DOCUMENT RESUME

ED 385 215 IR 017 206

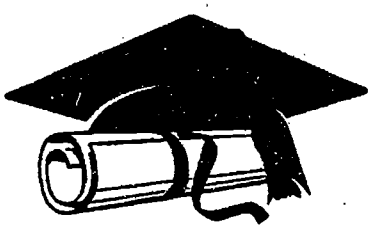
AUTHOR Dakin, Karl J.
TITLE Technology Transfer Educational Curriculum Plan for the State of Colorado.
INSTITUTION Colorado Advanced Tech. Inst., Denver.
SPONS AGENCY Economic Development Administration (DOC), Washington, D.C.
PUB DATE 93
NOTE 43p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Curriculum Development; *Curriculum Research; Diffusion (Communication); Higher Education; Information Dissemination; Information Transfer; Research and Development; *Scientific and Technical Information; *Technology Transfer
IDENTIFIERS Colorado

ABSTRACT

A recommended plan for an educational curriculum on the topic of technology transfer is outlined. A survey was conducted to determine the current levels of ability and knowledge of technology users and of transfer intermediaries. Information was collected from three sources: individuals and organizations currently presenting educational programs on technology transfer, a review of programs presented by Karl J. Dakin, and a survey of technology companies and service providers by the Colorado University Business Advancement Center. A general lack of awareness of the benefits of technology transfer in the target audiences and an inadequate number of available educational programs were revealed. In general, programs currently available fail to address the lack of awareness, are largely limited to introductory material, and typically are not available in a format or at a time convenient to most of the target audiences. The recommendation outlined in this report seeks to provide a coherent strategy to create a technology transfer curriculum which will be able to adapt to a broad range of audiences at multiple levels of knowledge, using the same basic building blocks and channels of distribution. Specific objectives include enhancement of awareness of technology transfer, creation of a standard curriculum to be delivered through a variety of mediums and channels (written text, video, and interactive multimedia computer), and cost control through a large scale collaborative approach. A number of educational topics were identified and broken down into the following 10 basic courses: (1) Introduction to Technology Transfer; (2) Technology Sale and Licensing; (3) Technology Acquisition and Implementation; (4) Developing a Technology Transfer Plan; (5) Technology Validation: Technical, Market, Economic and Legal; (6) Resources for Technology Transfer; (7) Transfer Structures; (8) Pricing Technology; (9) Technology Transfer Methods and Techniques; and (10) Practical Studies in Technology Transfer (internship). The syllabi developed for each of these courses is provided. Additional topics for advancement and specialty courses, and a number of prospective collaborative participants are identified. Cost of development of educational materials and the attendant costs of presentation are detailed. (MAS)

TECHNOLOGY TRANSFER EDUCATIONAL CURRICULUM PLAN FOR THE STATE OF COLORADO



KARL J. DAKIN, P.C.

Prepared under contract to
The Colorado Advanced Technology Institute
with a grant from the Economic Development Administration
of the U.S. Department of Commerce

INDEX

TECHNOLOGY TRANSFER
EDUCATIONAL CURRICULUM PLAN
FOR
THE STATE OF COLORADO

[To aid in the review of this plan, a glossary of terms has been attached as Schedule A.]

I. EXECUTIVE SUMMARY

Having recognized a need for an improvement in knowledge about and performance of technology transfer among organizations in the State of Colorado, the Colorado Technology Action Consortium (CoTAC) prepared and submitted to the Economic Development Administration a request for funding as part of an effort to create a state wide economic development plan based upon technology transfer. One portion of this effort is to develop a recommended plan for an educational curriculum on the topic of technology transfer. The following report outlines that plan.

First, the method of study used to develop the curriculum plan involved a survey to determine the current levels of ability and knowledge of technology users and of transfer intermediaries. This is followed by a short description of the results of the study and its analysis which led to the conclusion that a need exists for a cohesive technology transfer curriculum. Finally, a recommended plan for establishment of an educational curriculum is described. This suggested program is unique in that it will be flexible enough to be presented in a variety of formats to a multitude of audiences while remaining standardized enough to be cost efficient and coherent.

In order to create this plan, information was collected from three sources: individuals and organizations currently presenting educational programs on technology transfer, a review of programs presented by Karl J. Dakin, P.C., and a survey of technology companies and service providers by the Colorado University Business Advancement Center (CUBAC).

This review revealed a general lack of awareness of the benefits of technology transfer in the target audiences and an inadequate number of available educational programs In general, programs currently available fail to address the lack of awareness, are largely limited to introductory material, and typically are not available in a format or at a time convenient to most of the target audiences.

The recommendation outlined in this report seeks to provide a coherent strategy to create a technology transfer curriculum which will be able to adapt to a broad range of audiences at multiple levels of knowledge, using the same basic building blocks and channels of distribution. Specific objectives include enhancement of awareness of technology transfer, creation of a standard curriculum to be delivered through a variety of mediums and channels, and cost control through a large scale collaborative approach.

A number of educational topics were identified and broken into ten basic courses. A syllabus summary was developed for each of the basic courses and attached as Schedule E to this plan. Each basic course could be presented in a one hour, eight hour and forty hour format. Additional topics for advanced and specialty courses were also identified.

The curriculum outlined in this plan calls for a collaborative effort among those organizations already involved in technology transfer education. A number of prospective participants are identified in Schedule F. The development of materials would be coordinated by a single lead organization in accordance with the advice of the collaboration's participants. Individual courses would be developed by individual experts. Editing and production would be completed by the lead organization.

A variety of delivery mediums were considered with three being selected: (1) written text, (2) video, and (3) interactive multimedia computer. These formats could be used alone, in combination, or as additions to a lecture presentation; thus they provide a wide variety of presentation options while still permitting concurrent development for cost efficiency.

Presentation of materials would be completed by the collaborators, and could be presented on a national or regional scale. The materials would become the basis for lectures, short courses/workshops, and component parts of undergraduate, graduate and continuing education programs. These presentations would be disbursed via current distribution channels, described in Section 6.

The proposed curriculum is designed to meet the educational needs of the target audiences. These audiences were determined to be comprised of eleven different categories, ranging from inventors to government policy advisors, described in Section 5.

There are a great number of available distribution channels for these educational materials within Colorado. These channels include technology transfer organizations, professional/technical organizations, business incubators and technology institutes, educational institutions, federal laboratories, business assistance groups and other forums. A list of distribution points are set forth in Schedule F attached to this plan.

The primary cost to author the entire basic curriculum (ten courses), publish the materials, and present the materials is set at approximately $3,300,000. A portion of this cost and secondary costs must be carried by the collaboration's participants to be reimbursed out of presentation revenues. The balance may be funded from one or more federal government sources. Additional savings will be recognized due to the economies of scale provided by the creation of all ten courses concurrently. The development of the educational materials and the attendant costs of presentation are detailed in the body of this report.

All production cost estimates were based on one product (i.e. one video of one course), and replication costs were based on small batches (1,000 copies). This was done to obtain a cost break down for each topic which specifies the cost for each format in each medium. The matrix breakdown of these costs is contained in Section 7. This breakdown of separate costs enables users to determine which aspects of the program can be implemented if the resources for an entire collaborative development effort are not

available.

Although significant cost savings are attached to the development of the total curriculum program outlined herein, the authors recognize that within the State of Colorado, it may not be feasible to develop the entire program at once. Thus, the budget is outlined such that users can choose appropriate options based on the monies available. Portions of the entire plan could be developed individually, thus allowing for the same benefits without the total cost. Once a plan to guide the development of basic materials is adopted on a large scale, organizations interested in spending less money can tailor the materials they choose to fund based on their specific needs. [A specific recommendation for such a truncated program is contained in Section 2.] It should be pointed out, however, that a collaborative effort is still necessary to keep materials consistent and to maintain access to existing materials. Furthermore, piecemeal development will result in an estimated increase in costs of forty (40%) percent. The development of the entire program at one time will be the most cost effective and coherent way to complete the development of a standard curriculum.

II. METHOD OF STUDY

To initiate the study, a draft curriculum was prepared and circulated to over fifty individuals and organizations, local and national, known to be participating in the development and presentation of educational materials on the subject of technology transfer. Recipients of the draft curriculum were requested to provide comments and suggestions to be incorporated within this plan.

An attempt was made to acquire and review all available educational materials on technology transfer. These materials were reviewed as to topical focus and methods of presenting concepts, and are described in Schedule D attached to this report. A limited response was received to this request. This was due in part to a stated need to preserve proprietary materials. It was also due in part to requests for payment for the materials at prices that could not be supported by the size of this study.

Information was also gathered from the development and presentation of a course titled Management of Technology Transfer in the University of Denver's graduate program for Management of Technology. Further information came from the development and presentation of a one hour lecture on Introduction to Technology Transfer to the Rocky Mountain Inventors and Entrepreneurs Congress and the 9th Annual Rocky Mountain Electronics Expo.

A survey of technology businesses and service providers on the topic technology transfer needs was the final source of information. This survey, completed by the Colorado University Business Assistance Center (CUBAC) as another part of the development of a state wide plan, was mailed to almost 3,000 organizations.

III. STUDY RESULTS AND STATEMENT OF NEED

A portion of the following information is drawn from CUBAC's report on the results of its survey. This survey was presented in two formats, one designed for service providers and one designed for manufacturing companies. Accordingly, the summary of the results, presented in Schedule B, is broken down in the same manner.

Key issues to technology transfer education are set forth as follows:

- Technology commercialization is critical to effective competition in today's global marketplaces, yet many individuals and organizations are unaware of or do not understand the processes involved.
- Technology transfer educational efforts have lacked a common focus, leading to divergent educational materials among different sources of technology transfer education: federal, higher education, and commercial training.
- There is an apparent limitation upon resources for development and presentation of educational materials. These resources would not be effectively utilized through redundant and uncoordinated efforts.

The solutions to these problems lie in improved knowledge of the process of technology transfer and in enhanced planning of the development and presentation of technology transfer training materials.

As CUBAC's survey results show, the target audiences for receipt of educational programs on technology transfer are largely unaware of the benefits that technology transfer presents. Therefore, any effort at building an educational program will require a first level awareness-raising approach before more substantive courses may be widely taught.

Of the educational courses currently available on the subject of technology transfer, largely all are introductory courses with very little available in the form of courses with greater depth or focus on key sub-topics. A review of available course materials reflects different styles, perspectives, backgrounds and interests. To the lay observer, these courses may appear to conflict with and contradict each other. This wide divergence among educational programs demonstrates a need for a coordinated development program which standardizes the presentations within a common scheme.

Existing educational programs on technology transfer typically address only a small number of potential target audiences. In addition, the form of presentation typically precludes participation by a large percentage of the target audiences that are addressable. The common barriers are cost and time availability to attend courses when provided. This situation calls for development and presentation of materials in convenient modes and forums as frequently as possible, while minimizing the fees to the audience.

IV. OBJECTIVES OF THE PLAN

The objectives of the plan for an educational curriculum are as follows:

- To enhance awareness of and skills in technology transfer;
- To improve methods of teaching technology transfer and commercialization to target audiences;
- To identify subject matters for a standard technology transfer curriculum;
- To develop a set of educational materials for a basic curriculum;
- To present standardized formats for educational materials in different modes of presentation;
- To utilize different existing delivery channels for this educational material to improve ease of access;
- To minimize cost of develop and delivery of educational materials.

V. EDUCATIONAL TOPICS FOR DEVELOPMENT AND PRESENTATION

A number of topics have been identified as core subjects for educational programs. The core subject topics are listed below. A description of the issues to be covered in each course is attached hereto as Schedule C.

- Introduction to Technology Transfer
- Technology Sale and Licensing
- Technology Acquisition and Implementation
- Developing a Technology Transfer Plan
- Technology Validation: Technical, Market, Economic and Legal
- Resources for Technology Transfer
- Transfer Structures
- Pricing Technology
- Technology Transfer Methods and Techniques
- Practical Studies in Technology Transfer (internship)

A second set of topics have been identified which represent optional or specialty courses. These courses have been listed below:

- International Transfer of Technology
- Technical Assistance in Technology Implementation
- Operation of a Technology Brokerage
- Advanced Techniques: Federal Technology
- Advanced Techniques: University Technology
- Advanced Techniques: Private Technology

A third set of topics could be created by limiting courses to a specific industry. For

example, there could be a course on technology transfer within the environmental, aerospace or mining industries.

VI. DEVELOPMENT OF MATERIALS AND PROGRAMS

The State of Colorado should solicit the participation of other individuals involved in technology transfer education and training, including educational institutions, private sector organizations and government agencies, to collaborate in the development and presentation of an educational curriculum on technology transfer. A proposed structure for the collaboration would include a project manager who would serve to coordinate and support all activities. This project manager would be assisted by a Board of Advisors. The Board would be comprised of individuals with experience in technology transfer education, and would critique materials as they are completed. The Board would also make final topic selections and set guidelines for the quality of materials development and presentation.

The actual authorship of individual courses would completed by sub-contractors representing expertise within the subject matters covered by the respective courses. Such authors could be drawn from across the United States. This would facilitate the use of materials already developed. This process would be overseen by the project manager who would ensure that each author created certain standard materials which could be placed in multiple mediums and which would be sufficiently detailed to support all three levels of detail.

Approximately ten basic topics would be selected for development and presentation. Materials would be developed for each topic to permit presentation in one hour, eight hour, and forty hour formats. The materials would be published in written text, video and interactive multimedia computer mediums. The materials would be distributed by the project manager, participants in the collaboration, and through satellite broadcasts.

Each course would be presented at three levels: (1) basic [1 Hour Format], (2) intermediate [8 Hour Format] and (3) advanced [40 Hour Format]. The topic would remain the same, but additional materials would be added in order to achieve greater depth of the subject matter. The basic level courses would be suitable for business luncheons or as segments of larger educational courses. The intermediate level would be suitable for workshops and seminars which could be presented individually or as part of a conference or larger educational course. The advanced level would be suitable for degree oriented courses or continuing education programs. This tiered approach will allow the materials developed in a basic level to be re-used in an intermediate or advanced level; thereby resulting in consistency and lower costs.

It is anticipated that development activities will take approximately 6 to 12 months to complete from the point of funding. Clearly, some materials are already available which could reduce development time. However, the use of these materials within an integrated curriculum may be more costly than starting from scratch, since they will require some modifications.

As previously mentioned, it may be necessary (due to the limited funds) to develop

only a portion of the curriculum program. In this case, the authors suggest that the emphasis of such a program should be on general awareness-raising and wide distribution. Such a program should include, at a minimum, the one hour format of an introductory course in technology transfer, developed in all three mediums without broadcast over satellite. The approximate cost of this limited production would be $25,000, and should be completed within 3-6 months. A program of this sort would be able to reach a variety of audiences since it would be available via text, video, and CBT (self-study, video, CBT, and short course formats all scored well on CUBAC's survey of preferred methods of learning, see Schedule A). In addition, the topic, Introduction to Technology Transfer, will address the general need for improved awareness of technology transfer and its benefits among service providers and technology users as identified by the CUBAC study.

VII. DELIVERY MEDIUMS

Materials on technology transfer cover a broad range of delivery mediums with individual advantages and disadvantages. These different mediums are set forth and described below:

Interactive Computer-based Training

One of the most advanced methods of imparting educational information is computer-based training (CBT). This is an interactive learning tool that the student can work through at his/her own pace. CBT programs utilize computerized lessons which lead students through the topic step by step. Its greatest disadvantage is the time and money involved in its development, however this expense is offset by the significant time-savings when revising course material later on.

The advantages of CBT programs include allowing students to work through a lesson at their own pace, availability of detailed explanations for each idea, and interesting methods of presentation (due to the ability to incorporate multiple mediums such as video clips, animations, and graphics). In addition, CBT programs provide a forum for testing students in real time, and a means for teachers to monitor students' progress.

Video

Video tapes have become another useful tool in the dissemination of information. Video tapes allow teachers to impart information to an unlimited number of people, do not require any alteration of normal classroom technique. One advantage of video is that it has a flexible cost range, from inexpensive do-it-yourself tapes to much more sophisticated productions.

Video has the additional benefit of being presentable through satellite broadcasts. Thus, video's greatest strength is the capability of reaching many people at once via a

very widely used medium (television). Nearly every household in America has at least one television set, and most industrialized countries overseas report similar conditions.

Slides and Overheads

Slides and overheads require a person to present them, and so they are often used in conjunction with some of the other methods outlines in this section. Production costs can be kept to a minimum using basic computer drawing programs, photocopying machines, and cameras. In addition, slides can be used to spice up a traditional lecture presentation and are versatile enough to be presented through other formats, such as video taped programs. The greatest advantage of slides is their rock bottom cost. Their greatest disadvantage is the requirement of a person to present them, unlike video, CBT, or text which can be used by the student alone.

Written Text

Text books are a traditional tool of teaching, since the student can either follow along with the book during a class; or be left alone to read the material and then participate in class discussions. Text books are especially useful because the student can take his/her time in learning and reviewing the material and prepare any questions before addressing the teacher. In addition, the student has a constant resource available to review. Printing cost and difficulty in updating textbooks are their major disadvantage.

VIII. PRESENTATION OF EDUCATIONAL MATERIALS

Once the education materials have been developed, it will be necessary to place the materials into the various distribution channels. This will require meeting with representatives from the different organizations, educational institutions, and private businesses involved. It is anticipated that basic and intermediate level materials will be placed with minimum difficulty. The advanced courses may require additional funding to start up technology transfer programs at the universities and colleges.

Wide scale presentation of the materials could be accomplished through satellite broadcast, such as that provided by the National Technological University. In this manner, short courses or degree programs could be presented to educational institutions, small business development centers, and large corporations in live broadcasts or tape delay broadcasts.

The scale of this effort will require continued work from the prime contractor. It is anticipated that placement of the materials will consume 6 to 18 months, with more time required by the advanced courses.

IX. TARGET AUDIENCES

Several groups have been identified as recipients of educational programs on technology transfer. Each group is set forth and described below:

Technology managers - People in organizations that use technologies who are specifically responsible for the management of such technologies, (i.e. CAD program managers, automated assembly line controllers, etc.)

Technology/technical assistance agents - Those people to whom companies, laboratories, and universities can turn for assistance in finding technologies, assessing technical needs, or improving utilization of current technological abilities. These people generally deal with technology users rather than technology sources.

Technology brokers, dealers and representatives - Intermediaries that help to move technologies between sources and recipients. Some of these people and organizations will represent specific technologies or organizations, such as federal laboratories; others are more free lance, representing most any technology.

Inventors - People who come up with a new idea for a product, service, or process improvement or an improvement on an existing product, service, or process.

Investors - Venture capitalists, bankers, other companies, and the general public who are interested in contributing money toward the development, production, and/or marketing of a product, service, or process improvement and who are interested in achieving a return from such an investment.

Research and Laboratory Managers - Those responsible for the research activities in a research and development organization, and/or the daily activities in a laboratory setting.

Product Development Managers - People in an organization who are responsible for the development of a product from the research stage to the marketing stage.

Business Managers - In general, a person who manages a company or a segment of an organization which is considered a business unit; such person would be interested in technology transfer education as a means of improving his/her business' competitive ability.

Service Providers and Consultants - Organizations or individuals who provide general consulting in the use of technologies, or specific services dealing with technologies, to the users and sources of those technologies.

Economic Developers - Public entities involved in improving the level of economic advancement and technological development in the surrounding community.

Government Policy Advisors - Aids to government officials and organizations in the development of technology policies.

X. DISTRIBUTION CHANNELS

The educational materials may be presented through a number of existing distribution channels within the State of Colorado. A list of these distribution points is set forth in Schedule F. Each of these channels is set forth and described below:

Technology Transfer Organizations - Groups which serve to bring together professionals and practitioners in technology transfer. Information is generally presented via short seminars or organizational meetings.

Professional/Technical Associations - Organizations which provide a central point of contact for companies operating in specific fields. Information is often passed along via short seminars and meetings or through extended conferences.

Business Incubators - These operations are created to provide supportive environments that nurture young businesses. Information is generally presented in a less formal format, perhaps through printed materials or by passing along information about those organizations where the appropriate help can be found.

Educational Institutions - Educational institutions include universities and community colleges as well as non-traditional institutions such as satellite colleges. Technology transfer information is passed along through a technology transfer department or through another related department (generally business or engineering). This information is usually in the form of either a semester-long class or a short workshop, although some classes introduce technology transfer as part of the covered material. For example, a course entitled Marketing Technologies may discuss transfer as one of many strategies to bring a technology to market.

Federal Laboratories - These are laboratories affiliated with the Federal government which perform technology transfers or are otherwise involved with the transfer of technologies out of the government. Generally these organizations provide technology transfer information via technology assistance centers at either the federal or the state level.

Business Assistance Groups - These are organizations, such as technology transfer intermediaries, which provide aid to businesses. These groups pass on technology transfer information in the process of helping the organizations, in other words businesses learn by doing.

Other - This group includes such various channels as conferences and trade shows, consultants, corporate training offices, and retail stores/catalogs. Information is passed

on in many ways, from seminars to published materials, to "learn by doing", to do-it yourself formats such as computer-based training programs available via catalog.

XI. BUDGET

The budget to develop this program is a product of the helpful input of several area experts, and includes both development and presentation costs for each medium. Sales costs were not included for two reasons, many of the collaborators have ready-made markets (universities courses for example) or can recapture sales costs through fees for the training (tuition and seminar fees for ex.). Some special cases may require some promotional dollars, but these are not the norm and so should be dealt with as they occur.

Each course was priced separately, so volume discounts are not reflected in the totals. This allows for the possibility that the entire sum of $3.3 million to produce the entire program is not available, so an organization may wish to choose less expensive options. It must be noted that this is a more expensive approach in the long run for two reasons: coordination will be more difficult if several organizations are working on different portions of the program at different times, and volume discounts will not be as great for smaller projects.

Total primary costs of the development, production and presentation of the ten basic courses in all three formats (1, 8, and 40 Hour Formats), in all three mediums (Text, Video and CBT), and including one satellite broadcast for each 8 and 40 Hour Format are estimated to be approximately $3,300,000. The complete breakdown of this cost is contained in the spreadsheets at the end of this Section.

If the entire program is funded, it is anticipated that half of the costs of authorship can be deferred to be compensated out of a royalty participation in the presentation of the materials. It is also anticipated that much of the primary and secondary presentation costs can be deferred to be paid out of fees charged for presentation of the materials. Additional savings are expected from volume discounts. It is expected that initial funding requirements could be cut to $900,000 to $1,100,000, dependent upon the total volume of reproductions desired and the specific media design decisions (the more creative the production, the more expensive it becomes in any medium).

The funding of the initial costs would need to be obtained through federal funding. This funding may come from the National Technology Transfer Center, from the Economic Development Administration as a grant for implementation of this plan, through the upcoming ARPA defense conversion solicitation, or by an individual federal department or agency. The costs carried by course authors and presenters of materials could serve to meet match requirements of these sources.

Budget Notes

The budget is presented in three parts: 1 Hour Format
8 Hour Format
40 Hour Format

Each format is comprised of four mediums: Written Text or Workbook
Video tape
Interactive Computer Based Training
Satellite Broadcast of Video

The authorship of the Text includes the cost for authoring the Video and CBT storyboards and all graphical images used therein. The taping of the Video includes the cost of producing the Video for the CBT and the Broadcast.

If a topic is developed in an 8 Hour Format, some of the costs of such development would include the costs of development for the 1 Hour Format. Likewise, if a topic is developed in a 40 Hour Format, some of the costs of such development would include the costs of development for the 8 Hour and 1 Hour Formats. In consideration of development of any topic in any Format or any Medium, an allowance must be made for costs which are included elsewhere. This consideration reflects that separate development of different Formats and Mediums would likely increase the overall costs by 40%.

Many of the presentation costs were not included. For example, if someone desired a copy of a video on a particular topic, there would be secondary costs in the form of maintaining an inventory of the video, responding to the order, and shipping. Although these costs are considered significant, it is presumed that such costs may be borne by the distribution point or by a fee paid by the recipient.

The cost to present a 40 Hour Format Broadcast is not fully stated. The costs set forth are a fixed minimum with a participation in revenues derived from the presentation. Additional costs of the downlink site(s) would need to be covered by tuition fees.

1 HOUR FORMAT				
	ACTIVITY	COST PER UNIT	NUMBER OF UNITS	TOTAL COSTS
TEXT				
AUTHORSHIP	Drafting	$60/hour	48 hours	$ 2,880
	Graphics	$50/graphic	30 graphics	$ 1,500
PUBLICATION	Printing	$.06/page	30 pages	$ 1,800
	Binding	$.85/book	1 book	$ 850
	Editing	$55/hour	24 hours	$ 1,320
PRESENTATION				Not calculated
VIDEO				
AUTHORSHIP	Storyboard	Costs included within Text Authorship		
	Graphics	Costs included within Text Authorship		
	Taping	$2,000		$ 2,000
	Editing	$170/hour	12 hours	$ 2,040
PUBLICATION	Dubbing	$5/tape	1 tape	$ 5,000
PRESENTATION				Not calculated
CBT				
AUTHORSHIP	Storyboard	Costs included within Text Authorship		
	Graphics	Costs included within Text Authorship		
	Video	Costs included within Video Authorship		
	In...	$55/Hour	70 hours	$ 3,850
	Editing	$55/Hour	30 hours	$ 1,650
PUBLICATION	Dubbing	$1/diskette	2 diskettes	$ 2,000
PRESENTATION				Not calculated
BROADCAST				
AUTHORSHIP	Video	Costs included within Video Authorship		
PRESENTATION	Uplink			Not calculated
	Downlink			Not calculated
Grand Total				$ 24,890

8 HOUR FORMAT					
	ACTIVITY	COST PER UNIT	NUMBER OF UNITS	TOTAL COSTS	1 & 8 HOUR FORMAT
TEXT					
AUTHORSHIP	Drafting	$60/hour	225 Hours	$ 13,500	$ 13,500
	Graphics	$50/graphic	120 graphics	$ 6,000	$ 6,000
	Editing	$55/hour	60 hours	$ 3,300	$ 3,300
PUBLICATION	Printing	$.06/page	100 pages	$ 6,000	$ 12,000
	Binding	$.85/book	1 book	$ 850	$ 1,700
PRESENTATION				Not calculated	Not calculated
VIDEO					
AUTHORSHIP	Storyboard	Costs included within Text Authorship			
	Graphics	Costs included within Text Authorship			
	Taping	$3,750		$ 3,750	$ 3,750
	Editing	$170/hour	20 hours	$ 3,400	$ 3,400
PUBLICATION	Dubbing	$5/tape	4 tapes	$ 20,000	$ 25,000
PRESENTATION				Not calculated	Not calculated
CBT					
AUTHORSHIP	Storyboard	Costs included within Text Authorship			
	Graphics	Costs included within Text Authorship			
	Video	Costs included within Video Authorship			
	Input	$55/Hour	140 hours	$ 7,700	$ 7,700
	Editing	$55/Hour	60 hours	$ 3,300	$ 5,340
PUBLICATION	Dubbing	$1/diskette	16 diskettes	$ 16,000	$ 18,000
PRESENTATION				Not calculated	Not calculated
BROADCAST					
AUTHORSHIP	Video	Costs included within Video Authorship			
PRESENTATION	Uplink	$6,000/broadcast	1 broadcast	$ 6,000	$ 6,000
	Downlink			Not calculated	Not calculated
Grand Total				$ 89,800	$ 105,690

40 HOUR FORMAT					
	ACTIVITY	COST PER UNIT	NUMBER OF UNITS	TOTAL COSTS	ALL FORMATS
TEXT					
AUTHORSHIP	Drafting	$60/hour	500 hours	$ 30,000	$ 30,000
	Graphics	$50/graphic	250 graphics	$ 12,500	$ 12,500
	Editing	$55/hour	100 hours	$ 5,500	$ 5,500
PUBLICATION	Printing	$.06/page	300 pages	$ 18,000	$ 30,000
	Binding	$2/book	1 book	$ 2,000	$ 3,700
PRESENTATION				Not calculated	Not calculated
VIDEO					
AUTHORSHIP	Storyboard	Costs included within Text Authorship			
	Graphics	Costs included within Text Authorship			
	Taping	$ 29,800		$ 29,800	$ 28,900
	Editing	$170/hour	80 hours	$ 13,600	$ 13,600
PUBLICATION	Dubbing	$5/tape	20 tapes	$ 100,000	$ 125,000
PRESENTATION				Not calculated	Not calculated
CBT					
AUTHORSHIP	Storyboard	Costs included within Text Authorship			
	Graphics	Costs included within Text Authorship			
	Video	Costs included within Video Authorship			
	Input	$55/Hour	210 hours	$ 11,500	$ 11,500
	Editing	$55/Hour	90 hours	$ 4,950	$ 10,380
PUBLICATION	Dubbing	$25/CDROM	1 CDROM	$ 25,000	$ 43,000
PRESENTATION				Not calculated	Not calculated
BROADCAST					
AUTHORSHIP	Video	Costs included within Video Authorship			
PRESENTATION	Uplink	$8,000+	1 broadcast	$ 8,000+	$ 14,000+
	Downlink			Not calculated	Not calculated
Grand Total				$ 260,850+	$ 328,080+

SCHEDULE A

GLOSSARY

Interactive multimedia - a method of information delivery which utilizes computers to present material incorporating multiple formats such as computer generated graphics, video clips, sound recordings, and text; and which requests user input from a mouse or keyboard in order to operate.

Satellite broadcast - live or tape-delayed presentations to a restricted access market.

Technology commercialization - the process of moving new knowledge with commercial potential from concept to a point of application.

Technology transfer - an added step or sub-process in technology commercialization which involves transfer of technology from the hands of its creator into the hands of another who will commercially exploit the technology as a business opportunity or apply the technology as an end user.

Video - taped visual and audio materials.

Written text - printed materials such as text books and workbooks.

SCHEDULE B

SUMMARY OF SURVEY RESULTS

Service Providers

Almost 60% of the responding service providers (intermediaries, incubators, small business development centers, etc.) felt that technology training is important to their staff development, 23.7% felt it was not important, and just over 18% did not respond. Among the respondents, the most popular topics for staff training are how businesses can benefit from university research and technology, the small business innovation research program, and how businesses can benefit from federal lab research and technology. Each topic received better than 50% of the responses.

The most popular format for staff training among service providers is clearly the all day intensive instruction format. This category was chosen by 60.2% of the respondents. Short (two hour) courses received 41.9%, and the video format ranked at 32.3%. (Respondents were allowed to choose more than one format.) Coming in at the mid to low 20% range were self-study of written material, in-house training tailored to personnel, cable or satellite television courses, and computerized learning. Two or three day conferences received 15.1%, and a series of weekly evening classes registered only 5.4%.

The survey information is also broken down into the following topics, introduction to technology transfer, technology transfer policy & management, primary technology transfer skills, secondary technology transfer skills, and special topics. The most popular topics in introduction to technology transfer are how small firms handle technology and options in commercializing technology. Almost half of the respondents identified these as key topics.

In technology transfer policy & management, the preferred focus is options for businesses, financing research & development and options for transfer of government technology. The most important elements of a curriculum for technology transfer skills identified by the respondents were research opportunities for small businesses, economic feasibility of inventions, techniques for working with the federal government and educational institutions, and the commercialization of innovations. The special topic of strategic marketing for technical products was identified as the most pertinent one to be included in a technology transfer curriculum.

Manufacturers

Only 34% of the manufacturers responding to the question "Is technology transfer training important to staff development in your company?" said that it is, 50% felt it is not important, and 16% did not respond. Overall, research opportunities for small business and how small businesses handle technology are the most popular topics among the respondents. The first rated 79.2% and the second topic listed at 72.7%.

Among manufacturers, the most popular format for training is on-site training

tailored to company personnel, chosen by 51% of the respondents. All day intensive instruction came in second with 36%. Short two-hour presentations received 34.5%, video presentations for home VCR's received 33%, and self-study from written material came in at 28%. Eighteen percent of the respondents preferred computerized learning, 14% preferred a series of weekly evening classes, and 12% preferred two to three day conferences.

Training courses were once again broken down into topical areas: introduction, policy & management, skills, and special topics. In introduction to technology transfer, the most popular courses are options in commercializing technology and technology planning & strategy development, receiving 51 and 45 votes respectively.

The most popular issues in policy & management are financing research & development and options for businesses. Under the skills heading, research opportunities for small business, commercialization of innovation, and market assessment for inventions earned the best responses. Of the special topics, partnerships & alliances and strategic marketing for technical products were the top course topics for a technology transfer curriculum.

Results

The results from both surveys are similar in several results. The all day, video and short course formats ranked in the top four of both survey results, while the weekly evening classes option was last on both; and both surveys scored self-study, computerized learning, and two or three day conferences in the middle, ranging from the low teens to the low twenties in both surveys. The most notable difference is the disparity in the number of respondents in each group that recognize the importance of technology transfer training. Clearly, service providers are more aware of the benefits that improved technology transfer skills impart to a company, but both groups as a whole still need a better awareness level.

A second difference is that manufacturers far prefer on-site training (top choice), but service providers do not (low 20's). This difference is most likely due to the different structures: manufacturers generally have large audiences and require help with on-site problems (dealing with machinery that cannot be moved for example), whereas service providers are more likely to be small operations without a large enough audience to justify on-site training and a need for training in methods rather than processes.

Although the survey revealed some differences between service providers and manufacturers, most notably the large difference in the perceptions of the importance of technology transfer training to staff development, it also revealed some important similarities such as the general need for improved awareness. These results confirm our position that a cohesive and coherent program for improving technology transfer awareness and knowledge is important to improve economic development.

SCHEDULE C

COURSE SYLLABI

1. Introduction to Technology Transfer

Content

I. What is Technology Transfer
   - A. Definition
   - B. Role in Commercialization
   - C. Principal Participants

II. What are the Benefits of Technology Transfer
   - A. Societal
   - B. Economic
   - C. Seller's Perspective
   - D. Buyer's Perspective

III. Getting Started
   - A. Planning
   - B. Primary Tasks
   - C. Required Resources

Outcome

Students will gain a basic comprehension of technology transfer as a process, its importance, and the key participants involved.

2. Technology Sale and Licensing

Content

I. Objectives of Technology Sellers
II. The Seller's Technology Transfer Plan
III. Obstacles to Selling
IV. Transfer Options

Outcome

The student will gain a knowledge of how technology transfer works from the seller's perspective and the selection among various selling options.

3. Technology Acquisition and Implementation

Content

I. Identification of problems
    A. Defining the problems
    B. Recognizing where improvements will help
II. Identification of solutions
    A. Attendant costs and benefits
    B. Process improvements
    C. Low tech. solutions
    D. High tech. solutions
III. Strategy development and tactics

Outcome

The student will learn how to use technology commercialization as a strategy to improve competitiveness, as well as how to identify and cope with problems that might be solved by technology acquisition and implementation.

4. Developing a Technology Transfer Plan

Content

I. Determination of transfer objectives
    A. Profit
    B. Cash
    C. Competition
    D. Public benefit
    E. Risk reduction
    F. Development goals
II. Technology assessment
III. Availability of resources
IV. Selection of a structure
V. Time line
VI. Tactics
VII. Measurements of success
VIII. Business plans

Outcome

These courses will educate the student in the purposes and methods of strategic planning for technology transfer.

5. Technology Validation: Technical, Market, Economic, and Legal

Content

I. Technical validation
    A. Proof of concept
    B. Alternative means of validating
    C. Due diligence
    D. Prototypes
II. Market validation
    A. Identification of end users
    B. Measure of benefit
    C. Identification of distribution channels
    D. Identification of transfer candidates
    E. Competitive assessment
III. Economic validation
    A. Profit assessment
    B. Risk assessment
    C. Capital requirements assessment
    D. Forecasting
IV. Legal validation
    A. Legal Rights
    B. Forms of ownership
    C. Contracts

Outcome

The student will learn the reasons for and methods of performing technical, market, and economic and legal validations of technologies.

6. Resources for Technology Transfer

Content

I. Information
    A. Databases
    B. Publications
    C. Networks
II. Human
    A. Technical skills
    B. Market skills
    C. Transactional skills
    D. Management skills

E. Team building

III. Capital
- A. Venture
- B. Alliances
- C. Grants
- D. Self-funding

IV. Assistance
- A. Programs
- B. Consultants

Outcome

The student will gain an understanding of the types of resources involved in technology transfer and the effects of these resources (or lack thereof) on the success of the transfer.

7. Transfer Structures

Content

I. Sale
II. License
III. Cooperative research and development
IV. Consortium
V. Other
- A. Publication
- B. Loaned servant
- C. Merger
- D. Spin off
- E. Reverse engineering
- F. Theft

Outcome

The student will learn the many methods of performing technology transfer as well as gain the ability to determine which structure is appropriate in specific situations.

8. Pricing Technology

Content

I. Methods of pricing
- A. Test marketing
- B. Cost and profit margins

C. Profit analysis
D. Discounting methods

II. Profit allocation
A. Investment contributions
B. Risk level

III. Risk allocation

IV. Payment alternatives
A. Royalties
B. Lump sum

Outcome

The student will understand the methods of valuing a technology, the issues involved, and how to overcome difficulties.

9. Transfer Techniques and Methods

Content

I. Identifying transfer candidates
II. Technology presentation
III. Negotiations
IV. Federal lab technology
A. Culture and mission
B. Laws and regulations
C. Access mechanisms

V. University technology
A. Culture and mission
B. Laws and regulations
C. Access mechanisms

VI. Private sector technology
A. Culture and mission
B. Laws and regulations
C. Access mechanisms

Outcome

The student will learn about basic technology transfer techniques and how to apply them to each specific entity.

10. Practical Studies in Technology Transfer (internship)

Content

I. Case Study (live or simulated)

II. Team Formation
III. Transfer Planning
IV. Transfer Management

Outcome

The student will learn practical experience in technology transfer, through the formation of transfer teams, development of transfer plans, and project management.

SCHEDULE D

AVAILABLE EDUCATIONAL MATERIALS, COURSES AND PROGRAMS

Set forth below is a listing of educational materials, courses and programs. This listing is not complete, in that the scope of this study did not permit an exhaustive investigation. The listing was further restricted by the failure of some organizations to respond to requests and the lack of adequate material describing the contents of certain courses and programs. [Our recommendation for any future studies should pick up this research by contacting the Science Information Exchange, which is an exhaustive research data base run by the Smithsonian Institute. This organization may be able to provide a somewhat new, and perhaps more exact, list of prospective contacts with programs in the area of technology transfer education.]

AccuCost - Industrial Technology Institute, Ann Arbor, MI

This is a "PC-based software package that provides economic information essential to making decisions about manufacturing processes. It addresses three crucial areas, investment planning, product costing, and production control"*.

The Advanced Technology Implementation Game - Industrial Technology Institute, Ann Arbor, MI

This program is a role-playing business simulation which raises individual's awareness of the complexities of implementing new technology and of the communication and coordination necessary for success. It is delivered by two trained and certified facilitators during a one-day simulation.

Business Opportunities Workbook - Small Business Administration, Office of Business Development, Washington, D.C.

This book helps prospective entrepreneurs paint a general picture of the local business economy, step-by-step. It is full of worksheets to guide the reader from analyzing business opportunity factors in the community through generating and evaluating ideas. Its appendices contain helpful hints for initiating a project and ideas for access to capital.

Customer Assessment Protocol (CAP) II - Industrial Technology Institute, Ann Arbor, MI

This program is a second generation level computer-based telephone and/or on-site interviewing tool featuring a menu-driven user interface. It "provides a detailed overview of a firm's general characteristics, products and services, operational practices, customer and supplier relationships and issues, market activities, labor/management relations, work force training, and other miscellaneous issues having major business impacts on small- and medium-sized firms".

* Note: All quotes in this schedule are taken from Tools & Services to Support Industrial Base Modernization Assistance, a publication from the Industrial Technology Institute.

From Invention to Innovation: Commercialization of New Technology by Independent and Small Business Inventors* - *U.S. Department of Energy, Washington, D.C.

This publication discusses the requirements of technology commercialization in layman's terms. It covers most of the essentials in a basic but easy to read format, and includes two appendices with useful information such as a glossary of terms, a list of references, information on legal considerations, and a sample business plan, as well as a detailed description of the DOE's Energy-Related Inventions Program.

High Integration of Technology, Organization and People (HITOP) - Industrial Technology Institute, Ann Arbor, MI

HITOP measures the organizational and human implications of adopting new technologies. It identifies factors that require implementation to prepare the entire work force for the changes new technologies will bring to the firm.

"Introduction to Licensing" - Licensing Executives Society

A video format, created by the LES in 1987, this tape focuses on four speakers: Jay Simon, Evylyn Sommer, Gerald Lester, and Robert Goldscheider. All are members of the LES. Topics covered include licensing, intellectual properties, patents, trade secrets, analysis of licensing agreements, software protection, and negotiation issues.

Joint Work Statement - Lawrence Livermore National Laboratory, Livermore, CA

This publication is a sample joint work statement which outlines how LLNL structures its CRADA agreements. It covers the procedure LLNL follows, its purpose in forming CRADAs, the scope of responsibilities, costs and support sources, submittal, execution, negotiations, and benefits to each party. Sample documents are also included.

Management of Technology Transfer - University of Denver, University College, Denver, CO

This graduate course was part of a Management of Technology program. It was authored and taught for the first time in 1993 by Karl Dakin in a five-part, 20 hour format. A computer driven slide show was used to augment instruction. Each student was given an initial case study that was used to develop a tech. transfer plan during the course. The final exam involved the creation of a transfer plan for a new case study.

Managing Technology Changes (MTC) Checklist - Industrial Technology Institute, Ann Arbor, MI

This checklist is used to assess a firm's "readiness for technological change. The results provide an overall assessment of readiness for technological change and identification of areas needing improvement before change can be successful". Format is a hard paper copy.

Manufacturing Assessment Methodology (MAM) - Industrial Technology Institute, Ann Arbor, MI

MAM is a set of tools and techniques that consultants use on-site in gathering and

analyzing data. MAM is a two-stage process that first gathers information about the company and then analyzes it to "identify opportunities, determine strengths and constraints, and to characterize causes, symptoms, and corrective actions for improvement".

***Mining the Nation's Brain Trust* - Richard Chapman, Littleton, CO**

Mr. Chapman's book discusses the issues involving federal technology transfer, the reasons for using federal lab technology, where to find help in accomplishing the transfers, how to obtain existing technologies, and how to work with the labs to create new technologies. It includes a sample Cooperative Research and Development Agreement, a transfer checklist, and a thorough listing of technology transfer contacts

R.O. Anderson School of Management - University of New Mexico, Albuquerque, NM

This program is a part of other graduate programs at the School. Graduate courses in technology and entrepreneurship are offered which use real business clients as case study subjects for students. Thus, the program offers actual help to practicing transfer agents and at the same gives students real life exercise in technology transfer.

"The Role of Marketing in Matching Industry Needs with Technology Developed at Oak Ridge National Laboratory" - Martin Marietta, Lakewood, CO

This publication by Martin Marietta Corp. describes how Oak Ridge Lab handles technology transfer. It includes a flow chart for evaluation of the commercialization potential of technologies. It also provides a good description of the steps from idea publication through the start of licensing strategy development, including a how-to of initiating contact with industry partners.

T2C - University of California at Hayward, Hayward, CA

This is a certificate program offered by the University. The program is in its first stages, with the first 6-7 classes expected to be taught by June. The program is 96 hours of class time dedicated to teaching students with previous experience in technology areas how to go about transferring technologies out of the federal labs. Courses teach students how to understand the federal lab culture and work within it, how to work through transfers, how to understand intellectual properties, and how to plan for transfers and their component activities such as creating a business plan.

Required courses include Technology Transfer and Commercialization, Federal Lab and Corporate Culture, New Product Technology Development, and Legal Aspects: Patents, Licensing, Joint Ventures, CRADAs. Electives include Basics of Technological Business Plans, Marketing and Selling Technologies, and New Ventures and Entrepreneurship. Students receive a Technology Commercialization Certificate, as well as 1.6 hours of continuing education credits for each course. Other products of this program include: a set of case studies, a video program of each course, a book which discusses intellectual properties, product development, financing and commercialization of federal lab technologies and which is currently in negotiation for publication, and workbooks for each course which should be available by June.

Technology Application Guides - Industrial Technology Institute, Ann Arbor, MI

These booklets describe advanced manufacturing technologies and their business benefits in layman's language. They are available for six technology groups: Computer-aided Design, Computer-aided Manufacturing/Computer Numerical control, Programmable Controllers, Robots, Quality and Inspection, and Manufacturing Resource Planning.

Technology Transfer Curriculum Development Project - University of South Carolina, College of Business, Columbia, SC

This program was instituted to develop technology materials for introduction into the business administration, engineering, medicinal, and legal academic disciplines at the four South Carolina University Research and Education Foundation institutions (Clemson, Medical University of South Carolina, South Carolina State, and the University of South Carolina). The focus is on integrating technology transfer topics into selected existing academic disciplines.

The project's outputs include supporting materials for three introductory technology lectures in engineering courses. In addition, two new courses were developed: Engineering 401, "Creativity, Innovation and Entrepreneurship", and Business Administration 894T, "Management of Technology and Innovation". This program has succeeded in raising the awareness of technology transfer topics and their usefulness at each of the four participating universities, and is currently ending its second year of operation.

Technology Transfer: Financing and Commercializing the High Tech Product or Service: From Research to Roll Out - Karl J. Dakin and Jennifer Lindsey

An explanation of the processes involved in technology commercialization from concept to research and development through manufacturing to distribution and sale. The authors explain what technology commercialization is and how technology transfer fits into the commercialization process. The mechanisms for transfer are explained, and the necessary skills are described. The appendices provide such useful information as resources for technology transfer information, pertinent legislation, and a sample of one method of transfer (Cooperative Research and Development Agreement).

"Technology Transfer Profits for Small Business" - National Technological University, Fort Collins, CO

This satellite broadcast, presented by Karl J. Dakin, presents an introduction to technology transfer. Key terms are defined, and key components discussed, such as the need to plan for technology transfer, the reasons for doing tech. transfer, and the tasks involved. Materials include the video itself and the accompanying visual aids which follow the outline of the seminar.

Training for Executive Awareness in Manufacturing Technology (TEAM Tech) - Industrial Technology Institute, Ann Arbor, MI

This program teaches owners and managers of small and medium sized manufacturing firms to improve their awareness, knowledge, and understanding of

advanced manufacturing technologies and their benefits. The program is presented as a workshop, and licensees are given all workshop training materials and participant manuals, two days of trainer training, and electronic copies of support materials required for training and dissemination.

In addition to the above mentioned materials and programs, we have become aware of several programs to develop technology transfer educational programs which are still in a planning or discussion stage. The organizations involved in these efforts include the National Technology Transfer Center, the National Technology Transfer Society, and the Association of University Technology Managers,

Several programs were also noted which have some level of technology transfer education programs, but about which very little information was available due to time or other constraints. These programs include:

- Alabama's Center for Advanced Technology Transfer,
- the High Technology Development Corporation in Hawaii,
- the Indiana Corporation for Science and Technology,
- the Missouri Corporation for Science and Technology,
- the Ben Franklin Partnership Program in Pennsylvania,
- a training session for technology transfer agents at Virginia Tech,
- a technology transfer curriculum being presented by a consortium of community colleges in Spokane WA,
- the Washington Technology Center's Technology Transfer Program,
- the Center for Technology Administration at American University in Washington, D.C.,
- and a Technology Management program at Universidad de las Americas in Mexico City.

This list does not claim to be exhaustive, but is as complete as available time and information allowed.

SCHEDULE E

FORMATION OF COLLABORATION

To complete the development and presentation of a curriculum technology transfer, it will be necessary to draw upon resources outside the State of Colorado. This may be accomplished through formation of a collaboration including a number of organizations already involved in technology transfer education.

The following organizations are recommended as possible participants:

Colorado Institute for Technology Transfer and Implementation
Federal Laboratory Consortium
Georgia Institute of Technology
IC2 Institute, University of Texas at Austin
Industrial Technology Institute, Michigan
Karl J. Dakin, P.C
Licensing Executives Society
Massachusetts Institute of Technology
National Technological University
National Technology Transfer Center
R.O. Anderson School of Management, New Mexico
Technology Transfer Society
University of California at Hayward
University of Denver, University College
University of South Carolina
U.S. Department of Energy, Oak Ridge
U.S. Office of Personnel, Western Executive Training Center
U.S. Small Business Administration

Organizations would be invited to participate and formalize the creation of a collaboration.

SCHEDULE F

PART 1
TECHNOLOGY TRANSFER AGENCIES AND ORGANIZATIONS

Colorado Advanced Technology Institute
(SuperNet program)
C/O Sue Morgan, Deputy Director
1625 Broadway, Suite 700
Denver, CO 80231
(303)620-4777

Mid-Continent Regional Technology Transfer Center (Mid- Continent RTTC)
C/O James Wilhelm
Texas Engineering Experiment Station
237 WERC
College Station, TX 77843-3401
800-472-6785

National Technology Transfer Center (NTTC)
C/O Lee Rivers
Wheeling Jesuit College
316 Washington Ave.
Wheeling, WV 26003
(304)243-2455

PART 2
PROFESSIONAL/TECHNICAL ASSOCIATIONS

Association of University Technology Managers
C/O Spencer Braylock
315 Beardshear
Ames, Iowa
(515)294-4740

Colorado Technology Action Consortium (CoTAC)
C/O Sue Morgan
1625 Broadway, Suite 700
Denver, CO 80202
(303)620-4777

Federal Laboratory Consortium for Technology Transfer (FLC)
C/O FLC Administrator
1945 N. Fine, Suite 109
Fresno, CA 93727
(209)251-3830

Licensing Executives Society (LES)
C/O Marianne Hogenson
71 East Avenue
Norwalk, CT 06851-4903
(203)852-7168

National Academy of Sciences (Research Roundtable)
C/O Program Officer
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
(202)334-3486

Technology Transfer Society
C/O Maureen Swinney
611 North Capitol Avenue
Indianapolis, IN 46204
(317)262-5022

Colorado Chapter
C/O Karl J. Dakin, P.C.
5445 DTC Pkwy., #1000
Englewood, CO 80111
(303)220-1992

PART 3
BUSINESS INCUBATORS AND TECHNOLOGY INSTITUTES

Boulder Technology Incubator
C/O Jerry Donahue, Executive Director
1821 Lefthand Circle Dr., Ste. B
Longmont, CO 80501
(303)678-8000

Colorado Advanced Materials Institute
C/O Frederick J. Fraikor, Director
Colorado School of Mines
Golden, CO 80401
(303)273-3852

Colorado Advanced Software Institute
C/O Marjorie J. DeFries, Coordinator
5733 Central Ave.
Boulder, CO 80303
(303)440-3695

Colorado Bio/Medical Venture Center
C/O Lewis Kontnik
1610 Pierce
Lakewood, CO 80214
(303)237-3998

Colorado Institute for Technology Transfer and Implementation (CITTI)
C/O Larry Anderson
1420 Austin Bluffs Parkway
P.O. Box 7150

Colorado Springs, CO 80933-7150
(719)548-8245

CSU-Manufacturing Excellence Center
C/O Wade O. Troxell, Director
Colorado State University
AR202, Engineering Building
Fort Collins, CO 80523
(303)491-0476

Colorado Technology Transfer Center
C/O Hugh Blevins
Denver West Office Park
Building 19, Suite 400
Golden, CO 80401
(303)234-1550

PART 4
EDUCATIONAL INSTITUTIONS, RESEARCH FOUNDATIONS AND CONSORTIUMS

Arapaho Community College
C/O Don Yeager
2500 W. College Drive
Littleton, CO
(303)794-1550

Colorado Hispanic Institute
C/O Polly Baca, Executive Director
1445 Market, Suite 280
Denver, CO 80202
(303)620-4436

Colorado School of Mines, Office of Research Development
C/O Barbara Bosche, Research Development Coordinator
1500 Illinois Street
Golden, CO 80401
(303)273-3969

Colorado State University, Vice-President for Research
C/O Judson M. Harper, Vice President for Research Development
203 Administration
Fort Collins, CO 80523
(303)491-7194

Colorado State University Research Foundation (CSURF)
C/O Kathleen Byington, President
5th Floor, University Services Center
Fort Collins, CO 80523
(303)482-2916

Community College of Aurora
C/O Karl Van Etten, Dean of Instruction
16000 E. Centretech Pkwy
Aurora, CO 80011-9036
(303)360-4700

Community College of Denver
C/O Dr. Marlene Hall, Vice President of Instruction
Community College of Denver
P.O. Box 173363
Denver, CO 80217-3363
(303)556-2460

Front Range Community College
C/O Shyrel Hosseini
3645 West 112th Ave.
Westminister, CO 80030
(303)466-8811

National Center for Atmospheric Research (NCAR)/ University Center for Atmospheric Research (UCAR)
3450 Mitchell Lane
Boulder, CO 80303
(303)497-1000

National Technological University
C/O Lienal Baldwin
700 Centre Avenue
Fort Collins, CO 80526-1842
(303)495-6414

Pikes Peak Community College
C/O Dr. Edwin Ray, Vice President of Instructional Services
5675 S. Academy
Colorado Springs, CO 80906
(719)576-7711

Red Rocks Community College
C/O Candace Garrod
13300 W. 6th Avenue
Lakewood, CO 80401-5398
(303)988-6160

University of Colorado Health Sciences Center
C/O Michelle Reynolds, Assistant Director
4200 East Ninth Avenue, B 169
Denver, CO 80262
(303)270-7545

University of Denver, University College (Management of Technology Division)
C/O Richard P. Mignogna
University College

College Park
Denver, CO 80208
(303)871-3354

University of Northern Colorado Research Corporation
C/O Kyle Carter, President
UNC Research Corporation
University of Northern Colorado
Greeley, CO 80639
(303)351-0529

University Technology Corporation, CU
C/O R.C. Mercure, Jr., Phd.
4780 Pearl East Circle
Boulder, CO 80301
(303)492-9566

University Research Corporation, CU
C/O Charles G. McCord, President
P.O. Box 1140
Boulder, CO 80306
(303)492-5016

PART 5
FEDERAL LABORATORIES AND AGENCIES

National Institute for Standards and Technology
C/O Joseph Berke, Director
325 Broadway, Room 5001
Boulder, CO 80303
(303)497-7038

NOAA, Environmental Research Laboratories, Office of Oceanic & Atmospheric Research
C/O B.L. Trotter
R/E5X2, 325 Broadway
Boulder, CO 80303
(303)497-6378

National Renewable Energy Laboratory
C/O Dallas Martin
1617 Cole Blvd.
Golden, CO 80401
(303)231-1198

Rocky Flats
C/O David A. Westphal
P.O. Box 464, Bldg. 441
Golden, CO 80402
(303)966-2794

U.S. Bureau of Mines

C/O Guy Johnson
Bldg. 20, Denver Federal Center
Denver, CO 80225-0086
(303)236-0697

U.S. Bureau of Reclamation
C/O Chief, Research & Laboratory Services Division
Bureau of Reclamation, D-3700
P.O. Box 25007
Denver, CO 80225
(303)236-5981

U.S. Office of Personnel, Western Executive Training Center
C/O Sylvester Houston
Executive Tower Inn
1405 Curtis
Denver, CO 80203
(303)623-4140

PART 6
BUSINESS ASSISTANCE AGENCIES AND GROUPS

Chambers of Commerce
(see local white pages)

Colorado Business Development Office
(oversees Colorado SBDC, Hotline)
1625 Broadway, Suite 1710
Denver, CO 80202
(303)892-3840

Colorado International Trade Office
(Advanced Technologies Program funding)
C/O Area Trade Specialist
1625 Broadway, Suite 680
Denver, CO 80202
(303)892-3850

CU-Business Advancement Center
C/O Karen Eye
4700 Walnut Street
Boulder, CO 80301
(303)444-5723

Mayor's Office of Economic Development, City and County of Denver
C/O Robert P. Ortlip
216 16th Street, Suite 1000
Denver, CO 80202
(303)640-7100

Rocky Mountain Trade Adjustment Assistance Center

C/O Lisa Lopez
3380 Mitchell Lane
Boulder, CO 80303
(303)443-8222

U. S. Small Business Administration
Denver Regional Office
C/O David Leavitt
999 18th Street, Suite 701
Denver, CO 80202
(303)294-7116

PART 7
OTHER ORGANIZATIONS

Tech Ex
Dvorkovitz & Associates
P.O. Box 1748
Ormond Beach, FL 32075
(904)677-7033

Technology Transfer Conferences
Alladin Industries
P.O. Box 100225
Nashville, TN 37210
(615)748-3108

Invention Convention
ICS Corporation
6753 Hollywood Blvd., 212
Hollywood, CA 90028
(213)460-4408