ Title to intellectual property

ARCH has contractual authority to take title to intellectual property arising from research at The University of Chicago and Argonne National Laboratory.

■ Venture fund

ARCH has raised and now manages a \$9 million early-stage venture fund that provides seed capital for startups.

■ Track record

Between July 1, 1987 and June 30, 1990, ARCH evaluated more than 500 invention disclosures, filed 90 patent applications, received 22 patents, licensed more than 80 inventions, and incorporated seven companies.

■ Contributions to graduate business education

ARCH has provided the foundation for a center for business development and entrepreneurial studies at The University of Chicago's Graduate School of Business.

■ Joint sponsorship programs

ARCH has participated in a series of joint sponsorship programs with local communities (Evanston, IL), state authorities (Technology Centers, Business Innovation Fund, and Technology Venture Investment Program) and federal sponsors (Small Business Innovation Research grants from various federal agencies and National Science Foundation).

■ Technology transfer consultation

ARCH has consulted on the subject of technology transfer of public sector R&D with more than 20 colleges and universities, eight federal laboratories, and government agencies of the United Kingdom, France, Germany, Soviet Union, Japan, Taiwan, China, and Canada.

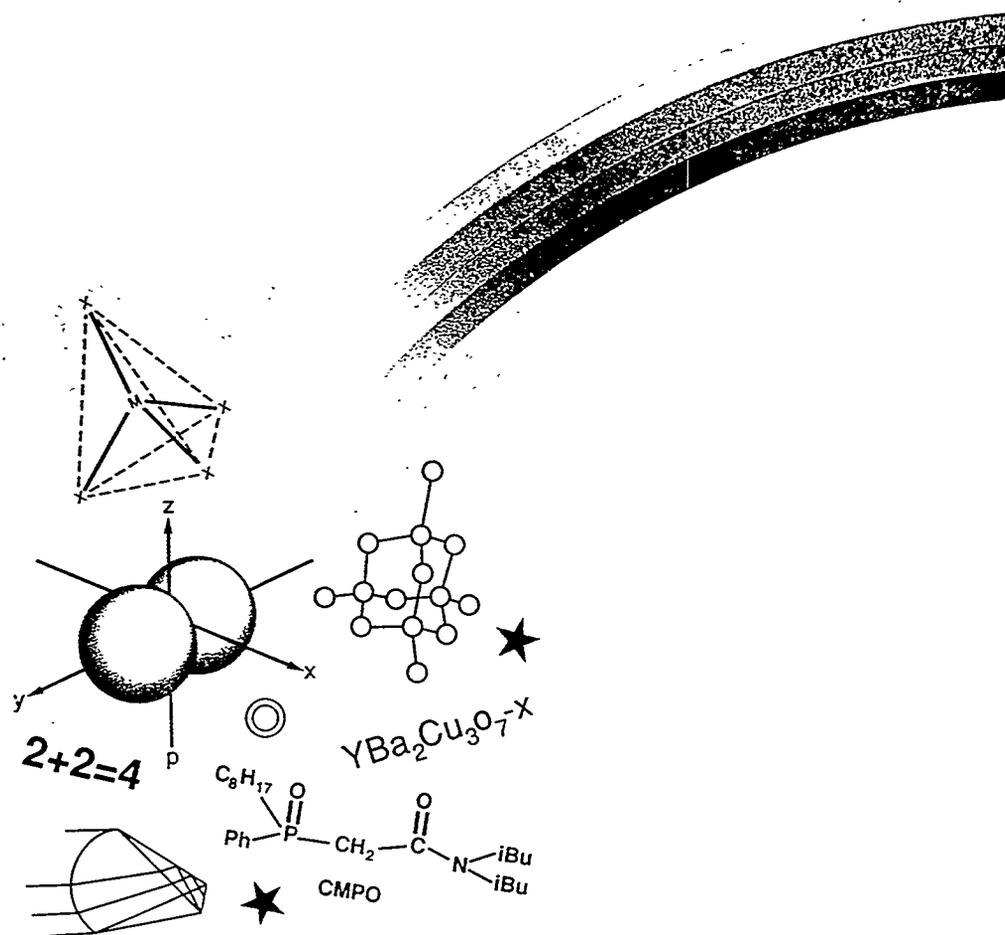


Neil E. Wyan,
Manager, Licensing

ARCH DEVELOPMENT CORPORATION

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9700 S. Cass Ave. Bldg 200
Argonne, IL 60439
708 260 5903
Telex 708 260 2876

The University of Chicago
1101 E. 58th St., Asker 213
Chicago, IL 60637
312 702 1692
Fax: 312 702 0741



ARGONNE NATIONAL LABORATORY—THE UNIVERSITY OF CHICAGO DEVELOPMENT CORPORATION

ARCH Development Corporation
 ARCH Development Corporation
 ARCH Development Corporation

The University of Chicago, 1101 East 58th Street, Walker 213, Chicago, Illinois 60637, Phone: (312) 702-7417
 Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439, Phone: (708) 470-4425
 Business Industry Research Laboratory, 1611 Maple Avenue, Evanston, Illinois 60201, Phone: (708) 441-3714

Appendix I. The Oak Ridge National Laboratory TCRD



THERE'S

TECH TRANSFER

GOLD

IN THE HILLS



...in North...

...laboratory is the first...

...Gold War...

...incidental...

...has been the...

...technology, transfe...





Outside the tall security fences built to protect America's nuclear might and now moved back to expose some of its riches, fallout covers not just transfer of technology but also its commercialization, leading to economic development, corporate formation and, finally, jobs.

These are not serendipitous by-products, but goals.

What is happening at Oak Ridge can be compared to a deliberate seismic event, with the greatest impact at the center, yet with powerful waves of energy expanding outward, bouncing against barriers, often increasing their strength when again they surge forward to pervade entire industries and emerging markets.

"Another kind of chain reaction is going on around here," says Jim Stiegler of Oak Ridge National Laboratory, whose programs are helping Tennessee create the third-highest job growth in the country.

This multidimensional effect is the goal of the Technology Transfer Office of Martin Marietta Energy Systems, created in 1984 when the company won from Union Carbide the contract to manage the ORNL complex, including its Y-12 and K-25 plants, for the Department of Energy. For the first time in a lab-management contract award, technology transfer was stipulated as a mission. By the late 1980s, it was a measurable part of the company's fee.

Embracing not just the role but a complex definition of its implications, Bill Martin, Energy Systems' vice president for technology transfer, has adopted a life-cycle approach that unites technology development and

economic development. Starting in the lab and the Y-12 manufacturing plant and ending in private-sector jobs, the Oak Ridge vision hopes for an economic payoff in its home base in East Tennessee as well as in a more competitive U.S. manufacturing capability. The payoff would be realized one advance at a time in individual companies, then in a more sweeping way through entire industries.

"I really applaud the people at Oak Ridge," said Richard Riebeling, Tennessee's Commissioner for Economic and Community Development. "They're working to turn their great technology into commercial applications and going out of their way to encourage employment in the area. They're so far ahead of the game."

Key to executing the Oak Ridge vision are strategic alliances with myriad stakeholders: An Oak Ridge executive is on loan to Riebeling and Tennessee Gov. Ned McWherter to coordinate science and technology initiatives and work with a new Science and Technology Council appointed by the legislature.

Other alliances, which leverage Oak Ridge assets through face-to-face contact, range from the University of Tennessee to local colleges; from other Department of Energy laboratories to the Department of Commerce's National Institute for Standards and Technology; to technology and industrial extension services in Tennessee and neighboring states; to the Tennessee Valley Authority, the power entity, and Tennessee Resource Valley, an East Tennessee economic development organization; and to small companies, the Fortune 500 and major industry consortia which value Oak Ridge as a mecca for materials and manufacturing technology.

"Their approach is excellent," said Carl Wooten, director

of technology transfer for the University of California system. "They're doing a great job. This has been needed for a long, long time."

Outcomes in technology development initiatives cannot be forecast with precision. But Energy Systems' Martin is bold enough to post milestones much further downstream in the commercialization process than cooperative research and development agreements and licensing contracts, where most of today's metrics start and end.

COMMUNITY LEADERSHIP
Martin Marietta Energy Systems is drawing upon a 34-year history of successful commercialization, though there is a gap in that time which began in 1960 with the founding of Fallout Company #1, Oak Ridge Technical Enterprises Corp., or ORTEC.

Around ORNL, the story is that scientists frustrated by the inadequate semiconductor detectors available for their research asked if they could set up a private company to manufacture the devices off-site.

The director of the laboratory was away on a study, so the deputy director gave the go-ahead. Among ORTEC's then mostly nights-and-weekends staff was Oak Ridger John Gibbons, now President Clinton's science adviser.

When the ORNL director learned of ORTEC, according to Oak Ridge publisher Tom Hill, he said it was a mistake that should never happen again. And for years thereafter, Hill says, if anything had any practical value, it was not appreciated — even though a steady stream of scientists came from all over the world to soak up technological breakthroughs on behalf of their economies.

"There was no place in the country with more federal money coming in and so little

falling out," Hill recalls.

In the meantime, ORTEC had become a motherlode for commercial enterprise, growing to as many as 400 people before being acquired by EG&G in 1987.

Spawning additional companies including Atom Inc. and Tennelec, now a division of the UK's Oxford Industries, ORTEC was a "tremendous training ground" for people in the nuclear



industry, notes EG&G's Sanford Wagner.

Aware of the ORTEC phenomenon, by the 1970s community leaders were pushing for ways to increase technology fallout on the local economy.

They identified the Tennessee Technology Corridor, which stretches south down a joint segment of Interstates 75 and 40 from the University of Tennessee and its engineering school at Knoxville, with the Pellissippi Parkway crossing east to

the airport and west to Oak Ridge. And they began lobbying political leaders.

Then-Gov. Lamar Alexander, who subsequently served on the board of Martin Marietta before joining the Bush cabinet, picked up on the idea and began pushing the Tennessee Congressional delegation, recalls attorney Gene Joyce, a founder of the two-county Roane Anderson

Encouraging continuous fallout now are year-round royalty streams to scientists and researchers who produced licensed technologies; and cash awards, provided by income resulting from technology-transfer activities, to inventors whose technologies resulted in CRADAs, classified successes, and in 1993, two members of a maintenance services team who devised a

a decade ago to facilitate startups and grow high-tech companies.

"An area coming together to build partnerships is unusual now," says Jim Henry, president of Resource Valley, where Martin Marietta Energy Systems is both a partner and a vital resource.

"But that's what's going to be required in the future, and communities that can do it are

rietta Energy Systems, the Technology 2020 partnership will be a gateway into and out of Energy Systems and the region's federal Energy facilities, says Dennis Grahl, the technology transfer office's director of economic development and full-time liaison with regional alliances.

Centered around a state-of-the-art electronic conferencing facility that can be used for community linkages when it's not hosting technology transfer and business development activities, Technology 2020 includes a telecommunications lab as well as a 25,000-square-foot incubator for emerging corporations.

But regional infrastructure consists of more than corridors, whether concrete or communications, and additional underpinnings come from the Tennessee Center for Research and Development, or TCRD, where Bill Martin and Grahl are actively involved on the board.

Four technology centers of TCRD — for laser, environmental, information and power electronics — complement the R&D expertise at ORNL and Y-12 while drawing on resources at the University of Tennessee and the Tennessee Valley Authority.

Beta Development Corp., a for-profit subsidiary of the Center for Research and Development, manages the Tennessee Growth Fund, which provides loans and direct seed capital for new ventures, as does the Martin Marietta-owned Tennessee Innovation Center, which functions additionally as a virtual incubator.

The venture funding and incubator support address one of Bill Martin's biggest concerns, which is providing a safety net for immature companies as they grow their competency in business and marketing. TCRD has supported 13 new companies creating 450 jobs, with an investment per job created of \$3,975.

Economic Council.

"Al Gore came over here right after he was elected Congressman to see what could be done here," recalls Joyce. "I don't know how much we talked to him about tech transfer at the time, but we talked a lot about the corridor.

"When Martin Marietta came in here, they were unleashed," Joyce said. "But without the community working to get the regulation modified, it couldn't have happened."

method to recycle filters. That year, cash awards amounted to \$61,000.

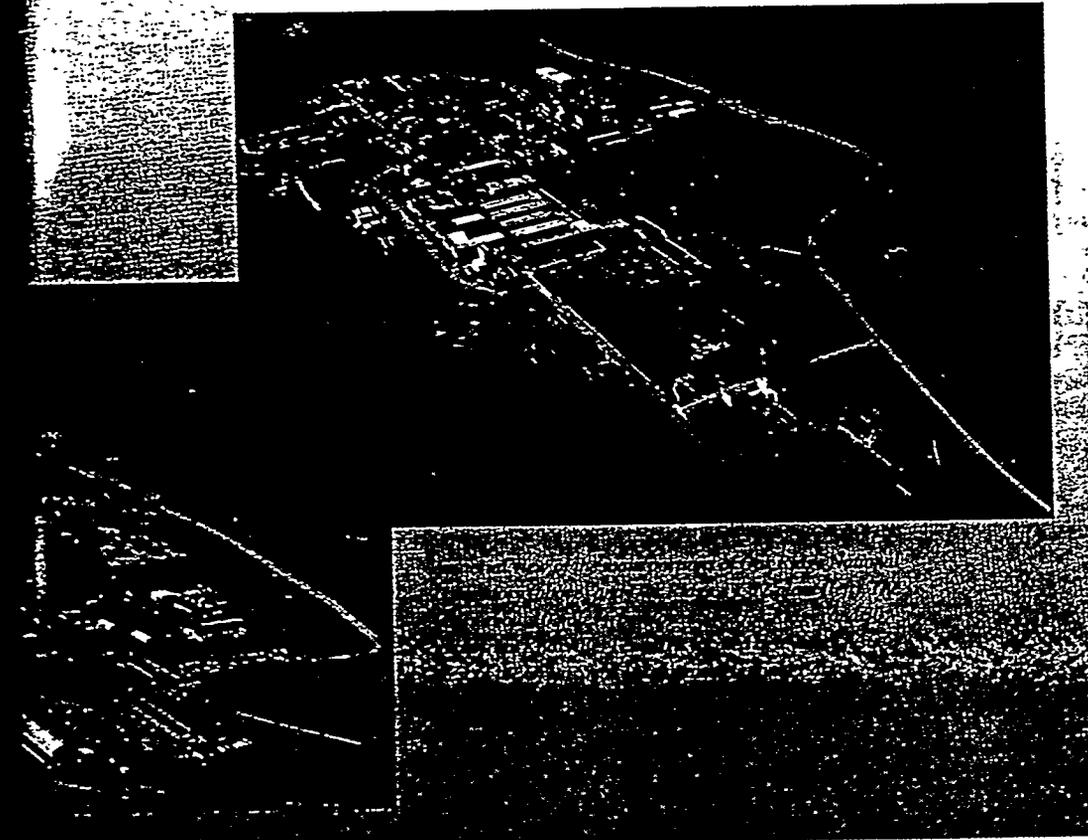
REGIONAL ALLIANCES

If the Tennessee Technology Corridor is development's signpost, Tennessee Resource Valley is its welcome center. Founded in 1987 with the pooled resources of more than 15 communities to change the image of East Tennessee, Resource Valley encompasses the Tennessee Technology Foundation, started

going to be way ahead. The ones that don't will continue to flounder."

Resource Valley is managing Technology 2020, born from a regional vision to exploit the state's advanced telecommunications infrastructure for technology transfer and commercialization.

With more than \$4.4 million in commitments from Bell South, the Tennessee Public Service Commission, the Department of Energy and Martin Ma-



GOLD
IN THE HILLS

CROSSING BORDERS

While the Technology Transfer Office's center of impact may be East Tennessee, Oak Ridge's next circle of fallout extends to neighboring states. Again partnering with complementary services already in place for maximum leverage, Oak Ridge teams up with state industrial and technology extension agents in Tennessee, North Carolina, Georgia and Florida. Building on its working partnership with the Tennessee extension service, Martin Marietta Energy Systems looks beyond mere awareness to put its tremendous manufacturing expertise at the disposal of compa-

nies of every size. Through extension agents it offers up to four days on-site for solving specific technical applications problems.

Oak Ridge responds to corporate "clients" large and small with a variety of mechanisms, many informal and quick.

In the future, Energy Systems' Director of Alliances and Partnerships David Jamison expects these relationships to expand as virtual enterprises, drawing on both the Southeast's industrial talent and its robust advanced telecommunications infrastructure, and including ever-changing configurations of companies, research institutions, and new infrastructure supports for enterprise development.

As extension agents fan out to the nation's manufacturing base, 50 percent of which is located within a day's drive of

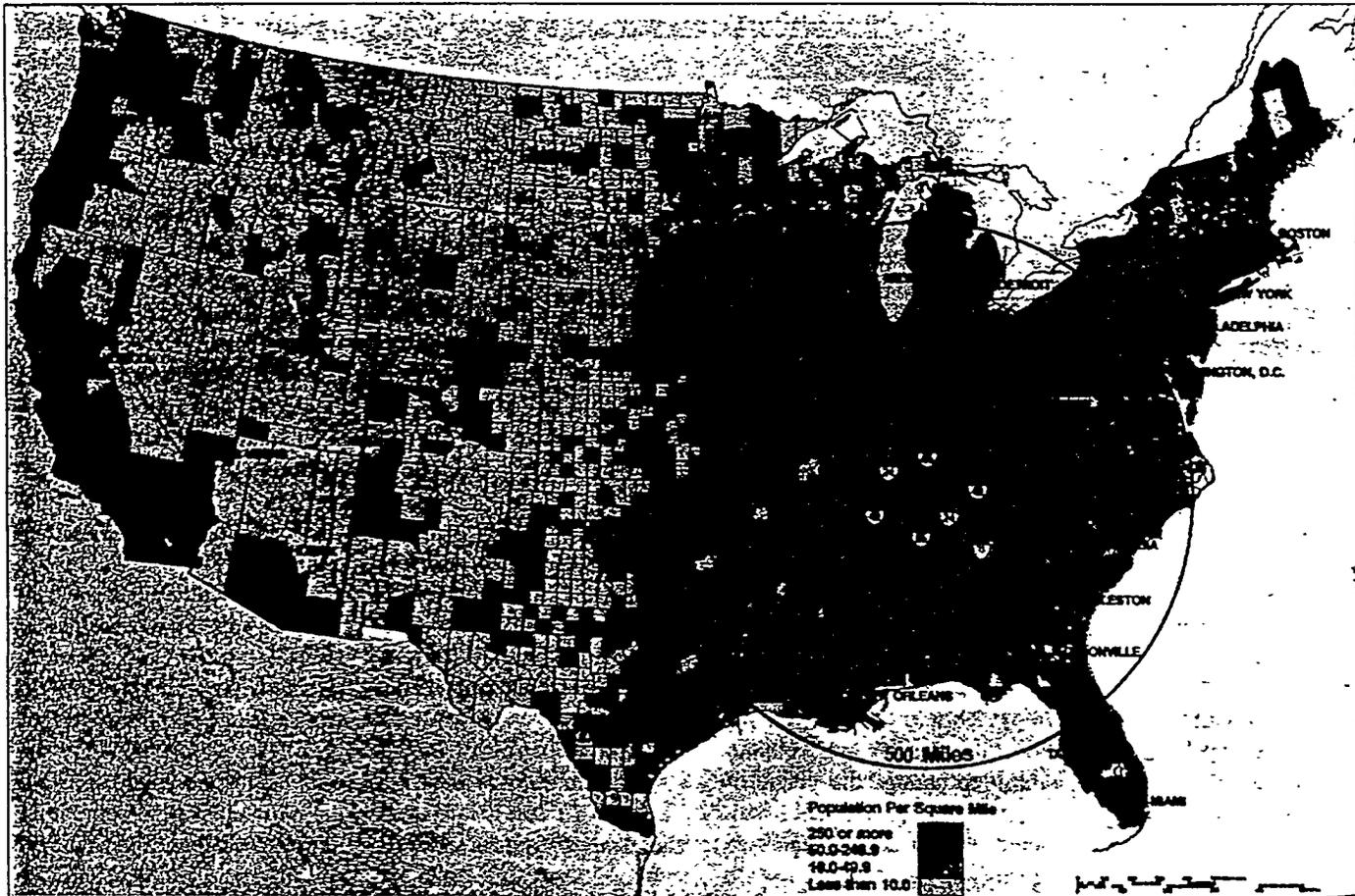
Oak Ridge Facts

ENTITY	MISSION	NUMBER OF EMPLOYEES
ORNL	R&D	5,760 employees
Y-12	manufacturing	6,210 employees
K-25	environmental restoration and waste management	4,000 employees

From 1984 to March 1993...
 ...79 license agreements, 58 active, producing \$66 million in annual sales for companies.
 ...75 CRADAs valued at \$85 million, more than half from industrial partners.

User Centers

- High Temperature Materials
- Advanced Manufacturing Technology
- Environmental Technology
- Waste Management
- Environmental Technology
- Waste Management





Oak Ridge, companies in turn are reversing the flow back to Oak Ridge to take advantage of Y-12's Manufacturing Technology Centers.

Installed in newly non-classified areas of Y-12's 4.7 million square feet of manufacturing floor space in Bear Creek Valley, the Centers' goal is to promote best practices in flexible manufacturing and other requirements for 21st century-scale success.

In 1993, their first year, the Centers assisted 2,500 small businesses, a number that is growing monthly at exponential rates.

It's easy to understand why: 77 of Y-12's 107 processes were identified as all-stars for the Navy's Best Manufacturing Practices database.

The drive to measure continues.

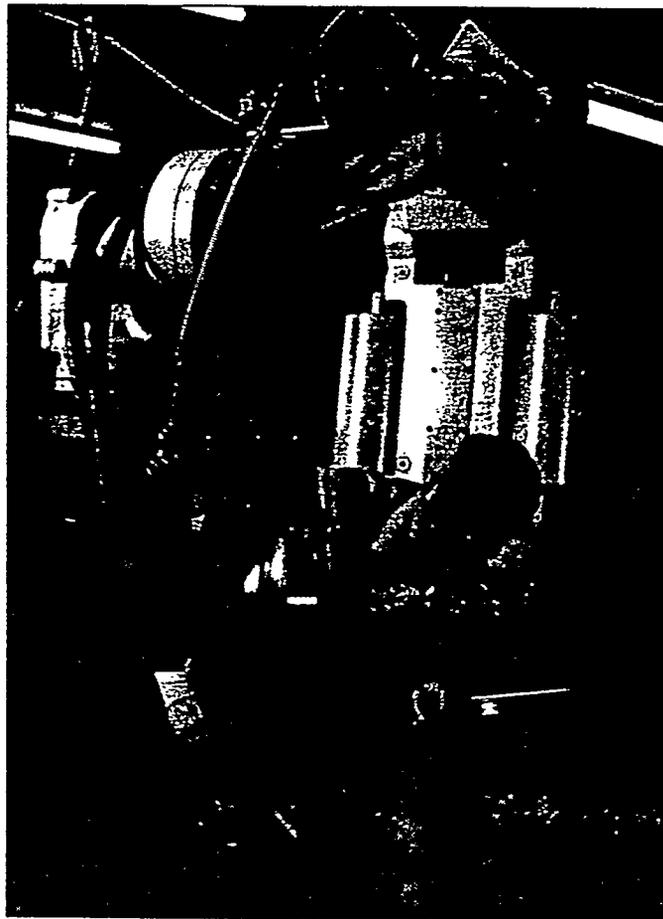
Centers manager Dave Beck has introduced metrics from the Cleveland Advanced Manufacturing Program, which already indicate a \$53 million return on a \$15 million investment, equal to 1,060 jobs created or saved. Over the next five years, the expectation is \$1 billion of private-sector impact, including 25,000 jobs created or saved.

"We don't understand mass production, but we do understand making large numbers of components of extremely high quality," says D.H. Johnson, the director of technology.

TRANSFER FOR Y-12

Rapid change of tooling, agile manufacturing, integrated manufacturing processes and advanced CAD-CAM technolo-

gies are among the capabilities made available to users from U.S. companies of all sizes, organized in the centers around manufacturing technology development; industry-specific technology; manufacturing quality and process assurance; and energy and environmentally conscious manufacturing.



Chris Foster checks the robot-compatible cryoblaster he co-developed to strip paint from military aircraft.

Tapping the expertise of 40 of Y-12's most skilled factory workers and its 1,200 machine tools is a new manufacturing skills campus, a feature of the Manufacturing Deployment Center, which will train 700 visiting factory workers on advanced machinery.

In addition to filling hard-to-identify training gaps, the service supports decisions by factory owners to purchase high-ticket capital equipment that may be essential to im-

proved operations. An additional 7,000 workers can be trained by remote telecast.

"It's a direct peace-dividend to our country," Beck says.

Oak Ridge, in typical fashion, has forged a strong partnership with the Commerce Department and NIST in the na-

agent's kit, and another magnet to draw users to the center of mass — this time to the user facilities at K-25's Centers for Environmental Restoration and Waste Management.

Case Studies in previous editions of *Technology Transfer Business* have highlighted Oak Ridge National Laboratory-developed microbes that 'eat' hazardous wastes, such as dynamite and Napalm, and also uranium.

The uranium microbes are at work in Dresden, Germany, doing their part in a CRADA with Ogden Environmental and the German government.

An environmental technology information service serving resources throughout the Department of Energy is operated from Oak Ridge by Energy Systems' hazardous waste remedial actions program.

It is accessible to the private sector by a toll-free information number for searches on specific technologies, procurements, grants and cooperative research throughout the department.

RESEARCH MECCA

While factory workers and industry leaders alike make up the users at Y-12, Oak Ridge National Laboratory and its component facilities also swing open their doors.

Guest researchers — more than 3,500 a year — come for a few days to a couple of years to join 1,500 scientists and engineers to work on problems of mutual interest.

"The parking lots are overflowing," complains Jim Stiegler. "There isn't enough office space. Everyone comes to work earlier."

At the High-Temperature Materials Laboratory, an ORNL showcase, 40 percent of the space is given over to users like a team from Norton's advanced ceramics groups, which

ditional drive to improve manufacturing competitiveness.

Likewise, expertise available at the K-25 site can be brought to bear to ensure environmentally sound manufacturing practices.

LEADING-EDGE ENVIROTECH

Increasingly, however, K-25 and ORNL's assets in environmental remediation technologies will become a standard tool in the industrial extension

GOLD
IN THE HILLS

for three years traveled back and forth from headquarters for a week at a time to log test results, set up tests and go home until the cycle concluded.

As many university researchers as industry researchers use HTML, and the vast majority of their work is in non-proprietary research, for which there is seldom a direct user cost. User agreements for proprietary research require a \$150-per-hour fee.

None of this is a giveaway: "We learn from interacting with the user," said HTML Director Vic Tennery. "It's not just that they're gaining from us."

Two major technology transfer thrusts of the HTML include a Ceramics Manufacturability Center, organized in partnership with Y-12 to assist both the machine tool and advanced structural ceramics industries; and a neutron residual stress facility, to provide a non-invasive testing mechanism to a broad range of U.S. industries.

Major companies participating in cooperative research agreements with HTML include Coors Ceramics, Detroit Diesel and Lanxide. Negotiations are in final stages with Caterpillar, Cincinnati Millicron, Eaton Corp. and Cummins Engine.

BIG BANG IN CONSORTIA

From its center of mass, Oak Ridge reaches individuals, companies and projects of every size. And while its strategy is focused on corporate formation and job creation, it's looking also, near-term, for industry revitalization and job retention.

Candidates for the Big Bang

include transportation and textiles.

The USCar consortium with the automobile industry draws upon six Energy laboratories to collaborate in five formally organized partnerships for low emissions, automotive materials, supercomputing automobile applications, environmental research and vehicle recycling.

About two dozen CRADAs are signed or in the works to support these efforts, and Oak Ridge alone will have at least one CRADA relating to each of the five partnerships, in addition to

extensive expertise in lithium is key, reports John Bates.

Helping pull these assets together is the newly created Oak Ridge Transportation Technology Center, which will take a practical approach to newer, safer and more efficient transportation technologies by relating Oak Ridge's 20 years of transportation technologies experience to the national Clean Car, IVHS and infrastructure improvement research.

Better flywheels and lighter but stronger materials are just two areas of interest. In addition,

used in currency and stamp evaluation, said Oak Ridge's Glenn Algood. Oak Ridge is also participating in DAMA, AmTex's integrated industry automation project recently launched with a \$20 million for the first year's research.

At the 40-person Technology Transfer Office at 701 Scarborough Road, a user-friendly site outside the Energy Department complex, Bill Martin is drawing on manufacturing and materials technology that doesn't exist anywhere else in the country to build alliances across a spectrum



Jim Hewitt (left) prepares to remove chlorine from a PCB-contaminated liquid.



Wayne A. Neff (above) adjusts a system that recycles chemicals used in industrial plating.

Pat Parr and Barbara Rosensteel (right) obtain soil samples for testing.



playing on the intra-Energy team.

"This is a unique experience for the labs as well as for industry to work on such a large-scale collaboration," notes Jon Soderstrom, who participated in a recent videoconference that included the Big Three, field offices and laboratories to discuss ways to make the consortium work most effectively to produce the most momentum.

One initiative that dovetails with USCar is Oak Ridge's work on batteries. Approaching problems of scale, research ranges from small medical-implant devices, to personal electronic aids to, a few years from now, the electric vehicle. The laboratory's

ORTRAN will apply its databases of highway, railway and waterway passages to problems such as transporting hazardous materials, says Bob Honea.

AmTex, the U.S. textile industry consortium, has signed a CRADA with Oak Ridge for Computer-Aided Fabric Evaluation, or CAFE, a key enabling technology for future efficiency.

Seeking to staunch the flow offshore of 600,000 jobs over the past 14 years, AmTex plans to invest \$20 million for five years for CAFE, a project to optimize fabric yield and speed of handling by automating the defect identification process.

CAFE will create a new market for machinery currently

of individuals, companies, institutions and regions. He takes the temperature of his multiple programs against a tall thermometer he himself devised, and against a vision of 21st-century differentiators consisting of people and skills.

"It's unique to have a contractor be the leading economic development organization in a city," notes the Oak Ridge Chamber of Commerce's Tom Rogers.

"We take our lead from what Martin Marietta is trying to do," agrees Tennessee's Riebeling. "It's really getting ready for the future, and Martin Marietta is spending a lot of their resources and efforts to get there." ■

Bill Martin: Making an Effort to Magnify T² at Oak Ridge

William A. Martin, vice president of technology transfer, returned to Oak Ridge in 1987 after a decade in industry to become associate director of Martin Marietta Energy Systems' Office and Defense Technology Program, and later of ORNL's Engineering Technology Division.

Having started at ORNL in 1959 as a research engineer, Martin retained his ties to East Tennessee while based in New York and Connecticut as an international operations executive and general manager of Cabot Corp.

Drawing on his experience in corporate finance and man-

agement as well as his involvement in his adopted community, Martin hit the ground running when he took over at the end of 1992 from Bill Carpenter, whom his successor credits with changing the culture for technology transfer.

A year ago he issued a strategic plan for technology transfer that codified ongoing initiatives even while it set new goals and measurements.

"The tech-transfer act is magnified at Oak Ridge because we have Bill Martin," says Howard Harvey, vice president of Remotec, a beneficiary of Martin's initiatives.

ESTHER SMITH

Expanding the Vision to New Mexico

When Martin Marietta Energy Systems sought the contract to manage Sandia National Laboratory in Albuquerque, its Oak Ridge credentials played a prominent role in its proposal and became a key discriminator in the competition.

Sandia had a good track record in CRADAs, said Warren Siemens, now director of technology transfer and commercialization at Sandia, and formerly deputy director at Oak Ridge.

Under AT&T, Sandia backed up 145 CRADAs worth over a billion dollars and fostered successful alliances with Sematech and other large consortia and corporations.

But, based on its Oak Ridge experience, Martin Marietta is adding two additional priorities: an emphasis on intellectual property and licensing, and close working relationships with

local and regional economic development entities.

"We're looking for order-of-magnitude increases," said Siemens. "Our goal right now is to double the number of invention disclosures this fiscal year, double the number of patent applications, double the number of licenses to industry, do that for at least five years and see how that works."

Their success, combined with active participation in regional alliances, should make a major difference in New Mexico's economy.

For starters, Sandia will actively extend technical assistance, primarily in manufacturing, to the region's existing companies, and fuel entrepreneurial development by identifying potential deals and matching them with sources of management and finance.

ESTHER SMITH

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TECHNOLOGY

INFORMATION

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Advanced
Technology



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Manufacturing Sciences

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complex in Tennessee
beyond technology tr.

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COVER: *Illustration by Kelly*

TCRD

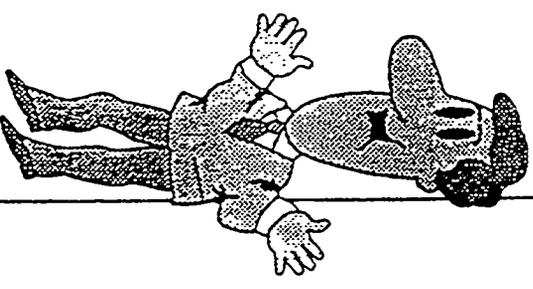
*Discuss TCRD's Mission, and
Technology Transfer and
Commercialization Activities*

Agenda

- **Introduction to TCRD**
- **Technology Transfer and Commercialization Activities**
- **Value Added Capabilities and Services**
- **Summary**

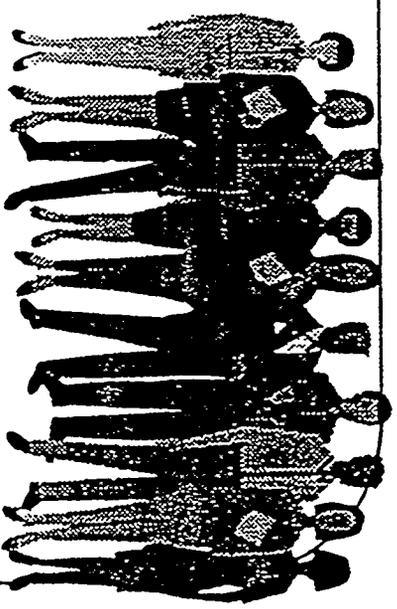
Introduction to TCRD
What is TCRD?

- A unique organization devoted to the commercialization of technology for regional economic growth
- A non-profit 501(c)(3) research and development, membership corporation
 - Founding members include TVA, MMES, and UT
 - Membership being expanded to include corporate members
- **Founded in 1984 and now includes**
 - Four technology centers,
 - One technology resource division,
 - One for-profit subsidiary



John Taylor

Introduction to TCRD
TCRD Strengths



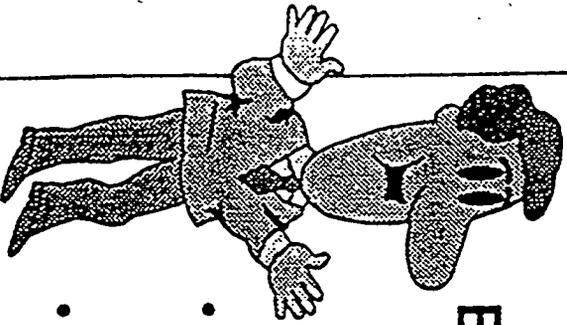
- Integrate and leverage regional technology, management, and capital to facilitate creation of economic opportunities
- Extensive commercialization experience
- Proven project management capabilities
- Advanced technical and extensive managerial resources through TCRD and its members
- Hands-on small business management experience

Introduction to TCRD

What is TCRD's Mission?

Enhance the development of the region and the nation through the creation of economic opportunities by:

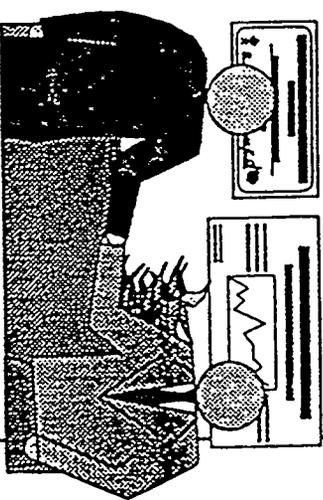
- “Attracting and facilitating the accomplishment of applied and advanced R&D”
- “Developing applications from R&D originating in public and private organizations into products, processes, and services ready for the marketplace”
- “Assisting ventures in business development, management, and obtaining financing for commercialization of these products, processes, and services”



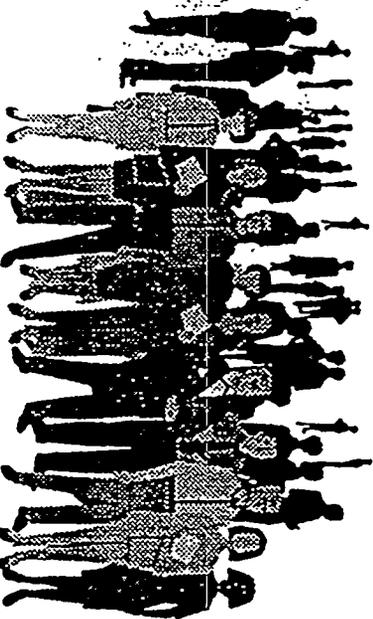
Introduction to TCRD

Assistance to Small Businesses

- Overview business management
- Business plan development
- Business incubation and mentoring
- Assist in identifying and obtaining management team
- Leverage start-up financing
- Technology and market analyses
- Product development expertise
- Legal and accounting assistance
- Links to regional experts/technology sources

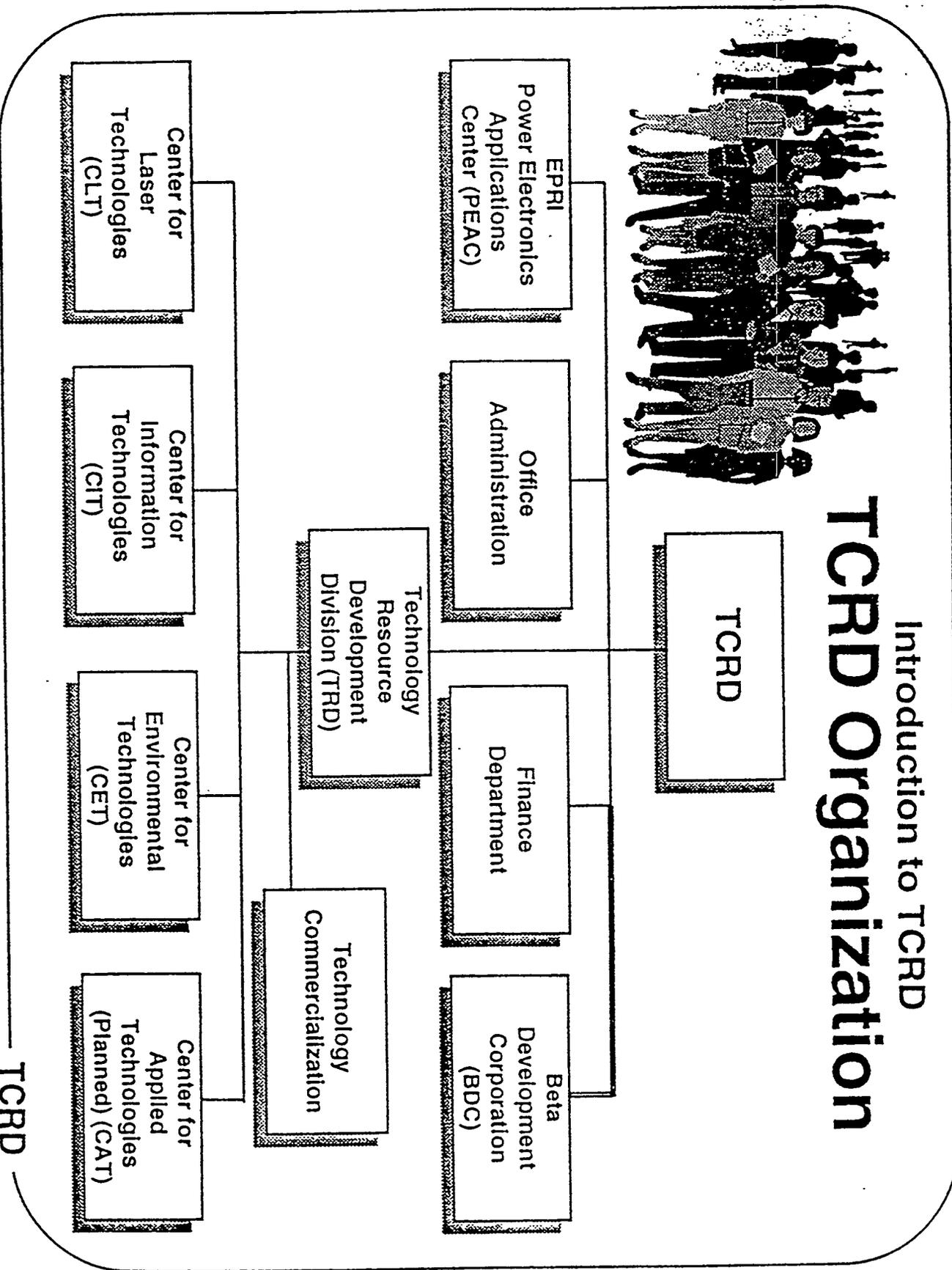


“In the last ten years, small businesses have created two out of three net new jobs.”



Introduction to TCRD

TCRD Organization

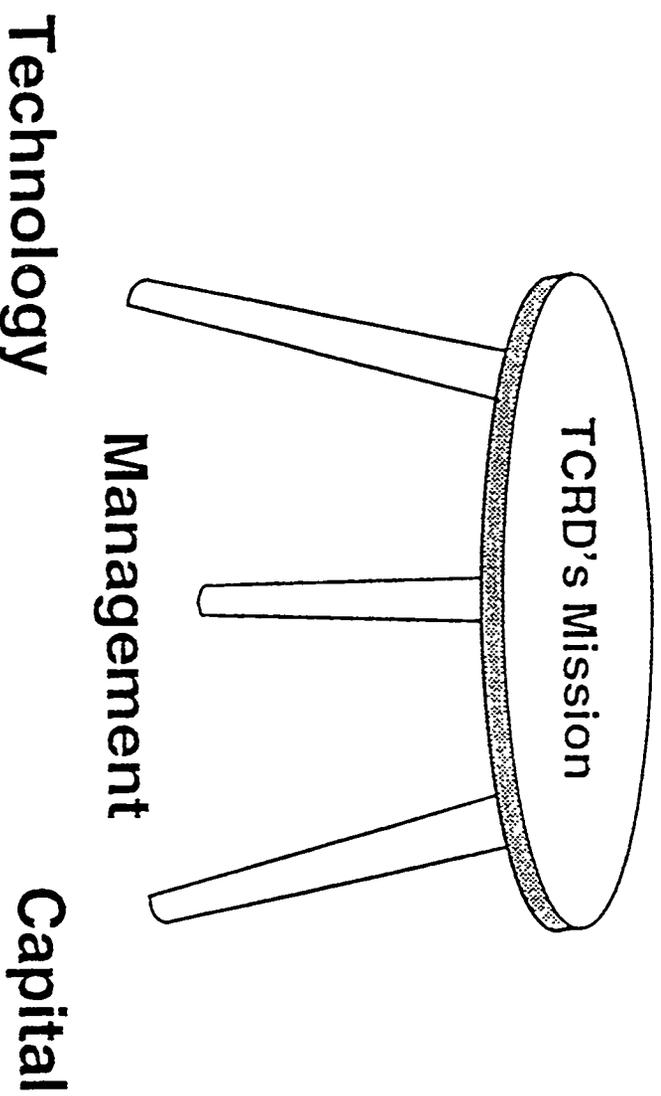


TCRD

Introduction to TCRD

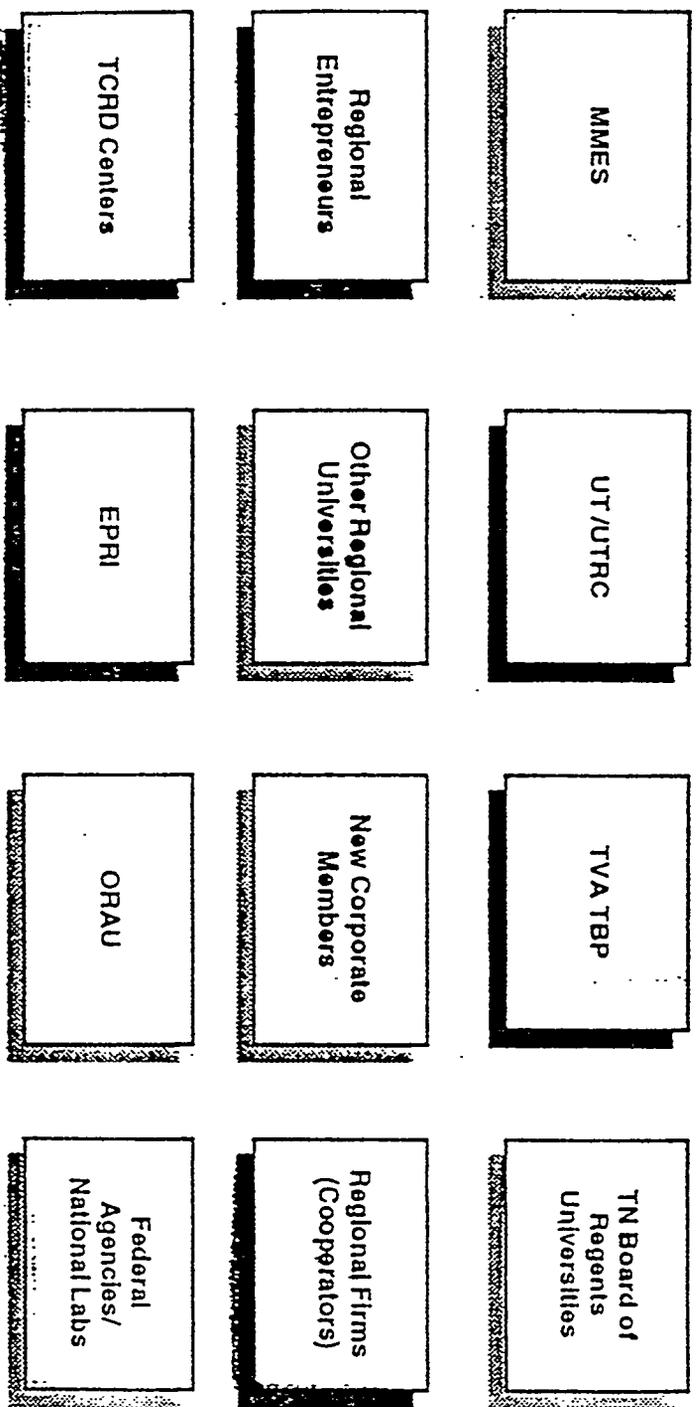
How Does TCRD Accomplish its Mission?

“Integration of Critical Resources”



Introduction to TCRD

Sources of Technology



Introduction to TCRD

Sources of Management

Regional Mentors
(Successful
Business Ldr.)

Angels

MMES Loaned
Mgrs.

Regional
Entrepreneurs

TCRD "Incubated"

UT Loaned
Experts

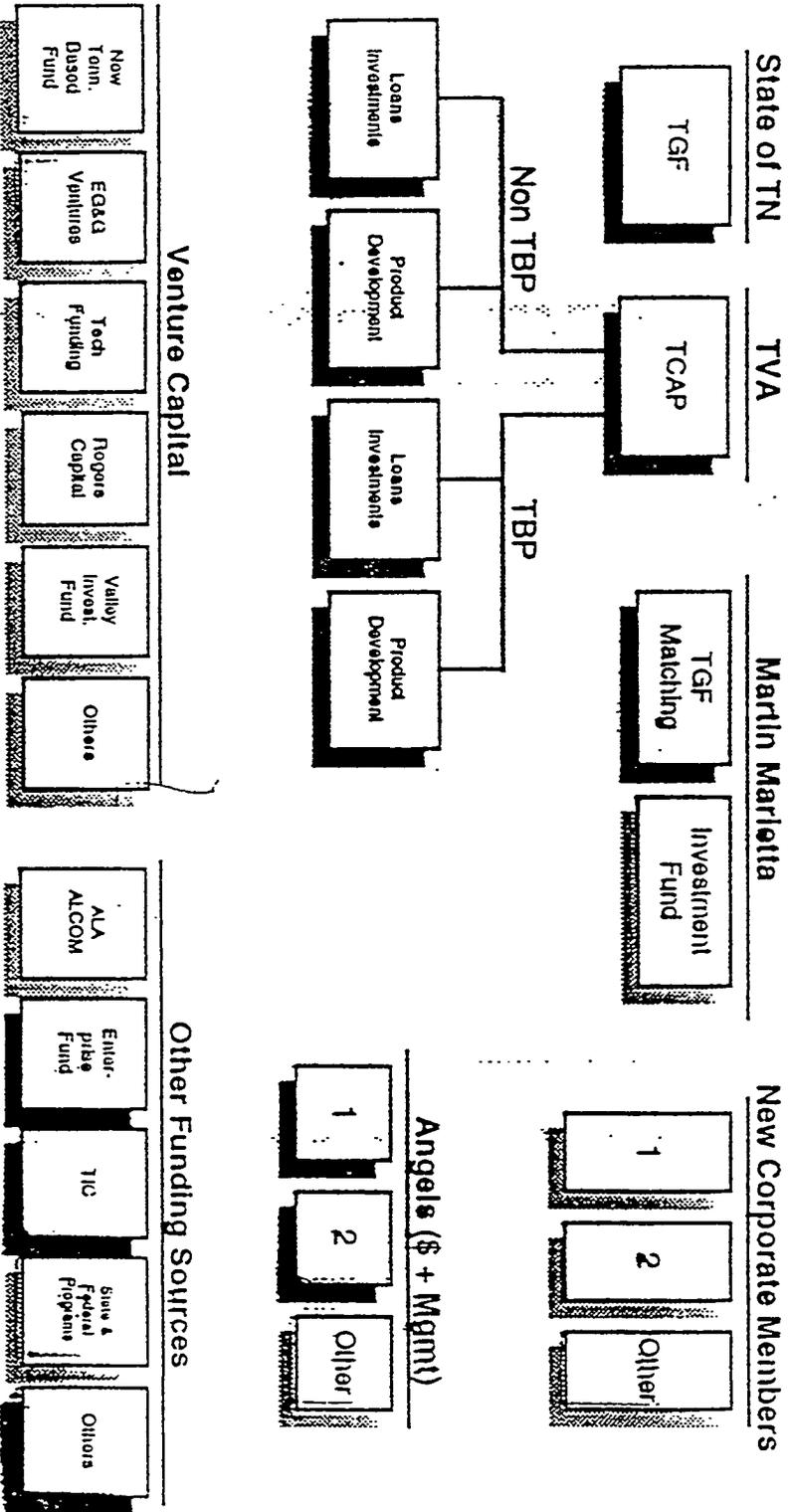
New Graduates
(MBA, Co-op, etc.)

TCRD Led
Mentoring

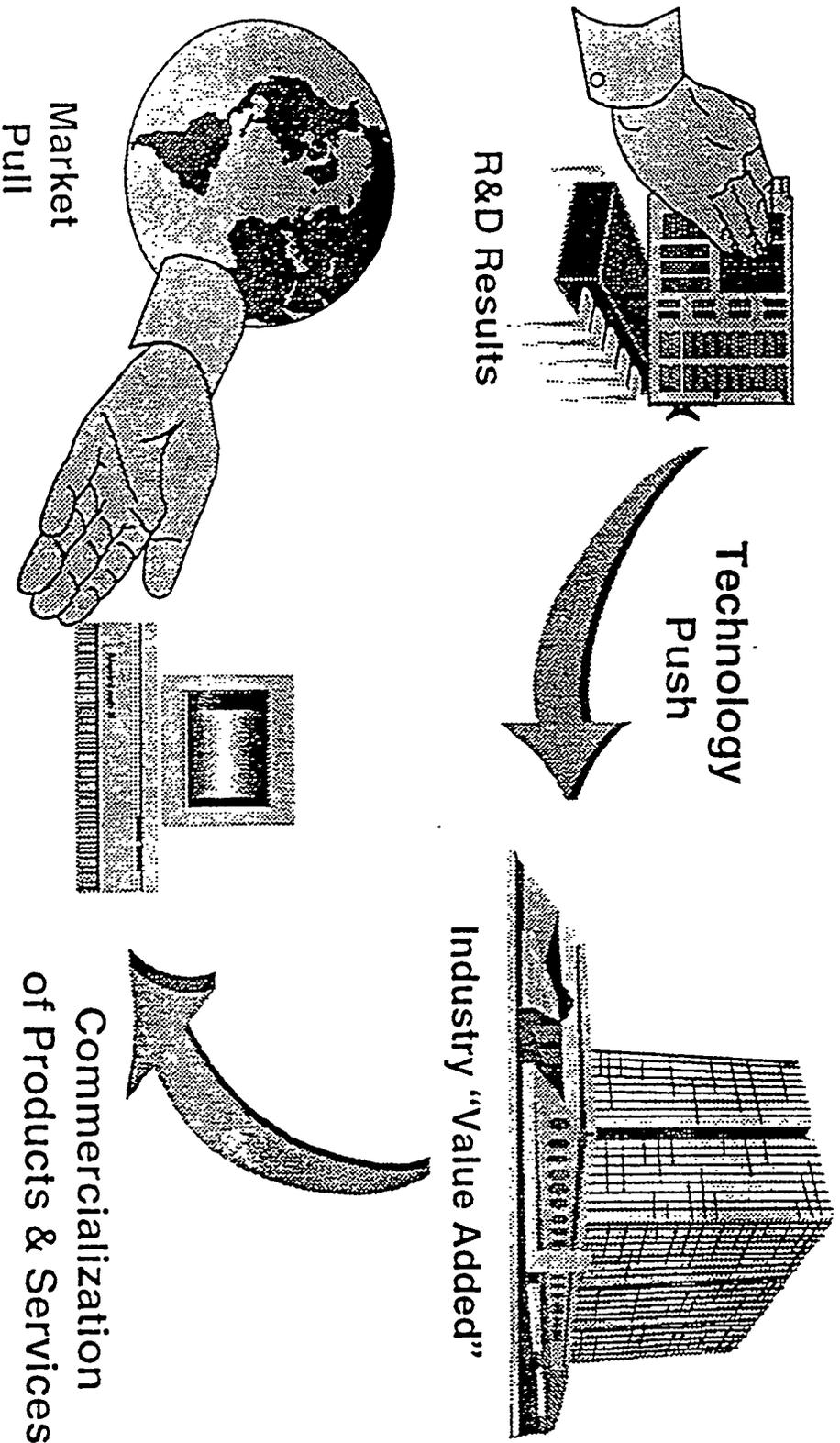
TVA Loaned Mgrs.

Sources of Early-Stage Capital

Introduction to TCRD

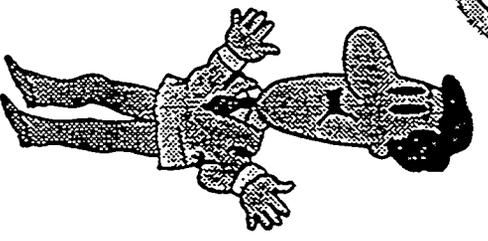
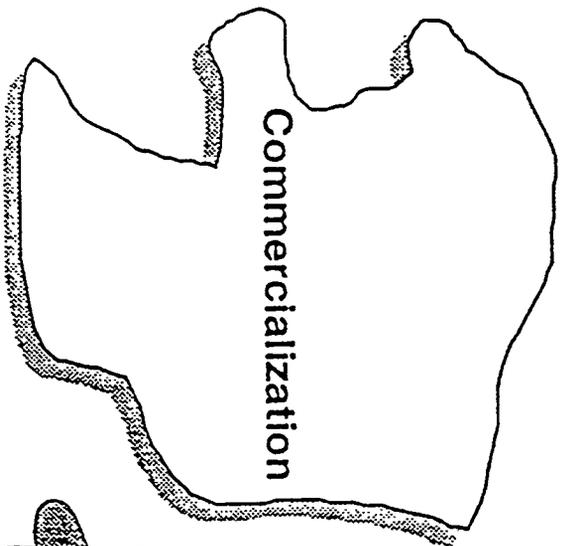
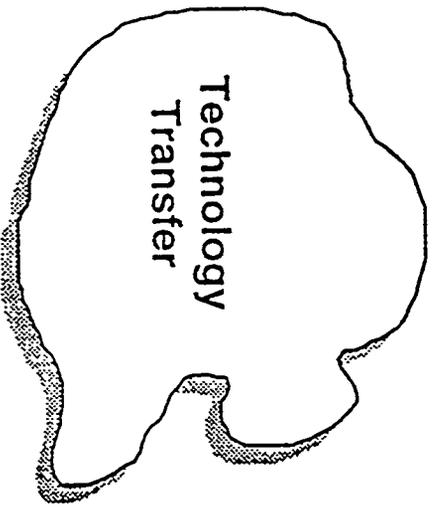


Technology Transfer and Commercialization Activities Overview



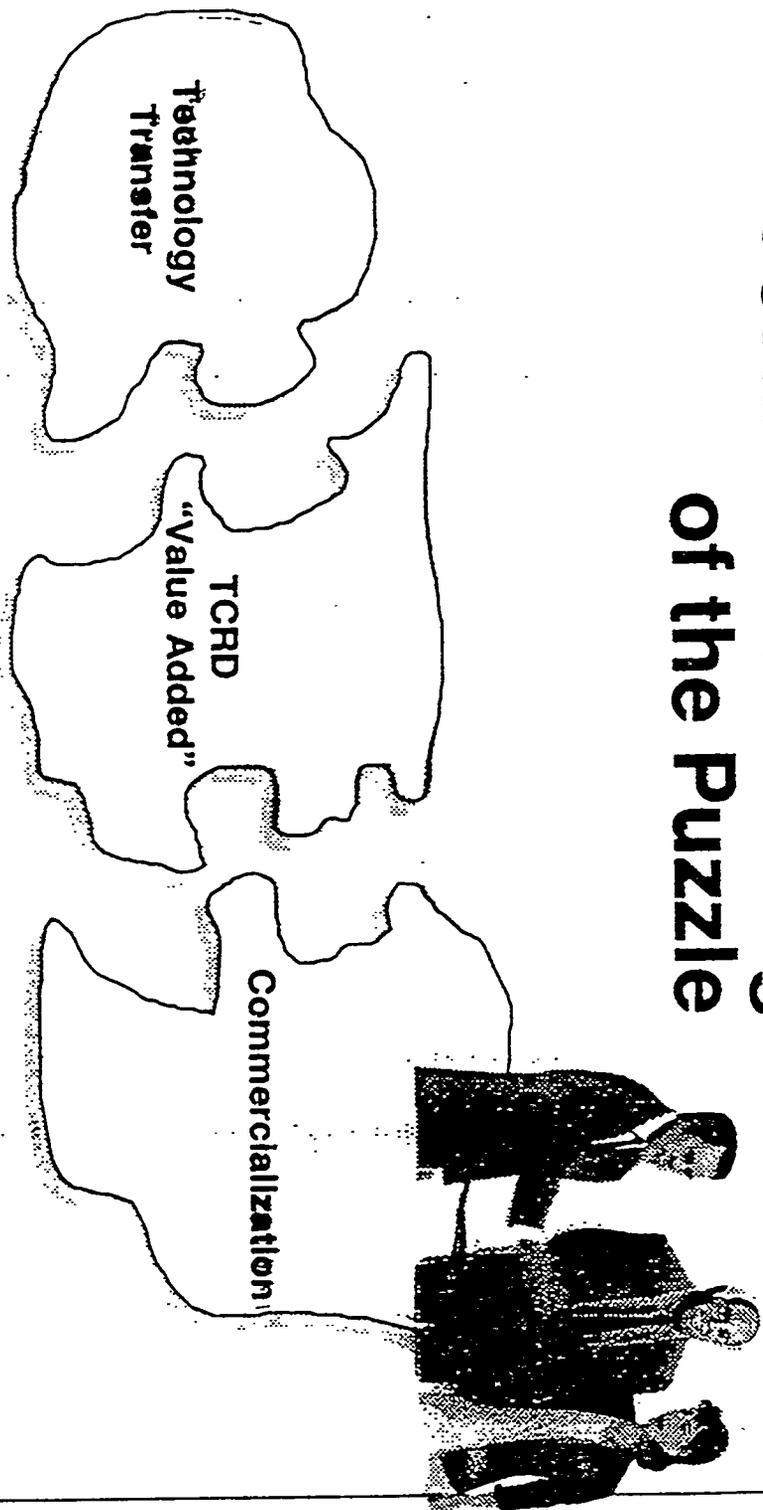
Technology Transfer and Commercialization Activities

Traditional View!



What is the missing piece?

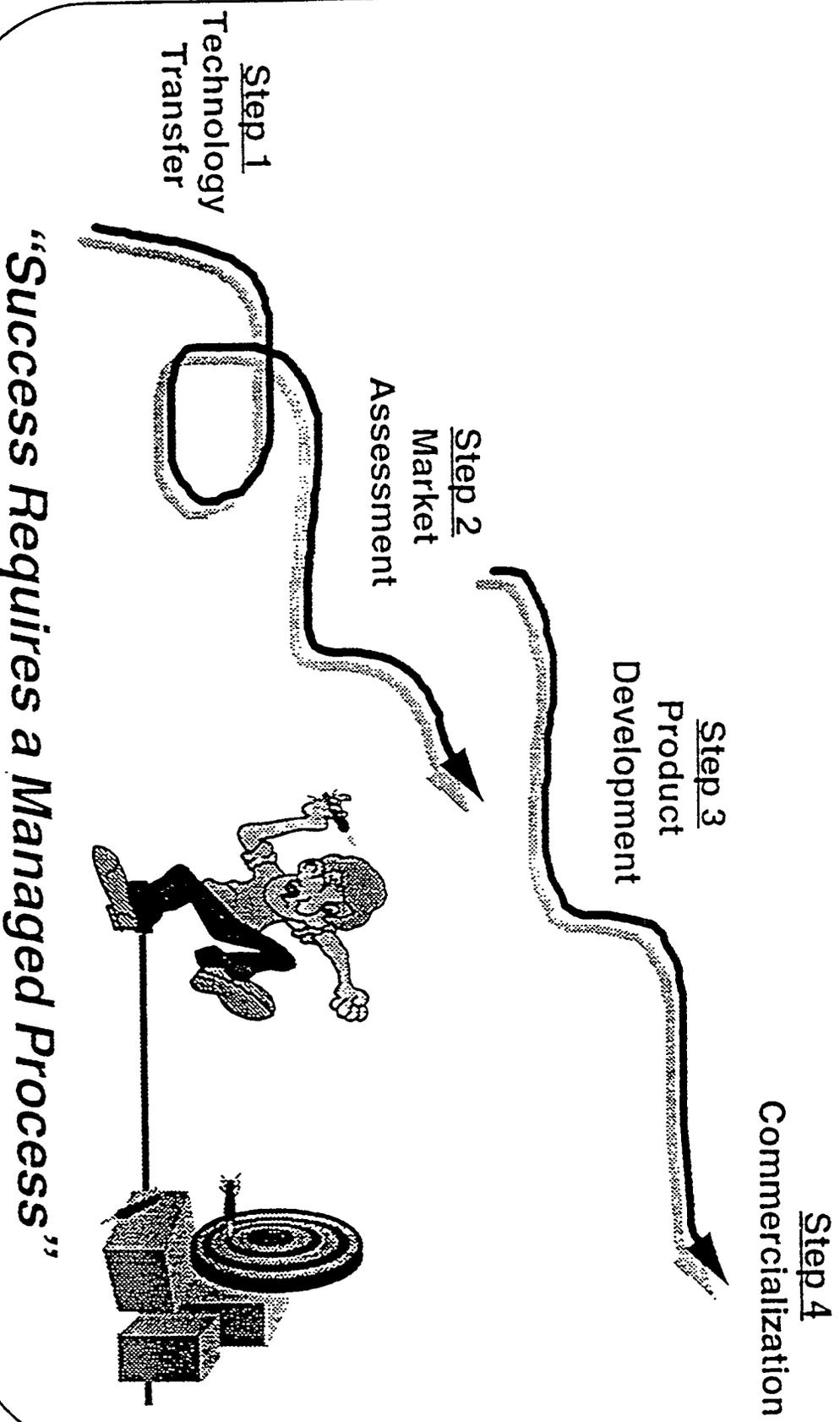
Technology Transfer and Commercialization Activities
TCRD - The Missing Piece
of the Puzzle



"Success Requires a Managed Process"

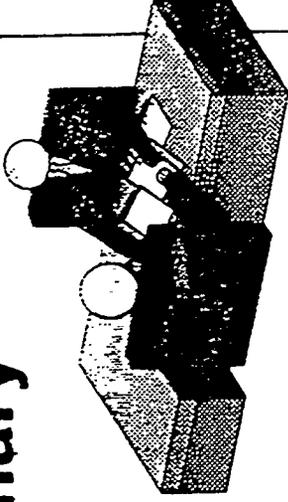
Technology Transfer and Commercialization Activities

Step-by-Step Process



Technology Transfer and Commercialization Activities

Due Diligence - Summary



"Detailed commercial and technical evaluation of products and services"

Over 350 Questions in Six Different Classifications and Four Major Business Stages

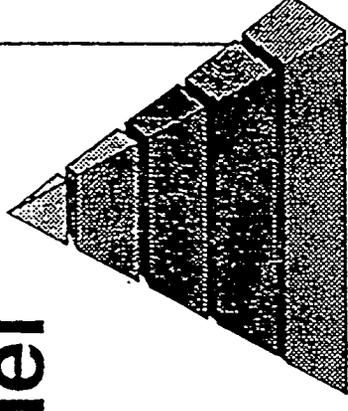
Classifications

Business Plan
Financial
People
Technology
Products
Marketing/Sales

Business Stages

Inception
Start-up
Market
Steady-state

Commercialization Model

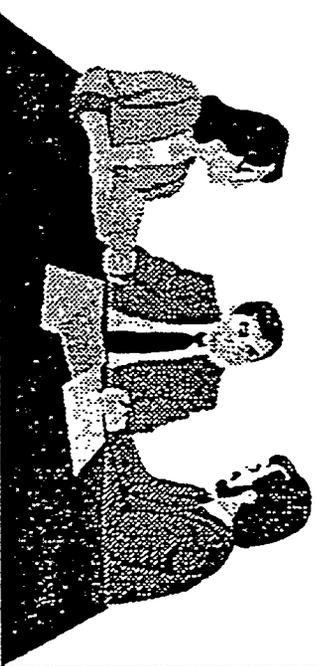


- Methodology to
 - Determine status of R&D results
 - Determine if R&D results have commercial potential
 - Identifies early those R&D results that have most potential for commercialization
- Integrate commercial entity early in development process
- Start-up and development capital for R&D results that show potential for success

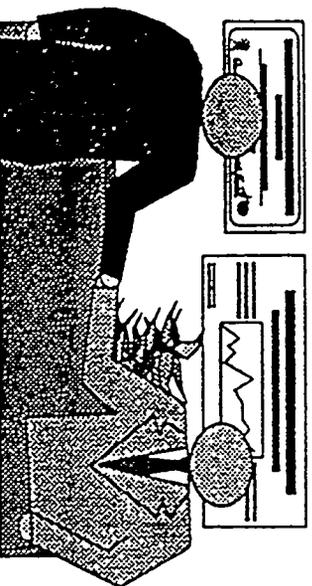
Value Added Capabilities and Services

Overview

- Analysis and Assessment
- Financial Assistance
- Marketing Assistance



- Product Development
- Start-up Assistance
- Educational Assistance



Summary (Con't)

- TCRD has developed and implemented methodology for technology transfer and commercialization that emphasizes a disciplined approach
- TCRD has an experienced staff with the capabilities to effectively manage technology transfer and commercialization programs for its members and others organizations

ORGANIZATION

OFFICE OF TECHNOLOGY COMMERCIALIZATION

Director:

Lisa Knuutila

Technology

Commercialization Associate:

• Renee Harvey

--

Analytical Instrumentation,
Environmental

Technology

Commercialization Associate:

• John Weis

--

Electronics, Software

Technology

Commercialization Associate:

• Brian Budeslich

--

Nondestructive Evaluation,
Metals, Ceramics

Technology

Commercialization Associate:

• Denise Hayward

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Chemical, Materials

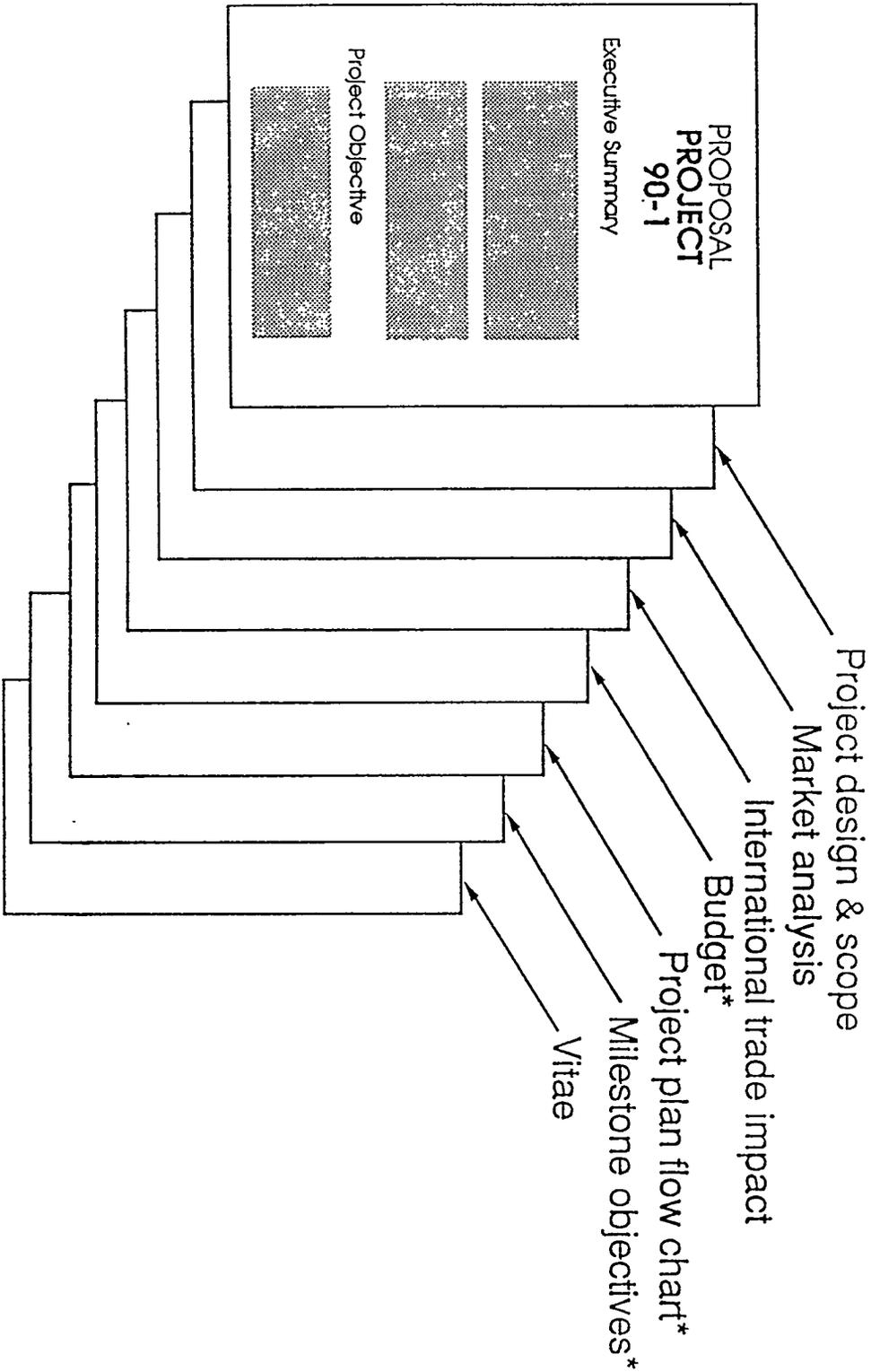
Software Licensing Assistant:

• Dan DeGheest
(Student)

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Software Licensing
(internal use)

PROJECT PROPOSAL CONTENTS



*Planning documents used in project management and DOC progress reviews

Center for Advanced Technology Development
Project Management

- Covers Exploratory Research Program, Applied Research Program and Industrial Contract Research Program
- Project management and control is delegated to the Principal Investigators
 - Informal project meetings as required
 - Monthly status reports (1-2 pages)
 - Semiannual DOC milestone reports
 - Semiannual Project Reviews with DOC
- Project proposal flow chart, milestone objectives and budgets are planning documents used in project management
- Commercialization status reports regularly updated and used in project management

Center for Advanced Technology Development
Technology Commercialization Plans

- Each project includes the preparation of a plan for commercializing the technology.
- Elements include applications, intellectual property, status, commercialization strategy and next steps.
- Important to achieving buy-in for commercialization plan by PI and researchers.
- Initiate these plans early in the development process.

Center for Advanced Technology Development
Technology Commercialization Plan

CATD Numbers: 88-1

Project Name: Powder Processing of Rare-Earth Alloys for Permanent Magnets

Inventors: I. Anderson, B. Lograsso

CATD Staff: R. Harvey, L. Kuuttila

Description: A process to produce ultrafine, high-purity powders from rare earth-iron alloy for the production of state-of-the-art permanent magnets. Can also be used for making a wide range of high purity powders for other applications.

Application: Ultrafine powder is vital to the successful development of a number of emerging powder processing technologies including metal injection molding, rapid solidification processing, and arc-plasma coating and deposition processing.

Intellectual Property: A number of patents and patent applications cover this technology. A diagram showing the relationship between the patents is being developed. A licensee to our patents probably will need a license to a U.S. Navy patent as well. The Navy has been contacted and is agreeable to working out an arrangement. Foreign filing has been initiated on the U.S. patent applications.

Status: The atomization research produced three results. First, it resulted in the redesign of the atomization nozzle (patent pending) to obtain superior powder specification levels. Second, the research progress on the atomization of metals and alloys with extremely elevated melting temperatures and with very reactive melt chemistry has been demonstrated by the operation of the HPGA at 2000° C and by the processing of alloys with refractory metal (CR) content of up to 30 at.%. Third, the atomizer has been modified to incorporate a device for in-situ application of a protective surface film on powders of extremely oxidation prone alloys such as rare earth compounds. Negotiations of license principles (option) completed—Ames Specialty Metals Division of EDGE Technologies Inc. has been announced for specific field of use for permanent magnets. Currently looking for licenses for other alloys and application.

Technology has broad applications for non-magnetic powders. Currently working to produce customer sample quantities—have inquiries for powder from 20 companies. License option under negotiation with Toronaga. Negotiating with company to fabricate 50 lb. atomizer unit. Delevan providing quotes for nozzle.

Commercialization Strategy: EDGE Technologies has licensed the technology in the application of permanent magnets. A number of companies (20), users and producers of various non-magnetic powders, have approached us for samples and information about licensing. One non-exclusive option agreement has been signed with Toronaga. A start-up company is also a possibility for commercialization. A comprehensive transfer strategy needs to be developed to encompass the commercialization of as many applications as possible.

Next Steps:

- Develop intellectual property matrix.
- Have Delevan sign non-disclosure agreement.
- Follow up with companies seeking sample quantities, establish shipping dates and review company specs.
- Develop policy with respect to samples, quality control and distribution.
- Develop comprehensive transfer plan including nozzle production and fabrication of gas atomizer units.
- Work out acceptable agreement with U.S. Navy to sublicense their patent in conjunction with our licenses.

Institute for Physical Research & Technology, Iowa State University
January 27, 1992

NO:991 AV



STAEDTLER
LUMOCOLOR

TRANSPARENCY MOUNTS
MOUNTURE POUR TRANSPARENTS

Center for Advanced Technology Development
Intellectual Property Database

- A networked database running under 4th Dimension on the MAC. Accessible to ISURF, Ames Laboratory and CATD as well as other groups on campus (future).
- Allows efficient access to and communication re intellectual property information.
- Data includes invention disclosure data, patent activity and, in a future version, licensing information.



Center for Advanced Technology Development
Marketing Strategies

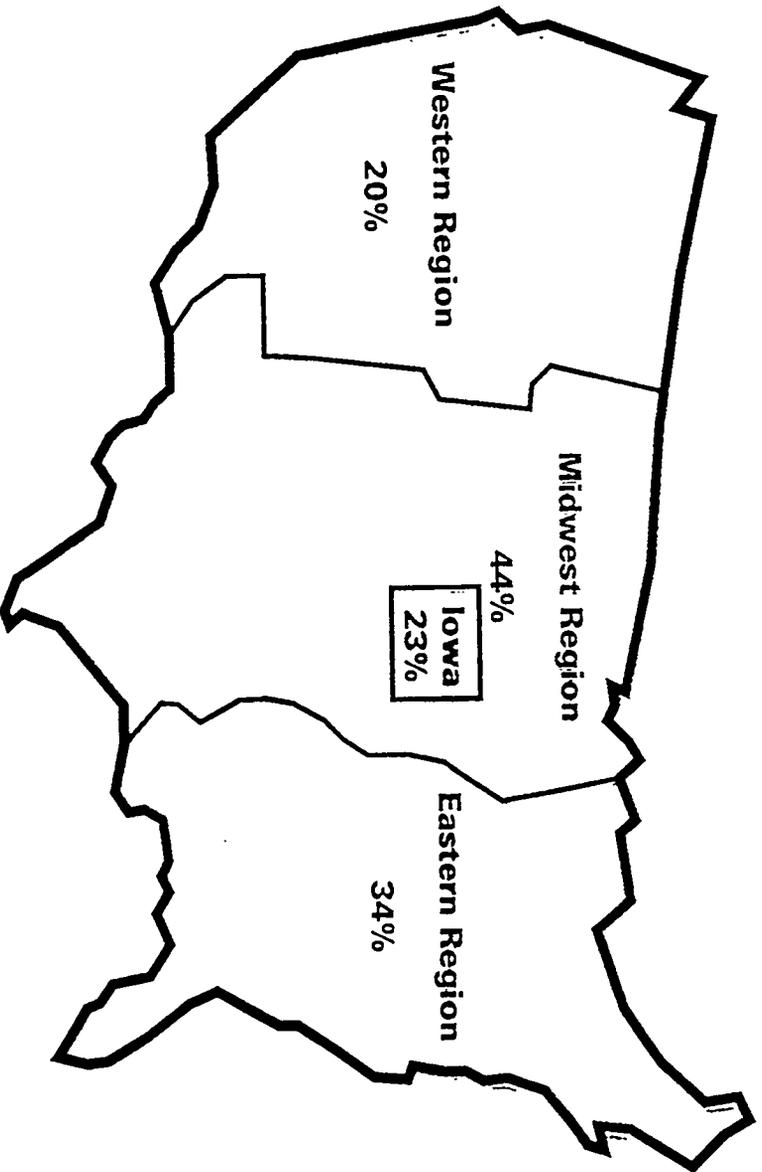
- Include market data in project selection criteria
- Involve industry early on
- Identify basic vs. incremental technologies: existing vs. emerging markets
- Determine as part of commercialization process: start-up vs. established company or alliance approach
- Identify promising applications - stay flexible through project depending on results
- Develop strong intellectual property position -
 - patent: U.S. and foreign
 - copyright
 - trademark
 - mask works
 - know-how
- Develop licensing strategy including degree of exclusivity, field of use, etc. based on industry/market conditions
- Contact U.S. companies via multiple approaches: shotgun and broad-brush
- Conduct due diligence on prospective licensees
- Work with licensees after the license is signed

Center for Advanced Technology Development
Tools

- Market studies: off-the-shelf reports and custom studies by outside consultants
- Cost and other technoeconomic studies by outside consultants
- Industry directories
- Patent and literature searches thru university library
- Technology abstracts
- Catalog of technologies available including description of applications
- CorpTech database
- Mailings and direct calls
- Attendance at targeted technology/industry-specific conferences
- Talks by CATD staff, PIs and other researchers
- Beta site testing of prototypes during course of project
- Option agreements during project
- Due diligence including company site visits

Center for Advanced Technology Development
Office of Technology Commercialization

Interaction in Past Year with U.S. Companies



CATD - Office of Technology Commercialization

Results

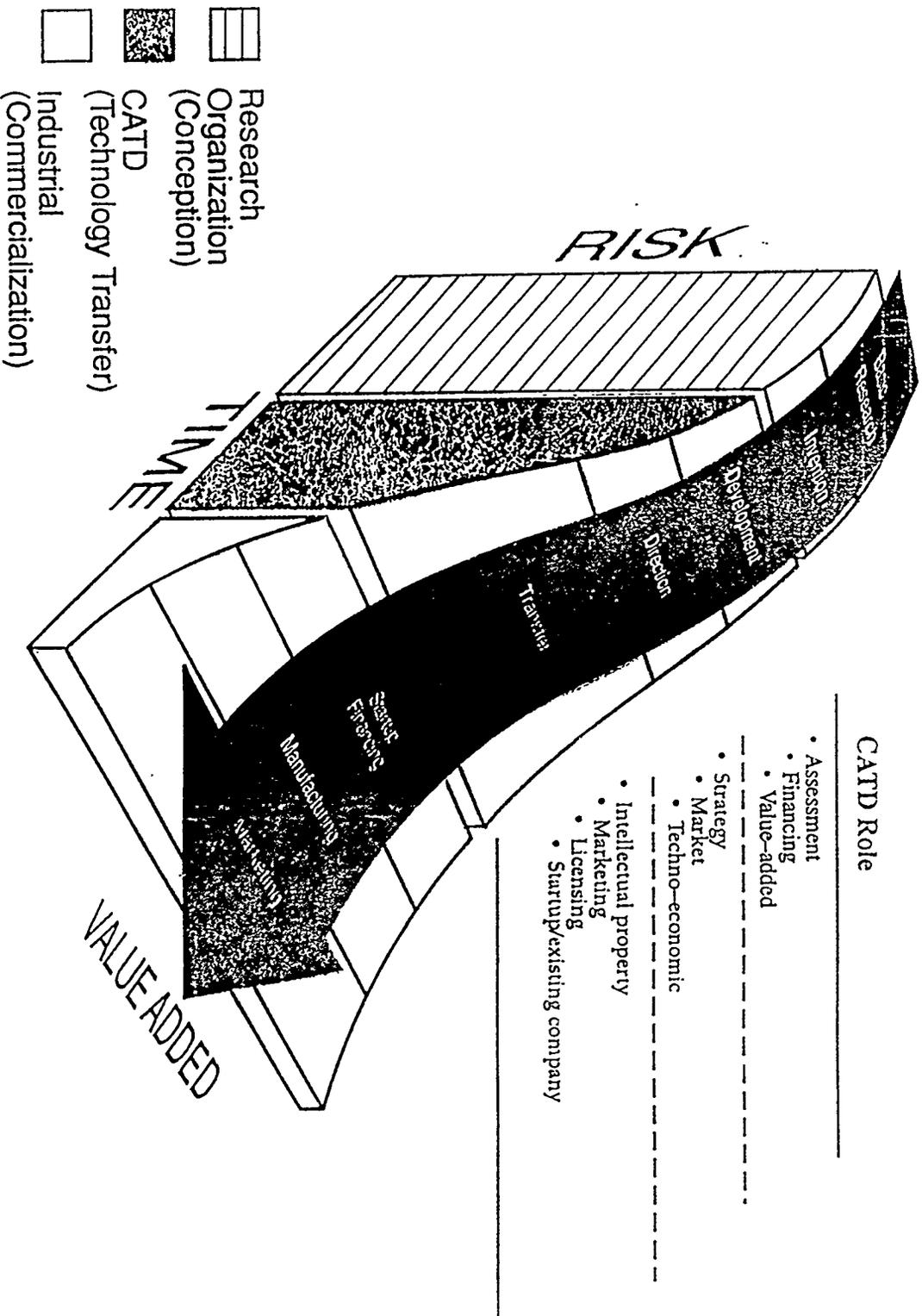
- Over 50 technologies/projects completed or underway.
- Fourteen licenses/transfers in place for 15 different projects (6 with Iowa companies).
- Over 10 option/development/license agreements under negotiation.

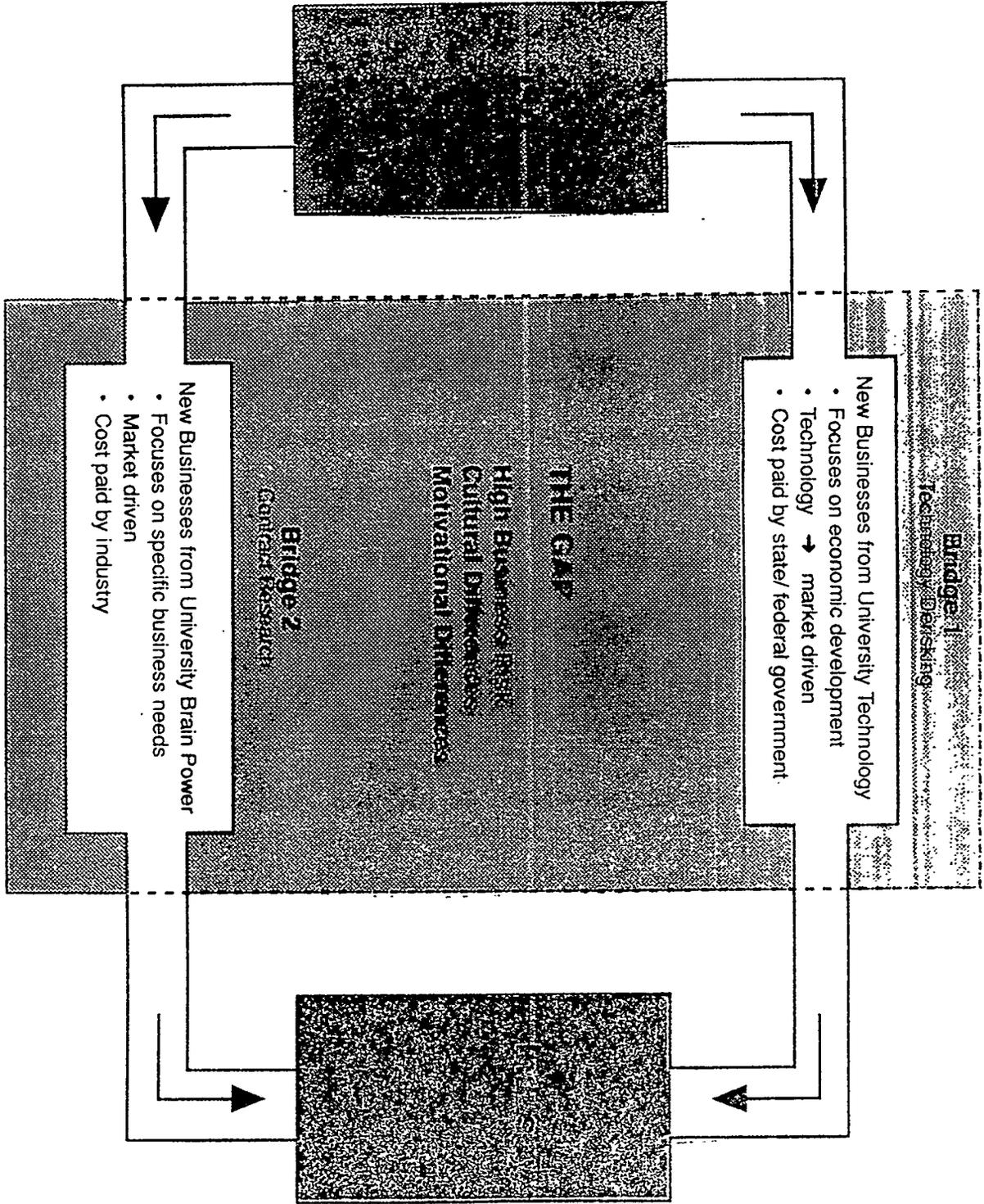
CATD - Office of Technology Commercialization

Impact on Iowa Businesses

- Direct License to Iowa Companies
 - New start up company
 - Established company
- Indirect Benefit to Iowa Companies
 - Equipment manufacturing for out-of-state licensees
 - Relationships with university start-ups

Center for Advanced Technology Development





Technology Transfer: Bridging The Gap

**Appendix J. The Ames Center for Advanced Technology
Development**



CENTER FOR ADVANCED TECHNOLOGY DEVELOPMENT

A Summary of Its History, Organization and Accomplishments

Institute for Physical Research and Technology
Iowa State University

Introduction

The Center for Advanced Technology Development (CATD) was formed in 1987 as a result of a first year grant of \$3.5 million grant from the U.S. Department of Commerce. Its mission is to develop and transfer Iowa State University technologies to the private sector so as to strengthen the competitiveness of U.S. industry, create jobs and, wherever possible, improve the economy of the state of Iowa.

CATD is a member of ISU's Institute for Physical Research and Technology (Exhibit 1) -- a federation of eleven interdisciplinary research centers that includes the U.S. Department of Energy's Ames Laboratory. Because of Ames Laboratory's size, about half of the CATD projects originate from research performed at the DOE facility. The remainder of the projects originate from basic research conducted at the other institute centers, the College of Engineering and the College of Liberal Arts and Sciences (Physics and Chemistry).

Model and Methodology

From the outset, CATD's approach to technology transfer has been new and innovative for the typical research environment found in universities and federal laboratories.

The main goal of CATD is to break down the barriers to successful university-industry technology transfer. The principal barrier is industry's perception of high business risk in commercializing the unproven and untested results of university research, which is then further complicated by the traditional cultural and motivational differences that exist between the two institutions. To address this problem CATD's technology transfer model was developed to include one to three years of business-directed applied research. This research results in the development of advanced prototypes or early product forms of the technologies, which can be evaluated or beta tested in actual end-use applications. By having licensable technologies that are well characterized and understood -- whether they involve materials, instruments, new processes, software or the like -- industry's perceived business risk is greatly reduced.

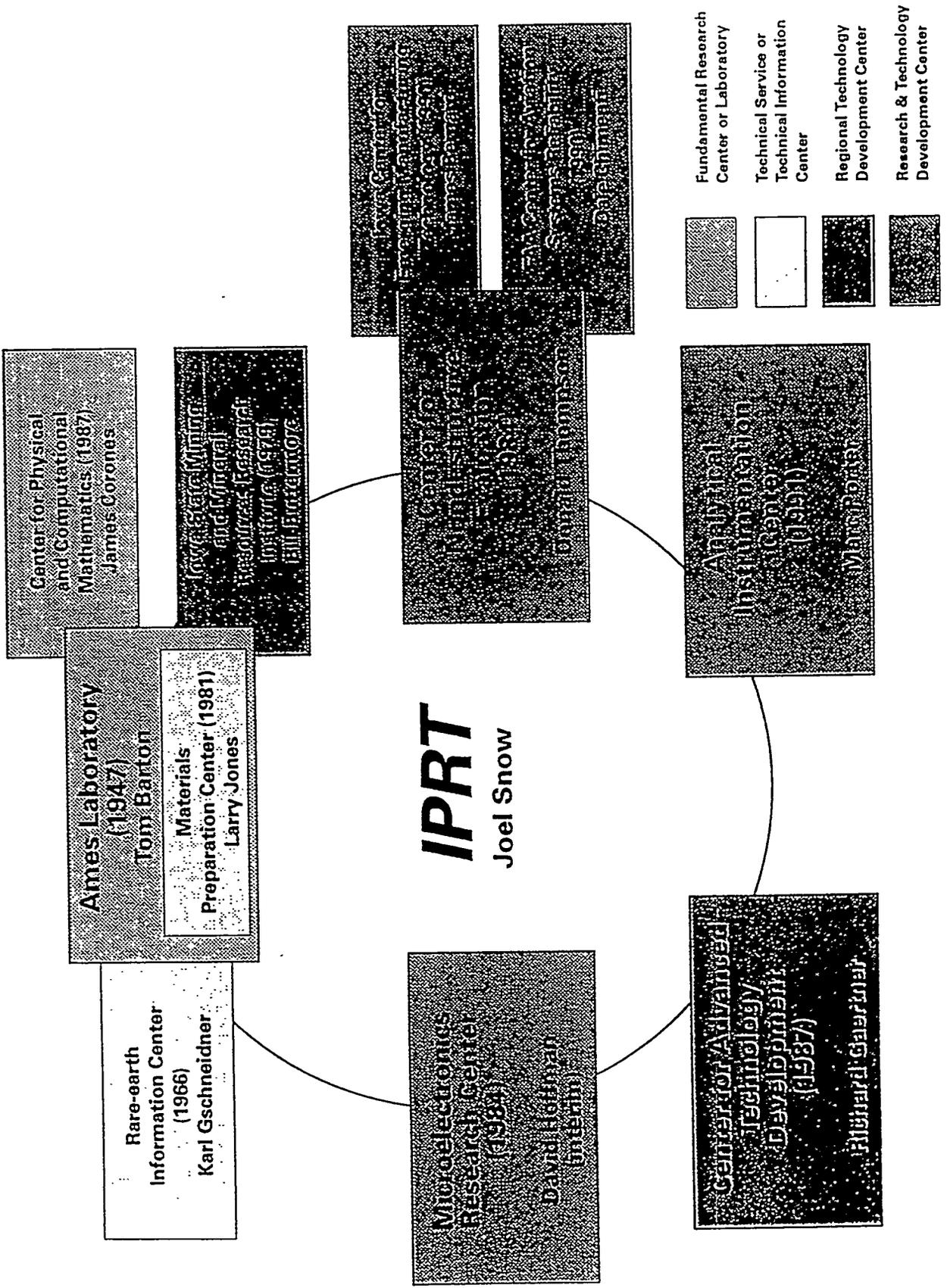
The methodology used with the model (Exhibit 2) provides total business direction to CATD's applied research. The methodology includes the use of market studies and techno-economic (manufacturing cost) analyses from leading industry experts and other consultants. It also includes, whenever possible, giving companies early options to license the technologies, thereby enabling CATD to establish a direct dialog with potential licensees and obtain business direction from these sources as well. Complementing these efforts, CATD gives its projects further direction through intellectual property considerations and the development of a patent filing strategy. By the time a CATD technology is ready for licensing, it is usually protected by a portfolio of one or more issued or applied-for U.S. patents, and in many instances by foreign patents as well.

Projects are selected for funding by CATD through a vigorous two-step screening process. Each project must pass at least one, if not both screenings, which evaluate the merit and uniqueness of the technology as well as its potential for commercialization.

IOWA STATE UNIVERSITY

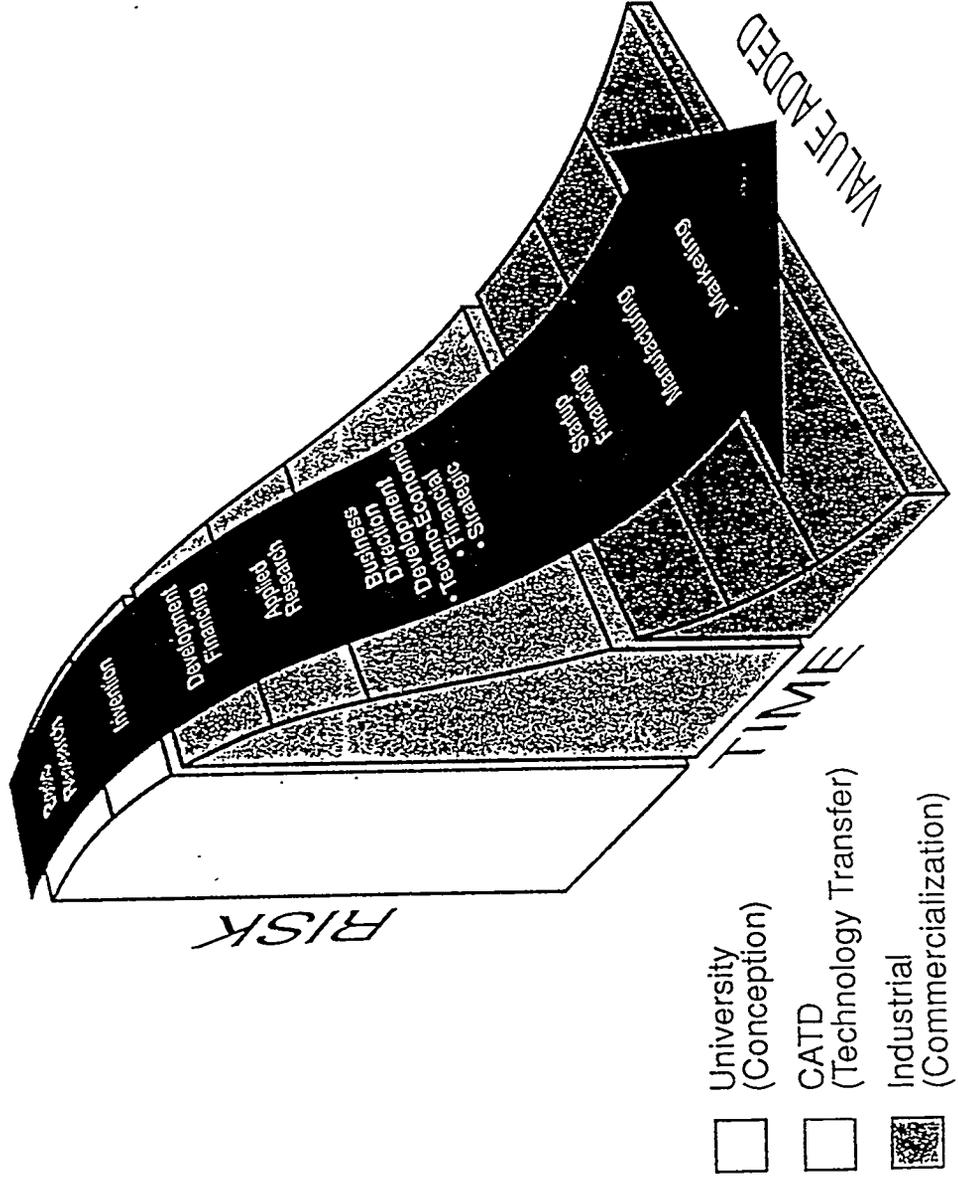
OF SCIENCE AND TECHNOLOGY

Institute for Physical Research and Technology



IOWA STATE UNIVERSITY
Institute for Physical Research and Technology

Center for Advanced Technology Development



The first screen is provided by an Advisory Board, which includes faculty and senior administrative personnel of the university who are chosen for their breadth of technical backgrounds and industrial experience. It also includes several external members from the business community- representing companies, banking institutions and venture capital firms- who are willing to sign confidentiality agreements. Each member of the Board is given a uniform set of criteria on which to evaluate the proposals and the proposed projects are ranked for possible funding. In situations where the Board does not have the required expertise or cannot reach consensus, the proposals then are sent for a second screening at the Battelle Institute in Columbus, Ohio. Professionals at Battelle review the technologies and their market potential on a confidential basis and provide a brief report. Based on this report and any additional information that can be obtained from the individuals who submitted the proposals, the Director of CATD makes the final decisions on funding.

Once a project is selected for funding, the principal investigator prepares a detailed applied research plan specifying the technical approach, semi-annual milestone objectives and the project deliverables. This constitutes a contractual agreement between the principal investigator (PI) and CATD for which the PI is held accountable. The project plan, in the form of a final proposal, is then submitted to the U.S. Department of Commerce for its review and approval.

Formal written progress reports on both the technical projects and the technology transfer efforts (marketing and licensing) are submitted to the U.S. Department of Commerce twice per year. In addition, a review team from the U.S. Department of Commerce visits the university campus twice per year for laboratory tours, demonstrations and face-to-face discussions with the researchers and the CATD administrative staff. This allows the DOC to see the progress first hand and to contribute its own insight and direction to the overall program.

(CATD applied research projects, including the idea of a contractual agreement between CATD and the PI, have been readily accepted and actually sought after by most faculty and research staff members, even those who have done academic research their entire careers. During the brief period CATD has been in existence, the program has involved 170 faculty and research staff members, 21 post-doctoral assistants, 78 graduate students and 176 undergraduate students.)

Technology Marketing and Licensing

By agreement with the university, CATD has responsibility for marketing its own technologies and negotiating its licenses. CATD licensing professionals identify potential licensees from the market studies they have conducted, through networking with industry contacts and from commercially available computer databases of major U.S. corporations. They also make use of such vehicles as company inquires to published technical papers, press announcements in trade literature and contacts at trade shows and other meetings where the technologies can be displayed and promoted. In cases where the technology can best be commercialized through a new company startup they identify and assist potential entrepreneurs. After a licensee is identified, and the terms and conditions are negotiated, the final license agreement is given to the Iowa State University Research Foundation for review and signature.

Organization and Personnel

The industrial experience of the CATD administrative staff (Exhibit 3), coupled with its ability to effectively work within the university community, has proved to be almost as important as the CATD model in reducing the perceived business risk to industry and in closing the cultural and motivational gaps between it and the university. Being able to speak both languages and to understand the needs of both parties significantly contributes to the success of the program. Each staff member has a broad range of industrial experience, including backgrounds in industrial research, manufacturing, corporate strategic planning, business development, technology marketing and licensing, small business assistance and venturing.

CENTER FOR ADVANCED TECHNOLOGY DEVELOPMENT

Institute for Physical Research and Technology
Iowa State University

ORGANIZATION AND STAFF

Richard Gaertner - Director

27 years industrial experience in research, manufacturing and business development

- Director of Research, Owens-Corning Fiberglas Inc
- Director, Strategic Technical Planning, Owens-Corning Fiberglas Inc
- Manager, Technical Resources, Chem/Met Div, General Electric Company
- Manager, Engineering, Laminated Prod Dept, General Electric Company
- Manager, Manufacturing, Plastics Dept, General Electric Company
- Manager, Tech Marketing, Plastics Dept, General Electric Company

Office of Contract Research

Robert Harris - Associate Director and Director, Office of Contract Research (OCR)

25 years experience in international contract research, technology marketing and licensing

- Senior Marketing Manager - BTIP, Battelle Institute
- Manager, Intellectual Property, Battelle Institute
- Manager, International Marketing, Battelle Institute
- Assistant Director, International Operations, Battelle Institute
- Sr Program Mgr, Korean Institute of Sci & Tech, Korean-Battelle Operation

Mark Laurenzo - Industrial Liaison Specialist, OCR

12 years of experience in economic development, business counseling and manufacturing

- Manager, Bus Dev Div, Iowa Dept of Economic Development
- Management Consultant, Iowa City Small Business Development Center
- Sr Lockbox Clerk, Norwest Bank of Des Moines
- Group Leader, Cominco Electronic Materials Inc

Office of Technology Commercialization

Lisa Kuuttila - Associate Director and Director, Office of Technology Commercialization (OTC)

16 years of experience in technology marketing, licensing and commercialization

- Vice President, Wallace Technology Transfer Foundation
- President and Founder, Technology Alignments Inc
- Director, Center for Technology Licensing, Regis McKenna Inc
- Technology Transfer Consultant, Stanford University
- Product Manager, American Microsystems Inc
- Applications Manager, Fairchild Corporation, Test Systems Division

Brian Budeslich - Technology Commercialization Associate, OTC

6 years of experience in manufacturing and engineering

- Manufacturing Engineer, Delevan Gas Turbine Products Division
- Project Engineer, Chamberlain Manufacturing Corporation

Organization and Staff (continued)

Denise Hayward - Technology Commercialization Associate, OTC

12 years of experience in software engineering and research

- Assistant Scientist, CATD, Iowa State University
- President, Parallel Solutions Inc
- Q.A. Software Engineer, Jet Propulsion Laboratory, NASA

Renee Harvey - Commercialization Associate, OTC

11 years experience in small business development and business counseling

- Assistant Director, ISU Small Business Development Center
- Program Coordinator, ISU Small Business Development Center
- Marketing Instructor, Des Moines Area Community College

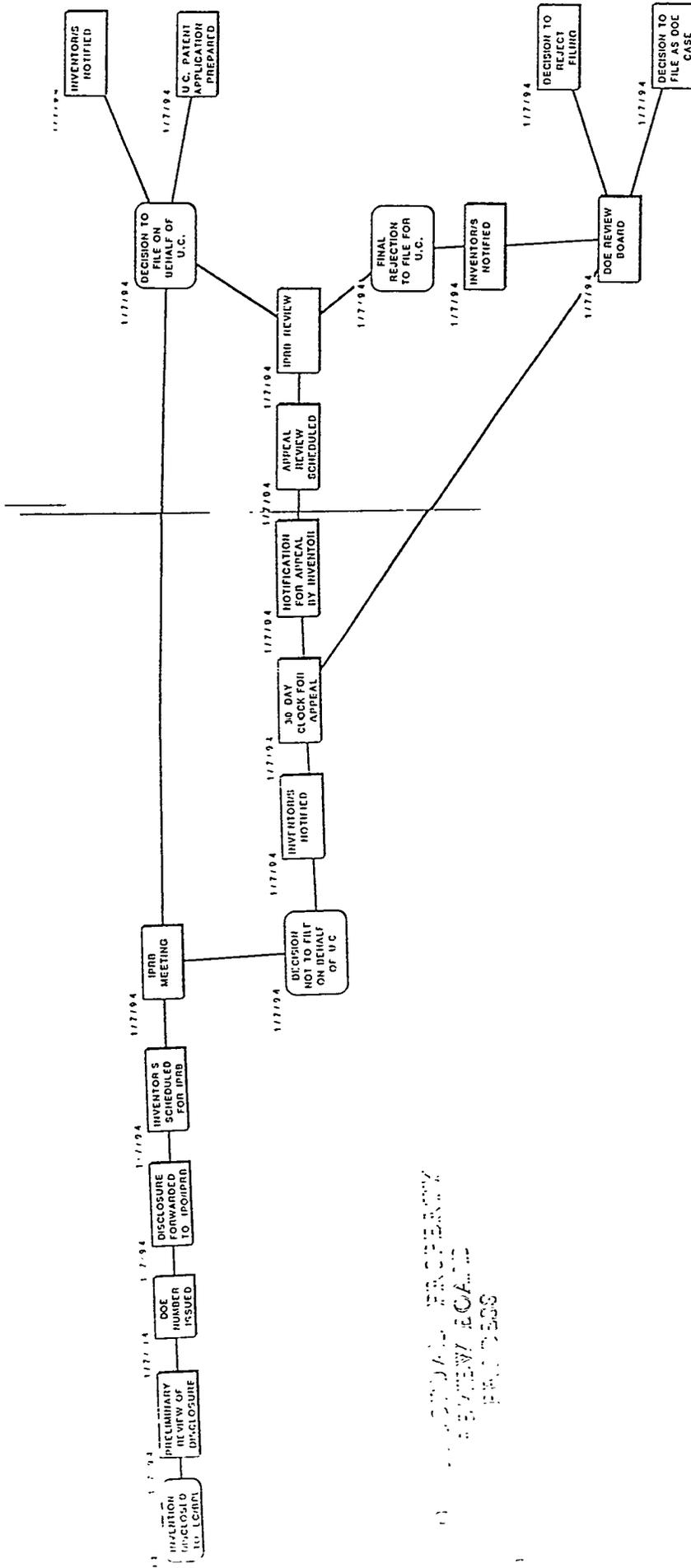
John Weis - Commercialization Associate, OTC

5 years of experience in engineering management

- Systems Integration Manager, Network Tech Ctr, AT&T
- Engineering Supervisor, Service Node Engr, AT&T
- Supervisor, Network Tech Dev, AT&T

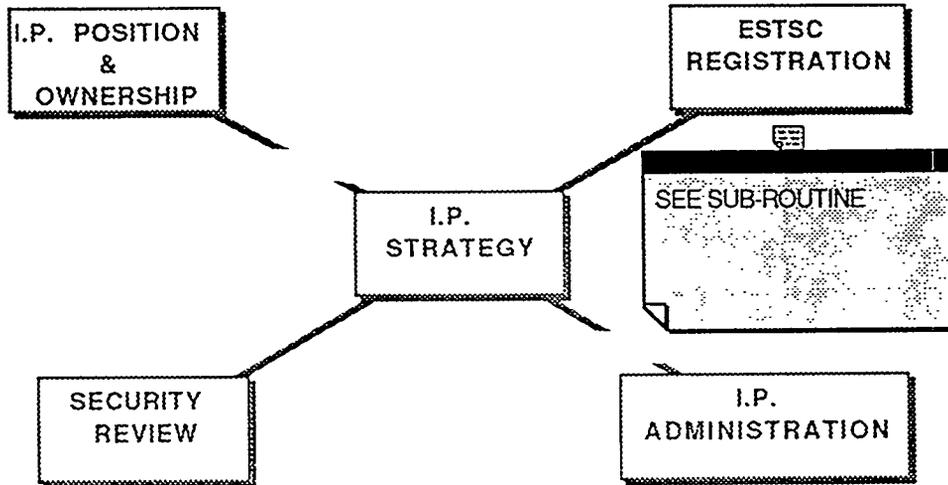
Appendix K. Los Alamos National Laboratory Licensing Procedures



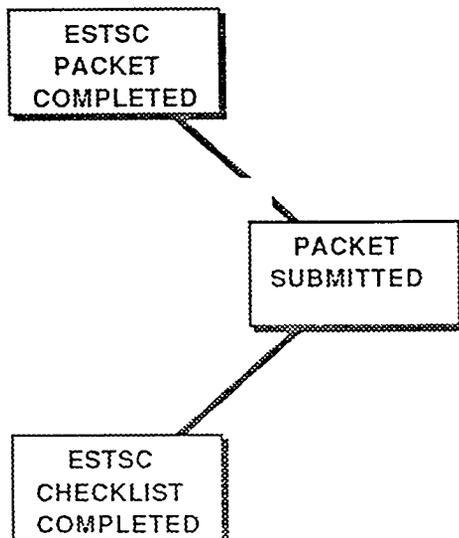


U.S. PATENT AND TRADEMARK OFFICE
 PATENT PROCESS

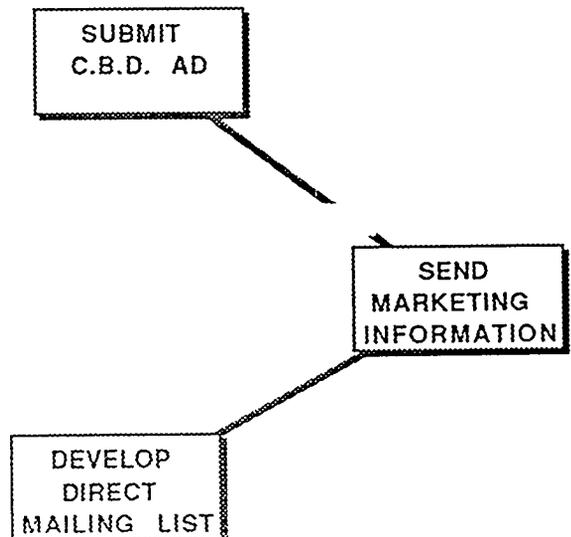
I.P. REVIEW SUB-ROUTINE



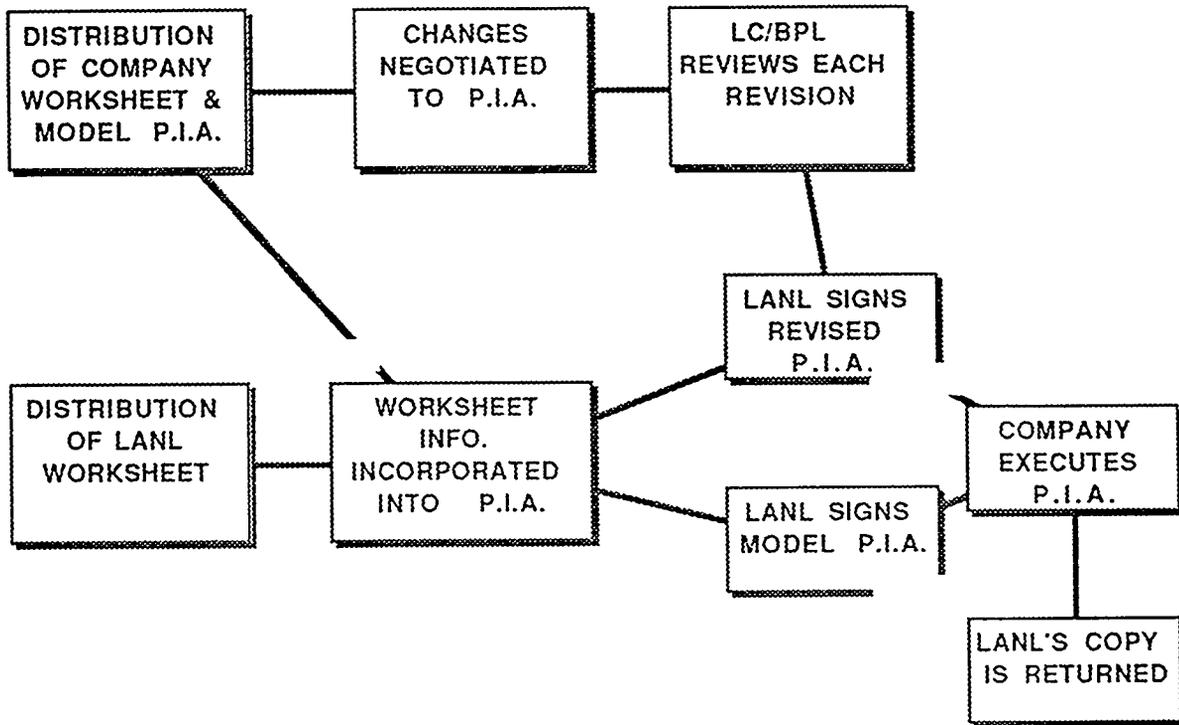
ESTSC REGISTRATION SUB-ROUTINE



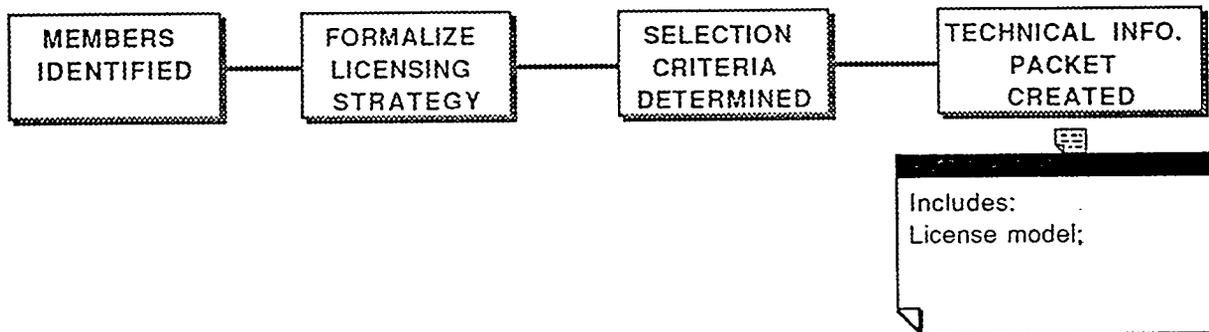
ADVERTISING SUB-ROUTINE



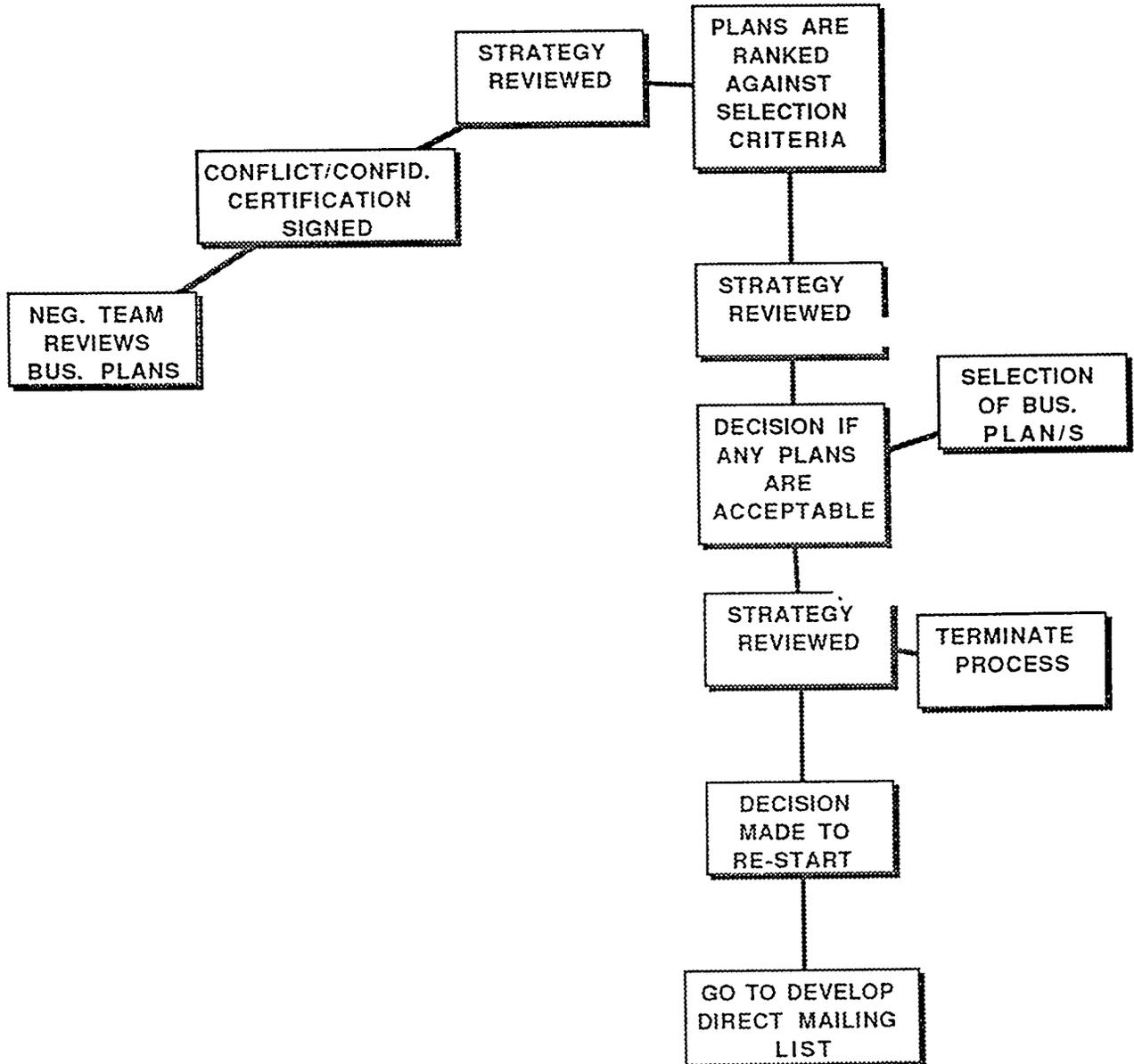
P.I.A. ESTABLISHED SUB-ROUTINE



NEGOTIATION TEAM REVIEW SUB-ROUTINE



BUSINESS PLAN EVALUATION SUB-ROUTINE



Status	Name
<input type="checkbox"/>	1. INTEREST IN TECHNOLOGY EXPRESSED
<input type="checkbox"/>	2. INQUIRY IS SCREENED
<input type="checkbox"/>	3. INFORMATION IS EXCHANGED
<input type="checkbox"/>	4. DETERMINATION OF FAIR OPPORTUNITY
<input checked="" type="checkbox"/>	5. ADVERTISEMENT
<input type="checkbox"/>	5.1. SUBMIT C.B.D. AD
<input type="checkbox"/>	5.2. DEVELOP DIRECT MAILING LIST
<input type="checkbox"/>	5.3. SEND MARKETING INFORMATION
<input type="checkbox"/>	6. GO TO "INTEREST IN TECH. EXPRESSED-1"
<input checked="" type="checkbox"/>	7. I.P. REVIEW
<input type="checkbox"/>	7.1. I.P. POSITION & OWNERSHIP
<input type="checkbox"/>	7.2. SECURITY REVIEW
<input type="checkbox"/>	7.3. I.P. STRATEGY
<input checked="" type="checkbox"/>	7.4. ESTSC REGISTRATION
<input type="checkbox"/>	7.4.1. ESTSC PACKET COMPLETED
<input type="checkbox"/>	7.4.2. ESTSC CHECKLIST COMPLETED
<input type="checkbox"/>	7.4.3. PACKET SUBMITTED
<input type="checkbox"/>	7.5. I.P. ADMINISTRATION
<input type="checkbox"/>	8. USE OTHER TECHNOLOGY TRANSFER MECHANISMS
<input checked="" type="checkbox"/>	9. P.I.A. ESTABLISHED
<input type="checkbox"/>	9.1. DISTRIBUTION OF COMPANY WORKSHEET & MODEL P.I.A.
<input type="checkbox"/>	9.2. DISTRIBUTION OF LANL WORKSHEET
<input type="checkbox"/>	9.3. WORKSHEET INFO. INCORPORATED INTO P.I.A.
<input type="checkbox"/>	9.4. LANL SIGNS MODEL P.I.A.
<input type="checkbox"/>	9.5. COMPANY EXECUTES P.I.A.
<input type="checkbox"/>	9.6. LANL'S COPY IS RETURNED
<input type="checkbox"/>	9.7. CHANGES NEGOTIATED TO P.I.A.
<input type="checkbox"/>	9.8. LC/BPL REVIEWS EACH REVISION
<input type="checkbox"/>	9.9. LANL SIGNS REVISED P.I.A.
<input type="checkbox"/>	10. DISCUSSION BETWEEN P.I. AND COMPANY
<input checked="" type="checkbox"/>	11. NEGOTIATION TEAM REVIEW
<input type="checkbox"/>	11.1. MEMBERS IDENTIFIED
<input type="checkbox"/>	11.2. FORMALIZE LICENSING STRATEGY

Status	Name
<input type="checkbox"/>	11.3. SELECTION CRITERIA DETERMINED
<input type="checkbox"/>	11.4. TECHNICAL INFO. PACKET CREATED
<input type="checkbox"/>	12. TECHNICAL PACKET DELIVERED
<input type="checkbox"/>	13. BUSINESS PLANS SUBMITTED
<input checked="" type="checkbox"/>	14. BUSINESS PLANS EVALUATED
<input type="checkbox"/>	14.1. NEG. TEAM REVIEWS BUS. PLANS
<input type="checkbox"/>	14.2. CONFLICT/CONFID. CERTIFICATION SIGNED
<input type="checkbox"/>	14.3. STRATEGY REVIEWED
<input type="checkbox"/>	14.4. PLANS ARE RANKED AGAINST SELECTION CRITERIA
<input type="checkbox"/>	14.5. STRATEGY REVIEWED
<input type="checkbox"/>	14.6. DECISION IF ANY PLANS ARE ACCEPTABLE
<input type="checkbox"/>	14.7. SELECTION OF BUS. PLAN/S
<input type="checkbox"/>	14.8. STRATEGY REVIEWED
<input type="checkbox"/>	14.9. DECISION MADE TO RE-START PROCESS
<input type="checkbox"/>	14.10. GO TO DEVELOP DIRECT MAILING LIST
<input type="checkbox"/>	14.11. TERMINATE PROCESS
<input type="checkbox"/>	15. NOTIFICATION OF REJECTED PROPOSALS
<input type="checkbox"/>	16. LICENSE NEGOTIATIONS
<input type="checkbox"/>	17. REACTIVATE COMPANY BUSINESS PLANS
<input type="checkbox"/>	18. LICENSE IS EXECUTED
<input type="checkbox"/>	19. LICENSE ADMINISTRATION
<input type="checkbox"/>	20. ONGOING LICENSE OBLIGATIONS
<input type="checkbox"/>	21. TRANSFER TECHNOLOGY/ (PRODUCTS)
<input type="checkbox"/>	22. LICENSE EXPIRES OR TERMINATES
	23.
	24.
	25.
	26.

NARRATIVES
FOR
LICENSING GUIDELINES
FLOWCHART

Note 1: Duration times are listed in weeks unless otherwise stated

1. INTEREST IN TECHNOLOGY EXPRESSED. A company contacts the licensing team at the IPO Division of LANL, and expresses interest in a specific I.P. (intellectual property). (A hard copy request is required.) The company contact will be directed to the Licensing Officer assigned to that case. (See Section I-Organizational Structure)
Responsible party: Company representative
Item: Letter of Intent
Duration Range: 0.1

2. INQUIRY IS SCREENED. If the "Letter of Intent" is in response to an advertisement/solicitation, then the Licensing Officer will screen the inquiries to eliminate those companies interested in procurements.
Responsible party: Licensing Officer
Item: Letter, fax or phone call.
Duration Range: 1.0-4.0

3. INFORMATION IS EXCHANGED. Information exchanged between the interested company and License Officer. Information is both requested from and shared with the company representative: Items covered:
 - Where the company learned of the intellectual property. (See Section IV - Fair Opportunity.)
 - Ownership of the company, i.e. % of the company which is foreign owned. (See Section IV - National Ownership.)
 - Previous or current company employees which were previously or are currently employed by U.C. (See Section IV - Two year involvement.)
 - The desired use of the technology, (i.e. use, make, sell, develop, evaluate), interest in collaborative efforts, and the market/s of interest.
 - Statistical information. (i.e. small-business, minority owned, disadvantaged, women owned etc..) (Not required)
 - Business plan requirements.

-Government and U.C. rights which will be maintained. (See Section IV -March in rights and U.C. rights)

-The value and need for P.I.A.

-The need for information to be marked "proprietary". (See Section IV - Proprietary.)

-Company's questions/concerns addressed.

Responsible party: License Officer/Company Representative

Item: Letter, phone call or fax.

Duration Range: 1 day to 2 weeks.

4. DETERMINATION OF FAIR OPPORTUNITY. Non-exclusive licenses inherently provide other companies a fair opportunity to obtain a license to commercialize the technology. When negotiating an Exclusive license, however, a determination is made if a C.B.D. ad will be required. This is dependent on frequency, distribution, location of information dissemination devices (ads; publications; seminars; conferences etc.). (See fair opportunity.)

Responsible party: License Officer

Duration Range: 1 - 2

5. ADVERTISEMENT

- 5.1. CBD AD SUBMITTED. C.B.D. ad submitted if required, in accordance with Section VII, Tab 1. (Submit ad to Dept. of Commerce, allow approximately 1 week for publication.)

Responsible party: License Officer

Item: Letter to the CBD and copy of publication

Duration Range: 1.14-1.5

- 5.2. DEVELOP DIRECT MAILING LIST. Database queried to identify companies which may have interest in the technology. (Dialogue database) Additional market information taken into account to target appropriate market areas.

Responsible party: License Officer/License Coordinator

Item: Mailing list

Duration Range: 0.5 hour - 1.0 hour

- 5.3. SEND MARKETING INFORMATION. Notification of licensing opportunity sent to companies on mailing list from 5.b.

Responsible party: License Officer

Item: Letter with copy of CBD ad

Duration Range: 0.14 to 0.29

6. GO TO "INTEREST IN TECH. EXPRESSED-1"
7. I.P. REVIEW
Duration Range: 0.29 to 2.0
- 7.1. I.P. POSITION & OWNERSHIP. I.P. position and ownership determined.
 - If the patent is in force?/has the patent application issued as a patent, or is it expected to?
 - Has U.C. elected/waived/asserted copyright from DOE
 - If DOE retains ownership have they licensed.
 - Determination to start election/waiver process
 - Prior commitments are reviewed in database. (CRADA, field of use)
 - Company or other agency ownership
 - If licensed-status is reviewed for compliance to terms and conditions of license
 - Responsible party: License Administrator
 - Item: Dependent on situation. Letter to LC/BPL, MOA started, termination notice (LINE FOR TERMINATION), data base update
- 7.2. SECURITY REVIEW. Confirm I.P. has been reviewed by security office (Export control, classification)
Responsible party: OS-6/LC-BPL
- 7.3. I.P. STRATEGY. I.P. strategy reviewed.
 - What tech. transfer mechanism is desired, given goals.
 - Identify type of license avail. depending on maturation level.
 - Extent of dissemination of information concerning I.P. to indiv./groups outside of lab.
 - I.P. overview/extent of P.I.'s possible involvement
 - Obtain PI's input for the content of the possible CBD ad.
- 7.4. ESTSC REGISTRATION (If rights are going to be granted by U.C., then Copyright Assertion is required and then registration with the ESTSC is required.)
Duration: 1.0 to 2.0
- 7.5.1 ESTSC PACKET COMPLETED. P.I. is educated about ESTSC and is given ESTSC packet to complete.
Responsible party: P.I./License Administrator

Item: Non-completed ESTSC packet (See forms)

7.5.2 ESTSC CHECKLIST COMPLETED. Checklist requirements completed.

Responsible party: License Administrator/OS-6/CRADA Coordinator

Item: Completed ESTSC packet

7.5.3 PACKET SUBMITTED. Packet submitted to ESTSC

Responsible party: License Administrator

Item: ESTSC published listing

7.6. I.P. ADMINISTRATION. If I.P. license will be pursued, then I.P. folder made or updated/all I.P. costs are updated.

Responsible party: License Administrator

Item: folder, cost sheet

8. USE OTHER TECH. TRANSFER MECHANISMS. It may be determined that licensing is not the optimal tech. transfer mechanism to be used for this intellectual property. If this is the situation, the case may be turned over to one of the other IPO teams.

9. P.I.A. ESTABLISHED

Duration Range: 2.0 to 24.0

9.1. DISTRIBUTION OF COMPANY WORKSHEET & MODEL P.I.A. Both the model agreement is sent to the company for evaluation, and the worksheet which needs to be filled out. (See Forms)

Responsible party: License Officer

Item: Model Bilateral P.I.A. and company worksheet.

9.2. DISTRIBUTION OF LANL WORKSHEET. The LANL worksheet is sent to the P.I. to complete.

Responsible party: License Officer

Item: P.I.A. LANL worksheet

9.3. WORKSHEET INFO. INCORPORATED INTO P.I.A. When the company and P.I. have completed the worksheets, they are forwarded to the P.I.A. Administrator. The P.I.A. Administrator will incorporate this information into the final revision of the P.I.A.

Responsible party: P.I.A. Administrator

Item: P.I.A. worksheets

- 9.4 LANL SIGNS MODEL P.I.A. If no changes are required to be made to the model agreement, then the P.I.A. Administrator has the authority to sign the agreement on behalf of LANL.
Responsible party: P.I.A. Administrator
Item: Partially executed P.I.A. (2 copies)
- 9.5. COMPANY EXECUTES P.I.A. The two drafts are sent to the company for their execution.
Responsible party: Company rep.
Item: Executed P.I.A.
- 9.6. LANL'S COPY IS RETURNED. The company forwards LANL's executed copy to the P.I.A. Administrator.
Responsible party: Company rep.
Item: LANL's Executed P.I.A.
- 9.7. CHANGES NEGOTIATED TO P.I.A. If the model P.I.A. is unacceptable to the company as written, then negotiations occur between the company representative and the P.I.A. Administrator until a final draft can be developed.
Responsible party: Company rep./P.I.A. Administrator
Item: Final draft of revised P.I.A.
- 9.8 LC/BPL REVIEWS EACH REVISION. Any negotiated changes made to the model P.I.A. must be approved by LC-BPL.
Responsible party: P.I.A. Administrator/LC-BPL
- 9.9. LANL SIGNS REVISED P.I.A. If the model agreement has been altered then the IPO Chief of Staff must sign the agreement for LANL.
Responsible party: P.I.A. Administrator/Chief of Staff
Item: LANL signed P.I.A. (2)
10. DISCUSSION BETWEEN P.I. AND COMPANY. Company may discuss I.P. with P.I. (This could include a meeting such as a seminar with all interested companies attending.)
(setting agenda / speakers / time coordination / travel)
Responsible party: Company representative/Licensing Officer./P.I.
Duration Range: 1.0 to 4.0
11. NEGOTIATION TEAM REVIEW.

Duration Range: 0.00 to 8.0

- 11.1. MEMBERS IDENTIFIED. The members chosen to serve on the negotiating team can include: License Officer; LC/BPL staff; P.I.; and P.I. line management or project management.
Responsible party: License Officer
- 11.2. FORMALIZE LICENSING STRATEGY. The licensing strategy for the I.P. is formalized. This includes the type of license desired. (i.e. exclusive, non-exclusive, development, field of use, etc.)
Responsible party: Negotiating Team
- 11.3. SELECTION CRITERIA DETERMINED . The team will determine which areas are critical for the commercialization/development of the I.P. This generally comes from a "baseline" list. (See Section VII, Tab 3)
Responsible party: Negotiating Team
- 11.4. TECHNICAL INFO. PACKET CREATED. This information is compiled, and includes: License models, technical information and descriptions, requirement for the business plan and deadline for it's return, and statement of selection criteria.
Responsible party: Licensing Officer
12. TECHNICAL PACKET DELIVERED. Technical packet is sent to all interested parties.
Responsible party: License Officer
Item: Technical Packet
Duration Range: 1.0 to 2.0
13. BUSINESS PLANS SUBMITTED. Business/Development plans are submitted by company to License Officer.
Responsible party: Company representative
Item: Business Plan
Duration Range: 4.0 - 12.0
14. BUSINESS PLANS EVALUATED.
 - 14.1. NEG. TEAM REVIEWS BUS. PLANS. Negotiating Team Members independently review copies of the business plans submitted.
Responsible party: Negotiating Team members
Item: Business Plans
Duration Range: 1.0 - 2.0

- 14.2. STRATEGY REVIEWED. The established licensing strategy which the Team developed will be reviewed to incorporate any new information which may have become available.
Responsible party: Negotiating Team
Duration Range: 1 to 2 hours
- 14.3. PLANS ARE RANKED AGAINST SELECTION CRITERIA. The Team members independently rank the business plans against established criteria. These independent rankings are reviewed as a group to establish any group consensus.
Responsible party: Negotiating Team
Duration Range: 0.14 to 0.29
- 14.5. STRATEGY REVIEWED. See above
- 14.6. DECISION IF ANY PLANS ARE ACCEPTABLE. Determination is made if any of the plans submitted are acceptable.
Responsible party: Negotiating Team
Duration Range: 1 to 2 hours
- 14.7. SELECTION OF BUS. PLAN/S. If any of the plans are acceptable, then the company or companies with the best plans are chosen by the Team to move into the negotiating phase.
Responsible party: Negotiating Team
Duration Range;; 1 to 2 hours
- 14.8. STRATEGY REVIEWED. If none of the plans are acceptable, then the possible alternatives are reviewed. New strategies could include refocusing marketing efforts.
Responsible party: Negotiating Team
Duration Range: 1 to 2 hours
- 14.9. DECISION MADE TO RE-START PROCESS. One possible alternative is that the process should be restarted. If this is determined, then the process starts over at the DEVELOP DIRECT MAILING LIST stage.
Responsible party: Negotiating Team
- 14.10 GO TO DEVELOP DIRECT MAILING LIST-5.2
- 14.11 TERMINATE PROCESS. One possible alternative is that the process should be terminated. No company will enter the

license negotiation stage, the licensing process will not be re-started.

Responsible party: Negotiating Team

15. NOTIFICATION OF REJECTED PROPOSALS. Notification is sent the companies who were not chosen to participate in license negotiations. Business Plans will be returned to these companies.
Responsible party: License Officer
Item: Letter
Duration Range: 1.0 to 2.0
16. LICENSE NEGOTIATIONS. Negotiation of the details of the agreement are conducted to establish appropriate rates/language/ and details. The legal staff will participate as needed. If no closure can be reached, then the negotiating team may be reassembled.
Responsible party: Company representative/Licensing Officer/LC-BPL staff/Company attorney.
Items: Model agreements
Duration Range: 1 week to 1 year and even longer
17. REACTIVATE COMPANY BUSINESS PLANS. If license negotiations do not reach closure, then the previously rejected business plans could be re-activated after authorization by the company submitting the plans. The process will return to the business plan evaluation stage.
Responsible party: Company representatives/Licensing Officer
Duration Range: 1.0 to 4.0
18. LICENSE IS EXECUTED
 - 18.1. Two final draft copies will be sent to the LANL Director for signature.
Responsible party: LC-BPL/LANL Director
Item: Partially executed license
Duration Range: 1 day - 1 week
 - 18.2. Document control numbers are issued. (LC-BPL sends to IPO) and then sent to company for signature.
Responsible party: LC-BPL/License Administrator
Item: Partially executed license with document number

- 18.3. One copy of the executed license is retained by company, and the other is forwarded to LANL.
Responsible party: Legal representative of company.
Item: Executed licenses
Duration Range: 1.0 to 2.0
19. LICENSE ADMINISTRATION. Forms are completed for the executed license. These are detailed under Section V, Forms, License Officer Forms and License Administrator Forms.
Responsible party: License Officer and License Administrator
Item: See Section Forms
Duration Range: 1.0 to 2.0
20. ONGOING LICENSE OBLIGATIONS. LANL's and the Licensee's obligations are met.
Responsible party: IPO-Licensing staff
Item: Defined by license
21. TRANSFER TECHNOLOGY/(PRODUCTS).
Responsible party: P.I.
Duration Range: 0.14 to 2.0
22. LICENSE EXPIRES OR TERMINATES. License can be terminated if the licensee does not meet contractual obligations. The license can expire according to terms of the license agreement.
Responsible party: License Coordinator/License Officer/LC-BPL
Items: Proper correspondence as stated in the license.

«DATA MAC IICx:Jerome's Shared:ConfusedFirms_DATA»



Date: September 17, 1993

Refer to: IPC-LIC:«letter #»

«title»«first name»«last name»

«position»

«firm»

«address 1»

«address 2»

Dear «first name»«last name»:

**SUBJECT: COMMERCE BUSINESS DAILY ADVERTISEMENT
IPC-93-0829**

Thank you for responding to our Commerce Business Daily ("CBD") advertisement, IPC-93-0829. This CBD ad is not a procurement solicitation. Rather, the University of California seeks potential licensees or CRADA (Cooperartive Research And Development Agreement) partners to further develop and commercialize the technology disclosed in the CBD advertisement.

If your firm is still interested in participating in our licensing or CRADA programs regarding this technology, please respond in accordance with the CBD ad by October 18, 1993. «IF firm="CAM-I"»«comment»«ENDIF»

Sincerely,

Jerome Jay Garcia
Industrial Partnership Center

JG:jb

Attachment(s): a/s

Cy:

CRM-4, MS A150
C. Rzeszutko, IPC, MS M899
License File
IPC LIC File

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: January 30, 1991
Reference: IAO-91-0385
Mail Stop: M899
Telephone: (505) 667-3839
(FTS) 843-3839
FAX: (505) 665-0154

Dear Respondent:

SUBJECT: CRYOGENIC COOLING FOR SATELLITE-BASED DETECTORS

Thank you for your inquiry regarding work at the Los Alamos National Laboratory in the area of cryogenic cooling for satellite-based detectors. We encourage U. S. companies, universities and other private sector organizations to work with us to continue research and develop applications for this new heat transfer technology, which has come to be known as the "coolahoop." We believe the coolahoop has many uses in both commercial and defense applications.

Enclosed is a brief description of the coolahoop and its capabilities. The coolahoop can replace conventional refrigeration technologies providing improved reliability and potentially reduced production cost. In addition to providing detector cooling for satellites and other defense applications, the coolahoop promises a convenient means of liquefaction of cryogens and natural gas at remote locations.

A strong patent position provides the opportunity to work with the Laboratory in the development of proprietary commercial applications of the coolahoop. U. S. Patent 4,953,366, "Acoustic Cryocooler," issued September 4, 1990, and is available for licensing.

To learn more about the coolahoop at Los Alamos, or to arrange a visit to the Laboratory please contact me, Ken Freese, at (505) 667-3839.

Sincerely yours,



Ken Freese
Industrial Applications Office

SECTION III

DEFINITIONS

FOR
LICENSING
GUIDELINES

DEFINITIONS

C.B.D.:	Commerce Business Daily
C.R.A.D.A.:	Cooperative Research and Development Agreement. A technology transfer mechanism available at LANL. Effort for a joint research project are shared between DOE and a commercial entity. (See p.125 Prime Contract)
DOE	Department of Energy.
E.S.T.S.C.:	Energy Science Technology Software Center. A DOE contractor serving as a centralized software distribution and control point in Oak Ridge Tennessee.
I.P.:	Intellectual Property which can be licensed by U.C. including patents, copyrights, trademarks, mask works and material. (See p.125 Prime Contract)
I.P.O.:	Industrial Partnership Office. The Division in LANL in charge of technology transfer.
LANL	Los Alamos National Laboratory.
LC/BPL	Legal Counsel-Business Patent Law. This is the group at LANL providing legal counsel to IPO.
P.I.:	Principle Investigator. Technical expert from LANL who is usually the inventor or author of the technology.
P.I.A.:	Proprietary Information Agreement.
Prime Contract:	Contract between the DOE and the University of California for the operation of LANL. Current version effective October 1, 1992.
U.C.:	University of California. Operator of LANL for DOE.

SECTION IV

REQUIREMENTS/ISSUES

ROUGH DRAFT

FOR
LICENSING
GUIDELINES

REQUIREMENTS/ISSUES

C.O.I

A "Conflict of Interest" exists when an individual's duty to act in his/her official capacity may be biased by his/her private pecuniary or other interests.

REQUIREMENTS: When a LANL worker has a C.O.I, U.C. policy generally precludes the worker from exercising UC/LANL authority or performance of a UC/LANL duty because the worker has a personal private interest in the outcome of the conduct.

Fairness of Opportunity

Fairness of Opportunity occurs when UC gives potential industry partners a reasonable chance through the media (e.g. trade journal publications) to become aware of and express an interest in commercializing a technology that the UC wishes to transfer to private industry.

REQUIREMENTS: Since LANL is a taxpayer funded national laboratory, LANL must provide "taxpayers" (who "funded" the R&D) fairness of opportunity. Therefore, UC must provide a fair opportunity for potential industry partners (licensees) to contact the UC regarding an interest in the technology prior to barring such opportunity by *exclusively* licensing the technology to a particular company.

The following are some factors that are considered on a case-by-case basis to determine whether LANL provided fairness of opportunity.

- Type of publication (e.g. national trade journal [extended access] v. internal memorandum [limited access] or internal meeting v. national seminar etc.).
- Length of time elapsed public had to have access to the "publication."
- Frequency of distribution.
- Advertisements.

LANL may also consider other relevant factors.

Government rights

All government entities and their contractors retain rights in the intellectual property to use the technology for research they conduct.

U.S. Manufacturing

Companies will be given preference for consideration in obtaining a license agreement if production, design and development of the technology and products will primarily be done in the United States for the U.S. market.

REQUIREMENTS: According to the Prime Contract, (p.128) preference will be given to companies who will perform design and development work in the U.S. Additionally, any resulting products should be substantially manufactured in the U.S. if they will be sold to U.S. markets.

U.S. Ownership

Companies will be given preference for consideration in obtaining a license agreement if that company's ownership is primarily from the United States if they wish to sell to the U.S. market.

REQUIREMENTS: According to the Prime Contract, (p.128) preference will be given to companies who are not subject to the control of a foreign company or government. Additionally, any resulting products should be substantially manufactured in the U.S.

SECTION V

FORMS

FOR
LICENSING
GUIDELINES

Forms

	Tab
Response to Letter of Intent	1
ESTSC Documentation.....	2
- Checklist	
- Author Notification	
- CRADA Verification	
- OS Review	
- Registration Handbook	
Bilateral P.I.A.....	3
- Instruction	
- Work Sheet- Company	
- Work Sheet- LANL	
- Model Agreement	
Negotiating Team Conflict/Confidentiality Form	4
Technical Packet-Sample	5
License Officer Forms for License Execution.....	6
- License Checklist	
- Billing Form	
- Summary of License Activity	
- License Deliverable Form	
License Administrator Forms for License Execution.....	7
- License Administration Form	
- Salary Factor Request	
- I.P. Notification Form	
- License Notification Form	
- License Fee Billing	
- License/Business Proprietary Form	
- Company Certification	

Status	Name
<input type="checkbox"/>	1. DISCLOSURE REVIEW
<input type="checkbox"/>	2. DOE NUMBER ISSUED
<input type="checkbox"/>	3. IPRB REVIEW
<input type="checkbox"/>	4. DECISION TO SELECT
<input checked="" type="checkbox"/>	5. DECISION TO REJECT
<input type="checkbox"/>	5.1. APPEAL PROCESS
<input type="checkbox"/>	6. INVENTOR REQUEST FOR TITLE
<input type="checkbox"/>	7. LC/BPL NOTIFICATION START PROCESS
<input checked="" type="checkbox"/>	8. NON-WEAPONS FUNDING OF TECHNOLOGY
<input type="checkbox"/>	8.1. RECOMMENDATION TO DIRECTOR
<input type="checkbox"/>	8.2. DOE NOTIFIED
<input type="checkbox"/>	8.3. CONFIRMATORY LICENSE/CONFLICT OF INTEREST
<input type="checkbox"/>	8.4. DOE OBJECTS
<input type="checkbox"/>	8.5. INVENTOR REFERRED TO DOE
<input checked="" type="checkbox"/>	9. WEAPONS FUNDING OF TECHNOLOGY
<input type="checkbox"/>	9.1. RECOMMENDATION TO DIRECTOR
<input type="checkbox"/>	9.2. PETITION FOR WAIVER & BUSINESS PLAN OBTAINED
<input type="checkbox"/>	9.3. INFORM. PACKET PREPARED FOR DOE REVIEW BOARD
<input type="checkbox"/>	9.4. DOE REVIEW FOR FILING
<input type="checkbox"/>	9.5. DOE ELECTS TO FILE
<input type="checkbox"/>	9.6. DOE REJECTS ANY FILING
<input type="checkbox"/>	9.7. INVENTOR GRANTED TITLE
<input type="checkbox"/>	10. INVENTOR REFERRED TO DOE
<input type="checkbox"/>	11. INVENTOR GRANTED TITLE
	12.

Status	Name
<input type="checkbox"/>	1. INVENTION DISCLOSED TO LC/BPL
<input type="checkbox"/>	2. PRELIMINARY REVIEW OF DISCLOSURE
<input type="checkbox"/>	3. DOE NUMBER ISSUED
<input type="checkbox"/>	4. DISCLOSURE FORWARDED TO IPO/IPRB
<input type="checkbox"/>	5. INVENTOR/S SCHEDULED FOR IPRB
<input type="checkbox"/>	☒ 6. IPRB MEETING
<input type="checkbox"/>	☒ 6.1. DECISION TO FILE ON BEHALF OF U.C.
<input type="checkbox"/>	6.1.1. INVENTOR/S NOTIFIED
<input type="checkbox"/>	6.1.2. U.C. PATENT APPLICATION PREPARED
<input type="checkbox"/>	☒ 6.2. DECISION NOT TO FILE ON BEHALF OF U.C.
<input type="checkbox"/>	6.2.1. INVENTOR/S NOTIFIED
<input type="checkbox"/>	6.2.2. 30 DAY CLOCK FOR APPEAL
<input type="checkbox"/>	☒ 6.2.3. NOTIFICATION FOR APPEAL BY INVENTOR
<input type="checkbox"/>	6.2.3.1. APPEAL REVIEW SCHEDULED
<input type="checkbox"/>	6.2.3.2. IPRB REVIEW
<input type="checkbox"/>	6.2.3.3. FINAL REJECTION TO FILE FOR U.C.
<input type="checkbox"/>	6.2.3.4. INVENTOR/S NOTIFIED
<input type="checkbox"/>	☒ 6.2.4. DOE REVIEW BOARD
<input type="checkbox"/>	6.2.4.1. DECISION TO REJECT FILING
<input type="checkbox"/>	6.2.4.2. DECISION TO FILE AS DOE CASE

INSTRUCTIONS FOR COMPLETING A PROPRIETARY INFORMATION AGREEMENT

Attached is Los Alamos National Laboratory's (LANL) bilateral Proprietary Information Agreement (PIA) model document and accompanying work sheet. Please review the contents of the PIA document and provide the Industrial Partnership Center (IPC) with any comments or concerns that you may have. Upon completion of your review, return the work sheet with the requested information to IPC in care of Kimberly Beckman. To expedite processing of the PIA, fax the work sheet to (505) 665-3125. The final document will be prepared and executed by the IPC and distributed to you for your signatures.

IPC has signature authority to quickly execute this document if your company does not take exception to the language in the PIA model. However, if changes need to be made to the PIA model document, the LANL's legal department must review and approve those changes. This will delay the execution of this document.

If you have any questions, please contact Kimberly Beckman (505) 665-1305.

**PROPRIETARY INFORMATION AGREEMENT
COMPANY INFORMATION WORK SHEET**

Please provide the following information about your company that corresponds with the boxes in the model Proprietary Information Agreement provided with this work sheet.

[1 COMPANY] Provide your Company name, do not use acronyms or abbreviations:

[2 STREET ADDRESS] Provide your street address, do not use P.O. Boxes:

[3 MAILING ADDRESS] Provide your mailing address (either street address or P.O. Box number):

[4 CITY, STATE, ZIP CODE] Provide your city, state, and zip code:

[5 ATTENTION] Provide the name of your technical contact:

[6 TELEPHONE NO] **[7 FAX NO]** Provide the telephone number and fax number of the technical contact:

[8 ATTENTION] Provide the name of your contract administrator:

[9 TELEPHONE NO.] **[10 FAX NO.]** Provide the telephone number and fax number of the contract administrator:

[11 SALUTATION] **[12 FIRST NAME]** **[13 LAST NAME]** Provide the name (with the salutation, Mr., Ms., Dr., etc.) of the individual who will execute this agreement for your company:

[14 TITLE] Provide the title of the individual who will execute this agreement for your company:

**PROPRIETARY INFORMATION AGREEMENT
LANL INFORMATION WORK SHEET**

The following information is required from the Principal Investigator.

Check which type of Proprietary Information Agreement you are requesting (Bilateral will be assumed if no boxes are checked):

- Bilateral - Both LANL and company share proprietary information.
- Unilateral In - Company provides proprietary information to LANL.
- Unilateral Out - LANL provides proprietary information to company.
- Software Out - LANL provides proprietary software to company (not to exceed 12 months).
[16 PERIOD]_____ months (For software only).

[15 DESCRIPTION OF INFORMATION] Describe the information that is to be provided under the Proprietary Information Agreement:

[17] [18] Provide principal investigator's name and Mail Stop:

Name: _____ Mail Stop: _____

[19] [20] Provide principal investigator's phone number and fax number:

Phone Number: _____ FAX Number: _____

[21] [22] Provide principal investigator's Division abbreviation and Group number (WX-3, NMT-4):

Division Abbreviation: _____ Group No.: _____

[23] [24] Principal investigator's Group Leader and Mail Stop:

Name: _____ Mail Stop: _____

[25] [26] Principal investigator's Division Leader and Mail Stop:

Name: _____ Mail Stop: _____

IPC INFORMATION - The following information is furnished in IPC.

[27] PIA Number:

94-

[28] [29] Provide the IPC Requester and Mail Stop:

Name: _____ Mail Stop: _____

**UNIVERSITY OF CALIFORNIA
LOS ALAMOS NATIONAL LABORATORY
BILATERAL
PROPRIETARY INFORMATION AGREEMENT
94-[27]**

I. This Agreement is between [1 COMPANY], having an office at [2 STREET ADDRESS], [4 CITY, STATE, ZIP CODE], and The Regents of the University of California (University), operator of the Los Alamos National Laboratory under Contract No. W-7405-ENG-36 with the U.S. Department of Energy.

II. WHEREAS the parties desire to disclose information, some of which may be Proprietary Information, as defined below, to each other for mutually beneficial purposes; and WHEREAS the parties further desire to protect such Proprietary Information from unauthorized disclosure and use under the terms and conditions contained herein.

III. The parties agree as follows:

1. For the purposes of this Agreement, Proprietary Information means all information which relates to [15 DESCRIPTION OF INFORMATION] and which is disclosed hereunder by one party to the other; provided that, when disclosed, such information is in written or other permanent form and is identified as proprietary by the originating party by clear and conspicuous markings. Any information disclosed in unwritten form shall be considered Proprietary Information hereunder, but only to the extent it is identified as proprietary at the time of original disclosure and thereafter summarized in writing with clear and conspicuous markings, and transmitted by the originating party to the receiving party within ten (10) days of the non-written disclosure.
2. Each party shall preserve Proprietary Information received from the other party in confidence for a period of three (3) years from the date of disclosure. During this period, each party shall refrain from disclosing such Proprietary Information to any third party without written authorization from the other party, except that the University may disclose such Proprietary Information to employees of the United States Government subject to 18 U.S.C. 1905. The obligations of this paragraph shall be considered satisfied by each party through the exercise of the same degree of care used to restrict disclosure and use of its own information of like importance.

3. This Agreement may be terminated by either party upon thirty (30) days written notice to the other. This Agreement shall expire one (1) year from the effective date set forth below unless terminated earlier. Termination or expiration of this Agreement for any reason shall not relieve either party of any obligation to preserve Proprietary Information received prior to termination or expiration, pursuant to Paragraph 2, and all such obligations shall continue until expiration of the period set forth in Paragraph 2.
4. Until such time as this Agreement shall terminate pursuant to Paragraph 3, each party may use Proprietary Information received from the other party for internal purposes, subject to any specific restriction agreed to by the parties by a supplement to this Agreement. Upon the expiration of the period set forth in Paragraph 2, all limitations on use of the Proprietary Information shall cease.
5. This Agreement shall not restrict disclosure or use of Proprietary Information that is:
 - a. Known to the receiving party without restriction as to further disclosure when received, or thereafter is developed independently by the receiving party; or
 - b. Obtained without restriction as to further disclosure from a source other than the originating party through no breach of confidence by such source; or
 - c. In the public domain when received, or thereafter enters the public domain through no fault of the receiving party; or
 - d. Disclosed by the originating party to a third party, including the United States Government, without restriction as to further disclosure.
6. Proprietary Information shall remain the property of the originating party. Neither this Agreement nor the disclosure of Proprietary Information hereunder shall be construed as granting any right or license express or implied under any inventions, patents, or copyrights now or hereafter owned or controlled by either party.

e. Required to be retained by court of competent jurisdiction ...

7. Proprietary Information, and other technical information, transmitted between the parties under this Agreement shall be addressed as set forth below, or as otherwise designated by written notice from either party to the other:

[1 COMPANY]	University of California
[3 MAILING ADDRESS]	Los Alamos National Laboratory
[4 CITY, STATE, ZIP CODE]	P.O. Box 1663, MS [18]
Attention: [5 ATTENTION]	Los Alamos, NM 87545
Telephone No. [6 TELEPHONE NO.]	Attention: [17]
FAX No. [7 FAX NO.]	Telephone No. [19]
	FAX No. [20]

Other communications relating to the administration of this Agreement shall be addressed as follows:

[1 COMPANY]	University of California
[3 MAILING ADDRESS]	Los Alamos National Laboratory
[4 CITY, STATE, ZIP CODE]	P.O. Box 1663, MS C331
Attention: [8 ATTENTION]	Los Alamos, NM 87545
Telephone No. [9 TELEPHONE NO.]	Attention: Kimberly J. Beckman
FAX No. [10 FAX NO.]	Telephone No. 505-665-1305
	FAX No. 505-665-3125

8. Upon termination of this Agreement prior to the period set forth in Paragraph 3, each party shall cease use of Proprietary Information received from the other party and shall, upon request, utilize its best efforts to destroy all such Proprietary Information, including copies thereof, then in its possession or control. Alternatively, at the request of the originating party, the receiving party shall return all such Proprietary Information, including copies thereof, to the originating party. Notwithstanding the other provisions of this paragraph, each party may retain one copy of such Proprietary Information, but only for archival purposes.

- 9. Each party shall bear all costs and expenses incurred by it under or in connection with this Agreement. Nothing in this Agreement shall be construed as an obligation by either party to enter into a contract, subcontract, or other business relationship.
- 10. The rights and obligations provided by this Agreement shall take precedence over specific legends or statements associated with Proprietary Information when received.
- 11. This Agreement contains the entire understanding between the parties, superseding all prior or contemporaneous communications, agreements, and understandings between the parties with respect to the disclosure and protection of Proprietary Information. This Agreement shall not be amended except by further written agreement executed by the duly authorized representatives of the parties.
- 12. The parties and their employees shall not use or disclose any Proprietary Information or any other information disclosed hereunder in any manner contrary to the laws and regulations of the United States of America, or any agency thereof, including but not limited to the Export Administration Regulations of the U.S. Department of Commerce.
- 13. This Agreement shall be effective as of the date of the last signature below.

IV. IN WITNESS WHEREOF, the parties have caused this Agreement to be executed in duplicate originals by their duly authorized representatives.

[1 COMPANY]

by _____

[12 FIRST NAME] [13 LAST NAME]

[14 TITLE]

Date _____

The Regents of the University of California
Los Alamos National Laboratory

by _____

John J. Russell

Industrial Partnership Center

Date _____

DISPOSITION OF UNIVERSITY OF CALIFORNIA
GROSS PATENT INCOME
(April 16, 1990 Patent Policy)

Gross Patent Income: All monies received from royalties and license issue fees (not including monies received as reimbursements of legal fees) on a given invention.

Adjusted Gross Income: Gross Patent Income less any amounts payable to co-assignees (non-UC co-inventors or their employers).

DISTRIBUTION TO INVENTOR(S)

Cumulative Net Royalty Income: Cumulative Adjusted Gross Income less:

- i. 15% of Adjusted Gross Income as an administrative cost;
- ii. Costs of securing and maintaining patent rights;
- iii. Costs of licensing patent and related property rights;
- iv. Such other costs, taxes, or reimbursements as may be necessary or required by law.

For inventions disclosed on or after April 16, 1990, inventor shares are 50% of the first \$100,000 of Cumulative Net Royalty Income; 35% of the next \$400,000 of Cumulative Net Royalty Income; and 20% of all additional Cumulative Net Royalty Income.

Inventors' shares are paid each February based upon penultimate calendar year income and prior calendar year costs.

Note: For inventions disclosed prior to April 16, 1990, inventor shares are 50% of the Cumulative Net Royalty Income.

DISTRIBUTION TO CAMPUSES/LABORATORIES

Campus Net Income/Loss: For all case files associated with each campus/Laboratory, Adjusted Gross Income less:

- i. Costs of securing and maintaining patent rights;
- ii. Costs of licensing patent and related property rights;
- iii. Such other costs, taxes, or reimbursements as may be necessary or required by law;
- iv. Inventor(s)' share distribution (as calculated above);
- v. State of California share calculated by multiplying 25% times the difference of the Adjusted Gross Income less inventor(s)' share and less all direct charges to case files (costs as in Cumulative Net Royalty Income, ii.-iv. above). The State share is not actually paid to the State, but is used as an offset against the University's research budget appropriation from the State. This share is transferred from the Patent Fund to the General Fund;
- vi. Pro rata share of OTT actual operating costs in support of each campus/Laboratory (Note: The 15% of Adjusted Gross Income as an administrative cost used in the calculation of the Inventor share, above, is not deducted as part of this Campus Net Income/Loss calculation).

Amount Distributed: Beginning in FY 93/94, the Amount Distributed (disbursed/charged) to each Chancellor/Laboratory Director will be the Campus Net Income/Loss as defined above. From FY 89/90 through FY 92/93, however, the Amount Distributed was adjusted pursuant to a complex payback protocol intended to ease the burden on those campuses with net losses during these phase-in years.

Amount Distributed is normally transferred (disbursed/charged) in September of each year. Disbursements are made to the campus Chancellor/Laboratory Director to be spent for further research at his/her discretion.

Appendix L. Presentation Slides from Monthly MCC/Los Alamos Review Meetings



Appendix L

Slides From Monthly Progress Report Meetings

LANL Project Review January 13-14, 1994 (37 pages)

LANL Project Review January 20 (9 pages)

LANL Project Review February 17, 1994 (31 pages)

LANL Project Review March 24, 1994 (24 pages)



MVI PRESENTATION TO LANL

January 13 - 14, 1994

Richard Brice



INDUSTRIAL STAFF MEMBER AGREEMENT

I. BASIC DOCUMENT QUESTIONS

Purpose - Allows an external participant to assign an employee to LANL as a defacto staff member

1. Agreement must be approved by regents of UC. Is this approval process complex? Lengthy?

II. TECHNOLOGY RIGHTS AND RESTRICTIONS

1. Inventions made by visiting staff member belong to UC. Has this ever been a problem? Has it ever occurred?

2. Participant can obtain rights under 41 CFR 9-9.109(e). Has this ever occurred? Is the process complex? Lengthy? What approvals are required?

3. If assignee's company does business with the lab, have OCI issues ever arisen?

INDUSTRIAL STAFF MEMBER

CONTINUED

III. FUNDING QUESTIONS

Participant pays salary, benefits etc. for visiting staff member. LANL provides offices and some infrastructure support. LANL charges for increases in insurance costs.

1. In practice, what are the actual costs the lab charges the participant company if the visiting staff member requires significant computing resources?
2. Is the visiting staff member expected to make a contribution to the lab's programmatic goals or can the visit be explicitly for the purpose of evaluating technology?
3. What budget provides the ordinary overhead costs, e.g. office, secretarial support, phone, email.

IV. LEGAL LIABILITIES

Participant must indemnify the UC and LANL for damages that result from visit.

1. What forms of indemnification have been used by past agreements, e.g. insurance policies, participant company financial stability?
2. Have there been projects at LANL where indemnification payments were required?
3. How has article X, Examination of Records, been applied, e.g. how open are the books of the participant?

INDUSTRIAL STAFF MEMBER
continued

V. INSIDE THE LAB QUESTIONS

1. How many instances of visiting staff members per year on average (estimate)?
2. Typical duration?
3. Initiated by LANL or by visitor?
4. Any small business participants

VI. ADVANTAGES

1. Gives Participant Access to Facilities

VII. DISADVANTAGES

1. Gives Ownership of Participant Inventions to UC
2. May open books of participant to government.

TECHNICAL CONSULTING SERVICES

I. BASIC DOCUMENT QUESTIONS

Purpose - Provides LANL expertise to external customers.

- 1. What approval process is required?**
- 2. What OCI documents are required?**
- 3. How often is this form of agreement used?**
- 4. How does LANL decide whether similar services are available commercially?**

II. TECHNOLOGY RIGHTS

LANL/UC retains rights to any inventions made by staff.

- 1. Have consulting services agreements been made with key LANL suppliers?**
- 2. Are there examples from the computing side of the lab, e.g. HIPPI, CFS?**

III. FUNDING QUESTIONS

No charges to the customer for services

- 1. How much budget is available LANL wide and how is the budget partitioned out to divisions?**
- 2. Would there be a problem using this approach to transfer technology to a small business?**

TECHNICAL CONSULTING SERVICES

Continued

IV. LEGAL LIABILITIES

1. Indemnification of UC, LANL required.

V. INSIDE LANL QUESTIONS

1. What OCI issues arise if the LANL consultants are part owners of the recipient business? If they later become part owners?

VI. ADVANTAGES FOR SMALL BUSINESS

1. Access to key lab experts during technology transfer.

VII. DISADVANTAGES FOR SMALL BUSINESS

1. OCI issues may prevent commercialization of technologies.
2. UC rights to inventions may hamper effectiveness, e.g. consulting services describe how to port software.

USER FACILITY AGREEMENT

I. BASIC DOCUMENT QUESTIONS

Purpose - External customers can gain access to lanl technical facilities under reimbursable contract.

- 1. Is the Statement of Work required by this agreement essentially the same as that required by a CRADA?**
- 2. How are the costs determined, e.g. are there standard costs for computing services, office space, etc.?**

II. TECHNOLOGY RIGHTS

- 1. All rights owned by participant, no questions asked??**
- 2. Participant notifies UC of all inventions.**
- 3. Participant must aggressively pursue patents and commercialization of inventions or risk title.**
- 4. Explain the DOE's right to grant license to others if the participant doesn't pursue commercialization aggressively enough.**

III. FUNDING QUESTIONS

Customer pays costs up front except overhead, depreciation.

- 1. What costs are actually included in the up-front charges?**
- 2. Lab prevented from competing with commercial alternative**
- 3. How does LANL determine if it is competing with commercial vendors of similar services?**

IV. LEGAL LIABILITIES

FACILITY USE AGREEMENT CONTINUED

V. INSIDE LANL QUESTIONS

- 1. If the request for facility use originates from an external customer, how are LANL personnel chosen to assist in preparation of SOW, etc.?**
- 2. Who does an external customer with an unsolicited proposal contact?**

VI. SUMMARY OF SMALL BUSINESS ADVANTAGES

- 1. Small businesses are granted access to lanl facilities and personnel?**

VII. SUMMARY OF DISADVANTAGES

- 1. Up front costs may stifle participation?**
- 2. Discoveries are at risk unless actively pursued.**
- 3. Reporting of discoveries, commercialization attempts etc. may require excessive paper work for small businesses.**

PROPRIETARY USER FACILITY AGREEMENT

I. BASIC DOCUMENT QUESTIONS

PURPOSE - Similar to the "User Facility Agreement" but this form allows for protection of proprietary data and includes all actual costs plus DOE overhead and depreciation.

1. User must mark all proprietary information as such, and remove from facility at end of agreement.

II. TECHNOLOGY RIGHTS

Sponsor Retains rights to all inventions made under the agreement.

2. UC retains march-in rights if participant not aggressive in commercializing. How does this work in practice? What does the UC define aggressive to be?

3. Clause II.C.2(e) might mean that the participant has to open it's books to the government; is that how it works?

III. FUNDING QUESTIONS

Participant must pay all actual costs and DOE overhead and depreciation up front.

1. Participant must show a preference for US industry in order to qualify? Failure to aggressively pursue commercialization in US markets places rights in jeopardy.

**PROPRIETARY FACILITY USE
AGREEMENT
CONTINUED**

IV. LEGAL LIABILITIES

Participant must indemnify UC, DOE, LANL etc. against patent infringement suits which arise as a result of the project or its followup.

V. INSIDE LANL QUESTIONS

A joint SOW is required which describes all activities.

1. Would OCI issues be a problem if the LANL participant later becomes a part of some startup which spun out of the facility use project?
2. How are unsolicited proposals managed?

VI. SMALL BUSINESS ADVANTAGES

Access to LANL technical infrastructure.

1. How is competition with commercial offerings detected; managed?

VII. SMALL BUSINESS DISADVANTAGES

Costs must be paid in lump sum up front.

Indemnification costs could present problems.

Documentation of inventions and commercial activity required. Might include open books.

OUTSIDE EMPLOYMENT AGREEMENT

I. BASIC DOCUMENT QUESTIONS

Purpose - This document describes the procedures to be followed when a LANL staff member wants to work for an outside employer.

The key concerns are conflict of interest and distraction from lab responsibilities. Note that an ex-lab employee is still considered the same as a lab employee for two years following separation for conflict of interest resolution. The request must be approved by the employee's AD.

Foreign organizations require approval from the Deputy Assistant Secretary for Military Applications.

II. TECHNOLOGY RIGHTS

1. The UC owns rights to all inventions the employee conceived or reduced to practice while employed by lanl. How is this managed in practice when a staff member leaves the lab to join a company that makes a product in the same technology area the staff member worked in while at the lab?

2. If the ex-staff members new company sells products to the lab, how have conflict of interest issues been handled in the past? What forms are required? What approval process?

III. FUNDING QUESTIONS

NONE

OUTSIDE EMPLOYMENT CONTINUED

IV. LEGAL LIABILITIES

No indemnification is required. OCI concerns may be paramount.

V. INSIDE LANL QUESTIONS

1. The employee's job is not guaranteed once the outside employment is over. How could this work in practice if the purpose of the leave was technology transfer, i.e. if the lab saw the leave as in the best interests of the DOE?

VI. SUMMARY OF BENEFITS

1. Small businesses can exploit lab staff members as temporary employees. This is an important mechanism for technology transfer, and for small businesses, does not require that the business guarantee permanent employment (although that might be a desirable option).

2. Businesses located near the lab can more easily exploit this agreement since the staff member on leave would not be inconvenienced by travel.

OUTSIDE EMPLOYMENT CONTINUED

VII. SUMMARY OF DISADVANTAGES

1. OCI concerns are almost certain to cause problems for both small and large businesses. For example, a small business that has used this form of agreement must go to great lengths to disprove the existence of any conflict of interest before it can sell products or services to the lab.
2. Lab employees may be reluctant to exercise this option since they aren't guaranteed that their job will be held for them.

ENTREPRENURIAL LEAVE POLICY

I. BASIC DOCUMENT QUESTIONS

Purpose - Entrepreneurial leave is very similar to personal leave (as is used for the outside employment agreement).

An AD can approve the leave as “programmatic” which seems to provide a more favorable return policy for the employee to regain his previous lanl staff position. It’s not clear just how this works, or what circumstances justify its use.

II. TECHNOLOGY RIGHTS

If the lab purchases material or services from the company the staff member has joined an immediate conflict of interest situation seems to exist.

Some doubt exists about who would own rights to technology created by the employee while on EL.

III. FUNDING QUESTIONS

The participant business pays all of the employees expenses.

1. Do programmatic leaves cost lanl money? How are they different from personal leaves?

IV. LEGAL LIABILITIES

1. Does the UC routinely pursue rights to inventions the employee on leave may have conceived prior to the leave or to inventions conceived during the EL?

ENTREPRENURIAL LEAVE CONTINUED

V. INSIDE LANL QUESTIONS

1. Does line management look favorably on staff members who pursue this option?
2. Is line management empowered to hold jobs for limited periods while employees are on leave?
3. Are there projects which have been started inside lanl with a plan to transfer the technology part of the original justification?

VI. SUMMARY OF ADVANTAGES

Could be a key mechanism for transferring technologies to small businesses located near the lab.

VII. SUMMARY OF DISADVANTAGES

OCI concerns.

Employee reluctance.

Management reluctance.

Documents to be Discussed

- Restructuring the Department of Energy**
- Changes and Challenges at Department of Energy Laboratories (October 1993 draft)**
- UC Conflict of Interest Requirements**
- DOE Approved CRADA Language and Guidance**
- Exclusive Patent License Agreement**
- Non-exclusive Patent License Agreement**

Restructuring the Dept. of Energy

General Overview:

This document clearly supports technology transfer and small business commercialization.

The mission statements for the Department of Energy offices and programs include language emphasizing economic security, job creation, and technology transfer.

The mission and function statements for the Department of Laboratory Management specifically support technology transfer.

Restructuring the Dept. of Energy

cont.

Office of Laboratory Management mission and function statements:

"Establishment of this Office is intended to better facilitate use of the National Laboratories to enhance America's scientific and technological competitiveness in cooperation with industry."

"The Office of Laboratory Management will monitor the implementation of Departmental policies and guidance affecting the Laboratory Complex to assure consistent interpretation and application in such areas as, technology transfer; work for non-Federal entities; Cooperative Research and Development Agreements; environment, safety and health; international research and development."

Restructuring the Dept. of Energy

Questions:

How is this document being implemented? Is it being implemented quickly?

How has the restructuring affected the Industrial Partnership and other technology transfer programs?

Has the reorganization included increased funding to the labs for small business commercialization?

Has an office for small business commercialization been created, or does the program exist inside the Industrial Partnership or another program?

How closely does the Office of Laboratory Management work with the LANL departments that control technology transfer and small business commercialization programs?

Has the Office of Laboratory Management issued guidelines or policies and procedures for technology transfer and small business commercialization?

Changes and Challenges at ^{#62} DOE Laboratories

General Overview:

The document generally describes the new mission of the labs, its goals and gives recommendations for meeting them.

Chapter V: Establishing Partnerships for Competitiveness

This chapter includes specific recommendations to improve partnerships with industry and technology commercialization.

Many of these recommendations address specific issues such as intellectual property rights and product liability, which can hinder efforts to commercialize technology.

Recommendations Affecting Small Businesses

- Reducing barriers to Partnerships
Makes a number of specific recommendations for improvements, many of which apply directly to technology transfer. Some recommendations address problems raised in the analysis of current documents.
- Reducing CRADA processing time
This will help any business wishing to commercialize a technology. The CRADA is only one instrument, among many, for commercializing technology. Many small businesses may need other kinds of agreements, since they wouldn't necessarily have funds for a CRADA.

Recommendations Affecting Small Businesses

- Management of department-funded intellectual property
- Recommends more business-oriented and consistent policy for filing patent applications. Encourages labs to "bundle" intellectual property to facilitate commercialization.
- Duration of protection for commercially valuable information
- Considers the benefits of adding a five-year extension under certain circumstances to the current five-year maximum duration of protection. Recommends more serious consideration of shorter-duration benefits.
- Product liability - Provides for options in contracts.
- Consideration of U.S. competitiveness provisions
- Continues examination of current provisions and the possibility of "best effort" alternatives in response to increasing multinational and global market considerations.

Recommendations Affecting Small Businesses

- Addressing "March in" rights should a private sector partner not adequately pursue commercialization.
- Conflict of interest problems
- Proposes clarification of current legislation that leaves unclear when federal researchers at government-owned, government-operated laboratories may be violating criminal statutes, for example, in the acceptance of royalties.

Changes and Challenges

Questions:

How are these recommendations being implemented at LANL?

Which department is responsible for assuring implementation of the recommendations?

Have they been prioritized? Has an action plan been written?

Are there any implementing documents, memos, guidelines or comments circulating through LANL?

Who must approve it?

UC Conflict of Interest

General Observations: Conflict of interest requirements greatly affect small business commercialization.

Helpful provision: The document supports technology transfer with a policy of giving approval to employees who are involved in the technology transfer process but have a potential conflict of interest.

Restrictions and Requirements:

- Any commercialization activity will be investigated by the lab to determine any potential conflict of interest.
- This requirement appears to prevent PI's from being involved in small business commercialization of technologies in which they have a financial interest.
- This document seems to show that ALL Licensing must be approved by the DOE contracting officer. Could draw out licensing approval process.

UC Conflict of Interest

Questions:

I. Technology Rights and Restrictions

Examples of conflicts of interest exemptions allowed for lab employees working on technology transfer?

Would federal employees, who accept equity as a form of royalty, be exempted from CI for commercialization activities relating to that technology?

How long does the exemption process take?

II. Legal Liabilities

Have any conflicts of interest been found for small business commercialization activities at LANL? How were these circumstances handled?

Employees are precluded from initiating and negotiating contracts with organizations in which they have a CI. Can they perform work under that contract?

UC Conflict of Interest

Questions, cont.

III. Inside Los Alamos

Has the lab issued CI guidelines to help PI's understand which technology transfer circumstances would lead to CI?

Which circumstances will be found exempt?

DOE-Approved CRADA Language and Guidance

General Overview: Includes LANL model CRADA and small business CRADA. A CRADA is a mechanism for industry to conduct joint technology research and development with LANL.

Advantages:

- Joint research allows access to expertise of Los Alamos scientists and facilities.
- Advance payment is negotiable.
- Allows for a "hold harmless" option, rather than requiring indemnification.
- Small Business CRADA is preapproved by DOE.

Requirements and Restrictions:

- DOE can grant an exclusive license to copyrighted computer software if industrial partner is not satisfactorily pursuing commercialization of the technology.

DOE-Approved CRADA Language and Guidelines

Requirements and Restrictions

- Industrial partner must designate as "Protected CRADA Information" any data he wishes to keep proprietary. Otherwise, the Government has unlimited rights to the data.
- Government retains licensing rights to data and inventions generated as a result of this contract. Industrial partner does not have exclusive intellectual property rights.

DOE-Approved CRADA

I. Basic Document

Could a small business with foreign ownership enter into a CRADA with Los Alamos?

II. Funding Questions

Who must approve the release of funds to the department in Los Alamos performing the CRADA work?

Can a small business use in-kind type funding for a CRADA?

Why can't small businesses pay for CRADAs with "Funds-in-contributions"? What forms of payment are allowed?

III. Legal Liabilities

Does adoption of the "hold harmless" option require DOE approval? Will DOE typically approve this option? Has this option ever been approved?

IV. Inside Los Alamos

Does the Lab Director have authority to sign the CRADA, or must it be approved by DOE? How long does that approval process take?

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Exclusive Patent License Agreement

General Overview:

- Gives the licensee exclusive access to the technology. This instrument provides sufficient intellectual property rights to a small business to protect the commercial value of the technology.

Advantages:

- The Agreement provides for the transfer of certain know-how and technical data relating to the technology; appears to include technical services.

Restrictions and Requirements:

- Manufacturing must be performed substantially in the United States.
- The document requires total product liability indemnification for the University of California. Indemnification applies to products manufactured using technology under this license.

Exclusive Patent License Agreement

Questions:

I. Funding Questions

Is the lab flexible on the one-time royalty payment?

II. Legal Liabilities

Does the indemnification apply to sublicenses?

Would the lab be willing or have the authority to negotiate the product liability indemnification? Has this provision ever been negotiated in the past?

III. Inside Los Alamos

The Agreement is signed by the Director. Who must approve at DOE?

What conflict of interest measures are taken before awarding an exclusive license? How many individuals must approve for conflict of interest?

Nonexclusive Patent License Agreement

General Overview: The licensee obtains a nonexclusive, nontransferable license to the technology.

Advantages: Small businesses, whose principle customer is the U.S. government, do not have to pay earned royalties on products sold to the government if the product is used for government purposes.

Restrictions and Requirements

- Licensee does not have exclusive access to the technology. Government could license the technology to a competitor.
- The licensee must submit reports and make payments on a timely basis or risk loss of the rights transferred by the license agreement.
- The products that result from the license must be substantially manufactured in the United States.
- The licensee must indemnify the University against any damages or liability—including product liability—resulting from the exercise of the license.

Nonexclusive Patent License Agreement

Questions:

I. Basic Document

How many nonexclusive patent licenses have been granted to small businesses?

If a small business needs technical advice on the licensed technology from the lab, would it have to obtain a separate technical consulting services agreement?

II. Funding Questions

Is the University flexible on the one time license fee payment?

Does the University typically audit licensees?

III. Inside Los Alamos

Does the license have to be approved by the University of California, or does the Director have the authority to approve?

Proprietary User Facility Agreement

General Overview: This agreement allows a private "User" to use the facilities at Los Alamos.

Advantages:

- Provides access to the specialized facilities and and technologies at Los Alamos Laboratories.
- Allows the private "User" to label as proprietary any data that result from the Agreement, subject to challenges by the Government.

Restrictions and Requirements:

- The User must label all data as Proprietary (includes data delivered to the Facility), otherwise the University will have unlimited rights to that data.

Proprietary User Facility Agreement

Restrictions and Requirements, cont.

- If the User fails to remove all data, including proprietary data, from the facility prior to termination of the Agreement, the Government will have unlimited rights to the data.
- The Government has unlimited rights to any data incorporated into the facility or equipment such that the facility or equipment are not restored to their prior condition.
- The DOE reserves the right to grant exclusive license to Subject Inventions developed under this agreement, if DOE determines that User has not made sufficient effort to achieve practical application of the Subject Invention in a particular field of use. (March-in Rights)
- Government has rights to Subject Inventions that result from work performed under the Agreement.

Proprietary User Facility Agreement

Questions:

I. Basic Document

How many of these Agreements have been issued by Los Alamos?

How long does it typically take to obtain such an agreement?

II. Technology Rights and Restrictions

How often has government exercised march-in rights under this kind of agreement?

Who resolves challenges by the government of whether data is actually proprietary? Has the government ever challenged a determination by User that data is proprietary.

III. Funding Questions

Is Los Alamos flexible on advance payment for work performed? Who would decide?

IV. Inside Los Alamos

Who approves this agreement? Must DOE approve?

APPENDIX D:

**LANL Project Review Meeting Presentation
January 20, 1994**

Documents Presented

Restructuring the Department Of Energy
Changes and Challenges at Department
of Energy Laboratories (October 1993
draft)
UC Conflict of Interest Requirements
DOE Approved Modular CRADA
Language and Guidance
DOE Approved Small Business CRADA
Exclusive Patent License Agreement
Non-exclusive Patent License
Agreement
Industrial Staff Member Agreement
Technical Consulting Agreement
User Facility Agreement
Proprietary User Facility Agreement
Outside Employment Agreement
Entrepreneurial Leave Agreement

1/20/94

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Restructuring the Dept. of Energy

Purpose

- Secretary of Energy's plan for reorganizing the Department of Energy. The plan has been implemented.

Small Business Advantage

- DOE mission statements emphasize technology transfer

Small Business Disadvantage

- None noted

Conclusion

- This document defines DOE policy, but does not directly affect any small business programs underway at LANL.

1/20/94

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Changes and Challenges at DOE Laboratories

Purpose

- DOE Laboratory Mission Priority team assessment of DOE labs new missions and goals and provided recommendations for meeting them.

Small Business Advantages

- Recommendations address current problems e.g.
- March-in Rights
- Better intellectual property management
- Duration of intellectual property protection
- U. S. competitiveness requirements

Small Business Disadvantage

- Future funding could be restricted to dual-benefit technologies.

Conclusion

- Implementation of these recommendations is essential for successful technology transfer.

1/20/94

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Changes and Challenges Recommendations

- Addressing "March In" rights should a private sector partner not adequately pursue commercialization
- Management of department-funded intellectual property
Recommends more business-oriented and consistent policy for filing patent applications. Encourages labs to "bundle" intellectual property to facilitate commercialization.
- Duration of protection for commercially valuable information
Considers the benefits of adding a five-year extension under certain circumstances to the current five-year maximum duration of protection. Recommends more serious consideration of shorter-duration benefits.
- Consideration of U.S. competitiveness provisions
Continues examination of current provisions and the possibility of "best effort" alternatives in response to increasing multinational and global market considerations.

1/20/94

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Conflict of Interest Guidelines for UC operated DOE Labs

Purpose

- Conflict of interest requirements give guidance for managing COI as required by the UC-DOE contract and in accordance with state and federal law.

Small Business Advantage

- None

Small Business Disadvantage

- COI creates obstacles to technology transfer

Conclusion

- Conflict of interest will continue impede small business commercialization activities until more flexible policies are developed.

1/20/94

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DOE-approved CRADA Language and Guidance

Purpose

- A CRADA is a mechanism for industry to conduct joint technology research & development with LANL.

Small Business Advantages

- Provides flexibility in clauses that previously slowed down negotiations between LANL and the industrial partner.

Small Business Disadvantage

- The modular CRADA must be approved by DOE, which lengthens the technology transfer process.

Conclusion

- Indemnification requirements, contract processing time, required DOE approval are still obstacles to small business commercialization.

1/20/94

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DOE-approved Small Business CRADA

Purpose:

- Provides a streamlined mechanism for small businesses to conduct joint technology research & development with LANL.

Small Business Advantage

- Pre-approved terms reduce processing time
- Does not require total product liability indemnification.

Small Business Disadvantage

- Cannot be used for small business commercialization of software.

Conclusion

- Streamlined approach for software commercialization must be developed.

1/20/94

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MVI

Exclusive Patent License Agreement

Purpose

- Gives the licensee exclusive access to a patented UC technology.

Small Business Advantages

- Transfers certain know-how and technical data relating to the technology
- Includes technical services

Small Business Disadvantages

- More difficult to obtain
- Expensive
- Requires total product liability indemnification

Conclusion

- The expense and product liability make the license less attractive to small businesses. However, exclusivity may be required by a venture capitalist.

1/20/94

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Nonexclusive Patent License Agreement

Purpose

- The licensee obtains a nonexclusive, nontransferable license to the UC patented technology.

Small Business Advantages

- Relatively easy to obtain
- Do not have to pay earned royalties on products sold to the government for government purposes.

Small Business Disadvantages

- No exclusive access to the technology. Government could license the technology to a competitor.
- The products must be substantially manufactured in the United States.
- Requires total product liability indemnification

Conclusion

Even without exclusivity, small businesses may still maintain time-to-market advantage.

- Only an advantage if the agreement is executed quickly.

1/20/94

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Industrial Staff Member Agreement

Purpose

- Allows external participant to assign an employee to LANL as a de-facto staff member at participant's expense

Small Business Advantage

- Participant gains access to LANL staff and technology infrastructure

Small Business Disadvantages

- UC owns rights to employee inventions
- Indemnification requirements
- May require long lead time to create position, get clearances
- Opens part of participant's books to government audit

Conclusion

- Useful technology transfer mechanism when long lead time and internal lab support are present.

- Inadequate for most small business requirements under current implementation

1/20/94

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Technical Consulting Agreement

Purpose

- Provides LANL expertise to an external participant

Small Business Advantage

- External participant not charged for LANL consultants

Small Business Disadvantages

- UC retains rights to LANL consultant inventions
- Indemnification required
- For use only if funds, personnel available

Question: Is there a separate (new) consulting agreement for small businesses only?

Conclusion

- Current implementation does not provide adequate level of support or protection for small business

1/20/94

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User Facility Agreement

Purpose

- External participant uses LANL facilities under reimbursable contract

Small Business Advantages

- Easy to establish
- Participant retains rights to inventions
- Access to LANL personnel and facilities

Small Business Disadvantages

- Up front costs (some negotiation possible)
- Some (minimal) risk to participant inventions if not actively pursued
- Competition with commercially available services prohibited
- Paperwork to notify UC of all inventions

Conclusion

- Promising approach, but need cost control alternatives, e.g.
- UC accepts equity instead of cash up front
 - Deferred reimbursement option

1/20/94

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Proprietary User Facility Agreement

Purpose

- Special form of user facility agreement that provides protection for proprietary information

Small Business Advantages

- Access to LANL personnel and facilities
- Participant retains rights to inventions

Small Business Disadvantages

- Indemnification
- Up front costs
- Documentation of inventions and commercial activity required
- Some (minimal) risk to inventions
- Preference for US industry required

Conclusion

Promising approach, but needs cost control alternatives, e.g.

- UC accepts equity instead of up front cash
- Deferred reimbursement option

1/20/94

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Outside Employment Policy

Purpose

- Allows LANL personnel to work for external participant

Small Business Advantage

- Technology transfer mechanism which does not require termination of LANL employee

Small Business Disadvantage

- UC retains rights to employee inventions
- Conflict of interest resolution may require significant effort and paperwork

Conclusion

- Technology rights and conflict of interest eliminate this as a technology transfer mechanism

1/20/94

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Entrepreneurial Leave Policy

Purpose

- Entrepreneurial leave is very similiar to personal leave with the addition of an (undefined) programmatic leave option

Small Business Advantage

- None clear

Small Business Disadvantage

- Unclear - may be same as outside employment agreement

Conclusion

A liberal entrepreneurial leave policy is essential to technology transfer and must provide:

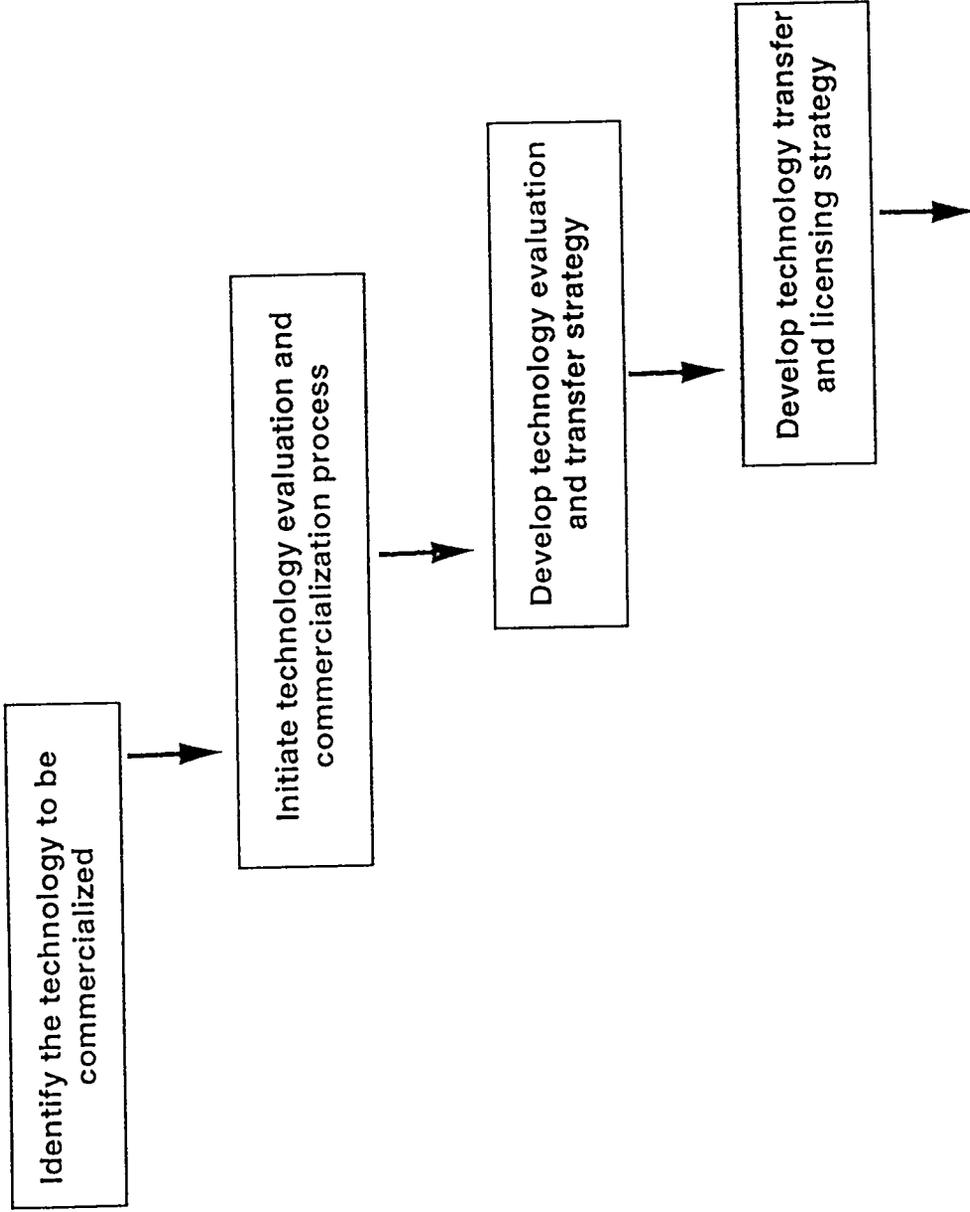
- Leave time to support tech transfer
- Minimal Conflict of Interest concerns
- Incentives, e.g. access to equity

**New Business Creation Scenario at
Los Alamos National Laboratories**

**Dominique Cartron
MVI**

February 17, 1994

Overview of the Commercialization Process at Los Alamos National Laboratories



Commercialization process moves outside
Los Alamos National Laboratories

New Business Creation Scenario: Assumptions

OCI/COI Fairness of Opportunity Considerations

- Principal investigator only gets royalties (No equity) and is not a principal
- Technology was advertised in the public domain

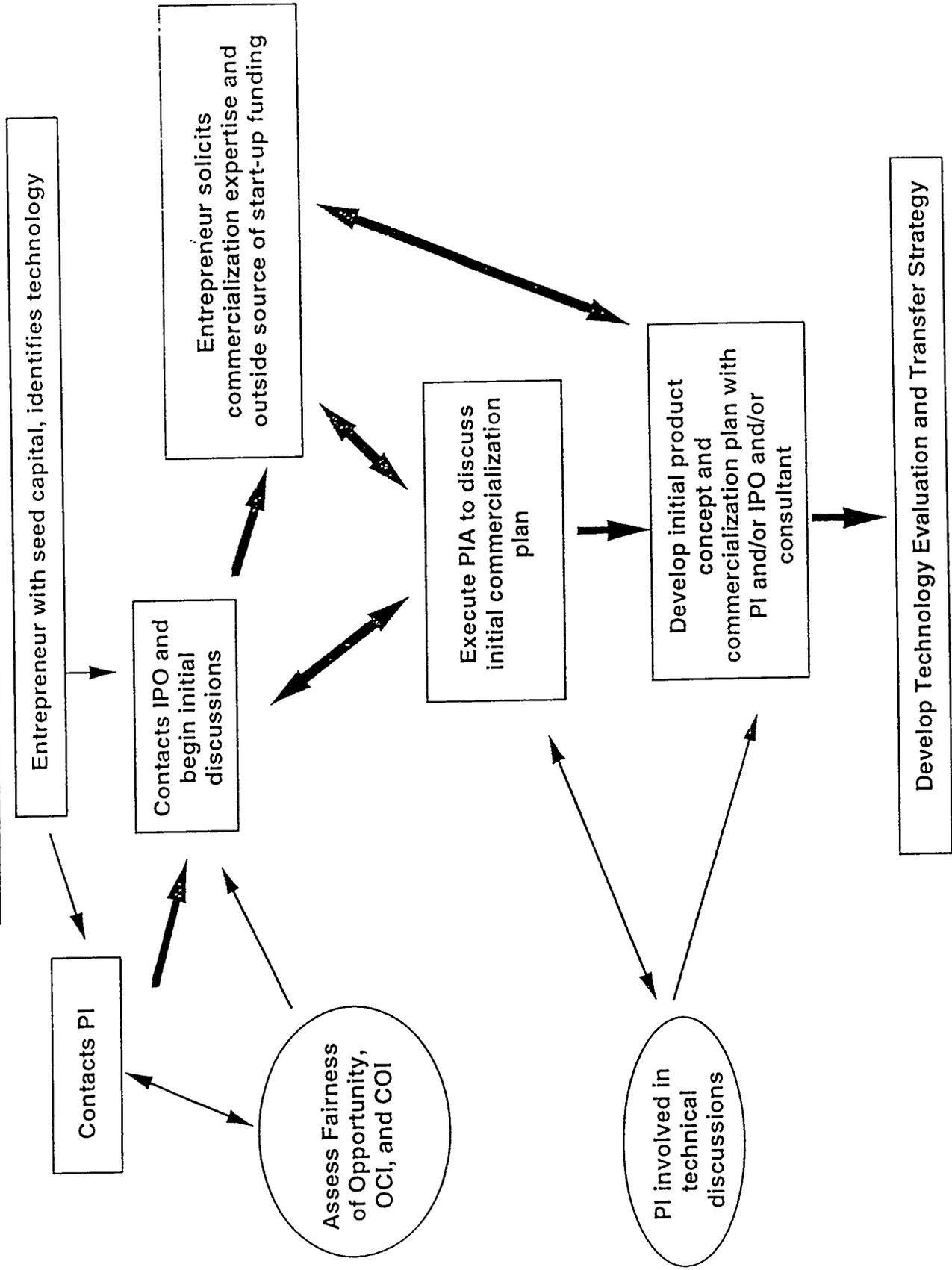
Capital Considerations

- \$ to develop commercialization plan
- \$ for license fees (flexible)
- Insufficient capital to mature technology

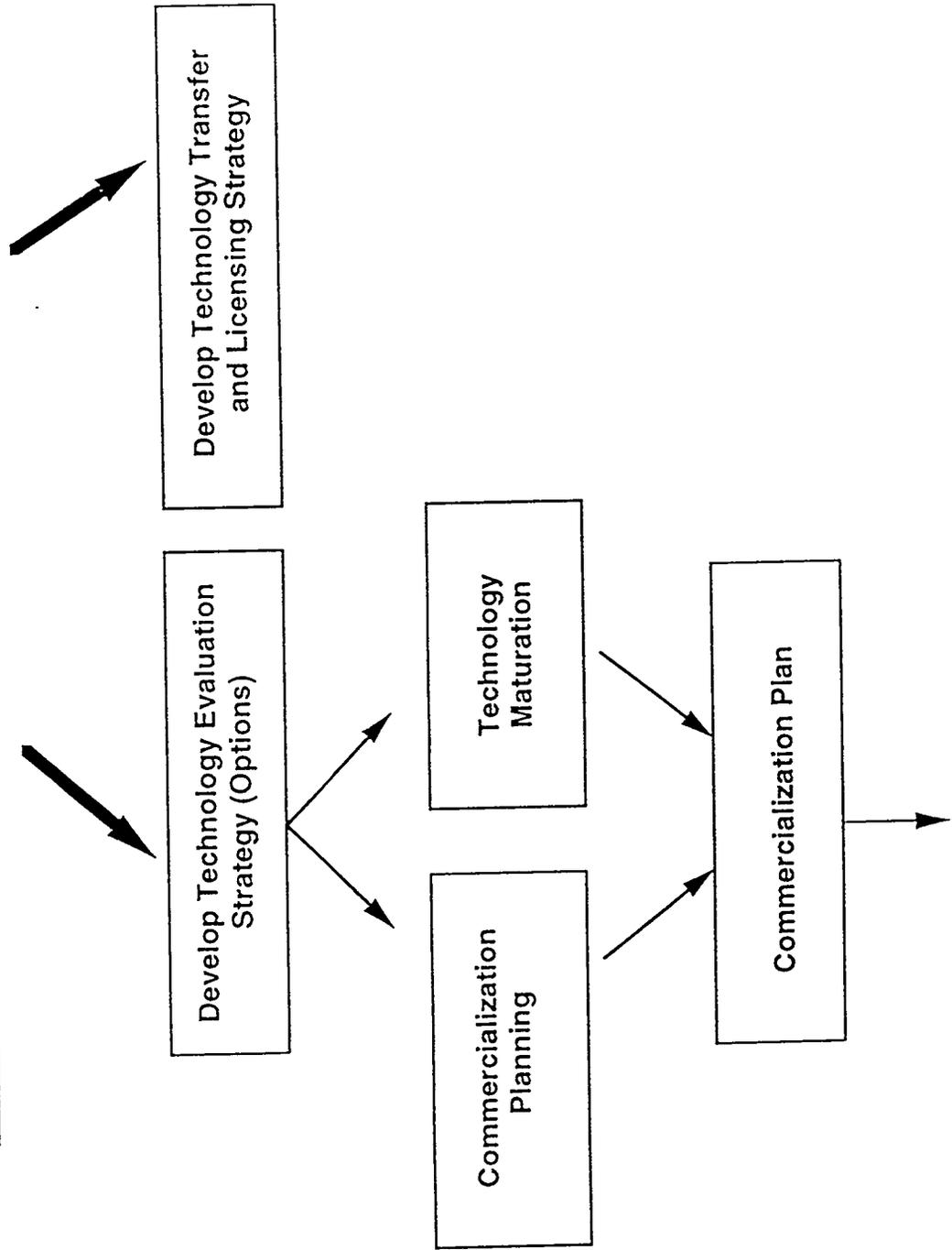
Other Considerations

- Clear definition of potential market
- Product concept partially developed
- No Funds-In Ageement Modular CRADA
- Preferred dual benefit technology
- Entrepreneur has sufficient business experience
- New Business fully accepts indemnification and substantial U.S. manufacturing requirements
- Preferred patent or copyright protection for intellectual property

Initial Commercialization Process



Develop Technology Evaluation and Transfer Strategy



Commercialization process moves outside
Los Alamos National Laboratories

Technology Evaluation Options

Entrepreneur needs mechanism for working closely with technology as part of evaluation

Entrepreneur pays for use of LANL facilities.

User Facility

- Easy to obtain, commonly used now.
- Large # of facilities available.

Gives industrial partner exclusive right to explore commercial potential of a technology.

Development License Agreement

- Relatively easy to obtain.
- Excellent mechanism for working with the technology.

Allows industry person to become part of lab staff on temporary assignment.

Industrial Staff Member Agreement

- May not apply to an individual entrepreneur.
- Potential Conflict of Interest and Fairness of Opportunity problems.

Allows a company to exchange personnel with the laboratory.

Personnel Exchange Program

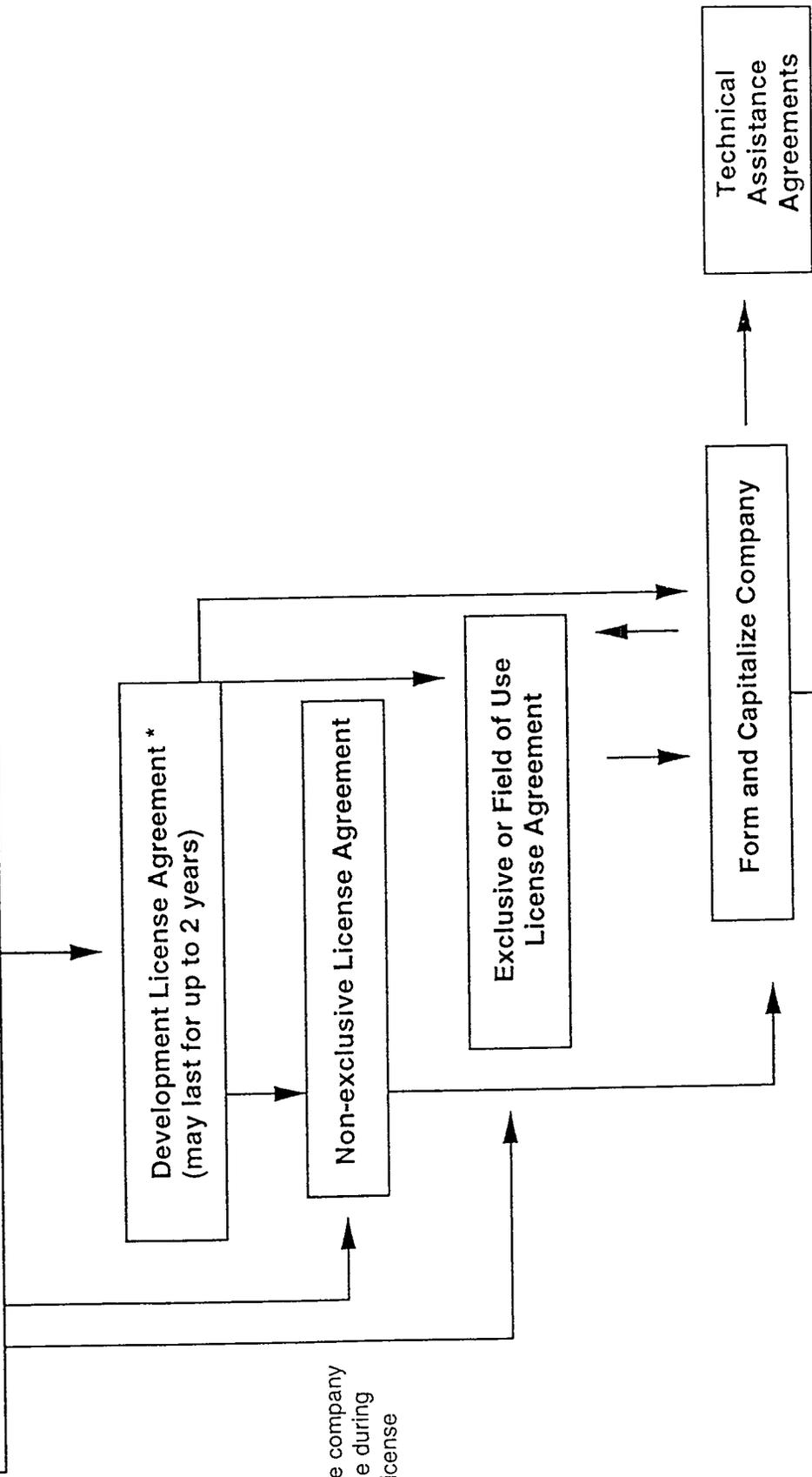
- Under development.
- Individual entrepreneur may not be eligible.

LANL provides personnel to help solve a technical problem.

Technical Assistance Agreement

- Easy to obtain, funds available, flexible to industry needs.
- Individual entrepreneur may not be eligible.

Develop Technology Transfer and Licensing Strategy



* Formation and capitalization of the company may occur any time during the development license phase.

Commercialization process moves outside Los Alamos National Laboratories

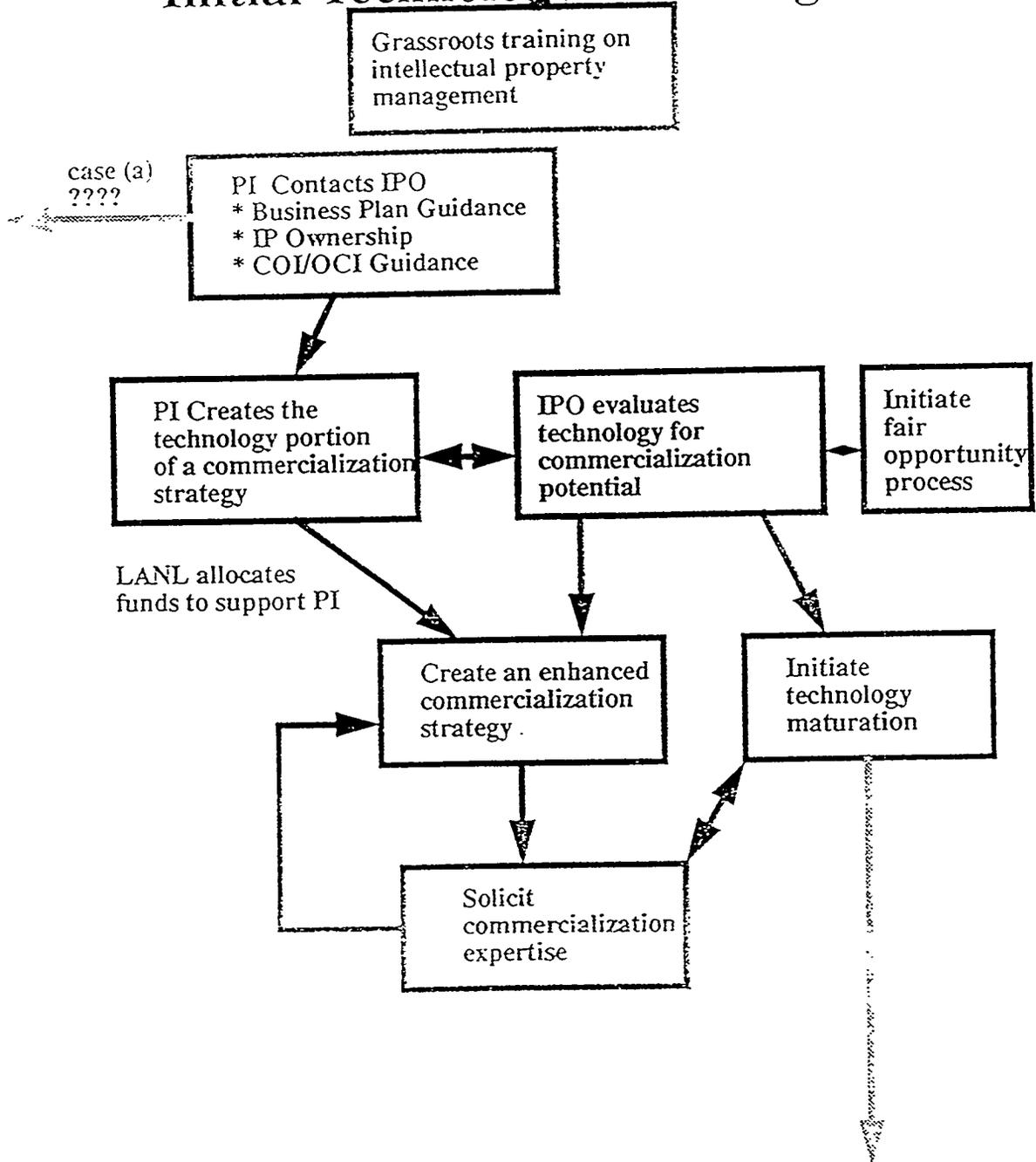
Scenario

LANL PI Wants to Form New Dual-Benefit Business

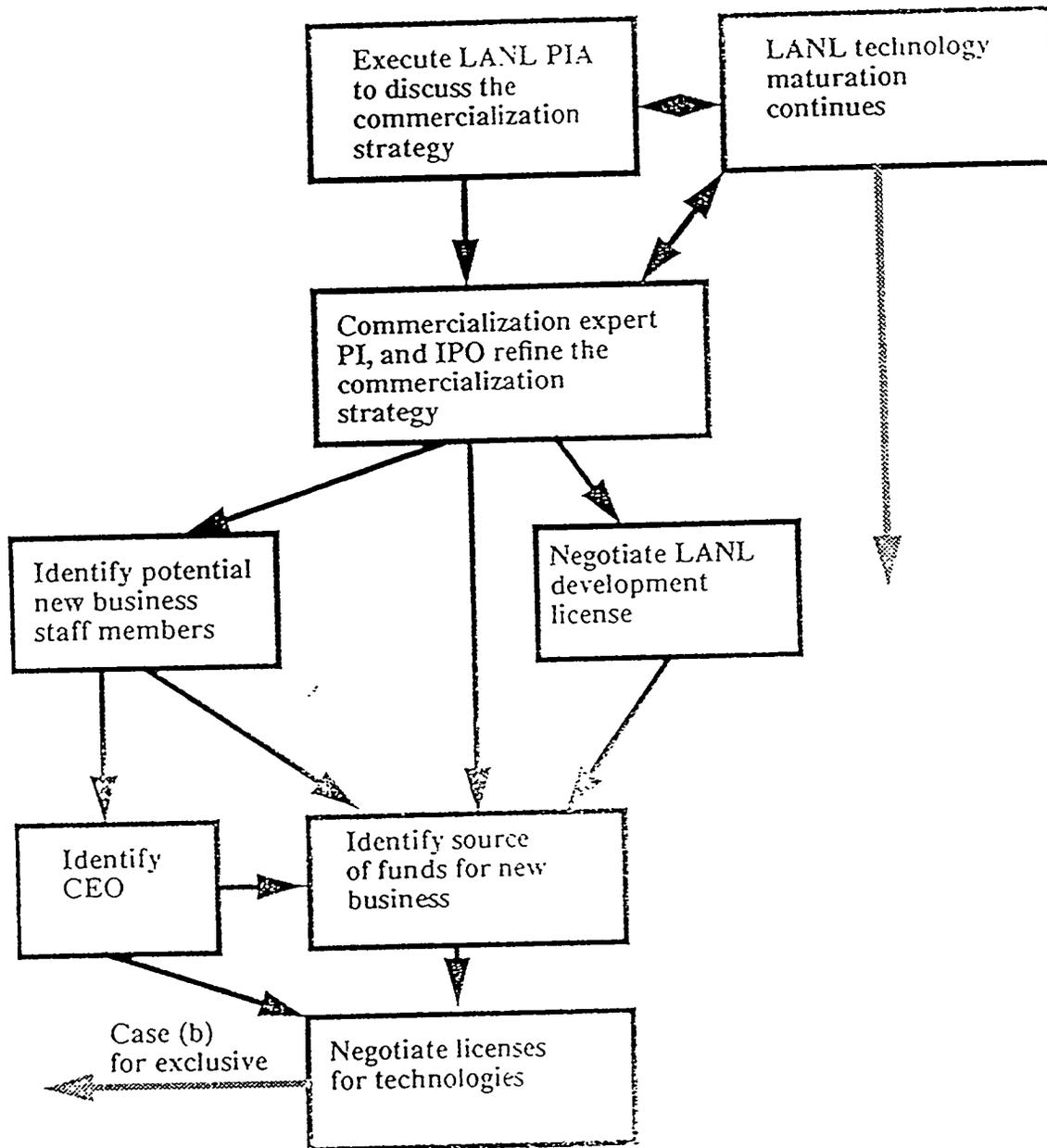
Where PI Serves as

- a) a principal (officer) in the company----
This case is included since some UC policies prohibit ex-UC employees serving as principals in potential licensee companies.
- b) a non-principal employee of the company----
This case is included to explore COI and OCI issues.
- c) as a UC employee with royalty rights----
This is the standard accepted practice
- d) as a UC employee with equity rights

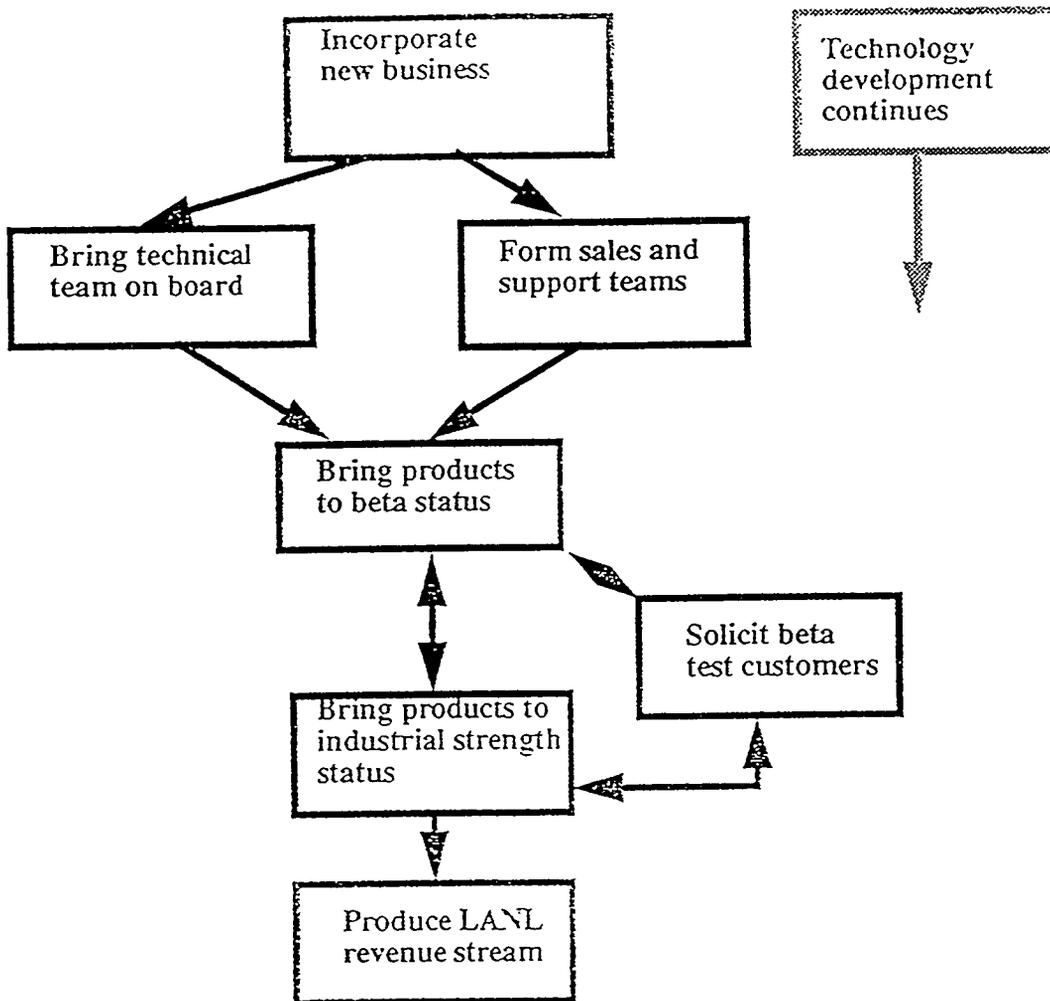
Phase-1 Initial Technology Screening



Phase-2 Create Prerequisites for New Business



Phase-3 Establish Markets



The following areas will continue to impede small business commercialization activities until more flexible policies are developed:

- Conflict of Interest
- Fairness of Opportunity
- Intellectual Property

DOE-APPROVED CRADA LANGUAGE AND GUIDANCE

- Indemnification requirements, contract processing time, and required DOE approval are obstacles to small business commercialization.

FUNDS-IN AGREEMENT

- Funds-in agreements are costly and difficult to execute which prevent them from being used by small businesses for technology commercialization.

PATENT RIGHTS & POLICIES

- Patent policies and intellectual property management are the basis of all licensing rights obtained by small businesses. Those rights are only valid if all patents are properly executed, maintained and protected.
- Some burden for protecting and maintaining patent rights are transferred to the small business, e.g., foreign patents, patent maintenance fees.

EXCLUSIVE PATENT LICENSE AGREEMENT

- The up-front license fee and product liability indemnification make the license less attractive to small businesses. However, exclusivity may be required by a venture capitalist.

NON-EXCLUSIVE PATENT LICENSE AGREEMENT

Even without exclusivity, small businesses may still maintain time-to-market advantage.

- Only an advantage if the agreement is executed quickly.

DEVELOPMENT LICENSE AGREEMENT

- Gives the small business the opportunity to explore a technology, without having to pay full price for exclusive rights to that technology. Rights to an exclusive license are not guaranteed.

USER FACILITY AGREEMENT

Promising approach, but need cost control alternatives, e.g.

- UC accepts equity instead of cash up front
- Deferred reimbursement option

PROPRIETARY USER FACILITY AGREEMENT

Promising approach, but need cost control alternatives, e.g.

- UC accepts equity instead of cash up front
- Deferred reimbursement option

INDUSTRIAL STAFF MEMBER AGREEMENT

- Useful technology transfer mechanism when long lead time and internal lab support are present.
- Inadequate for most small business requirements under current implementation.

TECHNICAL CONSULTING SERVICES AGREEMENT

- Current implementation does not provide adequate level of support or protection for small business

OUTSIDE EMPLOYMENT AGREEMENT

- Technology rights and conflict of interest eliminate this as a technology transfer mechanism

ENTREPRENEURIAL LEAVE POLICY

A liberal entrepreneurial leave policy is essential to technology transfer and must provide:

- Leave time to support tech transfer
- Minimal Conflict of Interest concerns
- Incentives, e.g. access to equity

EQUITY BULLETIN

- Contains groundrules and procedures for evaluating the option to accept equity in a potential licensee in lieu of some part of the license issue fee. Applies only to patented technologies; copyrighted and trademarked technologies are explicitly excluded.

EXCLUSIVE SOFTWARE LICENSE AGREEMENT

- Small business may lack funds or staff for:
 1. Due diligence on copyright validity
 2. Blanket indemnification
 3. Setting/meeting royalty goals acceptable to UC
 4. Meeting ESTSC documentation requirements
 5. COI restrictions on PI
- The disadvantages seem acceptable in most cases

WORK FOR NON-FEDERAL PARTNERS

- DOE recognizes problems in facility access; more favorable reimbursement and rights needed.

APPENDIX D:

February 17 Enterprise Creation Modeling Presentation

Enterprise Creation Model

Four Key Ingredients

- Management
- Markets
- Technology (Products)
- Capital

Generic Enterprise Creation Model

- Define Market Opportunity
- Identify a Marketable Technology
- Develop a Commercialization Plan
- Bring Technology To a Commercial State
- Form Company
- Recruit Management
- Secure Financing

LANL Enterprise Creation Model

- **Major Issues Categories**
 - Fairness Of Opportunity
 - Conflict Of Interest
 - DOE/Government Policies
 - U of C/LANL Policies
 - Management/Culture Of LANL
 - Infrastructure

Enterprise Creation Model

- Process Of Creating a Start-Up:
 - Very Complex; Unpredictable
 - Highly Individualized--
No Two Alike
- Fragile--
Always Subject To Failure
- Never Follows The Defined Plan--
Subject To Constant Adjustment
Sometimes Require Total Redirection
- Art; **Not** Science--
Models Easy To Describe--But--

Execution Is Key

LANL Enterprise Creation Model

- Why LANL Spin-Offs Are Different
 - DOE; Other Government
 - U of C M&O Contract
 - LANL Internal
 - State of New Mexico; Regional

LANL Enterprise Creation Model

- Origins
 - IPO Initiated--Via "Ferretting"
 - PI Initiated
 - Entrepreneurial Request
Response To Ad
Self-Initiated Inquiry
- Other

LANL Enterprise Creation Model

- **DOE/Government Policy Issues**
 - Fairness Of Access
 - Restrictions On Licensing (Assignment; Etc.)
 - Continued Right To Practice Technology (Agencies & Contractors)
 - Future Transfer Of Improvements/Enhancements To Others
 - Dual Benefit Requirements
 - Availability Of Maturation Funding
 - Substantial U.S. Manufacturing Requirements

LANL Enterprise Creation Model

- **U of C/LANL Policy Issues**
 - Ability Of Company Employing Ex-UC'er To Obtain License
 - Ability Of PI Or Consultant To Obtain A License
 - Ability To Accept Equity
 - Uncertain Status Of Entrepreneurial Leave
 - Policy On Distribution Of Licensing Income

LANL Enterprise Creation Model

- **LANL Management & Culture Issues**
 - Knowledge/Identification Of Existing Technologies
 - State Of Commercial/Market Knowledge
 - Non-uniform/Undisciplined IP Procedures
 - Experience In Commercializing Technology Via Small Businesses
 - Time Required To Obtain A License
 - Lack Of Successful Role Models
 - Conflicting Objectives/Motives: Management vs. EPIs
 - Encouragement/Discouragement Ratio

LANL Enterprise Creation Model

- **Infrastructure Issues**
 - Presence Of Qualified Management
 - Local Sources Of Private Equity
 - Facilities Availability In Los Alamos Area
 - Other

LANL Enterprise Creation Model

- **Plan For Dealing With Issues**
- Define Potential Effects If Left Unchanged
 - Effect On Start-Ups
 - Categorize: Critical Or Troublesome
- Establish Alternatives For Resolution
 - Work To Change Policy Or Other Conditions
 - Work Around
 - Other
- Evaluate Alternatives

LANL Enterprise Creation Model

- Requirements For Success
 - Market Orientation
 - Flexibility
 - Access To Commercial Knowledge
 - Rapid Response
 - Attention To Detail
 - Persistence
 - Successful Resolution Of Other Important Issues

MVI Presentation to LANL

March 24, 1994

Enterprise Creation Issues

Merlin Schulze

ENTERPRISE CREATION ISSUES

- FAIRNESS OF OPPORTUNITY REQUIREMENTS
 - Must make technology available to any interested party on equal basis
 - Broadly advertise or otherwise make available
 - Competition allowed through proposal or "business plan" submission
- IMPACT
 - Time factor - small businesses cannot endure long delays for advertising and proposal evaluation
 - Competitive conditions - small businesses at disadvantage vs. large businesses with more financial and other resources
- RESOLUTION ALTERNATIVES
 - Give preference to start-ups; other small businesses
 - Confirm exclusion of situations where small business initiates contact
 - Manage timing and conduct of public notification

ENTERPRISE CREATION ISSUES

- INABILITY OF LOS ALAMOS TO ACCEPT EQUITY
 - Unable to accept equity in return for intellectual property
- IMPACT
 - Inhibits cash-short start-ups
 - Limits potential returns (although return may be delayed 5 to 7 years or longer)
- RESOLUTION ALTERNATIVES
 - Adopt policy of taking equity from early-stage companies in return for transferred technology
 - Defer royalty payments

ENTERPRISE CREATION ISSUES

- POLICY ON SHARING LICENSING COMPENSATION WITH SUPPORTING LINE MANAGERS/OTHERS
 - Only those named on patent share in royalties
- IMPACT
 - Failure to share rewards broadly is potential impediment to successful commercialization
- RESOLUTION ALTERNATIVES
 - Modify licensing income distribution policy to include broader group
 - Use of SAR arrangement

ENTERPRISE CREATION ISSUES

- TIME REQUIRED TO OBTAIN A LICENSE
 - IPO estimates 15 to 125 weeks to complete a license
- IMPACT
 - Time delays may dissuade small companies from trying to access to Los Alamos technology
- RESOLUTION ALTERNATIVES
 - Implement steps to reduce time to award exclusive license
 - Reduce time in certain tasks; work parallel steps; simplify forms; co-locate attorneys

ENTERPRISE CREATION ISSUES

- RESTRICTIONS IN LICENSING/INABILITY TO ASSIGN PATENTS (RESTRICTIONS INCLUDE NON-EXCLUSIVE; FIELD OF USE; ETC.
 - Unable to assign patents to either a company or entrepreneur
 - Even with exclusive license, certain rights retained by government
- IMPACT
 - Difficult to evaluate impact: could be significant
- RESOLUTION ALTERNATIVES
 - Grant licensee rights to improvements or enhancements
 - Inform licensee of government requirements; give right to compete
 - Grant licensee first right to supply government needs in return for grant-back

ENTERPRISE CREATION ISSUES

- KNOWLEDGE OF/IDENTIFICATION OF EXISTING TECHNOLOGIES
 - No catalog or database of existing technologies
- IMPACT
 - Screening and selection of technologies for commercialization cannot be accomplished
- RESOLUTION ALTERNATIVES
 - Develop a catalog of Los Alamos technologies

ENTERPRISE CREATION ISSUES

- CURRENT STATE OF LOS ALAMOS' COMMERCIAL KNOWLEDGE AND MARKET ORIENTATION
 - Little past need for concern about commercial markets
- IMPACT
 - Decisions on what to work on/what to patent made without sufficient understanding of market opportunity or market requirements
- RESOLUTION ALTERNATIVES
 - Become more market oriented, develop marketing skills as a major, long-term cultural change

ENTERPRISE CREATION ISSUES

- UNIFORMITY AND DISCIPLINE IN INTELLECTUAL PROPERTY PROCEDURES
 - Laboratory notebooks not uniformly used; lack strong, consistent management support for patenting
- IMPACT
 - Valuable technology may not be protected; Los Alamos vulnerable in event of conflict over patent applications
- RESOLUTION ALTERNATIVES
 - Emphasis from the top of the organization; management priorities and education

ENTERPRISE CREATION ISSUES

- EXPERIENCE IN COMMERCIALIZING TECHNOLOGY THROUGH THE CREATION OF SMALL BUSINESS
 - Very few small companies have been created with Los Alamos technology
- IMPACT
 - Despite announced DOE goals, little tangible evidence that small business commercialization has increased in past five years
- RESOLUTION ALTERNATIVES
 - Near term: use experienced outside organizations to jump-start process; longer term; retain experience in internal teams

ENTERPRISE CREATION ISSUES

- AVAILABILITY OF RECENT SUCCESSFUL SMALL BUSINESS SPIN-OFF ROLE MODELS
 - Only two significant new business formed based on Los Alamos technology
- IMPACT
 - Lack of recent examples exerts dampening effect on additional start-ups
- RESOLUTION ALTERNATIVES
 - Successful start-ups expected to serve as role models; need "how to" examples of successful start-ups

ENTERPRISE CREATION ISSUES

- AVAILABILITY OF FUNDING FOR THE MATURATION ("COMMERCIAL DEVELOPMENT") OF COMMERCIALY VIABLE TECHNOLOGIES
 - Significant technologies have not yielded marketable products
 - No assurance of adequate Los Alamos funding to "mature" technologies for commercialization
- IMPACT
 - Without maturation funding, it is difficult to justify developing commercialization plans for candidate technologies requiring maturation
- RESOLUTION ALTERNATIVES
 - Rely on outside, non-government financing for maturation
 - Locate source(s) of maturation funding within Los Alamos
 - Locate other, as yet unidentified, sources of funding
 - Make increased use of developmental licenses, including provisions for technology maturation in license agreements

ENTERPRISE CREATION ISSUES

- ABILITY OF UC (LANL) EMPLOYEES OR CONSULTANTS TO OBTAIN A LICENSE TO TECHNOLOGY
 - Precludes granting of exclusive license to former employees for two years, without specific case by case waiver
- IMPACT
 - Policy may preclude most logical candidates from obtaining licenses and starting spin-outs
- RESOLUTION ALTERNATIVES
 - Obtain blanket DOE waiver, possibly with some restrictions on size or stage of business

ENTERPRISE CREATION ISSUES

- ABILITY OF A COMPANY EMPLOYING AN EX-UC EMPLOYEE OR CONSULTANT, WHO HAS WORKED FOR LANL WITHIN THE PAST TWO YEARS, TO OBTAIN A LICENSE
 - Company employing an individual who has been an employee or consultant to Los Alamos within two years, is excluded
- IMPACT
 - Precludes organizations with greatest likelihood of successfully commercializing a particular Los Alamos technology
- RESOLUTION ALTERNATIVES
 - Obtain blanket DOE waiver, possibly with some restrictions on size or stage of business

ENTERPRISE CREATION ISSUES

- AVAILABILITY AND CONDITIONS OF ENTREPRENEURIAL LEAVE
 - Leave of absence policy on hold; could be an important factor in encouraging entrepreneurial lab employees to help form new businesses
- IMPACT
 - Lack of entrepreneurial leave program discourages the departure of Los Alamos employees otherwise interested in helping to form and develop spin-out companies
- RESOLUTION ALTERNATIVES
 - Reinstigate an entrepreneurial leave program incorporating up to two years of unpaid leave, plus other terms similar to those contained in the former policy

ENTERPRISE CREATION ISSUES

- CURRENT LANL ORGANIZATION CULTURE AS IT AFFECTS WOULD-BE ENTREPRENEURS (LIABILITY VS. REWARD; LACK OF EFFECTIVE MOTIVATION; CURRENT EFFORTS VIEWED AS LIP-SERVICE
 - Current policies produce conflicting objectives and motivations, which separate division management and would-be entrepreneurs
- IMPACT
 - Real and perceived management opposition to entrepreneurial initiatives is a major barrier to generating successful spin-off businesses
- RESOLUTION ALTERNATIVES
 - Through various internal mechanisms, establish the acceptability of spin-off work, including mechanisms to encourage use of personal time, while insuring that other lab work gets done

ENTERPRISE CREATION ISSUES

- GOVERNMENT AGENCIES' AND CONTRACTORS' RIGHTS TO USE TECHNOLOGY LICENSED TO OTHERS - AND TO HAVE PRODUCTS MADE BY OTHERS (INCLUDING THE REQUIREMENTS IMPOSED BY ESTSC).
- Government retains unlimited rights to continue to use any licensed technology; software may also transfer through ESTSC to any government agency or contractor
- IMPACT
 - Government may elect to have another company manufacture products for use by government
 - Los Alamos may continue to develop enhancements and improvements to a licensed technology, potentially creating competition
 - Special problems for software, particularly in the overseas market, due to unpoliced distribution
- RESOLUTION ALTERNATIVES
 - Offer small company licensees the first right to supply the government with products containing licensed technology
 - In software,(which requires documentation, product support, and maintenance provided by a commercial organization) licensee to aggressively work the

ENTERPRISE CREATION ISSUES

- DUAL BENEFIT REQUIREMENTS
 - DOE has announced that preference will be given to technologies having the potential to serve both government and commercial markets
- IMPACT
 - Technologies not showing dual use applications will be of less interest and receive less support as candidates for maturation and commercialization
 - Attractive technologies with significant market potential may not have potential application for other DOE/government needs
- RESOLUTION ALTERNATIVES

ENTERPRISE CREATION ISSUES

- SUBSTANTIAL U.S. MANUFACTURE REQUIREMENT
 - Current license agreement include clause requiring "substantial" manufacture of products in the U.S., although the definition of "substantial" is not clear
- IMPACT
 - Impact is believed to be minimal, especially during earlier stages of company's development
- RESOLUTION ALTERNATIVES
 - Currently there is sufficient latitude in the application of this clause so as to present no barrier to initial development of businesses; no steps demanded now

ENTERPRISE CREATION ISSUES

- INDEMNIFICATION LANGUAGE IN LICENSES AND CONTRACTS
 - Current licenses and other contracts contain indemnification language requiring the recipient to hold the government harmless (product liability)
- IMPACT
 - Small companies view this as a significant problem
- RESOLUTION ALTERNATIVES
 - Explore the possibility of modifying or eliminating this clause from contracts with small businesses

ENTERPRISE CREATION ISSUES

- ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS ORIGINATING FROM WORK FOR OTHERS
 - Intellectual property rights from work done for others typically remains with Los Alamos, even when paid for by independent company. In industry, rights commonly granted to person paying for the work
- IMPACT
 - It may not be possible to locate outside financing for early-stage companies wishing to have unique work done by Los Alamos
- RESOLUTION ALTERNATIVES
 - Change the policy to more closely conform with industry standards

ENTERPRISE CREATION ISSUES

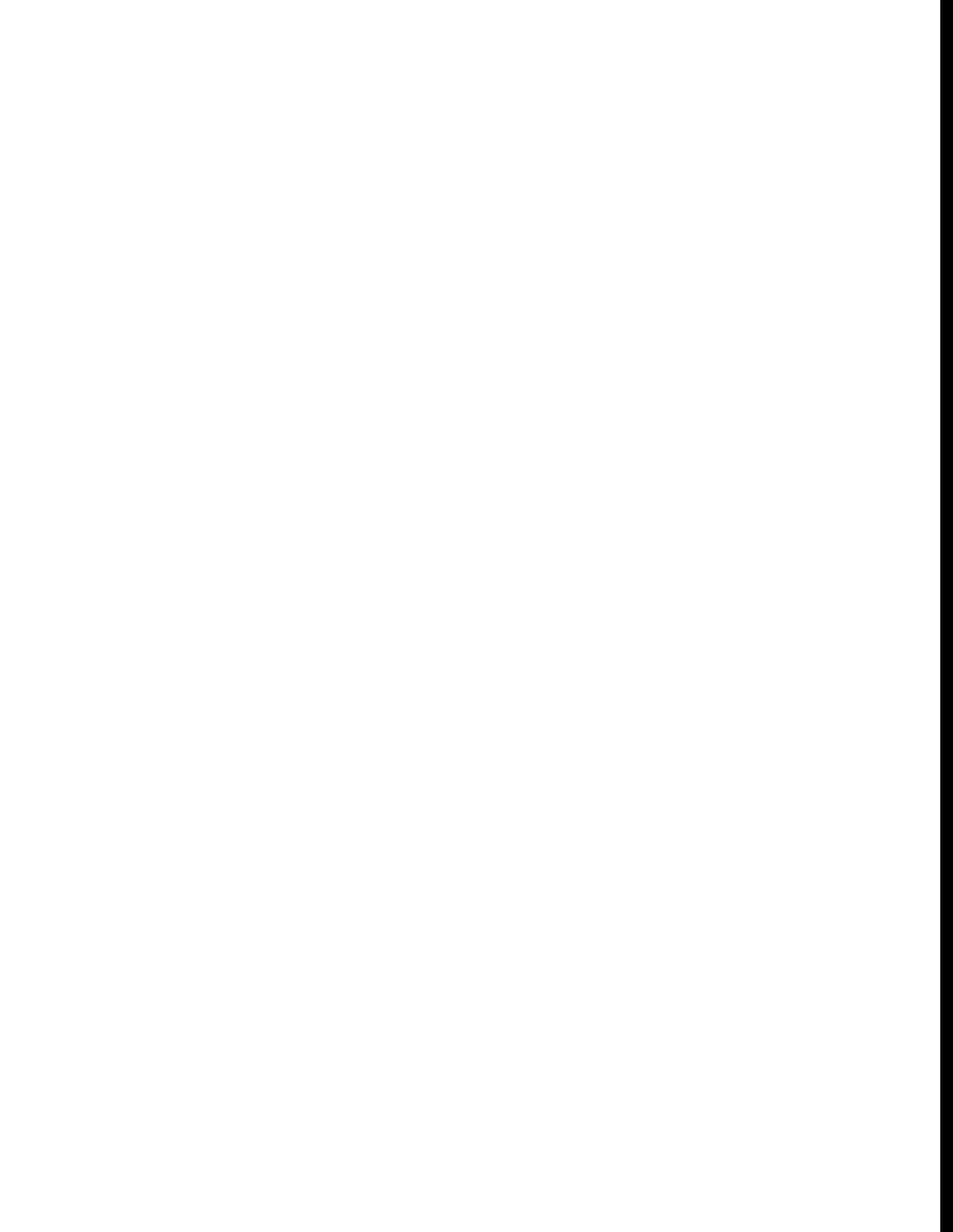
- FREEDOM OF INFORMATION ACT
 - Los Alamos is covered by onerous California statutes (through University of California as manager)
- IMPACT
 - May result in unintended public disclosure of valuable competitive information, presenting a minor, but important additional impediment to small business
- RESOLUTION ALTERNATIVES
 - Is Los Alamos excluded?

ENTERPRISE CREATION ISSUES

- COPYRIGHT AND TRADEMARK POLICY
 - Los Alamos lacks copyright and trademark policy
- IMPACT
 - Uncertainty exists as to how to effectively transfer rights to certain software to outside organizations
- RESOLUTION ALTERNATIVES
 - Develop and institute use of copyright licensing procedure consistent with US/DOE policies and with those commonly used in industry

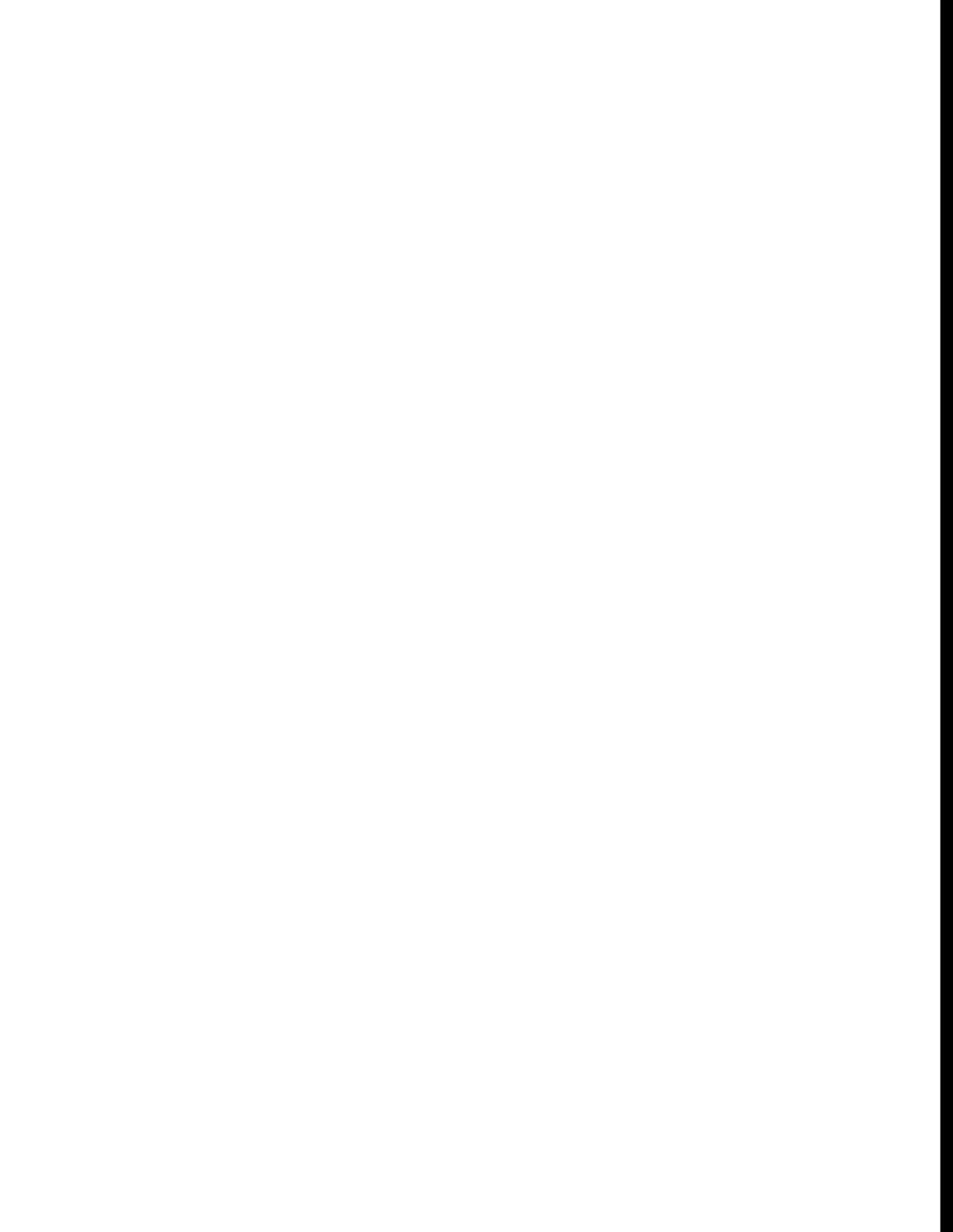
ENTERPRISE CREATION ISSUES

- CROSS-ORGANIZATION BUNDLING OF TECHNOLOGIES
 - Significant Los Alamos strength in bringing together multiple technologies from throughout the organization; however, organizational mechanisms to accomplish this are lacking
- IMPACT
 - Some very attractive business opportunities may be foregone



Appendix M. Generalized Entrepreneurship Model

The material in this appendix was included with the author's permission.



A GENERALIZED ENTREPRENEURSHIP MODEL
FOR THE COMMERCIALIZATION
OF PUBLIC-SECTOR TECHNOLOGY

PROFESSOR RAYMOND RADOSEVICH

GARY S. SMITH

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*Jan Gallegos checked
with Ray Wilson, patent
attorney, and said it was
all right to release this item.
A. Tamush*

DEVELOPED UNDER A CONTRACT
FROM THE
UNITED STATES DEPARTMENT OF ENERGY

A GENERALIZED ENTREPRENEURSHIP MODEL FOR THE COMMERCIALIZATION OF PUBLIC-SECTOR TECHNOLOGY

A. TECHNOLOGY SOURCE

1. Develop technologies.
Mature technologies jointly with partner(s).
2. Identify and assess commercial applications.
3. Protect intellectual property.
4. Define commercialization strategies.
5. Determine role of inventor employee(s).
6. Determine if local commercialization viable.
Select appropriate entrepreneurship mode.
Use surrogate entrepreneur alternative.

B. External Commercialization Interface

Market to and interact with external organizations.

Commercialization Process

C. Venture Packaging

1. Become aware of opportunity.
2. Complete detailed assessment.
3. Prepare business plan.
4. Define venture structure & build venture team
Expand existing firm
Start new firm
Inventor or surrogate entrepreneur
Relationships with support intermediaries
5. Define relationship with technology source.
Secure intellectual property
Joint technology maturation process
6. Secure early-stage resources.

D. Venture Launch

1. Develop technology to functional prototype.
2. Expand capital structure
3. Develop facilities
4. Expand venture team
5. Arrange strategic alliances
6. Progress through alpha and beta stages

E. Initial Commercialization

1. Begin manufacturing and marketing
2. Work out the bugs
3. Develop ramp-up capabilities
4. Ramp up operations

F. Steady-state Operations

1. Update business strategies
2. Begin 2nd generation product development
3. Work on exit issues for investors,
update capital structure

A GENERALIZED ENTREPRENEURSHIP MODEL FOR THE COMMERCIALIZATION OF PUBLIC-SECTOR TECHNOLOGY

Introduction

Commercializing technology from public-sector institutions is generally recognized as important to the health of the nation as well as the institution and the local economy in which it resides. The two primary modes of commercialization are to either transfer the technology to an existing firm or to work with a new entrepreneurial effort. In states such as New Mexico that do not have a large industrial base, the entrepreneurial mode is a more significant factor. In order to increase the incidence and success of technology commercialization in New Mexico, understanding the process and attempting to improve it are essential.

The degree of success and methodology of technology commercialization may vary among institutions and localities, but the overall process is similar. The purpose of this model is to depict the decisions and steps in the general entrepreneurial model of commercializing public-sector technology so that we can understand the resources and infrastructure necessary to support the process for most new ventures. Critical examination of this information in the context of a given set of circumstances (by institution or region) should provide decision makers at the institution(s) and those interested in economic development within the region with useful data for analyzing how to improve the process. Specifically, gaps or weak areas identified in the analysis should be the focus of improvement, e.g. the lack of seed capital, experienced entrepreneurs, policies at the institution to encourage entrepreneurial spin-offs, facilities, etc.

Each of the elements of the model presented in the figure above will be described, including the resources necessary to support each. The context for this discussion will be the State of New Mexico which includes three large federal research laboratories, three state research universities and various public, private and not-for-profit support organizations.

A. Technology Source

A.1 Develop Technologies

Mature technologies jointly with partners

Most technology development at public-sector research institutions is typically early stage and not directly tied to commercial products or processes. Heretofore, much of it was defense related and not driven by industrial or consumer mass production requirements and cost considerations. Circumstances are now encouraging closer and more frequent interactions with commercial customers at earlier stages in the development process.

Earlier in the evolution of technology transfer, it was commonly believed that public-sector research institutions were analogous to candy stores full of opportunities to be selected off the shelf. Experience now tells us that there is

likely to be significant opportunity, although it takes much more work than walking through the aisles and filling up a cart. Also, the product is typically not in a "ready-to-go" state. It is usually advanced only to the proof of concept or, at best, a functional prototype.

Continued interaction between the original developer and commercialization entity is usually key to successful transfer. The resources at the technology source can contribute significantly to the maturation of the technology up to a beta-site or preproduction model. User facilities, technical assistance programs and private consulting by technical staff members can be used by the technology source to contribute to the maturation.

In addition to the patent position, the intellectual property may be best protected by the use of trade secrets which evolve from the knowhow generated through joint technology development between the source and recipient. The process for entering into joint development agreements must be user friendly and timely to facilitate use of this important intellectual property tool.

Resource Requirements:

1. Creative environment with sufficient resources to create a substantial inventory of technological advances.
2. Environment within the technology source that encourages industrial interaction.
3. Availability of incremental funds for technology maturation.
4. Programs within the technology source which encourage and facilitate interactions with small business, e.g. user facility and technical assistance programs of relevance to small firms.
5. Incentives for technical staff to work with firms interested in establishing applications-oriented intellectual property (vis-a-vis rewards for publishing results in the open literature).

A.2 Identify and assess commercial applications

Identification of commercial applications synthesizes the potential users' benefits with the improved functionality afforded by the invention. It implies an understanding of the target industries and includes identification of potential industrial partners. Non-local firms identified during this process could become strategic partners for a local venture should that prove feasible.

The next step is to do a preliminary assessment of the commercial viability of the opportunity. This will assist in the patenting decision, in determining a commercialization strategy, in licensing, and in helping the inventor employees decide their level of participation in the commercialization process. The assessment should be guided by the subjective judgements of experienced businesspersons, especially in determining commercialization strategies in specific industries.

Resource Requirements:

1. Gatekeepers, boundary spanners, or product managers who understand and have networks in the industries associated with the technological advances.
2. Data bases such as Corptech or Technology Targeting that define technology areas of interest to industry; expert systems that match laboratory technology opportunity inventories to industry needs data bases.
3. Development of data bases of technology needs in local firms to supplement the commercial data bases.
4. Persons who are experienced in the new venture mode of technology commercialization and who are available to assist in preparing technology commercialization opportunity assessments. Such persons may be proven entrepreneurs, venture capitalists, or persons experienced in the professional business support services for start-up companies.

A.3 Protect intellectual property

Protecting intellectual property is a key for creating value for commercial applications. Since significant additional investment is required to bring the technological advancement to market, industry requires incentives through intellectual property protection to justify and protect their investment.

Recognition of technology advancements, their patentability and relative value are key aspects of the intellectual property decision since timing, effectiveness and allocation of limited resources impact the process of establishing and protecting intellectual property. The institutional culture must also support the process. The culture should include at least the following: communication of how important commercialization is to management, a timely and user-friendly system for disclosing inventions, etc., incentives to inventors, and recognition of the impact of intellectual property protection on publishing.

Resource Requirements:

1. A technical staff that is trained in intellectual property issues, applications identification, etc.
2. Policies and incentives that encourage staff to create technology-based commercial opportunities and to work with industry.
3. Sufficient patenting resources--attorneys, agents, filing and maintenance fees, etc.--to create a valuable intellectual property inventory.
4. Understanding of geographic markets and strategic alliance trends so that investments in expensive foreign patents are informed decisions.

A.4 Define commercialization strategies

The general policies of the institution and the specific decision made for each opportunity will determine how much commercialization occurs locally. If licensing to large companies takes precedence over encouraging inventor employees to become entrepreneurs and working with small or start-up firms, then areas like New Mexico will suffer because they have a small industrial base.

Although fair access and maximization of rewards back to the technology source must be addressed, an active partnership with local economic development networks may enhance both local economic development and success for the technology source.

Resource Requirements:

1. Appropriate process and resources to determine commercialization strategies that maximize the benefits to the technology source while effecting local technology commercialization.

A.5 Determine the role of inventor employees

Successful integration of inventor and key associate employees into the commercialization process is critical to commercialization success. It also has an important impact on the amount of local development. In areas that have experienced significant economic development based upon technology commercialization (Route 128, Silicon Valley, etc.), spin-off entrepreneurial ventures from universities and laboratories were an important factor.

Institutions that encourage and reward inventor participation most likely increase the incidence of opportunity recognition and marketing success. Although it is possible for an inventor to be integrated into the venture effort with a large firm, most entrepreneurial cases involve the formation of a start-up firm for the specific purpose of commercializing that inventor's technology.

It is usually best if the inventor devotes full time to the new venture; however, if the inventor prefers to stay with the technology source, alternative arrangements can be made to accommodate this circumstance. A new venture can still be formed with the assistance of a surrogate entrepreneur and the inventor can participate part-time assuming the technology source has the mechanisms to allow this. This method is discussed in more detail in section C.4 below.

Resource Requirements:

1. Inventors with sufficient business acumen and experience to serve as the venture entrepreneur or, alternatively, sufficient business support services to guide less- experienced inventors through the maze.
2. Policies which permit inventors to choose from a variety of participation mechanisms (consulting for equity or cash, leaves of absence, part-time employment, etc.) that best suit their personal situation.
3. Mechanisms which allow inventors and other new venture partners the ability to secure intellectual property rights while avoiding conflicts of interest and which allow the technology source to share in the benefits of commercialization (hopefully including the holding of equity in the new venture).

A.6 Determine if local commercialization is viable

This evaluation is based on: 1. the commercialization strategies noted earlier, 2. awareness of the local potential, 3. the relationship between the technology source and local economic development networks, and 4. the ability to assess the viability of supporting a decision to promote the venture locally. This decision must be balanced between the issues of fair access, the rights of inventors, value-added to the technology source and sponsors, community obligations, and the likelihood of success. To make local commercialization a viable decision, the technology source must have the mechanisms and policies in place to support the process and the local economic development networks (which includes the private sector) must have sufficient infrastructure in place to support the venture.

Resource Requirements:

1. Effective interaction by the technology source with local industry and the support infrastructure to determine local interest in commercialization. This interaction can be facilitated by formal networks and databases.
2. Ability to assess the local potential to commercialize the technology, especially in the highly-subjective aspect of management capacity. This requires extensive experience in launching new ventures in the local context.

B. External Commercialization Interface

The ability of technology producers to reach local potential users and the extent to which the interface is user-friendly is important to local commercialization. The tendency is often to bias this process towards seeking relationships with larger firms because it is perceived that larger firms would provide more resources for the interaction and would provide a greater likelihood of success. The local small business community is sometimes frustrated with an inability to get the attention of the technology producer and the lack of resources to facilitate the interaction. Policies and programs at the technology producers can mitigate this problem and a strong local economic development network can help to provide the screening and support necessary to make this interaction more productive.

The interface with the technology source usually has two paths, the official interface through the administrative structure and the interface with the technologists and their line management. The administrative staff typically can not understand all the specific technology implications, is burdened by having to orchestrate many interactions and does not have the same incentive as the technologists to make a particular deal work. The technologists often become personally involved in the process, understand the specific technology implications and needs, and are interested in making the deal work because the rewards are more direct and immediate. Knowing how to work with the administrative structure and developing a strong relationship with the technologists is important to potential local partners.

Resource Requirements:

Technology Source

1. Adequate outreach system to reach potential customers.
2. User-friendly system encouraging direct interaction of technical staff with local entities.

Local Infrastructure and industry

1. Programs to organize and facilitate interactions including education of local entrepreneurs and businesspersons in the methods of collaborating with technology sources.

Commercialization Process

C. Venture Packaging

C.1 Become aware of opportunity

Under ideal conditions, a substantial number of inventors at the technology sources would recognize the opportunities and form new ventures to capitalize on them. That has traditionally not happened in New Mexico. In the long-term, new policies, programs and cultural changes at the technology sources, together with more success stories to encourage and support the process, will result in more inventor-based spin-offs. In the interim, the local economic development network and private sector must interact with the technology sources to become aware of various opportunities. They must then encourage more inventors to participate in the commercialization process and provide surrogate entrepreneurial capabilities to supplement the traditional spin-off model.

Resource Requirements:

1. Process whereby local technology commercialization infrastructure interacts with technology sources on a meaningful and systematic basis to become aware of opportunities.

C.2 Complete detailed assessment

Not all opportunities identified will result in a viable business. Usually as part of the business planning process noted below, a more detailed assessment will be completed. Since resources will be very limited at this stage, the support infrastructure will play a key role in this process. A very cost-effective method which has performed well in the past has been the use of graduate business classes which work with potential entrepreneurs to help them complete an assessment and write a preliminary business plan as a class project. As the support infrastructure grows and matures, pools of more professional resources should be available to guide and complement the student resource. A number of federal laboratories have developed formal relationships with local universities to provide assessments.

Resource Requirements:

1. More private-sector involvement in laboratory-university programs for commercial assessments.

C.3 Prepare a business plan

A professionally-written business plan is a necessary tool for interacting with the majority of future resource providers to the venture (this includes the technology source, investors, key management yet to be brought in, partners, and others). It is the primary source for understanding and evaluating the merits of the deal. The plan should articulate the commercial opportunity, the basic business strategies, the competitive advantages afforded by the proprietary technology, the resources available (including management), the additional resource requirements, and the returns realistically expected from the investment.

Resource Requirements:

1. An experienced entrepreneurial team who understand and can adequately address the issues which the resource providers will want answered by the plan.
2. Experienced support services which can assist the entrepreneur in data gathering, analysis and business plan writing.

C.4 Define venture structure and build initial venture team

Traditionally, an entrepreneur leaves the technology provider and forms a new company to commercialize the technology. Alternatively, either an existing firm with complementary resources could provide a new home for the inventor, the existing firm could act as a surrogate entrepreneur, or a surrogate entrepreneur can start a new firm should the inventor prefer to remain with the technology source and provide only part-time support to the new venture. Under any of the above alternatives, a strong private/public local support infrastructure is important for building and nurturing start-up ventures.

Regarding the legal status of the firm, the proper form and jurisdiction under which the firm will operate should be considered. New Mexico is not a "progressive" state with respect to the legal liabilities of participants in for-profit firms. The roles defined by the directors and officers of the entity should match actual capabilities and the willingness to accept risk exposure. All participants should be well informed of these risks. Since both the jurisdiction and form of entity impact the manner in which resources can be sought and accepted by the entity, professional advice with respect to capital acquisition should be sought before forming the firm.

The venture will likely require the services of additional entrepreneurs or early-stage managers to complement the abilities of the inventor(s) to meet the challenging demands of a new venture. Preferred traits include experience with new ventures, experience in the field of application, willingness to take risks, multi-talented across several dimensions including functional areas, the ability to work closely with all members on the team, and the ability to overcome difficult challenges.

Resource Requirements:

1. A pool of experienced local entrepreneurs who are available to lead or support the new venture through the early stages of development (often four or five years).
2. A system to recruit potential entrepreneurs into the local situation.
3. A supportive business environment for the launching of new ventures (including the perception that seed capital is available for meritorious deals) that is sufficient to induce entrepreneurs to attempt a local start-up. This environment may either exist in a dynamic private sector or be supplied through sophisticated public and not-for-profit support services.
4. Local businesspersons who are available to complement the entrepreneur's business talents and who are experienced in technology-based, start-up activities (for example, to serve as members of boards of directors). Formalization of such a pool to provide a networking service to entrepreneurs could be especially valuable to surrogate entrepreneurs brought in from outside the state.
5. Networking opportunities with other entrepreneurs who are familiar with the New Mexico situation.
6. Advice and other services from experienced and competent professional service providers including business consultants and other entrepreneurs.
7. In the longer term, legislation should be passed that will foster a more positive business legal environment in New Mexico for participating in these kinds of entities. In the short-term, a coordinated "pro-business" lobbying effort is needed to identify and promote legislation which supports new ventures.

C.5 Define relationship with technology source

The two most important aspects of this relationship are the license for intellectual property rights and the technology interaction which includes transferring the technology and future co-development.

The new venture will need a strong proprietary position in the intellectual property associated with the invention and any improvements if it is to establish a viable market position and attract sophisticated investors. A license or other assignment of the rights to the new venture should include terms which provide for: 1. access to improvements, 2. exclusivity for initial fields of use, 3. at least non-exclusive rights to additional fields of use should the venture be successful in commercializing the first, 4. most-favored status in non-exclusive fields, etc. As suggested in the arguments found in section A.1 regarding joint technology maturation, the technology source should continue to provide assistance to advance the technology toward new generations and applications and should agree in advance to provide access by the licensee to the new technology based upon satisfactory performance to date.

Resource Requirements:

1. A timely licensing process that understands the unique needs of the nascent venture with respect to the acquisition of intellectual property (e.g. no advance

payments, assistance in policing infringements, assistance in researching infringement possibilities on others' patents, verification of the relative advantage over competing technologies, etc.).

2. Flexibility by the technology source in configuring the optimal methods of recouping value in the technology including accepting equity in the new venture instead of licensing fees.
3. Experienced professional legal services in intellectual property including substantial practice in litigating intellectual property issues, securing and issuing rights (licenses, etc.) to others, and contributing to the firm's strategies relative to the use and protection of intellectual property. Given the cash flow constraints of most early-stage companies, it would be ideal if professional services suppliers would take equity in exchange for services or provide substantial discounts on normal billing rates during the firm's formative stage.

C.6 Secure early-stage resources

There are several stages of evolution in forming and growing a new venture to steady-state operations. As the venture matures, it becomes easier to demonstrate what the venture is about and to better define the opportunity. More and better sources of capital typically become available as the venture matures. Consequently, it is hardest to find sources of capital during the conceptual stage. The resources necessary to launch a venture in New Mexico are usually limited to government sources which promote economic development (usually state and local programs but also includes the federal SBIR and STTR programs), family and friends, and previously-successful businesspersons. In some instances, it may not be premature, even at the formative stage, to begin seeking strategic alliances which have an interest in the technology or market applications.

Resource Requirements:

1. An angels' network that is specifically oriented toward technology-based ventures. Most of the wealth in New Mexico has been earned in other forms of commercial activity such as land development or extractive industries. These wealthy persons usually are reluctant to invest in technology ventures since they have little experience in this area.
2. A coordinated pool of local economic development resources. This includes firms willing to incubate the venture, incubator facilities, loaned personnel and facilities, and access to capital.
3. The use of more private-sector investment criteria by public-sector and not-for-profit sources of services and funds (that is, better screening of a client's business potential before providing funds or subsidized services).

D. Venture Launch

D.1 Develop technology to functional prototype

In most cases, the technology will require significant maturation, especially from the perspective of manufacturing engineering. Manufacturability and cost considerations will likely impact product materials, fabrication techniques,

tolerances, finishes, etc. If the product is consumer oriented, it is especially important to introduce product design skills which augment commercial appeal. As the functional prototype nears completion, planning and implementation of test and evaluation programs is required. These programs should also guide any required product regulatory approval processes.

Resource Requirements:

1. User facilities at universities and laboratories, especially those associated with expensive capital expenditures and short-term usage needs such as testing and certification of product designs.
2. Commercial design skills in professional services to assure product acceptance by target customers; these skills appear to be in short supply in New Mexico.
3. Manufacturing system design assistance and manufacturability studies of functional product designs.

D.2 Expand capital structure

Securing capital for a venture is typically a multi-staged process. Traditional sources of pre-seed and seed capital usually have limited resources and are the most expensive in terms of equity share per dollar. Founders like to limit how much of the company they must share with investors, so these sources aren't intended to supply all of the capital needs of the venture. As the venture progresses and the burn rate accelerates, the CEO will typically spend at least half time seeking the next round of financing.

By this stage, the venture should demonstrate sufficient promise to attract alliances which may also be the main source of equity monies. In many instances, strategic alliances will be the preferred mode of capitalizing the venture. The capital pricing is often favorable, the terms are less onerous, and greater ancillary benefits are provided such as access to markets or manufacturing knowhow and capacity.

Resource Requirements:

1. Local sources of early-stage risk capital oriented toward technology-based deals and industries in which local deal flow is likely to occur. Local sources which serve as lead investors are important to form syndicates of capital and to offset the tendency for out-of-state capital sources to encourage the venture to relocate close to them.
2. Experienced and reputable local agents and investment bankers to assist in the search for development and expansion capital.
3. A network of companies and their executives known to actively seek acquisitions and partnerships with early-stage companies. Such an inventory should include due diligence on the effectiveness of past partnerships with these companies.
4. Commercial bankers, commercial finance companies, leasing companies, etc., who understand the needs and peculiarities of technology-based, early-

stage companies and can provide financial advice and contacts as well as limited asset-based financing.

D.3 Develop facilities

Due to capital constraints, most start-up ventures begin operations either in an incubator or modest temporary facilities. As the firm matures and expands, it must move to a larger space to accommodate growth and begin acquiring the equipment necessary for manufacturing. This step can be traumatic as it can consume large amounts of precious capital and time. The decision to buy or lease is important. The lack of reasonably-priced space for specific applications, e.g. cleanrooms, could prove prohibitive.

Resource Requirements:

1. Pool of office and light industrial space. Landlords willing to provide some leasehold improvements to customize the space.
2. Lenders and leasing companies that understand leasing needs and processes for technology-based ventures.

D.4 Expand venture team

The start-up firm often struggles through the early stages with key management doing double duty. As the venture matures, the timing for acquisition of additional managers is critical. Often sophisticated investors will force the entrepreneurs to hire a CEO with industry experience or at least bring in experienced outsiders who were not part of the original start-up team. Salary expenses expand greatly and the transition is sometimes troubling. Because of New Mexico's limited industrial base, few executives are available locally for hiring and many must be recruited from outside of the state.

Resource Requirements:

1. Recruiting capability that is knowledgeable in securing management for technology-based venture firms.
2. Network which would facilitate the search and due diligence process.

D.5 Arrange strategic alliances

Assuming the venture has significant market opportunity, it is very difficult and usually not cost effective to build all manufacturing and marketing capability from scratch. Strategic alliances can provide much needed expansion capital, access to related technologies, a second source of supply, market recognition, and distribution and marketing resources which are especially important in foreign markets.

Resource Requirements:

1. Network, agents, and other intermediaries to help identify and arrange partnerships.

D.6 Progress through alpha and beta stages

The important aspect of this stage is finding suitable sites. In the past, many New Mexico ventures have been required to support beta systems at distant locations which present many logistical and cost drawbacks.

Resource Requirements:

1. Network to identify and arrange beta sites. Preferably, more sites could be found in and around New Mexico. Often potential sites in New Mexico aren't as cooperative with small firms as they might be with more influential encouragement.

E. Initial Commercialization

E.1 Begin manufacturing and marketing

Hopefully, this signifies the start of revenue generation by the new venture. Preliminary marketing and beta site information will guide the transition into full-scale marketing. Strategies devised earlier regarding promotion, trade show attendance, brochures, distribution, geographic roll-out, servicing, etc. are all put into practice. Resources are devoted to the formalization of selling and distribution relationships, the institutionalization of market research, and the organization of service functions. Customer support is established by captive and third-party servicing functions, user support materials and advisory functions, and a highly-trained, missionary sales organization. Future versions of product modifications will be defined during this process to facilitate customer use for unanticipated applications.

Resource Requirements:

1. Identification of local and regional early-adopter customers.
2. Availability of marketing and advertising support services to provide promotional media, advertising copy, trade show displays, etc.
3. Network to third-party providers of functions such as manufacturers representatives, product installation and servicing, customer financing, etc.

E.2 Work out the bugs

The new firm will always face some adversity as characterized by Murphy's Law, but resolution of unanticipated problems (and opportunities) is especially critical during the early stages of commercialization when resources are still very limited and everything is on the line. Experienced help from strategic alliance partners is most welcome at this time. Otherwise, consultants may be brought in to help resolve the problems.

Resource Requirements:

1. Start-up manufacturing and marketing expertise from private consultants and public or not-for-profit support services.

E.3 Develop ramp-up capabilities

Most new ventures can't afford the optimal first facility that affords sufficient room for explosive growth. As the new firm enters the market successfully, it must begin planning for expansion and the formalization of more and more systems and functions. Real growth and its associated requirements now put the young firm into another round of capital raising. Although it will still be difficult, success to date is likely to open up additional avenues for pursuing capital.

Resource Requirements:

1. Progressive local banking practices for technology-based ventures.
2. Local intermediaries and agents who provide access to a broader base of financing sources.
3. Local support services for expansion capital planning.

E.4 Ramp-up operations

The dramatic, high-growth expansion of operations will cause the venture to add personnel, formalize policy and procedures, complete automation of management systems, secure banking relationships for working capital, expand distribution systems, evaluate and add suppliers, move some professional service functions in-house, and in general, create additional capabilities which will allow rapid movement along the experience curve.

Resource Requirements:

1. Access to resources (consultants, new employees, recruiting firms, etc.) that understand the difference between the needs of growing early-stage firms and those of large corporations.

F. Steady-state operations

F.1 Update business strategies

Although the initial business plan may have provided early guidance for the venture, enough surprises and changes will have taken place that require updating and revision of business strategies. Such revisions will be based upon reviews of the firm's technology position, the pursuit of internal development and technology acquisition programs, the results of marketing experience, the recognition and acknowledgement of competitor responses and customer needs, and the serendipitous opportunities for new alliances, etc.

Resource Requirements:

1. Access to a network of sophisticated private-sector industrial managers who understand business strategy and its implementation. These managers serve as directors, consultants, and occasionally replace the entrepreneurs as the firm matures to the later stewardship phase.

F.2 Begin second generation product development

The maturing venture should be achieving efficiency of operations, cost reduction and additional market penetration at this stage. Competitive

advantage is achieved by expanding product lines, seeking new applications of the technology, developing the next generation of technology and improving the effectiveness of the management team.

Resource Requirements:

1. Local availability of expansion resources--management, capital, facilities, and personnel.
2. Competitive business environment that does not provide disincentives to remain in New Mexico. Any such disincentives should be identified and removed through the actions of "pro-business" groups.

F.3 Work on exit issues for investors, update capital structure

Investors invest for the primary purpose of making money. By now, they will want a mechanism to take their gains. This is most often accomplished by going public or selling the firm to another company, perhaps one of the strategic partners.

Resource Requirements:

1. Investment bankers and other intermediaries who provide investor exit mechanisms such as IPOs, acquisition services, etc.

F.4 Support local technology-based economic development

As the replication of venture formation is the goal of technology-based, home-grown economic development, hopefully spin-offs from this venture will provide the next generation of entrepreneurs. The firm could also serve as a "role model" and provide resources to promote and assist in the packaging and incubation of new ventures.

An ongoing objective evaluation of the support infrastructure and services provided is needed to identify gaps, improve the services and improve the incidence of successful ventures.

Resource Requirements:

1. Network and support services which identify opportunities for local suppliers to growing firms.
2. All the above resources, one more time, for the next generation of ventures.
3. A third-party objective evaluation process of the support infrastructure and services with feedback to facilitate learning and improvement.

Appendix N. Receiving Equity for Technology: Opportunities, Issues, and Structures



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MEMORANDUM

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Receiving Equity for Technology: Opportunities, Issues and Structures

Introduction

The Lure of Equity

For many members of the scientific community the words "venture capital" have an almost magical sound. These words conjure up visions of scientists and entrepreneurs forming fast growing new companies, commercializing new technology and building whole new industries.

The steadily growing role of small new private companies in taking advantage of new technology to develop new products and services has been widely observed. The term "venture capital" is now part of common parlance, and the names of successful new technology based companies are constantly in the press.

The economic behavior of these new rapidly growing companies is distinctly different from that of more mature, larger enterprises. One basic difference is that these companies are voracious consumers of cash as they develop and expand but have many fewer financial resources than larger established enterprises.

To provide the resources needed for their growth, these companies exploit the value represented by their potential for rapid growth and future earnings. This future value is represented by the equity securities of the company. Because these new companies are normally unprofitable and frequently generate only modest revenues during their development phase, venture companies are forced to use their own equity to meet their needs for capital, employee compensation, and other critical requirements--including the acquisition of technology. Equity securities frequently become these companies' primary resource and medium of exchange.

The increasing importance for new companies of equity, in both the acquisition of technology for commercialization and in the compensation of key employees has led many research institutions to re-evaluate both how they deal with the disposal of their technology for commercial development and how they should respond

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to the increasing interest of their research staff in participating in the perceived benefits of equity ownership in the companies commercializing the technology which they have developed.

The Focus of this Memorandum

This Memorandum addresses some of the basic issues which arise, first, when a research institution considers accepting equity securities in a private company as financial consideration for technology transferred to that company, and second, when a research institution wishes to use such securities to provide additional compensation to its scientific research staff.

This Memorandum will review issues which arise in a number of specific areas:

- why a research institution would consider accepting equity securities in a private companies as consideration for technology;
- why receiving additional compensation in the form of equity securities of a private company developing transferred technology has become of increasing interest to scientific research staff;
- special problems for research institutions associated with receiving equity securities of a private company as consideration for transfer a technology; and
- special problems for scientific research staff associated with receiving equity securities of a private company.

Finally, this Memorandum will describe issues and approaches related specifically to providing compensation to scientific research staff based on equity securities received from a private company as consideration for transferred technology.

Why Take Equity?

Why should an institution consider accepting equity in a private company as consideration for technology? There are a number of important reasons:

- the ability to accept private equity provides an institution with access to a broader range of potential buyers (or licensees) for its technology, most particularly small growing companies;
- private equity can provide an institution with the opportunity for significantly greater economic returns on transferred technology; and

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- receiving equity in a company which acquires technology can allow an institution to pass on economic benefits to its staff which can be similar in effect to the equity oriented incentives provided to the employees of many private companies developing technology.

The traditional way for an research institution to dispose of technology is through a license under which a third party obtains rights to use the technology (on an exclusive or nonexclusive basis) in exchange for paying a cash royalty to the licensing institution. The terms of the license may vary, and the royalty may be set at a fixed dollar amount or determined on a percentage or other formula basis. What is constant, however, is that the consideration the licensing institution receives is in the form of cash.

Receiving compensation in the form of cash has some significant advantages for a licensor; cash is relatively simple to value, manage, account for and transfer. Cash royalty licenses for intellectual property are, and will remain, the technique of choice in many situations.

A Broader Range of Buyers

Focusing exclusively on cash consideration, however, has some significant drawbacks. The primary obvious effect is that they limit the potential buyers to those entities which have (or can most easily afford) to pay cash. In general, this creates a bias towards larger more profitable companies which have the available cash flow for royalty payments. Even though cash royalties are frequently structured so that royalty obligations only accrue when the licensee has actual revenue (or profits) related to the licensed technology, there is still a significant bias towards enterprises which have relatively more available cash.

This bias is most strongly felt by new businesses which are rapidly growing and developing, and are typically net cash consumers (that is, all available cash is reinvested in the business to support development). Thus, the bias tends to operate against the type of smaller growing enterprises which, as the experience in the computer, software and biotechnology industries illustrate, have historically been the most effective in developing and exploiting significant new technologies.

Improved Economic Returns

Another effect of the bias towards cash, is that it can significantly limit the potential economic rewards to an institution (and its staff) from the development, transfer and successful commercialization of new technology. This is particularly the case for technologies which have the potential to create significant opportunities for the development of new businesses.

The reason behind this can be found in the normal investment trade off between risk and reward. The economic risks associated with cash royalties (even where they are tied to the commercial success of a technology) are generally less than the risks associated with the equity in a private company.

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The other side of the greater risks associated with equity is the potential for greater economic gain. As the venture capital industry in the United States has demonstrated, on a long term basis the returns associated with equity investments in developing private companies have out performed most other asset categories. In short, private equity will generally have a greater degree of investment risk than a cash royalty stream, and for that risk it will provide a potentially higher investment return.

Impact on Staff Compensation

Academic and other research institutions typically do not have staff compensation structures which are designed to provide significant rewards to staff for the development, identification, transfer and successful commercialization of technology. While many institutions provide for the flow-through or sharing of cash royalties generated by intellectual property developed by staff, where technology with very significant economic value is involved, it common to see staff leave for positions at the private company commercializing the technology.

Although salaries for scientific staff are frequently higher in private industry than in academic or government research institutions, it is conventional wisdom by now that it is the allure of the wealth which can be created through stock ownership and stock options which induces scientists (and business people) to take on the risks associated with working with a new and growing business. The opportunity to benefit from the creation and rapid appreciation of value which occurs in a successful new company is a powerful magnet.

Institutions can, to some extent, address the competitive economic pressure from private companies by finding a way to provide their staff members economic benefits which are similar to those they would enjoy from equity ownership. To provide economic benefits of this type, institutions need to be able to receive and hold the type of equity from which these benefits flow.

In addition to addressing competitive pressure on compensation, many institutions have an affirmative policy mandate to increase the commercialization of technology developed in the institution's research environment. An important element in accomplishing this goal is aligning the interests of the staff with this part of the institution's mission. Apart from changes at the policy and management level, in order to produce a widespread effect at the staff level it is helpful to provide economic incentives for staff which reward actions that advance this goal.

Although there are many factors which influence the behavior of scientific staff, creating a structure which provides direct economic rewards for developing, identifying and facilitating the transfer and successful commercialization of technology can help to align the economic incentives provided by the institution with this policy objective.

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Special Institutional Problems

Although it can provide substantial economic rewards, equity is a particularly complex type of asset, and presents special problems for any institution dealing with it:

- equity in private companies is much more difficult to value than either cash or securities of companies traded in public markets;
- the economic and legal terms of private equity securities are frequently very complex and require substantial experience to understand and negotiate; and
- private equity securities frequently require ongoing active management to realize their potential value.

Valuation of Private Securities

The first of the specialized problems is valuation. To negotiate effectively, one has to be able to form an idea of the value (or range of probable values) of what you are being offered--or what you intend to ask for. This is a difficult problem with private companies, and is at its most difficult for new growing companies developing new and unproven technology.

While it is true that private equity can be very valuable, its value is a function of the underlying prospects and value of the business, the economic terms of the particular equity security, and both the relative and absolute amount of equity being received.

Unlike the payment stream represented by a cash royalty or the fluctuating market price of publicly traded securities, there is no straightforward way to calculate the value of the securities of a private company. Such valuations normally require the ability to evaluate the markets the company seeks to address, the competition, the difficulty (and cost) of developing and marketing the company's prospective products, the quality of the company's management, and many other factors. Without this type of expertise, one is left unable to determine what to ask for--or how to evaluate what is offered.

Complexity of Economic and Legal Terms

The problems with valuation described above are compounded by the fact that the economic and legal terms of the securities issued by private companies are frequently both much different and much more complex than the terms of the securities issued by public companies.

The terms of the securities in venture capital financed private companies are to an unusual degree "custom negotiated" to fit the circumstances of the company at the time and the requirements of investors who will buy the securities.

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Particularly in the case of new private companies which rely on financing from professional and institutional investors such as venture capital funds, it is common to see multiple classes of equity securities with varying economic rights, as well as complex legal agreements addressing voting rights, registration rights and many other issues affecting investors.

To deal effectively with private equity securities, an institution needs to be able to evaluate the capital structure of the company it is negotiating with, the terms of the equity securities being offered, and the effects of the various agreements relating to the company and its securityholders.

It should be noted that this is frequently not just a negotiation between the institution and the private company. Where an institution is disposing of technology with substantial value and plans to get a significant equity interest in the acquiring company as consideration, the institution will often find itself negotiating with both the company and with the company's other investors.

Active Portfolio Management

The discussion of the problems associated with valuing private company equity securities, and the complex negotiations both between companies and investors, as well as among investor groups, should suggest that managing a portfolio of private equity securities is a comparatively active process.

A successful new business is characterized by rapid growth. This rapid growth results in a continuing series of important decisions about major business issues, such as strategic direction, the need for more capital, the need for changes in top management, and other issues which are central to the value of the growing enterprise--and are therefore of critical concern to investors. In private companies it is quite common for major investors to influence or control decisions of this type.

In addition to issues affecting the management of the business, because of the highly negotiated nature of large equity investments, as a company expands and increases its capital, an investor can expect to be involved in periodic negotiations with new investors as they come into the company. The determination of the value of the company at the time new investors come in and the relative economic terms of different classes of equity securities have a substantial effect on the value on an institution's original investment.

As a result, a significant equity investor in a private business is passive at its peril. The participation of the significant equity holders is important to the success of a new business, and changing economic relationships among groups of investors as a company develops can alter the value of an investment dramatically.

In the institutional investment community, assets of this type are normally managed by specialized investment professionals, such as the persons who operate venture capital funds or manage private equity portfolios for other types of financial

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institutions. In the corporate community, this type of expertise is most often found in specialized departments (such as business development groups) whose personnel deal specifically with the acquisition and divestiture of business units.

The Effect of Transaction Value

As the discussion above indicates, it requires a significant commitment of institutional resources to effectively capture the value available from private equity securities.

Developing and applying these resources makes sense when an institution experiences (or anticipates) recurring transactions in which it will be transferring technology with very significant value. Where there is a lot at stake, the potential value can make the investment of resources economically worthwhile.

Special Problems for Individuals

Although scientists may dream about stock and stock options, the reality is far more complicated and fraught with problems than many individuals are prepared to deal with:

- state and federal securities laws regulate the ability of private companies to issue equity to persons who do not meet the applicable standards for a sophisticated and financially secure investor;
- the receipt of illiquid private securities can create unexpected income tax problems for the recipients unless carefully managed;
- the private companies frequently have relatively complex capital structures and legal agreements, which are not designed for laypersons and make these securities hard to understand and manage; and
- private equity securities are normally completely illiquid until the issuing company has an initial public offering, and even afterward these securities are far more complicated to sell than normal stock bought on a public market.

The "Accredited Investor" Problem

In any arrangement in which scientific research staff receive securities from a private company there is an initial legal issue as to whether the company is legally permitted to sell its equity to the staff members. (For securities law purposes, any transfer of equity for value is generally regarded as a sale.)

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The compensation levels for scientific research staff, even at senior levels, do not normally allow these persons to meet the financial (and other) criteria for qualified buyers under state and federal securities laws unless they have substantial additional personal resources in addition to their salary. This makes it very difficult for companies to issue equity either directly to the staff members of a research institution, or to the research institution if that institution intends to redistribute such equity to its staff members.

Both state and federal securities laws regulate the sale of equity securities by companies. These regulations are complex and generally designed to insure that when a company offers its securities to members of the public, it provides the extensive amount of information required to allow a prospective buyer to evaluate the company and the security being offered. Complying with these "disclosure requirements" is a very expensive and time consuming process for a company; a process which is often impossible or uneconomic for a small private company to undertake.

To address this problem, the securities laws generally provide various exemptions from the regulatory disclosure requirements for transactions where a company is not viewed as offering its securities to "the public" and where the buyers are viewed as sufficiently sophisticated and financially substantial that they do not need the same degree of regulatory protection as a member of the general public. These exemptions are frequently referred to as "private placement" exemptions, referring to the non-public nature of the sale.

The most important of these exemptions is a regulation under the federal securities laws which provides a "safe harbor" for private placements. That is, the regulation sets out conditions for different types of transactions which if met insure that the transaction will be treated as an exempt transaction for purposes of the federal securities laws. (This regulation is called "Regulation D" under the Securities Act of 1933. There are parallel regulations and exemptions under the separate securities laws of many states.)

Under Regulation D, one of the conditions for the private sale of securities to a person is that the person must meet the criteria set forth in the Regulation for an "Accredited Investor". The criteria for individuals include minimum requirements for annual income (currently \$200,000 per year for the last two years and the current year) or net worth (currently \$1,000,000).

The restrictions resulting from state and federal securities regulations are normally not a problem where the transaction is between the company and the research institution, since many research institutions will be large enough to qualify in their own right either as "Accredited Investors" or under other exemptions available to institutional investors.

Thus for a research institution, the policy problem is how to acquire equity securities and pass the economic benefits on to staff members, without entangling the

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private company issuing the securities in the regulatory difficulties associated with issuing stock to individuals.

The "Non-Cash Income" Problem

The receipt of equity securities in a private company can cause serious income tax problems for individuals. This results from the securities being treated as taxable income in the year they are received, even though such securities may have to be held for years before they can be sold.

For federal income tax purposes, income is generally defined as the receipt of anything of determinable value. Although most individual taxpayers receive their income in the form of cash (such as salary or bonus), income also includes non-cash property which is received as compensation.

What this means for a person who receives equity securities as compensation, is that the person is treated as receiving taxable income equal to the value of the securities received. This value is taxable without regard to whether or not the securities are salable by the recipient when they are received (although illiquidity may affect the value of the securities).

This creates the awkward (thought not uncommon) problem of an individual receiving private securities and being liable currently for income tax on the value of the securities, but being unable to sell the securities in order to raise the money to pay the tax. For most individual taxpayers with moderate incomes, this mismatch between the timing of tax liability and the receipt of cash can be very damaging. Paradoxically, as the value of the securities received increases (normally a result to be desired), the potential for harm from the current income tax consequences of this otherwise happy event also goes up.

To avoid creating a situation which contains potential tax pitfalls, programs which compensate individuals with securities need to give careful attention to tax and liquidity issues, so that the timing of income tax liability and the availability of the liquidity necessary to discharge such tax liability will match.

The Complexity of Private Securities

Despite the powerful attraction of private equity securities and their prevalence in the private company employee compensation plans, as discussed above, these securities are unusually complex to deal with. They are very difficult for individuals who are not professional investors in private equity to understand and manage successfully.

Small nonprofessional holders of private securities tend to be especially disadvantaged. These investors normally do not have the financial or legal knowledge needed to analyze the economic significance of a private company's capital structure or anticipate likely future developments. When an investor holds a relatively small position

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in a company, it is often uneconomic for the investor to pay for the professional financial and legal assistance necessary to understand and effectively exercise rights provided by the equity security and related legal agreements.

Even after a private company has an initial public offering and it becomes possible for private investors to sell their securities in the public market, the rules and procedure for selling private securities are much more complex than the ordinary transactions through a stockbroker with which many individuals have experience. Even for individuals who are relatively familiar with selling private securities in the public market, the assistance of stockbrokers with specialized expertise in this area is normally required.

These difficulties can reduce the effectiveness and benefits of programs providing private equity securities to individuals. To avoid or reduce these problems, an institution must give attention to either finding a way for its recipient staff members to obtain necessary assistance, or become involved in the process of managing the securities directly.

Structures for a Private Equity Program

Objectives

The first issue in designing any program is to identify its objectives. For purposes of this Memorandum, the objectives are assumed to be:

- to allow the institution to deal effectively with transactions in which technology is transferred and private equity securities are received as consideration;
- to allow the institution to manage private equity it receives so as to maximize its economic value; and
- to allow the institution to use such equity as the basis for additional compensation to staff members responsible for the development of the technology.

Functions

To achieve the first two of these objectives, a program needs to address the basic functions required to deal with private equity:

- the capacity to evaluate private companies, assess the economic value of the company and any securities offered, and formulate proposals (or counterproposals) which meet the institution's economic and other objectives;

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- the capacity to conduct the business and legal negotiations involved in the acquisition of private securities;
- a legal structure for receiving private equity securities which eliminates or minimizes securities regulation problems for the private company issuers; and
- the capacity to manage the portfolio of private equity securities acquired by the institution over time.

To implement the last objective, an institution needs to develop a plan which can be integrated with its structure for private equity acquisition and management, and which provides:

- a process for identifying the appropriate staff recipients for the benefits of equity received by the institution, including allocating consideration received among various individuals, when more than one individual has been involved; and
- a process for transferring economic benefits from equity securities received by the institution to staff members, while minimizing potential tax and management problems for individual staff members.

Acquiring Management Expertise

Developing a private equity management function is often one of the most difficult steps for a research institution. One common barrier to this process is a lack of understanding of what types of specialized expertise are required. Relatively few individuals come into contact with venture capital and private equity investments or the professionals who make and manage such investments, and as a result it requires some education for most organizations to begin to appreciate what is involved.

This process is often made more difficult because the professional skills required for the business and legal negotiations and ongoing management activity are rarely found as a normal part of the administrative structure of a scientific research organization. This means that an institution may be faced with adding staff to find the professional expertise to address this need. Where an institution is just beginning a program, or the anticipated volume of appropriate transactions is not expected to be large, it is often difficult to justify the increase in administrative staff and overhead required to develop and maintain the required level of professional expertise internally.

Fortunately, the private equity management and venture capital industry in the United States is by far and away the largest and most diverse in the world. Venture capital and other private equity investments are most commonly managed by small private firms, managing from several million to several hundred million dollars (and in a few cases substantially more) in assets. In addition, there is a very well developed

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consulting industry which exists to provide advisory services to private companies and their investors.

The extensive amount of private advisory expertise available in this industry makes it possible for an institution to locate highly experienced firms and consultants who can both assist institutions on an advisory basis, or provide services on an essentially turnkey basis, for private equity acquisition and management. This market opportunity can allow an institution to begin a program and acquire the professional services it needs only when and to the extent necessary, thus reducing the start up and overhead costs associated with the implementation of a program of this type.

Developing a Staff Compensation Plan

Although it seems obvious, a major issue in developing a plan to provide staff members with economic benefits from private equity acquired by an institution is to keep the plan as simple and free from legal and other complexities as possible. This is important both to reduce the administrative costs of the program and to make the plan easily understandable to the staff persons it is designed to benefit. As is normally the case, this is much more easily said than done.

Where possible, it is desirable to structure a compensation plan so that it avoids or minimizes problems arising from the regulations surrounding employee benefit plans, and the regulations relating to offering securities to employees. A well designed compensation plan can avoid legal characterization as either an employee benefit plan or as a security which the institution is offering to its staff members. Both of these legal concerns must be kept in mind, however, to avoid unintended complexity.

One relatively straightforward approach to this problem is to develop a plan which is essentially a type of formula bonus plan. This type of plan is set up to provide a designated staff member with a cash bonus, the timing and amount of which is determined by a specified formula based on the amount and timing of cash proceeds realized by the institution from the (eventual) liquidation of specific private equity securities acquired by the institution as consideration in the transfer of specific technology.

Under a plan of this type any private equity securities acquired are received, owned and managed to liquidation by the institution (utilizing advisory services or internal staff). An employee who would, for example, be entitled to a share of a cash royalty from the license of such technology, is instead entitled to a cash bonus, the amount and timing of which depend on when the institution is able to liquidate the securities it has received for that technology and how much it actually receives when the securities are sold.

The private securities stay under the ownership, management and control of the institution at all times. This greatly reduces the securities regulation problems associated with the acquisition of private equity securities.

The securities are collectively managed by investment professionals retained by the institution. The institution can provide professional management for its whole portfolio on a more economic basis than any individual. Professional management also supplies necessary expertise, and because the securities are managed as one position, it is much easier to monitor the company and take any necessary action to exercise rights under the securities or related agreements. Likewise, the administrative problems of selling private securities can be centrally handled by personnel familiar with transactions of this type.

Because the staff members receive only an unsecured promise by the institution to pay cash compensation at a later date (based on the formula), they are not treated as having received taxable income until the cash payment is actually made to them. This is the case even where the right to eventually receive a bonus is "vested" and not subject to forfeiture by the individual. This tax treatment does result in the income received being characterized as "ordinary income" rather than "capital gains", however, this disadvantage is offset to some extent by the match between when tax liability occurs and when cash is received.

The fact that the plan is based on a formula which determines the amount of a cash payment also allows an institution great flexibility in structuring "vesting" conditions for payments, timing the payment of proceeds, or varying the formula based on different types of consideration which are received by the institution. As a result, plans of this type can be designed with comparative ease to address varying policy and compensation objectives of different institutions.

Conclusion

Private equity is often viewed as the contemporary equivalent of the gold rush. As people become aware of the opportunities, they imagine the value being as easy to realize as picking up nuggets from a stream bed. In reality, while there are many extraordinary benefits to be realized, the process is much more equivalent to operating a modern gold mine. The gold is there, but it requires serious effort and technical expertise to get it out of the ground and into the bank.

Christopher Lane Davis

Sample Form of an

Incentive Bonus Program for Scientists

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Schedule I

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Incentive Bonus Program for Scientists

Introduction

The _____ (the "Institution") has established an Incentive Bonus Program (the "Program") to strengthen its ability to commercialize technology developed by the Institution and to attract and retain qualified scientists.

The Program will offer scientists employed by the Institution the opportunity under its terms to:

- be involved in the commercial disposition to unaffiliated companies of technology developed in the course of their work at the Institution, and
- receive cash incentive bonuses based on the income received by the Institution from the commercial disposition of technology developed by scientists during their work at the Institution.

Summary Description

The following is a brief descriptive summary of the principal points of the Program:

- The Program will be administered by a Committee appointed by the Institution who will review proposals for the disposition of technology, and award incentive bonuses.
- Scientists desiring to propose arrangements with companies involving the utilization of technology resulting from discoveries by them will be required to submit to the Committee written proposals regarding such technology. The Committee will review and approve or disapprove such proposals.
- Following Committee approval of any proposed disposition of technology, the Committee members will supervise the preparation of appropriate agreements or other documentation with respect to such disposition.
- All revenues and other consideration resulting from any disposition of technology approved by the Committee will be paid to and be the property of the Institution.
- Scientists will be eligible for incentive bonuses awarded by the Committee based on a formula related to the income received by the Institution from approved dispositions of technology resulting from discoveries attributable to the scientist.
- The amount of any incentive bonus will be a function of the type of income received by the Institution. Three different types of income received by the Institution may result in payments under incentive bonuses under the Program:
 - (1) royalties from licenses covering technology;
 - (2) cash proceeds from the sale of technology; and
 - (3) cash proceeds from the sale of stock or other equity securities in companies received as payment for technology.
- Based on the amount of income received by the Institution, incentive bonuses may be awarded to scientists in amounts of up to:

- (1) _____% of net royalties from licenses covering technology,
 - (2) _____% of net cash proceeds from the sale of technology and
 - (3) _____% of net cash proceeds from the disposition of stock or other equity securities in companies received as payment for technology.
- Incentive bonuses will generally be paid out over _____ years depending upon the type of income from which the amount of the bonus is calculated. Payment may be accelerated at the discretion of the Committee. Future payments with respect to an awarded bonus will generally terminate on termination of employment.
 - All revenue and proceeds from the disposition of technology approved under the Program will be the property of the Institution. The Program will not confer on any Institution employee any right of ownership in any revenues or property received by the Institution in respect of dispositions of technology resulting from their discoveries or in any other assets of the Institution.

This summary is qualified in its entirety by the specific provisions of the Program set forth below.

Certain terms used in this document have meanings which are specifically defined with respect to the Program in this document. For reference, a cross-reference sheet for defined terms has been included with this document.

The Incentive Bonus Program

I. Administration of the Program

A. Committee. The Program will be administered by a committee (the "Committee"), which will consist of ___ regular members, and up to ___ additional members added from time to time on an ad hoc basis to provide expertise required in connection with particular projects.

The regular members will be designated by the Institution from time to time and will be:

- ___ representatives from _____,
- ___ representatives from _____.

Members will serve on the Committee as determined by the Institution, and the Institution may change the individuals serving as members of the Committee, the number of members and the composition of the Committee from time to time as the Institution sees fit.

B. Committee Responsibilities. The Committee will be responsible for the general administration of the Program, including the following:

- (1) determining whether any discovery or technology is eligible for inclusion in the Program;
- (2) approving or disapproving any proposal for the disposition of technology to a private party;
- (3) supervising documentation of any approved disposition of technology to a company;
- (4) determining which scientists are eligible for an incentive bonus with respect to any specific technology;
- (5) determining the time at which any incentive bonus shall be granted and the amounts of such incentive bonus; and
- (6) construing the terms and provisions of the Program.

The Committee may have such other powers and responsibilities, and operate under such procedures as the Institution may determine from time to time.

C. Timing of Awards. Incentive bonuses will be awarded by the Committee with respect to dispositions of technology after the execution of definitive written agreements and the conclusion of any related transaction.

Determination of the amount and timing of any payments under an awarded incentive bonus is separate from the award of the incentive bonus, and is discussed below in Section V Incentive Bonus Amounts and Section VI Incentive Bonus Payments.

For example, the Committee would normally award an incentive bonus with respect to a disposition of technology, after the execution of final agreements and after any further action contemplated as a condition to the transaction (such as a closing) was concluded.

After the award of the incentive bonus, the amount of any payments under the awarded incentive bonus will be determined as provided under Section VI, and the timing of the payments will be determined as provided in Section VII (and will depend both on when bonus income was received by the Institution and the schedule for payments in the table attached as Schedule I).

D. Notice of Awards. At the time the Committee awards an incentive bonus, the Committee will send the scientist receiving the bonus a letter which will state:

- (1) the technology and disposition transaction with respect to which the incentive bonus is awarded;
- (2) the formula which determines the amount of the incentive bonus; and
- (3) the period over which the incentive bonus will be paid.

II. Eligible Staff

A. Eligibility. Any member of the scientific staff of the Institution is eligible to participate in the Program and be considered for an incentive bonus. An incentive bonus may be awarded under the Program to any scientist who was responsible (alone or together with others) for the development of technology which has been approved by the Committee for disposition to an unaffiliated company.

B. Conflict of Interest Policy. It is a requirement of the Program that each scientist who wishes to participate in the Program sign a copy of the Institution's Conflict of Interest Policy (a copy of which may be obtained from _____) prior to approval of any bonus with respect to the disposition of any technology.

III. Eligible Technology

Technology can be proposed by a scientist for inclusion in the Program if:

- the proposing scientist is responsible (alone or with others) for the development of the technology; and
- the Institution determines that it is not contractually or legally restricted from disposing of the technology for commercial use by a private party.

The decision to include any specific technology in the Program is in the discretion of the Committee, and even though a technology is not presently being actively developed by the Institution, it may not be appropriate to include it in the Program.

IV. Disposition of Technology

A. Eligibility. A scientist responsible for the development of a technology may request approval from _____ to present the technology to the Committee for consideration. If _____ determines that the technology is appropriate for consideration by the Committee, then the scientist may request that the Committee approve the technology for disposition to a private party.

B. Approval Process. Any request to include technology in the Program shall be made in a written proposal submitted to the Committee

A proposal should include the following information:

- (1) a description of the technology;
- (2) the names of all scientific staff members who the scientist believes were involved in the development of the technology; and
- (3) any proposals which the scientist may have regarding the disposition of such technology (including any proposals the scientists may have received from private parties).

The Committee will review such requests and evaluate whether the technology is appropriate for disposition to a private party.

"Installment payout percentages" are determined based on the type of income received. The installment payout percentages for each of the three general types of income are shown in the table attached as Schedule I.

The installment payout percentages generally apply to the percentage of an amount which is to be paid annually; however, in the case of bonus income from the sale of technology, there are installment payout percentages for payments in a year such bonus income is received.

C. Classification of Income. The Committee has the discretion to determine how any item of income should be classified for purposes of bonus percentages. If income is received by the Institution which the Committee determines does not appropriately fit in one of the general categories listed above, the Committee will determine a bonus percentage with respect to such income in its discretion.

D. Allocation of Bonus Percentages. Where more than one scientist is involved in the development of a technology, the Committee may allocate the bonus percentage among the persons who have received incentive bonuses with respect to the same technology, up to the total amount of the maximum bonus percentage.

E. Maximum Amount Payable. The amount payable with respect to any one incentive bonus (or more than one incentive bonus, if awarded with respect to the same technology) is subject to the limitation that the maximum amount of all payments with respect to that incentive bonus (or all incentive bonuses related to the same relationship or technology) may not exceed _____ dollars.

The limitation on the maximum amount payable applies both to more than one incentive bonus awarded to the same scientist with respect to the same technology and to more than one incentive bonus awarded to more than one scientist with respect to the same technology.

VI. Incentive Bonus Payments

A. Installment Payments. An incentive bonus may result in payments in more than one year because the amount payable with respect to a year may be paid out in installments, normally over a _____ year period. Where income is received by the Institution with respect to an approved disposition of technology in more than one year an incentive bonus will result in more than one series of installment payments.

A scientist may receive more than one incentive bonus, and incentive bonuses may be payable over more than one year. At the end of each year in which an amount has become payable under an incentive bonus, the recipient of an incentive bonus will receive a statement from the Committee showing the amount to be paid for that year with respect to each incentive bonus the recipient has received.

B. Timing of Payments. Normally payments with respect to incentive bonuses will be made after the end of the calendar year, following the determination of bonus income with respect to an incentive bonus for that year.

The receipt of bonus income with respect to more than one incentive bonus will result in more than one series of installment payments, which will be paid concurrently.

VII. Management of Securities

A. Receipt of Securities. The Institution may receive equity securities or debt securities as consideration for an approved disposition of technology. All securities are considered noncash income for purposes of the Program. Proceeds from equity securities are considered a separate type of income, as described in the table attached as Schedule I. Cash proceeds from debt securities (either interest or repayment of principal) will be considered to be cash proceeds from the sale of technology, as described in the table.

"Equity securities" mean any equity securities (including options, warrants, securities convertible into equity securities and rights to acquire equity securities). Equity securities include additional equity securities issued by reason of a stock dividend, stock split, subdivision or reclassification of equity securities or by reason of a decrease in the number of equity securities. If there is a capital reorganization, consolidation or merger of the issuer of the equity securities with another entity or a liquidation, partial liquidation or separation, including a spin-off of assets of the entity, equity securities (for purposes of calculating incentive bonus amounts)

will include the securities or property delivered by the entity upon the reorganization, consolidation, merger, liquidation, partial liquidation or separation in lieu of the equity securities originally acquired by the Institution. In the event the issuer issues rights or warrants to purchase additional equity securities in respect of the original equity securities, the rights or warrants upon their issuance shall become part of the equity securities. For purposes of determining bonus percentages and annual payout percentages, equity securities will include any dividends or interest paid in cash in respect of an equity security.

"Debt securities" means any promissory note or other debt instrument which is not by its terms convertible or exchangeable into equity securities. For purposes of determining bonus percentages and annual payout percentages, debt securities will include any securities issued in exchange for debt securities, and any interest paid in cash or in securities in respect of a debt security.

B. Management by the Institution. All securities received will be owned and managed by the Institution through the _____, and no bonus amount will be payable with respect to any securities unless and until cash proceeds have been received by the Institution from interest, dividends, other distributions from, or sale or repayment of the securities.

In some cases an equity security may be retained by the Institution on a long term basis, and the receipt of cash proceeds from the disposition of (or as distributions with respect to) the equity security may occur after the right of a recipient of an incentive bonus to receive payments has terminated. No amount will be payable under an incentive bonus with respect to an equity security which is held by the Institution, unless cash proceeds are received by the Institution and are payable to the recipient prior to the termination of the recipient's right to receive payments. The circumstances under which a recipient's right to receive payments under an incentive bonus terminate is discussed below in Section VIII Termination of Bonus Payments.

C. Receipt of Cash. For purposes of determining the applicable installment payout percentage for cash proceeds of equity securities in the table attached as Schedule I, year 1 is the year in which the equity security is acquired by the Institution (rather than the year in which the cash proceeds are received from the equity security). Where cash proceeds are not received until after year 4, for the year in which the cash proceeds are first received, the applicable installment payout percentage is the sum of the installment payout percentages for all prior years. The applicable installment payout percentage for each year after the year in which the cash proceeds are first received is the percentage set forth in the table for that year.

For example, the year in which an equity security is acquired is year 1. If cash proceeds were received with respect to that equity security in year 6, the applicable installment payout percentage for year 6 would be 75%, which is the sum of the installment payout percentages for years 4, 5 and 6). The applicable installment payout percentage for year 7 would be 25%, as set forth on the table.

VIII. Termination of Bonus Payments

A. Termination of Employment. Generally, upon termination of employment with the Institution, payments with respect to any incentive bonus awarded to a recipient will terminate and the recipient will have no further rights to any payments from the Institution.

Where a recipient's employment with the Institution is terminated after the end of a year for which the recipient is entitled to an installment payment with respect to an incentive bonus, termination of employment will not result in the termination of the recipient's right to receive the installment payment due with respect to the prior year.

B. Equity and Debt Securities. In the case of cash proceeds from equity and debt securities, recipients will continue to have a limited right to receive payments after their employment with the Institution is terminated, unless such termination is for cause under the Institution policies. Termination for cause under the Institution policies terminates all rights to receive payments under any incentive bonus.

If a recipient's employment with the Institution is terminated after the end of a year in which the recipient would have been entitled to an installment payment with respect to an incentive bonus had cash proceeds been received in that year, then the recipient will continue to be entitled to receive payments.

For recipients whose employment with the Institution is terminated, only one installment payment will be made with respect to any cash proceeds received during a year. The amount of the payment will be a bonus amount calculated using the installment payout percentage applicable to the year prior to the recipient's termination. This percentage will be fixed at the time of termination and will not change after termination. Payment will be made in the manner described in Section VII Timing of Payments.

For example, securities are received by the Institution in connection with the approved disposition of technology in year 1. The securities are held by the Institution, no cash is received by the Institution and no payment is made with respect to any incentive bonus. A scientist who received an incentive

bonus with respect to the disposition of that technology terminates his employment with the Institution in year 6.

At the time of his termination, had cash proceeds been received in the prior year (year 5), he would have been entitled to a 50% installment payment (the sum of 25% for year 4 and 25% for year 5) with respect to cash proceeds from equity securities and a 100% installment payment with respect to cash proceeds from debt securities. This percentage (50% for equity securities or 100% for debt securities) becomes the fixed installment payout percentage for that recipient for that type of bonus income.

If cash proceeds are received by the Institution in year 7, the scientist will be entitled to one installment payment with respect to such cash proceeds, calculated as provided under Section V Incentive Bonus Amounts, with the amount of the installment payout percentage for that calculation set at 50% for cash proceeds from equity securities and 100% for debt securities. No further installment payments will be made with respect to such cash proceeds. If additional cash proceeds are received with respect to the same securities in year 8, the recipient will again receive one installment payment with respect to the additional cash proceeds, calculated with the installment payout percentage set at 50% for equity securities and 100% for debt securities.

C. Retirement and Disability. Retirement from the Institution pursuant to the Institution's normal retirement policies, under an Institution early retirement program or as a result of a medical disability under the Institution's policies will not terminate payments under an incentive bonus.

D. Death. The death of a recipient, either while an employee or after retirement, will result in the termination of all payments under incentive bonuses.

Where a recipient dies after the end of a year for which the recipient is entitled to an installment payment with respect to an incentive bonus, the death of the recipient will not result in the termination of the recipient's right to receive the installment payment due with respect to the prior year.

E. Current Addresses for Recipients. If a recipient of an incentive bonus terminates his or her employment with the Institution, it is his or her obligation to keep the Institution advised of an address to which the Institution can send any payment due to the recipient with respect to an incentive bonus. Information with respect to a recipient's current address should be sent to _____. If the recipient has not provided the Institution with a current address, and the Institution is not able to make a payment within _____ years after the beginning of the year in which the payment is made, the recipient's right to such payment will terminate.

F. Waiver by the Committee. The Committee may, in its discretion where it finds circumstances appropriate, waive the termination of payments with respect to any incentive bonus on the termination of employment by the recipient.

IX. Nonassignability of Awards

No bonus awarded under the Program shall be assignable or otherwise transferable by a recipient.

X. Withholding Taxes

The Institution shall be entitled to withhold from any cash payment with respect to an incentive bonus an amount sufficient, in the judgment of the Institution, to satisfy all current or estimated future Federal, state and local withholding tax and employment tax requirements relating to the payment.

XI. Ownership of Assets

The Program shall not confer upon any recipient of a bonus under the Program any right of ownership with respect to any assets of the Institution (including any technology or equity interests). Bonus income is an economic units of measurement only based on property owned by the Institution, and not rights of ownership with respect to that property or its proceeds.

All property comprising the bonus income will be owned both nominally and beneficially, and all rights incident to such ownership will be held by the Institution or its nominees. The Institution will have the sole authority in its sole discretion to make all decisions regarding the property comprising bonus income (including any securities), including the sale, exchange, exercise or conversion of that property in light of its own best interests as the Institution determines. The Institution shall have no duty of any kind to any recipient of a bonus under the Program with respect to any property comprising any securities or any proceeds therefrom.

The Institution shall be entitled to the full amount of all distributions, if any, made with respect to property comprising bonus income and shall be entitled to all proceeds received on a disposition of property comprising bonus income. Neither any property comprising bonus income nor any proceeds therefrom will be segregated, pledged or otherwise encumbered for the benefit of any recipient of a bonus under the Program.

All payments with respect to any bonus awarded under the Program will be made from the general cash funds of the Institution, and the Institution shall not be required to establish a special or separate fund or otherwise segregate assets to assure such payments. Nothing contained in the Program, and no action taken pursuant to its provisions, shall create or be construed to create a trust of any kind between the Institution and any recipient of a bonus under the Program.

XII. No Evidence of Employment

The Program shall not confer upon any recipient of a bonus under the Program any right with respect to the continuation of his or her employment by the Institution or interfere in any way with the right of the Institution (subject to the terms of any separate employment agreement) to terminate such employment, or to increase or decrease the compensation of a recipient of a bonus under the Program at any time.

XIII. Effective Date

The Program shall become effective on _____.

XIV. Amendment

The Institution may in its sole discretion at any time and from time to time amend any of the terms of the Program or terminate the Program in its entirety.

Each bonus awarded under the Program shall be irrevocable (subject to the provisions for termination of payments set forth in the Program), shall be governed by the terms of the Program as in effect as of the date of the award of the bonus and shall not be subject to any subsequent amendment or termination of the Program.

Schedule I

Type of Bonus Income	Bonus Percentage	Installment Payout Percentage							
		Immed.	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7
Royalties	10%	0%	20%	20%	20%	20%	20%	0%	0%
Cash Proceeds from the Sale of Technology	10%	0%	36%	16%	16%	16%	16%	0%	0%
Dividends or Sale of Equity	20%	0%	0%	0%	0%	25%	25%	25%	25%

[N.B., All percentages are for purposes of illustration only.]