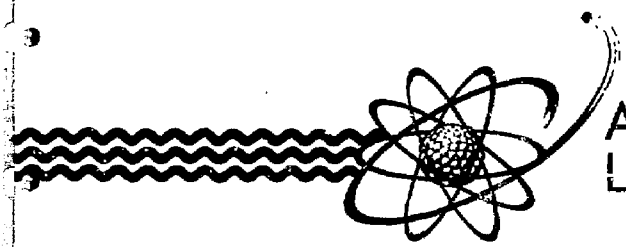
Lawrence Livermore National Laboratory
MARTIN MARIETTA
Energy Systems

AVLIS

Industrial Access Program



Atomic Vapor Laser Isotope Separation

Document PP-020
November 15, 1984

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AVLIS

Industrial Access Program

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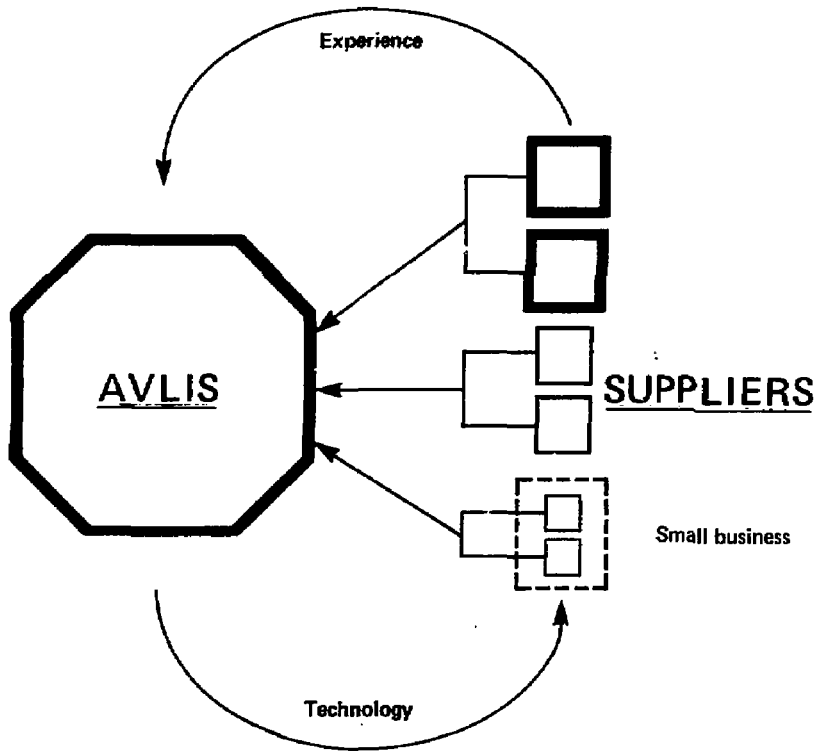
AVLIS INDUSTRIAL ACCESS PROGRAM

FOREWORD

The AVLIS Industrial Access Program generally covers AVLIS procurement plans from the present through plant operations for either a Federal or a private enrichment enterprise. The material presented in this document is tailored to the requirements for Data Package III of the 1985 Federal selection process. For this purpose, the concentration is on the federal enterprise and construction of the first plant. Privatization is not discussed.

Developmental procurements for the engineering demonstration phase are discussed; no developmental procurements are planned for the plant. The levels of integration at which procurements will be made are presented; the procurement decisions for the first plant will be made on the basis of cost. Long-term procurement plans conditioned by a maturing commercialization of the equipment are discussed in policy, but not in detail. In general, AVLIS will be proactive in ensuring and promoting commercial access to the technology; the benefit being decreased costs to the enterprise and spin-off markets for AVLIS suppliers.



AVLIS benefits from industrial experience and capability through its procurements and encourages AVLIS suppliers to utilize its advances in technology. The build-to-print nature of many AVLIS procurements permits significant small business participation.

This document provides an overview of the AVLIS technology development and facility construction phases. A key feature of this program is continued work in cooperation with the AVLIS suppliers to improve the performance of facility equipment. This continuing effort is helping industry enhace its existing capabilities while achieving the primary AVLIS performance and deployment goals.

1.3. GOALS OF THE INDUSTRIAL ACCESS PROGRAM

1.3.1. Develop a Reliable Supplier and Support Network

The construction of the AVLIS Production Plant will require several types of industrial partners, in addition to equipment suppliers. Systems and facility engineering will be provided by engineering companies with close support from LLNL and Martin Marietta Energy Systems. The organization and responsibilities of these support companies will be determined by the project plan and schedule that is selected for the construction of the production plant. The existing organization composed of LLNL and Martin Marietta Energy Systems, with engineering and construction companies, has demonstrated that this approach can work effectively.

1.3.2. Promote Effective Use of Industrial Capability

The suppliers to the AVLIS program come from all parts of the United States. Figure 1-1 shows the locations of the AVLIS suppliers from the last two year period. Effective utilization of the technical and commercial experience of these suppliers will minimize the cost and time required to build the AVLIS Production Plant and facilitate its smooth operation.

Fig. 1-1. This map illustrates the AVLIS supplier network for the past two years. The numbers shown for each state represents the suppliers that provided equipment and services for both the Livermore, Calif. and Oak Ridge, Tenn. sites.

1.3.3. Spin-Off AVLIS Technology

Although transfer of technology is not required to support the construction of the AVLIS Production Plant, the new technology developed for the AVLIS process, in general, will be made available to industry. The Industrial Access Program facilitates the program/industry interactions needed to support this spin-off of technology. There will be constraints on the transfer of some of the technology because of classification restrictions. However, the advances that will be shared will allow the suppliers to establish markets, beyond AVLIS, for new products and services.

Private industry will benefit from the government-funded AVLIS development program in a number of areas. Some of the advances derived from AVLIS that will be ready for commercial use are in copper vapor and dye laser components and systems, remote optical monitoring and process control, liquid metal handling, photochemical processes, and military applications.

The AVLIS program will benefit from the development of expanded markets for AVLIS suppliers. The cost of products supplied to the AVLIS program will be further reduced because of the economy of scale achieved by its suppliers.

1.3.4. Utilize Small Business and Government Socio-Economic Guidelines

The AVLIS organization utilizes the procurement guidelines that are specified by the Federal government. The AVLIS program gives special emphasis to the utilization of small businesses. There are many AVLIS procurement needs, both in conventional and advanced technology areas, that small businesses are well-suited to supply. The AVLIS program, via the Industrial Access Program, ensures that the benefits of AVLIS technology are equitably and effectively distributed.

1.4. PROJECT DESCRIPTION

1.4.1. Introduction

The first AVLIS Production Plant is planned to be built in two increments--the initial increment and the fully activated plant. This

strategy will allow rapid deployment and early displacement of the existing gaseous diffusion enrichment plants. The initial increment of production for the first plant will be 5 million separative work units per year. The production capacity of the fully activated plant, which will incorporate technological advances currently in development, will be 10-13 million separative work units per year.

1.4.2. Physical Description

The first AVLIS Production Plant will be built at the K-25 site in Oak Ridge, Tenn., or at another of the Department of Energy's gaseous diffusion plant sites. The production plant will consist of a process building, feed and product handling buildings, and various support operations buildings. Because of the location of the Plant on an existing enrichment facility site, many of the facilities are already in place. An AVLIS Production Plant built at a new site will require additional basic facilities.

The process building is the core of the AVLIS Production Plant. This building contains laser systems, separator systems, laser and separator refurbishment areas, instrumentation and controls, and areas for other general process support. The total area of this process building will be approximately 560 000 ft^2. This area will be sufficient to house all equipment required for the fully activated plant, as well as the initial production increment.

The other structures that will make up the AVLIS Production Plant are the separator mechanical equipment building, the laser mechanical equipment building, the separator utility building, the dye pump building, the diesel generator building, the motor generator storage building, the F_2 generation building, the UF_6 feed building, the feed preparation building, the feed conversion building, the uranium recovery building, the product conversion building, a general office/changing-room/control room building, and the administration building. The projected total size of the production plant site is

80 acres. Figure 1.2 contains a sketch of the the AVLIS Production Plant as it is planned for the K-25 site in Oak Ridge.

1.4.3. Schedule

The AVLIS program strategy is to deploy the initial increment of production as soon as reasonably possible. A project deployment schedule corresponding to this strategy is shown in Fig. 1-3.

The deployment strategy for the AVLIS Production Plant initial increment calls for site construction to begin twelve months after the engineering start (October 1985) with a 51-month overall construction and activation duration to the end of FY91. The procurement of long-lead items will begin in 1987, with all construction-, and startup-related procurements complete in mid-1990. Operation of the production plant will begin in early 1990, with the full capacity of 5 MSWU per year achieved in 1991. The conventional facilities will be completed by late 1988 to permit the installation of special equipment/systems.

1.4.4. Costs

The overall cost of the initial increment of the AVLIS Production Plant is estimated to be less than 1 billion dollars. This amount consists of approximately 37% for facilities and 63% for equipment and process support systems. Facilities covers site preparation, landscaping, utilities, buildings, and building systems. A general procurement category breakdown of the initial increment of the AVLIS Production Plant is shown below:

- o Engineering design services - 14%
- o General support services - 4%
- o Construction services - 13%
- o Lasers and optical systems (including electronics) - 26%
- o Mechanical systems - 16%
- o Electrical equipment (conventional) - 16%
- o Instrumentation and control systems/Computers - 10%
- o Bulk materials - 1%

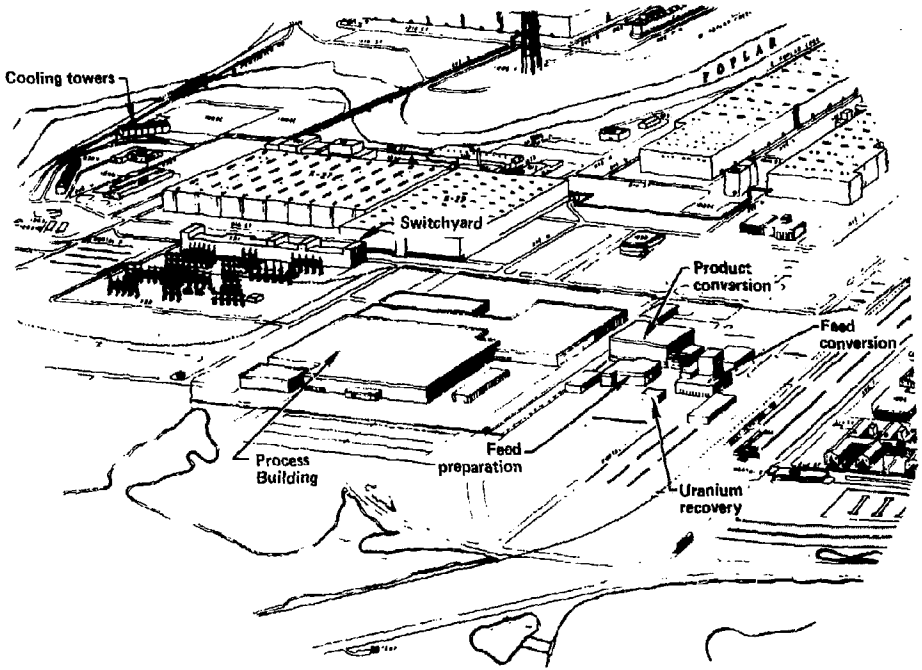


Fig. 1-2. Concept of the AVLIS Production Plant to be located at the K-25 enrichment site in Oak Ridge, Tenn.

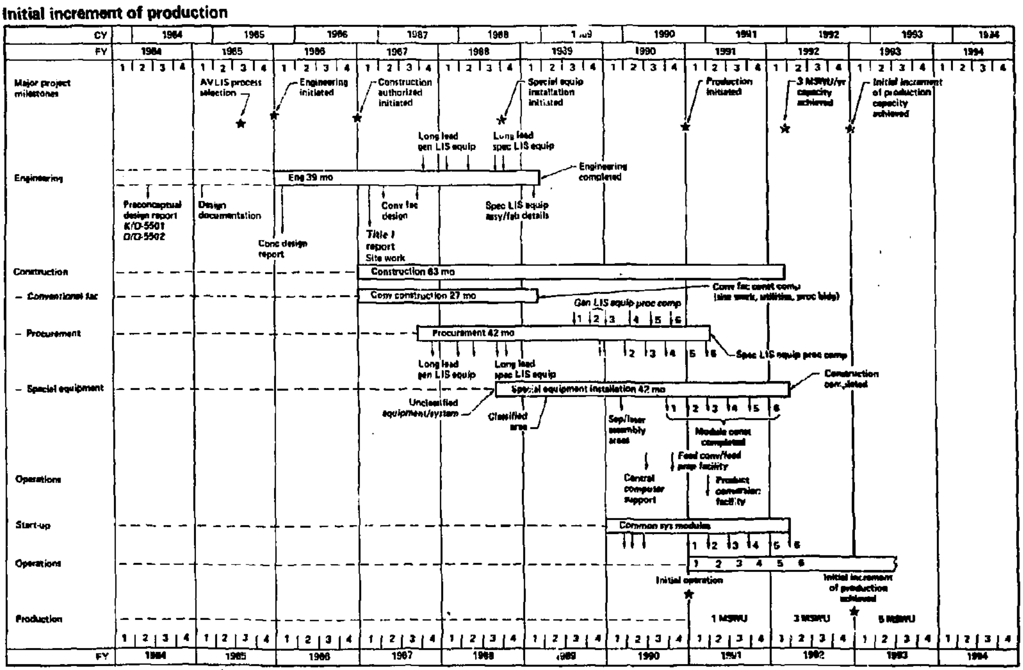


Fig. 1-3. Master schedule for the AVLIS Production Plant.

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1.5. GENERAL PROCUREMENT DISCUSSION

1.5.1. Scope

The Industrial Access Program has been developed to facilitate the procurements of the AVLIS program for the first AVLIS Production Plant. Lawrence Livermore National Laboratory is the primary development organization for AVLIS, and will continue to provide technical support during the construction and start-up phases of the production plant. Martin Marietta Energy Systems, Inc., is coordinating the planning for the construction management, engineering, and operation of the AVLIS Production Plant. These two organizations have been responsible for procurements during the engineering demonstration phase. A procurement management organization, under the direction of Martin Marietta Energy Systems, Inc., will have the responsibility for administering the procurements for the first production plant.

1.5.2. Strategy

Procurements for the AVLIS Production Plant will be structured so that the suppliers provide equipment at a level of performance and integration complexity that is within their demonstrated capability, and at a level that is consistent with the refurbishment requirements and practices of the operating plant.

Because of this overall strategy, commercially available equipment with low refurbishment requirements (i.e., cooling, vacuum, and power systems) will be procured as turn-key systems. Equipment that will be substantially refurbished many times over its useful life (i.e., laser heads, collector components) will be procured at the subsystem level needed to support the refurbishment recycle operation. Any needed assembly of subsystems will be performed in the plant refurbishment areas.

Many AVLIS Production Plant procurements, in both the high technology and standard equipment areas, will be suitable for small business participation. The AVLIS program is taking full advantage of this to diversify the production plant supplier base and to utilize these potentially lower cost sources of supply. Supplier qualification ensures that AVLIS suppliers are capable of providing reliable support.

The reinforcement of the existing base of commercial suppliers has been a major objective of the AVLIS engineering demonstration program. During the engineering development phase, modified products and developmental materials/equipment are being procured and tested to qualify these products and their manufacturers. The differences in program needs, required supplier capabilities, and contracting methods between the different project phases are described in later sections of this document. Standard competitive practices will be followed for AVLIS procurements. The overall strategy of the Industrial Access Program is discussed in Section 2 of this document.

1.5.3. Data Base

A procurement and supplier data base has been developed to support the AVLIS program and its Industrial Access Program. The commercial availability of specific equipment items, lists of suppliers, breakdowns of estimated costs, projected schedules for the project (deployment, expenditures, etc.), and a current list of the equipment to be finalized during the demonstration phase comprise the information contained in the data base. This data is being updated and maintained as information becomes available. The data base, its contents, and its uses are discussed in Section 3 of this document.

1.5.4. Action Plan

The Industrial Access Program is a vehicle for the identification of potential suppliers for the AVLIS program and the AVLIS Production Plant. The production plant cost breakdown included in the Industrial Access Program data base will be used as a basis to advertise the needs of the

program. Supplier conferences will be used to provide further detail to interested companies on how they can support the construction and operation of the AVLIS Production Plant project.

The management of the AVLIS Production Plant construction project will involve the tracking of some procurement items that require special attention. The ordering of some equipment (such as large vacuum tanks) requires a long lead time, with special attention paid to the scheduling of these procurements. The technological development and/or reliable supply of a few pieces of AVLIS process equipment (such as some laser and separator power supplies) is not currently available at the quality or cost desired for the plant. These items will be tracked to ensure the requisite quality and availability standards for the plant.

The AVLIS program and the AVLIS Production Plant project are expected to result in advances in technology with spin-off applications on a number of levels, some as simple as improved manufacturing techniques and others as complex as new industrial photo-chemical processes based on lasers. The Industrial Access Program will facilitate the program/industry interactions needed for effective spin-off of AVLIS technology for alternate applications.

Section 4 of this document discusses the action plan to be followed for these areas of the Industrial Access Program.

2. PROCUREMENT STRATEGY

2.1. BACKGROUND

2.1.1. Program Description

AVLIS is a process that is being developed by Lawrence Livermore National Laboratory, Livermore, California, and Martin Marietta Energy Systems, Inc., in Oak Ridge, Tenn. This process enriches natural uranium to provide fuel for nuclear reactors. The Department of Energy has responsibility in the United States for providing enrichment services to the commercial nuclear power industry. The AVLIS program is currently involved in a peer review process that will determine whether AVLIS or the advanced gas centrifuge process will become the technology that receives the major support for continuing toward implementation of a full-scale production facility to supply low-cost product for the U.S. uranium enrichment enterprise.

Numerous sub-scale experiments over the past 10 years at LLNL and Martin Marietta Energy Systems, Inc., have already successfully demonstrated the technological feasibility of the AVLIS process. Fully functionally integrated demonstrations of the AVLIS process equipment have been achieved in the past and will be continued in 1985 with a full-scale laser system. Figures 2-1 and 2-2 contain photographs of the experimental equipment that has been used in development work at LLNL. Full-scale system operations in 1987 will complete the engineering demonstration phase of the AVLIS program. The next phase will be the final design and construction of the AVLIS Production Plant that is described in subsection 1.4 of this document.

2.1.2. Process and Equipment Description

The AVLIS process is shown schematically in Fig. 2-3. Metallic uranium is melted and vaporized to form an atomic vapor stream. This vapor stream flows through the collector where it is illuminated by precisely tuned laser light. The U-235 atoms become electrically charged by photoionization and are removed from the vapor stream as product by an electromagnetic field. Unaffected U-238 atoms pass through the product collector section and are withdrawn as tails. Figure 2-4 presents a sketch of how the AVLIS equipment will work in a production plant.

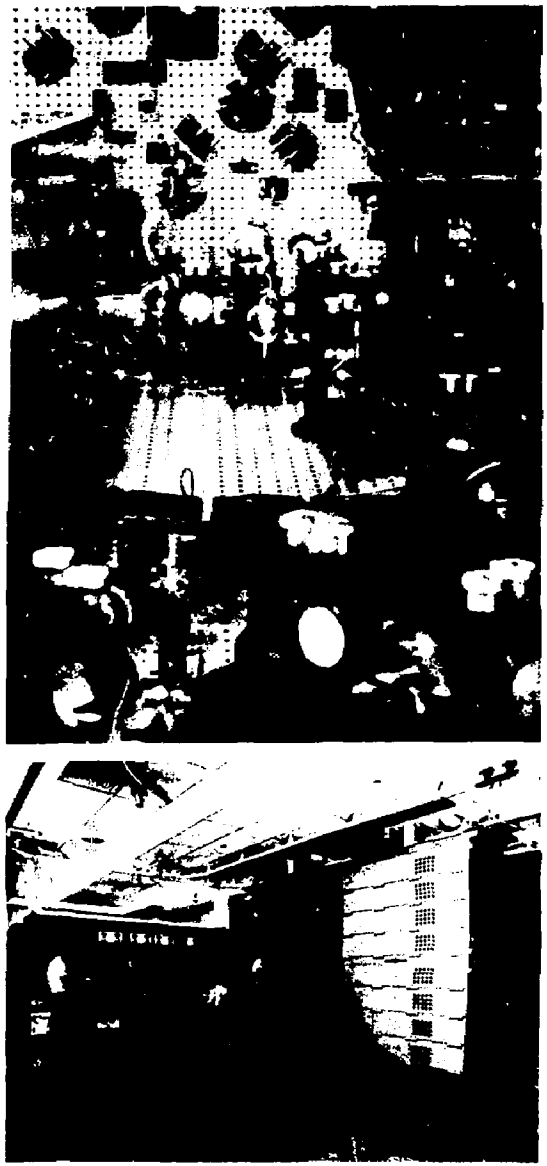


Fig. 2-1. Functionally integrated laser systems at LLNL: waveform generator (top), and amplifier (bottom).

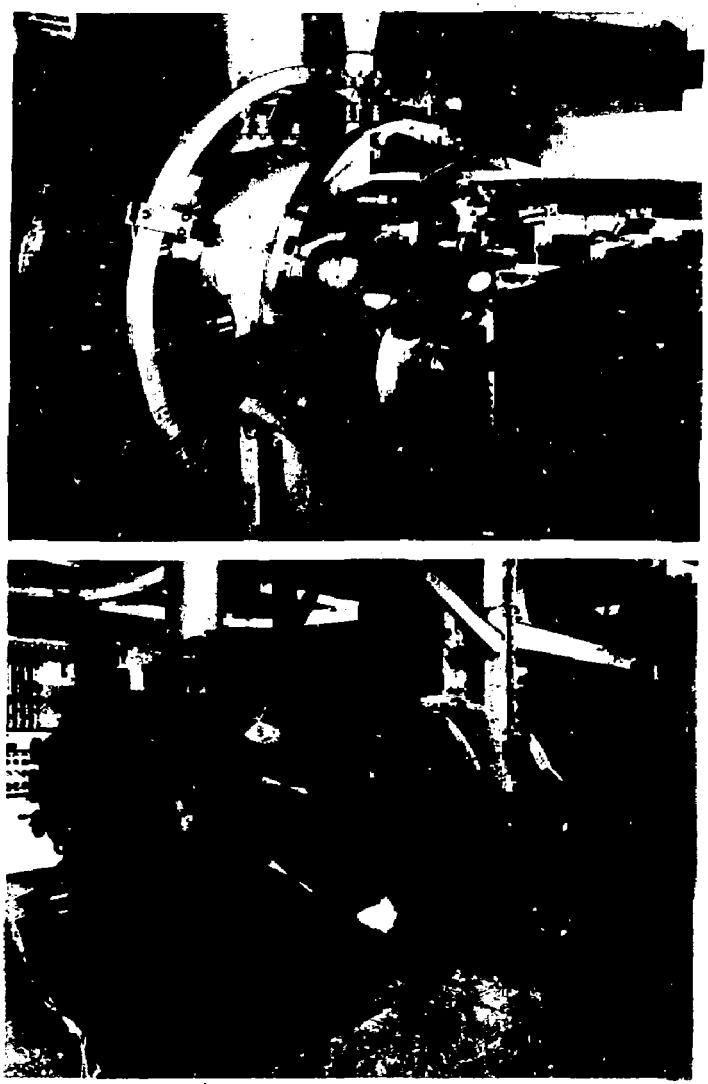


Fig. 2-2. Functionally integrated separation systems at LLNL: pre-prototype (top), and half-scale (bottom).

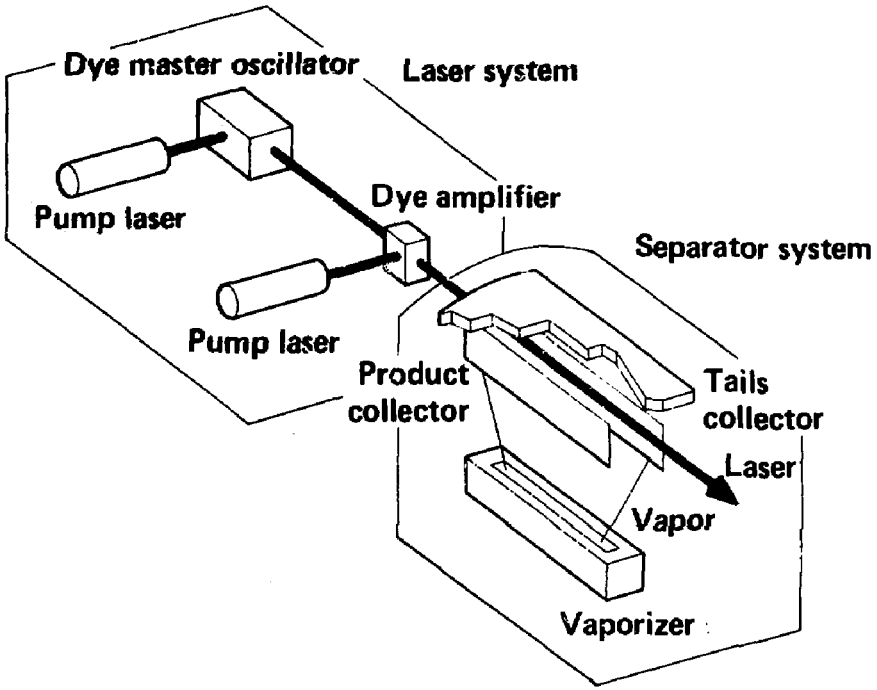


Fig. 2-3. Schematic of the AVLIS process systems.

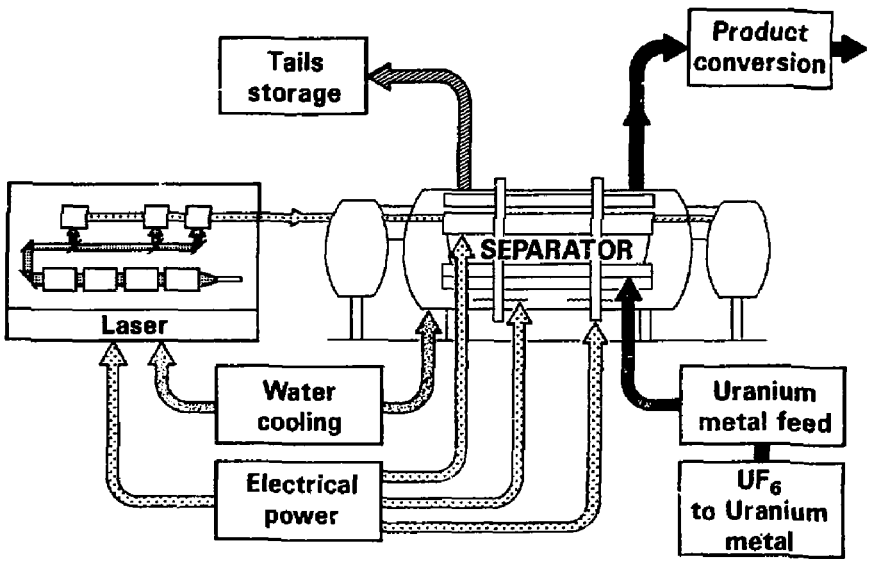


Fig. 2-4. Flow chart for the AVLIS process equipment.

The vaporizer uses an electron beam to heat uranium metal contained in a crucible, thus forming the uranium vapor. This has been standard practice for many years in commercial metal refineries and processing plants for such metals as steel and titanium. This subsystem is now well developed, with the specific temperatures, materials, etc. being optimized for the AVLIS process. Figure 2-5 contains a photograph of the Material Handling Demonstration Module at Oak Ridge.

The collector structures are a key element of the AVLIS process. Again, the basic technology of uranium foundries has been adapted. Specific design details for AVLIS equipment are different from those in common industrial use, but intermediate-sized collectors have now been assembled and tested at LLNL and Martin Marietta Energy Systems, Inc., in Oak Ridge, Tenn.

The AVLIS laser system consists of dye lasers that are pumped by copper-vapor lasers. Figure 2-6 presents a schematic of the AVLIS copper-vapor and dye laser systems. Both laser systems are configured in parallel master-oscillator, power-amplifier chains. The dye lasers produce and amplify the precise colors (red-orange) that are used in the uranium photoionization and separation process. The copper vapor lasers (green-yellow) pump the dye lasers; that is, the copper vapor laser light is absorbed by the dye and re-emitted as red-orange light.

The principle elements of the dye system are the flow system (pumps, filters, piping) that pumps the dye (dissolved in alcohol) through the laser head, the laser head itself, and the dye. The flow channel in the dye head, which has precise, polished surfaces, has been comercially procured since it was first designed for experimental evaluation. This element and all other parts of the system, including the electro-optics, are commercially available.

The copper-vapor laser system consists of several subsystems that include the laser head, pulsed power, gas supply and vacuum, the unit enclosure, and the system support structures. All of these elements are currently being procured commercially. The pulsed power systems are being manufactured specifically for AVLIS. The design is expected to have wide spread use for other applications. Elements of the laser head are also being manufactured specifically for AVLIS. It is expected that the

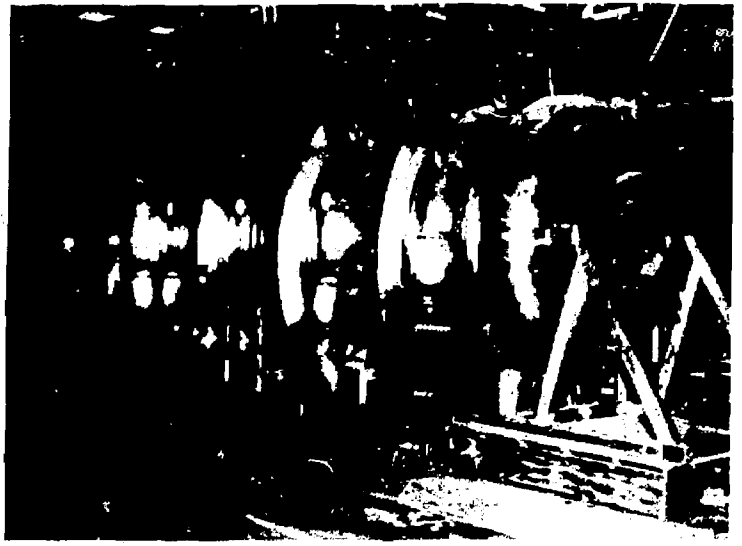


Fig. 2-5. The Material Handling Demonstration Module at Oak Ridge, Tenn., is being used to examine various aspects of the separation process: uranium feed, vaporization, condensation, flow, and casting.

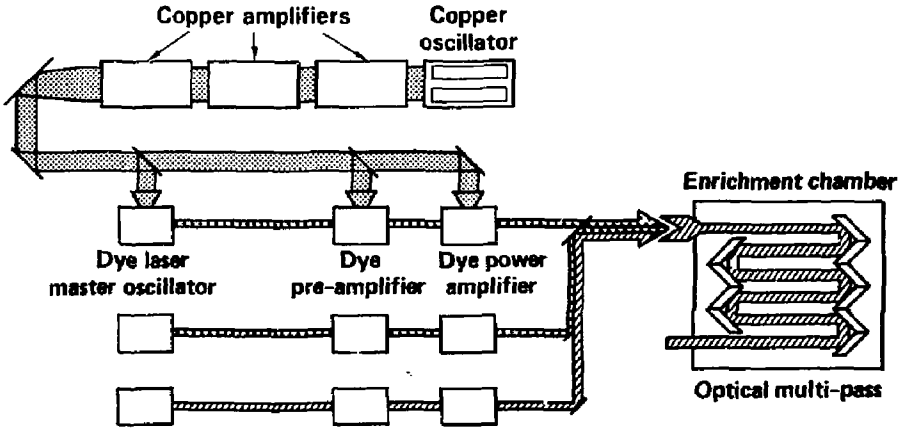


Fig. 2-6. Schematic of the coppor vapor and dye laser systems configurations.

AVLIS requirements for these components will stimulate additional markets that will result in economies of scale and in decreases in cost to AVLIS.

Finally, the many optical elements in both laser systems and in the separation chamber are being procured commercially. In this case, AVLIS will continue to pursue better reflectivity and coating durability. Although the system does not stress the basic properties of the materials, improvements in coating performance will continue to improve both capital and operating costs.

The laser system controls and diagnostics are standard commercial products available from multiple suppliers.

2.1.3. Nature of Procurements

Procurements for the AVLIS Production Plant will utilize standard, competitive practices. A concerted attempt has been made to match the requirements of the production plant process equipment to the established capabilities of industry. All AVLIS materials and equipment are currently available from commercial suppliers. Some improvement in price and performance is still desired and expected for specific items (power supplies, optical coatings, ceramic parts of proper size and shape). For these items, pre-procurement supplier qualification development activities are underway as part of the engineering development program.

The extent of these qualification development activities vary from item to item, depending on the degree of similarity of the desired items to products already on the market. In other words, the activities for some products take more time and are more comprehensive than the activities for slight modifications of currently available products.

The objective of the qualification development activities is, of course, the achievement of production quality equipment and materials for the AVLIS Production Plant. AVLIS technical personnel are interacting closely with the potential suppliers during the pre-procurement qualification development programs to ensure that the process requirements for the AVLIS equipment are met. Several manufacturing iterations may be required before products of production quality are achieved.

2.1.4. Procurement Types

Procurements for the AVLIS Production Plant will include construction services contracts, engineered equipment contracts, and material and equipment orders for both conventional construction and special equipment. Conventional construction covers site preparation, landscaping, utilities, buildings, and building systems. Special equipment includes the process and support systems that complete the plant.

Conventional construction services will be procured from contractors who serve the general area of the AVLIS Production Plant. As stated earlier in subsection 2.1.3., conventional construction contracts will be awarded using standard competitive procurement practices. All procurements that require a long lead time (due to material availability or other factors) will be scheduled to allow time for adequate competition. Figure 2-7 outlines the practice to be followed for the procurement of standard equipment.

All special equipment procurements will be the responsibility of the construction project procurement organization. The procurement of special equipment will in some cases involve AVLIS technical staff directly in the pre-procurement qualification development activities that were discussed above in subsection 2.1.3. The model for this interaction is the standard contracting officer/technical representative relationship. AVLIS technical personnel will prepare the equipment specifications and ascertain the quality of the manufactured items. AVLIS program technical and procurement staff will assist the construction project procurement personnel upon request in the identification of any equipment items with special procurement requirements.

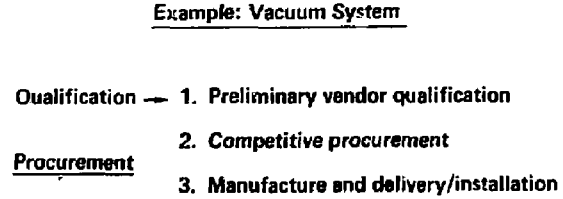


Fig. 2-7. Procurement of standard equipment and fabrications, such as vacuum systems and mechanical laser parts.

The special equipment items requiring qualification development activities are categorized as modified products and developmental materials/equipment. As mentioned above in subsection 2.1.3, the qualification of these items involves close interaction between AVLIS program personnel and the potential suppliers. Care is being taken during the qualification development phase to preserve competition among the suppliers. After the qualification development activities have resulted in qualified products and suppliers, the AVLIS Production Plant procurement organization will conduct the procurement competition. For appropriate cases, the final procurement will be split (approximately 60%-40%) between the two most qualified suppliers so that a back-up supplier will be available.

Modified products are items that are already available, but that need to be altered to meet the requirements of the AVLIS Production Plant. Figure 2-8 presents the practice to be followed for the procurement of modified products. The pre-procurement qualification development activities required for modified products include sample procurement and testing iterations before the competitive selection of the supplier. These activities also provide a contractual mechanism for the interaction that is needed between the AVLIS organization and the potential production plant suppliers.

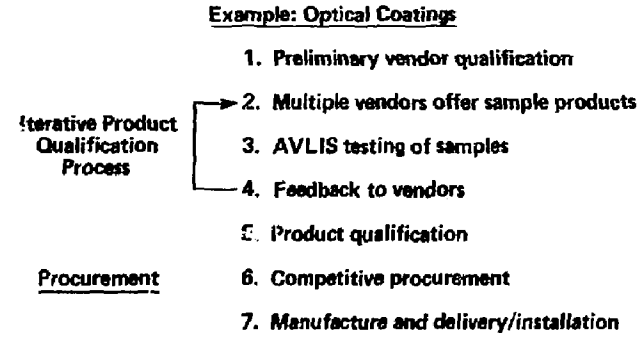


Fig. 2-8. Procurement of modified products, such as optical coatings.

A piece of developmental material/equipment (e.g., power supplies) is different from a modified product (e.g., optical coatings) in that the suppliers do not have an existing product that closely resembles the needed item. In the case of optical coatings, there will always be a substantial economic payoff in reaching beyond current practice to higher reflectivity. This item is currently considered developmental, and will remain a modified product procurement even after parts have been delivered to the plant, in order to encourage further improvement. Developmental material/equipment suppliers participate in an iterative design, prototype, and testing process as part of the qualification development activities. The close interaction between AVLIS staff and the potential suppliers that is required for modified products is more important for developmental material/equipment. The risks associated with developmental products are higher than for the other procurements, since more complex improvements are required. Figure 2-9 outlines the practice to be followed for the procurement of developmental materials/equipment. At this time, the number of items on the developmental materials/equipment list (see Section 3.6) is less than ten.

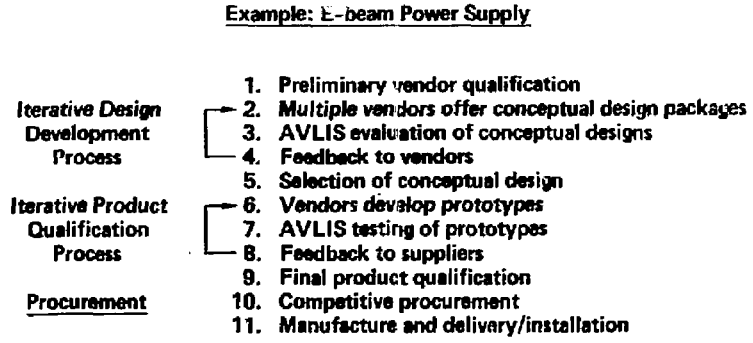


Fig. 2-9. Procurement of developmental material/equipment, such as E-beam power supplies.

2.2. DISCUSSION

2.2.1. Procurement Guidelines

A major goal of the AVLIS program is to develop a reliable supplier base that will effectively support the construction and operation of the AVLIS Production Plant. The consideration of the plant operational requirements dictates a different procurement philosophy for some special equipment than applies to conventional construction. The Industrial Access Program has been developed to ensure that adequate attention is paid to the special AVLIS procurement considerations.

2.2.1.1. Basis for Level of Procurement Complexity. The AVLIS organization follows a general policy of procuring equipment at the highest level of system complexity that industry can provide in accordance with normal construction and manufacturing practice. There are, however, two major exceptions to this policy. These two exceptions

concern: the existence or potential of a market for the product beyond AVLIS; and the operational refurbishment requirements of the AVLIS Production Plant.

External Market. In general, long-term supplier reliability is degraded if there are no external customers. A strong external market ensures a competitive supply. Therefore, unless there is an existing or potential strong market, the equipment needed for AVLIS will be procured at a lower level of system complexity (subsystem, component, part, etc.) than needed so as to procure at the level that the external market can support. The general procurement policy is to procure at the highest level of integration that is supported by an external market. Figure 2-10 illustrates how external market conditions affect the AVLIS Production Plant procurement strategy.

EXTERNAL MARKET STRENGTH	PREFERRED PROCUREMENT STRATEGY	ALTERNATIVE STRATEGY
Strong	• Procure at desired integration level	
Potential	• Procure at available integration level • Transfer technology, then • Procure at desired integration level	• Procure at available integration level
No prospect	• Procure at available integration level	

Fig. 2-10. External market strength effect on the AVLIS procurement strategy: AVLIS is using suppliers' capabilities within their experience base, but strongly encourages new products when these favor plant economics.

AVLIS Plant Refurbishment. The AVLIS process separator and lasers are designed in a modular fashion. This modularity helps to minimize operational downtime, since repairs and refurbishment will be performed away from the operating floor. The modular units will be refurbished on-site in dedicated separator and laser refurbishment areas and recycled back into operation. Figures 2-11 and 2-12 contain sketches of the separator and laser module refurbishment breakdowns.

The separator and laser-system units each have a characteristic recycle rate, determined by the components with the shortest lifetimes--the recycle rate is equal to the inverse of the number of hours between routine refurbishment. After a number of recycle operations, when the components with long lifetimes reach the end of their lives, a unit will have to be totally replaced. Recycling separator and laser subsystems, rather than simply replacing them, is economically justified because the overall unit life is far longer than the life of the replaceable elements.

The AVLIS organization does not require its suppliers to develop capabilities in support of construction that cannot be fully used during operation. The AVLIS Production Plant construction costs would otherwise increase, since the supplier's additional capitalization cost would have to be recovered in the initial construction procurement. Since the production plant refurbishment areas will have a large assembly capability, the AVLIS plan is to perform the initial assembly there also. This will simplify procurement and shipping requirements, and will ensure quality control. Figure 2-13 illustrates how these refurbishment considerations will mesh with the external market conditions (shown in Fig. 2-10) to produce the overall AVLIS procurement strategy.

While this procurement strategy is the most economical in general, exceptions will be made in two cases. First, when the required subsystem units closely resemble commercially available equipment, the external market influence would overshadow the benefits of on-site assembly. Second, when the cost of the shortest lifetime components approach the cost of the entire unit, it may be more economical to replace the entire unit. In these two cases, entire units will be procured initially and as replacements, along with any spare components determined to be useful.

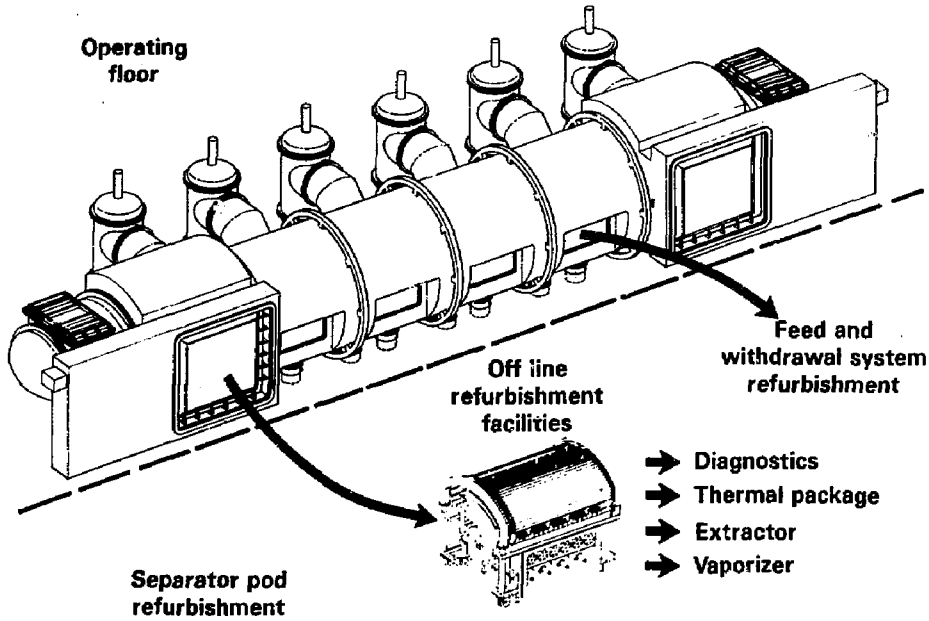
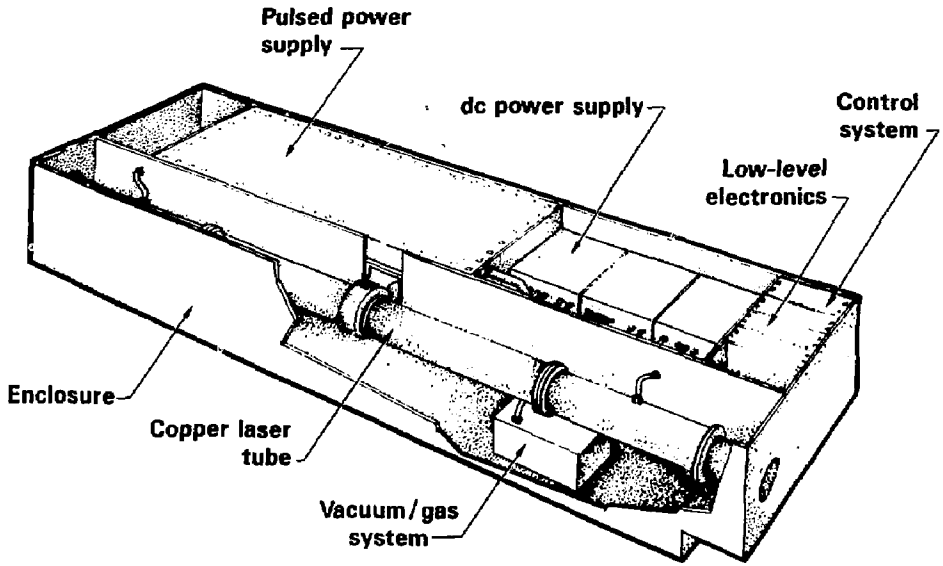


Fig. 2-11. The operability of the AVLIS separator system is supported by on-site repair and refurbishment.

Refurbishment will be performed at the component level only in cases where it proves to be economically appropriate (such as random, infrequent failures of inexpensive components). The actual operational experience of the AVLIS Production Plant may eventually dictate a revision of these procurement and replacement strategies toward replacement of entire units as the unit costs decrease and the unit component lives are extended.

2.2.1.2. Transition from Engineering Development to Construction Procurement. During the early developmental phase of AVLIS, the design, prototype development, and experimentation was done primarily within the development organization (LLNL and Martin Marietta Energy Systems, Inc.).



Plant prototype packages are now being procured as build-to-print items

Fig. 2-12. The laser system modules are refurbished offline utilizing plug-in subsystems and replacement of complete units online.

The suppliers have provided materials, conventional services, standard equipment, and build-to-print components. Exceptions to this generalization are pulsed power systems, instrumentation, and integrated mechanical systems (e.g., vacuum, cooling, structures, gas supply), which are currently being supplied as complete systems and subsystems.

For the construction of the Full-Scale Demonstration Facility, laser subsystems (pulsed power systems and control modules, for example) are being assembled and tested by the suppliers. The level of procurement has moved from components to subsystems.

	EXTERNAL MARKET STRENGTH	PREFERRED STRATEGY	BACK-UP STRATEGY
Throwaway	Strong	Procure finished item.	
	Potential	Procure at available integration level. Encourage commercialization.	Procure parts. Assemble in plant.
	No Prospect	Procure at available integration level.	
Recycle	Strong	Procure at level of replacement item that is economical.	
	Potential	Target procurements at level of replacement items and encourage commercialization.	Procure parts. Assemble in plant.
	No Prospect	Procure at available integration level.	

Fig. 2-13. AVLIS equipment procurement strategy is determined by refurbishment practices and the strength of the outside market.

During the construction phase of the AVLIS Production Plant, however, the suppliers will provide larger quantities and second or third generation versions of these subsystems. There will be no more developmental work at this stage, except in cases where the advantage of performance improvements is high and the development risk is low. Figure 2-14 illustrates the transition from development, through engineering demonstration, to construction.

The expanded role taken by the suppliers during AVLIS Production Plant construction requires preparation by both the AVLIS developers and the suppliers. The Industrial Access Program is focusing the attention of the engineering development organization on the procurement needs of the production facility. Care is being taken during the engineering development phase to utilize multiple suppliers who are capable of

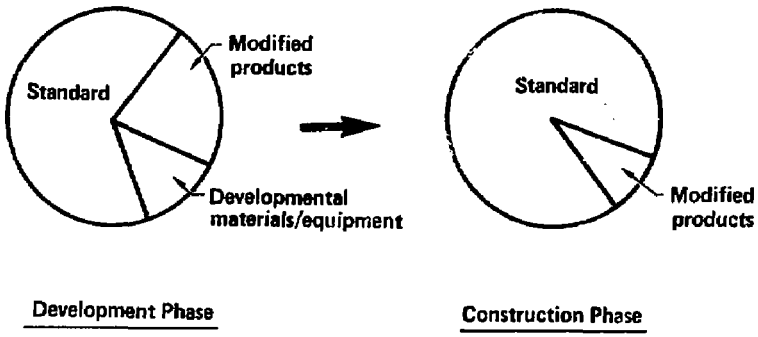


Fig. 2-14. One objective of the engineering development program is to identify a supplier network such that all construction phase procurements are either standard equipment or modified product competitive procurements.

manufacturing at the scale that will be needed for production facility construction and operation. Secondly, contracts with potential suppliers in the qualification development activities for modified products and developmental materials/equipment are structured to ensure competitive procurement for the production facility.

The AVLIS program is in transition from engineering development to full facility construction. The Full-Scale Demonstration Facility is being built at LLNL in Livermore, California. Figure 2-15 shows a cut-away sketch of the Full-Scale Demonstration Facility, which will include hardware that represents the prototype for the AVLIS Production Plant. In the future, it is also expected to serve as the test-bed for AVLIS process equipment improvements. The procurement process for the laser and separator hardware to be included in this facility allows the AVLIS engineering development organization and some of the potential production plant suppliers to interact on both standard and developmental equipment. The benefits for the AVLIS Production Plant construction

project include the development of an initial base of qualified suppliers and a smooth transition from developmental work to the plant construction phase. Figure 2-16 illustrates the role of the Full-Scale Demonstration Facility in the transition from engineering development to construction.

2.2.1.3. Transition from Procurements from the Construction Phase to Operations. After the AVLIS Production Plant is built, the procurements to support the operation of the facility will become standard in nature. Industries that have strong markets beyond AVLIS will routinely support the needs of the production plant operation (control modules, pulsed power supplies, optical coatings, etc.). The remainder of the plant operational needs will be satisfied either by its on-site refurbishment facilities or by commercial suppliers who are capable of supplying AVLIS specialty items at lower cost than they can be repaired on site (a possible example is a laser head).

As discussed in subsection 2.2.1.1. of this document, the operational considerations of the AVLIS Production Plant strongly influence the overall construction procurement policy that the AVLIS program will implement. The AVLIS Production Plant areas used to perform refurbishment operations will also be used for the initial assembly of the separator and laser system modules. The quantities of construction and operational phase procurements will be balanced as much as possible to avoid supplier capitalization in excess of long-term operational needs. The effect of external market conditions on AVLIS suppliers will be considered to ensure a reliable supplier base for operation. Thus, the construction phase procurement strategy developed in the Industrial Access Program will provide for a smooth transition to the operational phase. Figure 2-17 illustrates the transition of procurements from AVLIS Production Plant construction to operation.

2.2.1.4. AVLIS Technology Spin-offs. The Stevenson-Wydler Act was established in 1980 to facilitate the transfer of technology from government projects to private U.S. industry. The development of the AVLIS process has spurred the advancement of existing technologies and has also resulted in the development of totally new technology. Although

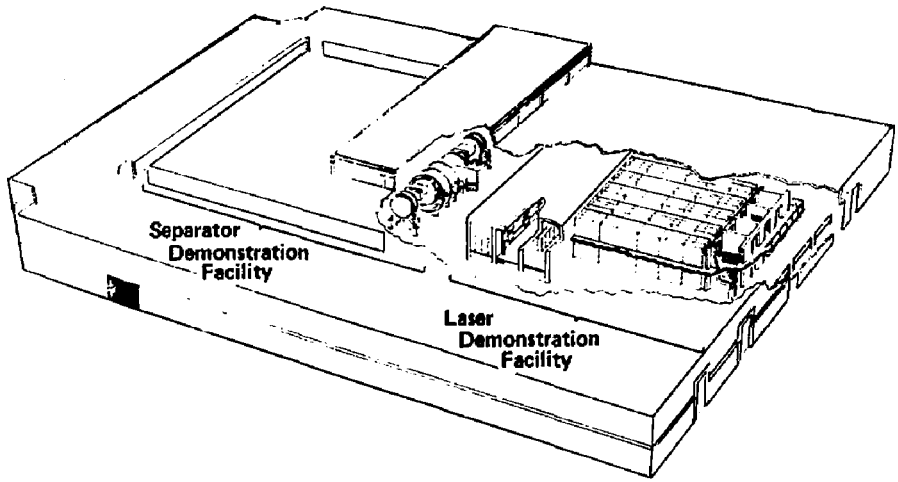


Fig. 2-15. The Full-Scale Demonstration Facility at LLNL represents the prototype for the AVLIS Production Plant separator and laser systems, and their supporting systems and facilities.

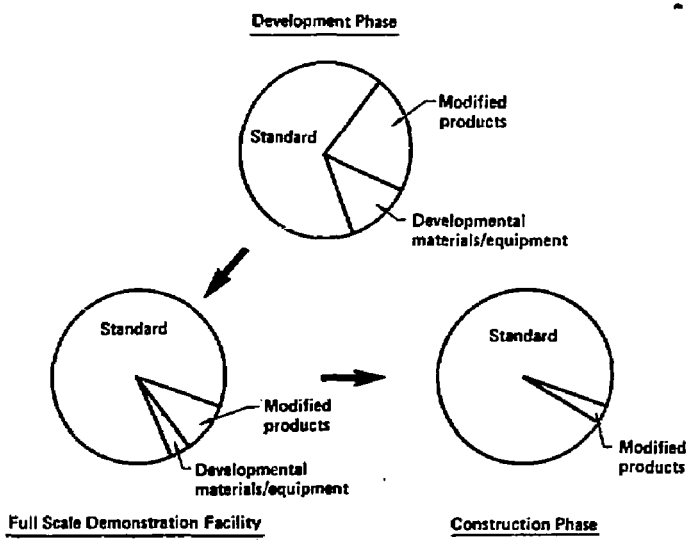


Fig. 2-16. The Full-Scale Demonstration Facility construction will complete the phase of developmental procurements.

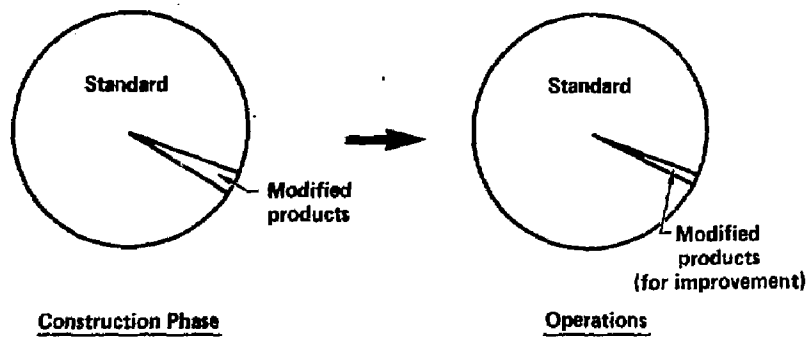


Fig. 2-17. Procurements for the operation of the AVLIS Production Plant will be standard and competitive. Some items, such as optical coatings that can benefit from further improvement, may continue to be procured as modified products to stimulate supplier development.

no technology transfer is required for the production of AVLIS Production Plant equipment, technological advances will be made available for use by industry. This technology spin-off process is being promoted via the Industrial Access Program.

The active transfer of technology by the AVLIS organization is limited by only two considerations: goals for non-proliferation, and the external market's potential. To impede the AVLIS process from being modified and extended (through additional research) for the production of weapons materials, some aspects of the process and equipment design are restricted.

The AVLIS program will benefit from the commercialization of marketable AVLIS technology. Larger production levels will result in lower unit costs, because a manufacturing company can spread capitalization costs among all customers and can profit from its investment more quickly. Therefore, the AVLIS program's costs would be reduced from those for one-of-a-kind or limited-use products. In

addition, the incentive of an expanded market will encourage the suppliers to develop more rapidly the products and services that are needed for AVLIS.

2.2.1.5. Small Business and Government Socio-Economic Guidelines. The Small Business Innovation Research Program was authorized by the Small Business Innovation Development Act in 1982. The DOE is a participant in this Program in the area of uranium enrichment technology research. Many of the procurement needs of the AVLIS Production Plant are well-suited to small businesses, in part due to the build-to-print nature of many equipment procurements. For this reason, the AVLIS program places special emphasis on the utilization of small businesses for AVLIS Production Plant procurements.

All government-funded programs must be responsive to the procurement guidelines that have been established to assist disadvantaged businesses. The AVLIS program currently utilizes the guidelines that are sponsored for procurement of Department of Energy engineering development projects. These guidelines will also be applied for AVLIS Production Plant procurements so that the benefits of AVLIS technology are distributed throughout U.S. industry.

2.2.2. Procurement Methods

Normal competitive procurement practices will be used. Procurement solicitations will be issued along with drawings, specifications, and terms and conditions to interested suppliers. In cases where time is critical or the item to be procured has critical specifications, prequalification of multiple suppliers will be used. No developmental procurements are anticipated. First article acceptance tests may be used for some laser subsystems and components. Procurement liaison representatives from both LLNL and Martin Marietta Energy Systems, Inc., coordinate the procurements for the program engineering development phase and production plant construction phase.

2.2.2.1. Requests for Quotations. The designated AVLIS procurement liaisons, with appropriate technical and scheduling input from AVLIS Production Plant project personnel, will coordinate the preparation and scheduling of requests for quotations for all AVLIS Production Plant procurements. Most production plant procurements, including materiel and services that are commonly offered by more than one supplier, long lead time items, and equipment developed through qualification development activities are being procured using this method.

Care will be taken that the initial requests for quotations contain sufficient information to elicit complete, competitive, and comparable proposals from an adequate number of suppliers. The Industrial Access Program is assisting this effort by the development of supplier lists in each of the major procurement categories. These lists are part of the Procurement and Supplier Data Base that is discussed in section 3 of this document.

The requests for quotations will contain a statement of the work to be performed, the quotation evaluation criteria, information concerning any prequotation supplier conferences, supplier qualification criteria, and any other information needed to assure that the quotation process proceeds efficiently. The entire quotation solicitation and evaluation process will be structured so that small businesses and businesses owned by economically and/or socially disadvantaged persons have an opportunity to provide materiel and services for the AVLIS Production Plant.

2.2.2.2. Contracting Options. AVLIS Production Plant equipment will be bought using fixed-price contracts to the maximum extent practicable. Much of the component, fabrication, and subsystem procurement will be build-to-print at a fixed price. Construction work for the production plant will be done under fixed-price contracts, or by a cost-plus-award-fee contractor. Some standard services will be purchased on fixed-price, time-and-materials contracts. In addition, during the qualification development activities for modified products and developmental materials/equipment, cost-plus-fixed-fee contracts are being used.

Modified Products. Selection of a supplier for a modified product will be based on an evaluation of sample articles. These samples will be "first articles," in that they result from the standard manufacturing techniques that will be used for the production run. Multiple suppliers who have undergone a preliminary qualification (see the subsection on Standard Criteria below) receive a fixed-price or other appropriate type contract (depending on the extent of the modification) to produce a representative sample of a piece of production equipment. The AVLIS organization is testing these samples and providing feedback to the suppliers. This sample production and testing process is repeated until acceptable items are produced. The qualified suppliers will compete for production of the item. The supplier and backup (if appropriate) selected will provide the equipment under fixed-price contracts.

Developmental Materials/Equipment. Developmental material/equipment is being obtained for the engineering demonstration systems following a sequence of conceptual design, prototype, and testing iterations. Once vendors have successfully gone through this process and have been selected, they will be able to begin finalizing the product design in cooperation with the AVLIS design teams. Currently, a combination of project engineering staff and single or multiple suppliers are participating in these developments. The final design and possibly a backup are selected on the basis of the prototype.

As in the process for modified products, potential suppliers for developmental material/equipment undergo preliminary qualification screening. The qualifying suppliers develop the design and a prototype under fixed-price or other appropriate contracts. Other suppliers may also be solicited to bid on the production material/equipment procurement. The specific development sequence and participant responsibilities vary depending on the complexity of the item and the expertise of the participants. The AVLIS extractor power supplies are currently being obtained with this approach.

2.2.2.3. Vendor Qualification. Supplier qualification provides a measure of quality assurance and facilitates procurements. Standard supplier qualification criteria and procedures are used for all items readily

available. In addition, the qualification development activities discussed in Subsections 2.1.3. and 2.1.4. are used to qualify both suppliers and production materials/ equipment for the AVLIS Production Plant. In many cases, the item procured is a catalog item and requires minimal additional supplier qualification and quality assurance.

Standard Criteria. The standard method of qualifying suppliers is to examine in detail their financial condition and performance record, analyze the current capabilities of their facilities, and determine the competence of their personnel to perform the work. This critical review identifies those suppliers that are capable of reliably providing the quality and quantity of equipment needed for production. The most efficient use of both AVLIS program and supplier resources is ensured if only capable suppliers participate in the proposal process.

Modified Products. As discussed in Subsection 2.1.4., qualification development activities are used to qualify suppliers when items similar to what is required for the AVLIS Production Plant are already commercially available. In this case, it is known that the supplier has facilities and a process in place to make the desired product. The AVLIS organization qualifies the supplier by specifying the desired modifications, obtaining a sample product, testing the sample, and reviewing the data and design with the supplier. This process is repeated until the sample product meets all the desired requirements of a piece of production equipment. In general, multiple suppliers participate in the product modification process so that the final procurement is competitive.

Developmental Materials/Equipment. The qualification development activities for developmental material/equipment call for the AVLIS program and procurement personnel to (1) identify potential suppliers for a product that is not currently commercially available, then (2) interact with them until a piece of production quality equipment is produced. The suppliers undergo the standard evaluation discussed in Standard Criteria subsection as a first step. The candidate suppliers are identified from responses to preliminary advertisements and from the sources and experience of AVLIS program and procurement personnel. The satisfactory candidate suppliers are invited to participate in a competitive design/prototype phase. The designs are reviewed and the prototypes are

tested by the AVLIS program personnel and the results fed back to the suppliers. When the equipment manufacture has been reduced to common practice by this process, the procurements are solicited more broadly.

2.2.3. Quality Assurance

The AVLIS Production Plant construction project will have a formal quality assurance program for assuring the performance of equipment and facilities. The AVLIS program a reliability, availability, and maintainability analysis for the production plant will be used in conjunction with the quality assurance plan to determine the construction activities and equipment items that will require special attention to quality control and quality assurance.

In general, the national consensus quality assurance standards already in use by supplier organizations will be considered adequate for AVLIS Production Plant equipment. The exceptions identified during the reliability, availability, and maintainability analysis will be dealt with on a case-by-case basis in the equipment specifications. The special actions required for these exceptions may include material certifications, verification of required test results, equipment calibration requirements, evidence of process control, and training and certification of personnel.

The AVLIS organization and contract manager will assure that adequate funding, manpower, and scheduling coordination is available to implement and track all special quality assurance actions that are considered necessary to assure quality. Examples of the activities that may be required are supplier surveillance, first article evaluation, and final approval of inspection hold points. The AVLIS Production Plant procurement organization will institute a procedure for control of deviations, waivers, and nonconformances in accordance with established DOE policy.

The quality assurance for all on-site construction and installation operations for the AVLIS Production Plant will be administered according to the quality assurance program established for the facility in coordination with the the cognizant DOE Operations Office.

3. PROCUREMENT AND SUPPLIER DATA BASE

3.1. INTRODUCTION

A data base is being developed to support directly the Industrial Access Program. This data base--formatted and categorized for the use of procurement managers--has been compiled from the project data, equipment purchase listings, and schedules that have been developed for the management of the AVLIS engineering development and AVLIS Production Plant projects. The purpose of this data base is to facilitate the identification of potential suppliers for the production plant and to promote industrial visibility into the AVLIS program. The Industrial Access Program, Procurement and Supplier Data Base is being updated as new information becomes available.

The manner in which each part of the Industrial Access Program data base has been prepared and how each is being used to support the AVLIS program and the Industrial Access Program are discussed in the following sections.

3.2. COMMERCIAL AVAILABILITY OF AVLIS EQUIPMENT

A Work Breakdown Structure has been developed to define, organize, and identify the work efforts for the construction of the AVLIS Production Plant. The detailed levels of the Work Breakdown Structure identify the equipment to be procured for the plant. In this subsection, the organization provided by the Work Breakdown Structure is used to discuss the commercial availability of this equipment.

The first three levels of the Work Breakdown Structure are shown in Fig. 3-1. The conventional pieces of the AVLIS Production Plant construction project can be identified from this level of detail. Commercial availability of the material and services required to complete the Process Building Conventional Facilities and Plant Support Facilities (Work Breakdown Structure elements 1.1 and 1.4) is not an issue. A large number of companies capable of performing the work in these elements are located in the general geographical area around Oak Ridge.

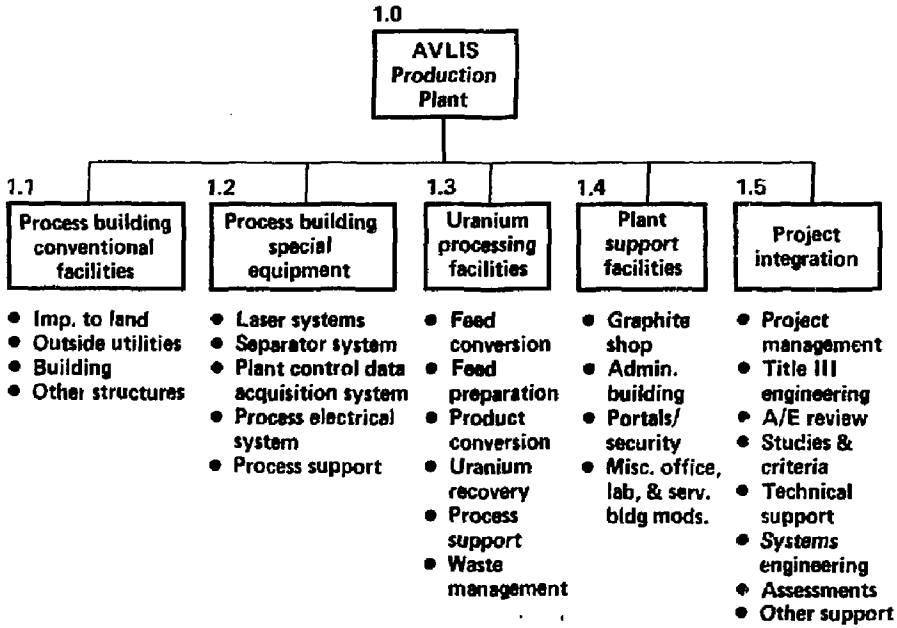


Fig. 3-1. The AVLIS Production Plant Work Breakdown Structure.

The equipment needed for the Uranium Processing Facilities (Work Breakdown Structure element 1.3) is also available from multiple suppliers. A few items, such as the casting conveyor and the furnaces, have been modified from what is used in the steel industry. However, there are multiple suppliers with steel industry experience that are capable and willing to compete to provide each of these items.

The Project Integration (Work Breakdown Structure element 1.5) will be performed by AVLIS personnel from LLNL and Martin Marietta Energy Systems, Inc. These personnel will be supported by one or more architectural/engineering firms. At present, Bechtel, Stone and Webster, and Westinghouse are providing engineering services for the conceptual design phase of the AVLIS Production Plant.

The only remaining Work Breakdown Structure element for which commercial availability is a consideration involves the Process Building Special Equipment. As can be seen from Fig. 3-1, this element contains the Laser Systems (1.2.1), the Separator System (1.2.2), the Plant Control Data Acquisition System (1.2.3), the Process Electrical Systems

(1.2.4), and Process Support (1.2.5). Elements 1.2.3, 1.2.4, and 1.2.5 contain equipment and software that are either standard off-the-shelf items or build-to-print/build-to-specification items. Multiple suppliers exist to provide all items in these three elements.

Much of the equipment in Work Breakdown Structure element 1.2.1, Laser Systems, has been developed for the AVLIS process. The items in this element are the Copper Laser System (1.2.1.1), the Dye Lasers (1.2.1.2), the Optical System (1.2.1.3), the Instrumentation and Controls (1.2.1.4), and the Refurbishment/Test Equipment (1.2.1.5). Figure 3-2 contains a list of representative suppliers for the key items in each four-digit element with an estimate of the number of capable suppliers that exist. As can be seen from the figure, there are at least three qualified suppliers for each key item; this is a sufficient number to ensure sufficient supply and competitive procurement of each item.

As with the Laser Systems, the Separator System (Work Breakdown Structure element 1.2.2) has been specifically developed for AVLIS. The items in this element are the Pod System (1.2.2.1), the Separator Local Control System (1.2.2.2), the Module System (1.2.2.3), and the

WBS Number	System Element	Representative suppliers	Potential Suppliers
1.2.1.1	Copper Laser System	TRW, Northrup, Hughes, MMES	20
	Laser head (shell; core)	FMC, Process Equipment; Coors, McDanel, Zircar	200; 10
	Enclosure	FMC, Process Equipment	200
	Pulsed power subsystem	Maxwell, Physics International, Raytheon	10
	Gas/Vacuum subsystem	FMC, Process Equipment, Consolidated Vacuum	30
	CVL optics	Spectra Physics, Laser Optics, OCLI	10
	Support structures	Albany Steel, PST Steel, Bethlehem Steel	100
1.2.1.2	Dye Laser System	TRW, FMC, Spectra Physics	100
	Mechanical assemblies	Connors Manufacturing, Remmele, Speedring	100
	Dye pumping system	PMI, S & O, Monterey Mechanical	100
	Dye laser optics	Spectra Physics, ALE, Laser Sonics	10
	Dyes	Cyanamid, Eastman Kodak	10
1.2.1.3	Optical System	Spectra Physics, Itek, OCLI	10
1.2.1.4	Instrumentation and Controls	EMC, Honeywell, Quadrex	30
1.2.1.5	Refurbishment/Test Equipment	TRW, Northrup, Hughes	40
	Optics	Zygo, Spectra Physics	10
	Test/QA Equipment (Conventional)	Tektronics, Hewlett Packard, Ethe Technology	10

Fig. 3-2. Representative suppliers for the Work Breakdown Structure element 1.2.1: Laser Systems.

Refurbishment/Test Equipment (1.2.2.4). Figure 3-3 contains a list of representative suppliers and estimates of capable suppliers for the key items for the Separator System. Again, a sufficient number of capable suppliers exist for all items in this element.

WBS Number	System Element	Representative Suppliers	Potential Suppliers
1.2.2.1	Pod System	TRW, Northrup, Lockheed	20
	Vaporizer	Lockheed, McDonnell Douglas, TRW	20
	E-beam system	Maxwell Labs	10 -20
	Guns	FMC, Industrial Contractors, Process Equipment	200
	Power supplies	Maxwell, Universal Voltronics	20
	Crucible	Cadman, Zak	20
	Feeder/Caster	FMC, Industrial Contractors, Process Equipment	200
	Extractor/Collector	Lockheed, McDonnell Douglas, Northrup	20
	Enclosure assembly	Integrated Contractors	20
	Ion extractor assembly	Ultra Carbon, Gem City, Boeing	100
	Alignment system	FMC, Aerojet	20
	Thermal system	Maxwell, General Electric	10 - 20
	Heaters	Thermcraft, Sunbeam, Ipsen, Abar	20
	Heater power supplies	General Electric, Westinghouse, ITE	40
1.2.2.2	*Instrumentation*	EMC, Honeywell, Quadrex	30
1.2.2.3	Module System	Chicago Bridge & Iron	30
	Vacuum tankage	Chicago Bridge & Iron, Pittsburgh Des Moines	30
	Cooling systems	Industrial Contractors, Process Equipment, FMC	200
	Vacuum system	High Vacuum Equipment, Consolidated Vacuum	25
	Air handling system	S&Q Corporation, American Air Filter	100
1.2.2.4	Refurbishment/Test	(Conventional equipment)	

Fig. 3-3. Representative suppliers for the Work Breakdown Structure element 1.2.2: Separator System.

In general, the procurement strategy guidelines discussed in subsection 2.2.1.1 will determine the level of integration at which AVLIS Production Plant items will be procured. However, by the time plant procurements are to be placed, some suppliers may be qualified to provide equipment at higher levels of integration. Suppliers interested in bidding on multiple specification packages, or in providing equipment at higher levels of systems integration will be encouraged if their proposals are economically favorable. Suppliers who have the potential of providing this type of systems integration have been identified for the

laser and separator systems. Figures 3-4 and 3-5 give examples of suppliers that could provide equipment at higher levels of complexity, as defined by the Work Breakdown Structures levels.

The construction of the Full-Scale Development Facility laser and separator systems is proceeding as planned. The AVLIS special equipment for this facility is being procured using standard procurement procedures and has not experienced procurement difficulties, in spite of an extremely rapid schedule. In addition to prototyping the procurement process for the plant, this activity is generating a complete set of suppliers, including those given as examples in Figures 3-2 through 3-5.

3.3. SUPPLIER LIST

The supplier list contained in this document has been compiled using AVLIS equipment purchase records from October 1982 through June 1984. The companies that make up this list have been entered alphabetically into a computerized database that can be searched and sorted. Each company has been assigned to one or more procurement categories, depending on the type of equipment or service each has provided. Figure 3-6 contains the list of the procurement categories used. The database file for each company listed also contains the item or service purchased, and the zip code of the company as shown in the procurement record (to indicate geographic location).

Appendix A of this document contains a sorted version of the supplier list. The database entries have been grouped according to the procurement categories shown in Fig. 3-6. Figure 3-7 shows a sample page of this sorted list. As the Industrial Access Program progresses into the actual construction procurement phase, the supplier database and the information included for each supplier will be expanded.

Companies that learn about the AVLIS Production Plant project through advertisements and supplier conferences may request that their names be added to the list as potential suppliers, in the appropriate procurement categories. To facilitate this access by interested suppliers, a point of contact has been identified.

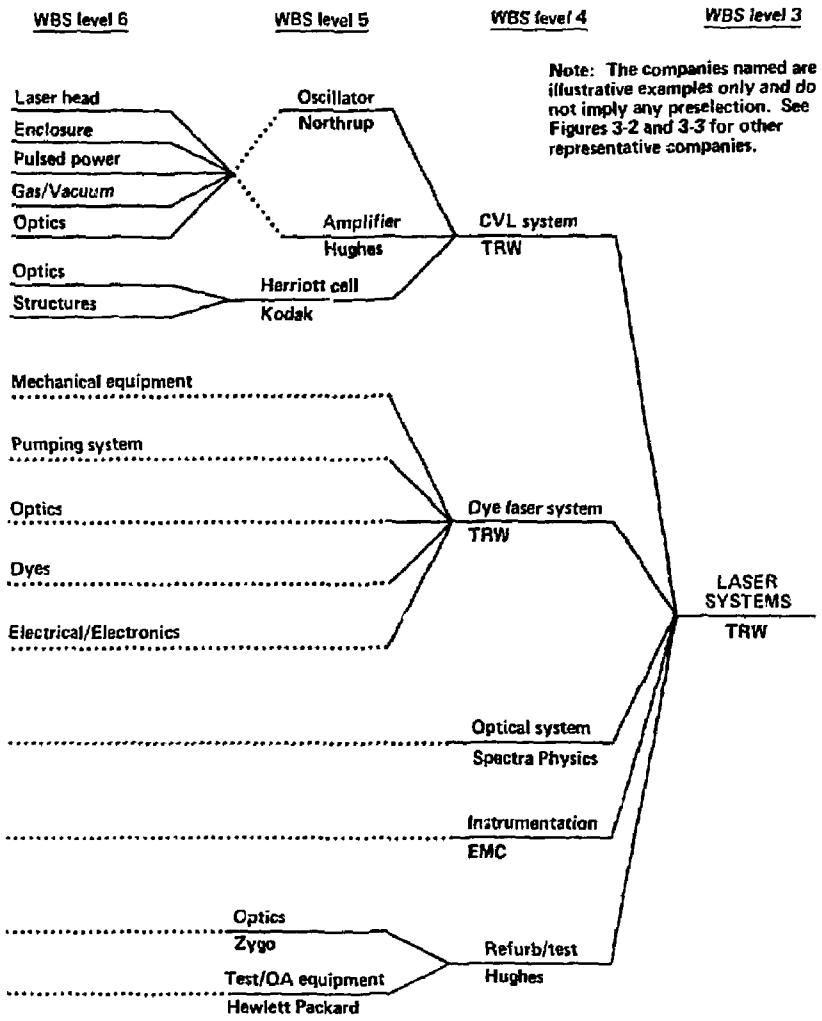


Fig. 3-4. Suppliers may propose to provide equipment at higher levels of systems integration. Examples of companies capable of doing this at the Work Breakdown Structure levels 3 through 5 are provided for the Laser Systems.

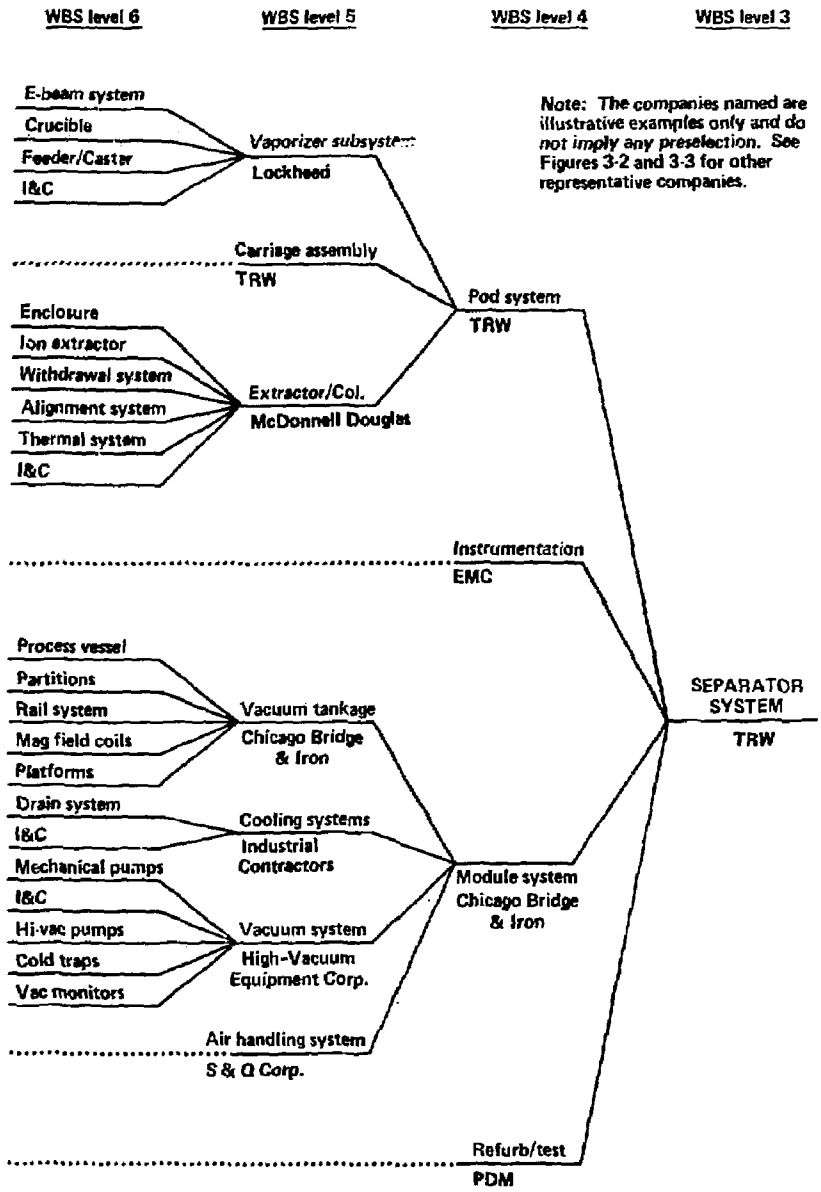


Fig. 3-5. Suppliers may propose to provide equipment at higher levels of systems integration. Examples of companies capable of doing this at Work Breakdown Structure levels 3 through 5 are provided for the Separator Systems.

Procurement Categories

Bulk Materials	***General Support***
Construction	**I & C/Computers**
Electrical	**Laser/Optical Systems**
Engineering Design	**Mechanical**

Fig. 3-6. Procurement catagories used in the AVLIS procurement data base.

The current supplier list is included in this document. Updated versions and sorts of the list will be available on request, along with copies of this document and other information contained in the AVLIS Procurement and Supplier Data Base. The designated Industrial Access Program point of contact discussed in the previous paragraph will respond to these requests.

The construction manager for the first AVLIS Production Plant will use the supplier network contained in this evolving Industrial Access Program list to identify companies interested in bidding on AVLIS work. In addition, the list will be maintained to assist the procurement for all future phases of the AVLIS program. Experience with suppliers gained during the engineering development and demonstration programs will be directly applicable to the construction procurement for the AVLIS Production Plant. Additional information on suppliers, including company addresses, will be available through the AVLIS procurement records or from commercially available procurement source books.

VENDORS - LASERS & OPTICS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PC
A. JAEGERS	L/O	ACHROMAT LENS	11563
AERO-SPACE WELDING CO	M,L/O	QUAD CLAMPS & BASE/4cm OSCILLATOR	95035
AEROTECH INC	L/O	MIRROR MOUNTS	15238
AIRTRON	L/O	LINEAR AMP/DYE WINDOW ASSY	07927A0
ALLIED CORPORATION	L/O	METGLAS	07054
ALPHA GROUP INC	L/O	4cm OSCILLATOR	94577
ANDOVER CORPORATION	L/O	CENTER WAVELENGTH FITLERS	01845
ANGENIEUX CORP OF AMERICA INC	L/O	3" WINDOW/LENS	03055
APPLIED OPTICS INC	L/O,M	LASER WINDOW	94544
ARDEL	L/O	TRANSLATOR	08457
ARTEL COMMUNICATIONS CORP	L/O	CV FIBER OPTICS	01607
ASTRO MET	L/O	POROUS TUNGSTEN TUBES	45215
AVTECH ELECTROSYSTEMS LTD	L/O	LENS	11101
BAUSCH & LOMB INC	L/O	GRATING LASER	14627
BEARING ENGINEERING CO	L/O	TELESCOPE PRG	94103
BELDEN CORP	L/O	OPTIC FIBER CABLE	60154
BERKLEY GLASS LAB	L/O	QUARTZ TUBE/C/M LASER	94530
C M C ENGINEERING	M,L/O	MOUNTINGS & FASTENERS/LASER TUBES	94538
C V I LASER CORP	L/O	LASER MIRRORS	87117
CABAL INC	L/O	3" TURNING MIRRORS	94306
CARSON OPTICAL INSTRUMENTS	L/O	INVESTOSCOPE/ZEISS SV8	94616
CAST ALUMINUM & BRASS CORP	L/O	CVL CASTING	94577
CHAMP CO.	L/O,M	TELESCOPE ASSY/COLLECTOR TANK	95008
CLEVELAND CRYSTALS INC	L/O	KDP SAMPLES	44117
COHERENT INC	MAC,L/O	POWER METERS	95601
COMMONWEALTH SCIENTIFIC CORP	L/O,E	ION SOURCE/PWR SUPPLY,MILLATRON & PARTS	22314
CONTINENTAL OPTICS CORP	L/O	CVL 3" WINDOW/SHEAR PL/BEAM SPLITTER	11788
CONTRAVES COERZ CORP	L/O	TELESCOPE	15238
CORNING GLASS	L/O	CVL WINDOW BLANKS	14831
COVENTRY TOOL MACHINE	L/O,E	OPTICS PRG/LINEAR AMP	2901

Fig. 3-7. Sample AVLIS supplier list sorted for suppliers of laser/optical equipment.

3.4. AVLIS PRODUCTION PLANT PROJECT COST BREAKDOWNS

There are two basic cost breakdowns of AVLIS Production Plant procurements that are relevant to the Industrial Access Program. Breakdowns have been prepared according to the AVLIS Production Plant Work Breakdown Structure and according to the procurement categories defined for the data base supplier list. These procurement categories act as a cross index of supplier types within the Work Breakdown Structure. The two project cost breakdowns are discussed in the following two subsections. Updated breakdowns will be prepared and added to the Industrial Access Program data base as detailed estimate information becomes available.

3.4.1. Cost Breakdown by Work Breakdown Structure

A project cost breakdown has been prepared for the Industrial Access Program data base that corresponds to the third level in the Work

Breakdown Structure. This breakdown is primarily used to illustrate the major division of AVLIS Production Plant costs. The project cost breakdown for the third level in the Work Breakdown Structure is shown in Fig. 3-8.

3.4.2. Cost Breakdown by Procurement Category

A primary goal in the development of the Industrial Access Program data base was the identification of potential construction and operational phase suppliers for the AVLIS Production Plant. For this purpose, it is useful to have a cost breakdown according to the types of suppliers.

Figure 3-9 shows the project cost breakdown by procurement category for the AVLIS Production Plant. This breakdown is being used in the Industrial Access Program to identify major supplier types and to communicate project needs to the suppliers in each category. Potential suppliers for the production plant will be able to access this data base breakdown to determine the amount of work in their particular area.

3.5. SCHEDULE

The schedule for construction of the AVLIS Production Plant is shown in Fig. 3-10. The list of procurements and their planned start dates are given in Fig. 3-11. The long-lead time items are noted. Construction is planned to start in 1987 with special equipment procurements beginning in that year and lasting about three years until 1990. During this period, almost 1 billion dollars in engineering services, construction, and equipment will be needed. Between 1992 and 1995, an additional 500 million dollars (FY86 dollars) will be required.

The generic system test and deployment logic is shown in Fig. 3-12 with specific dates given for the special equipment broken down to Work Breakdown Structure level 4 or 5 in Figs. 3-13 and 3-14. The sequence of activities for these items begins with preliminary integrated system and life tests that establish the basis for the conceptual design and the equipment. The items for which suppliers or products have not yet been qualified have been included in a developmental materials/equipment list

WBS III	Costs ($M)	WBS III	Costs ($M)
Imp. to land	$ 10	Feed conversion	$ 18
Outside utilities	44	Feed preperation	9
Building	79	Product conversion	24
Other structures	10	Uranium recovery	11
		Process support	21
		Waste management	7
Laser systems	201	Graphite shop	7
Separator system	121	Admin. building	2
Plant control data acquisition system	11		
Process electrical system	63		
Process support	42		
		Project integration (level II – eng. & contingency)	109

Fig. 3-8. AVLIS Production Plant cost breakdown by Work Breakdown Structure.

preliminary (Title-I) design based on refined integrated system tests. By this time the full-scale engineering demonstration systems will be completed. The full-scale systems tests will provide the basis for definitive design (Title-II) and the preparation of the procurement packages. The procurements associated with the construction of the full-scale facilities will provide the base of suppliers for the production equipment.

Finally, the equipment will be fabricated, assembled, installed, activated and the AVLIS Production Plant will start operations. During this period, the full-scale engineering demonstration systems will have accumulated three years of operating experience with plant prototypical

Procurement Category	Costs ($M)
Bulk Materials	$ 9
Construction	105
Electrical	126
Engineering Design	109
General Support	35
I & C/Computers	82
Laser/Optics	201
Mechanical	122

Fig. 3-9. AVLIS Production Plant cost breakdown by procurement catagories.

components. For each of the principle subsystems listed in Figs. 3-13 and 3-14, a list of dates is provided of when the elements were first tested at full scale--engineering test (ET); the date when the element was first tested in the full-scale systems--plant preliminary design (PD)--complete and definitive design starts, the procurement start date (P), the duration from procurement start to first delivery, the total procurement duration to last delivery for the construction of the initial increment, and the date of operations start (O) for the system of which that component is an element.

3.6. DEVELOPMENTAL MATERIALS/EQUIPMENT LIST

As discussed in earlier sections, some materials and equipment required for the AVLIS Production Plant are not routinely available from commercial sources. The supplier qualification development activities for developmental material/equipment will result in production qualified

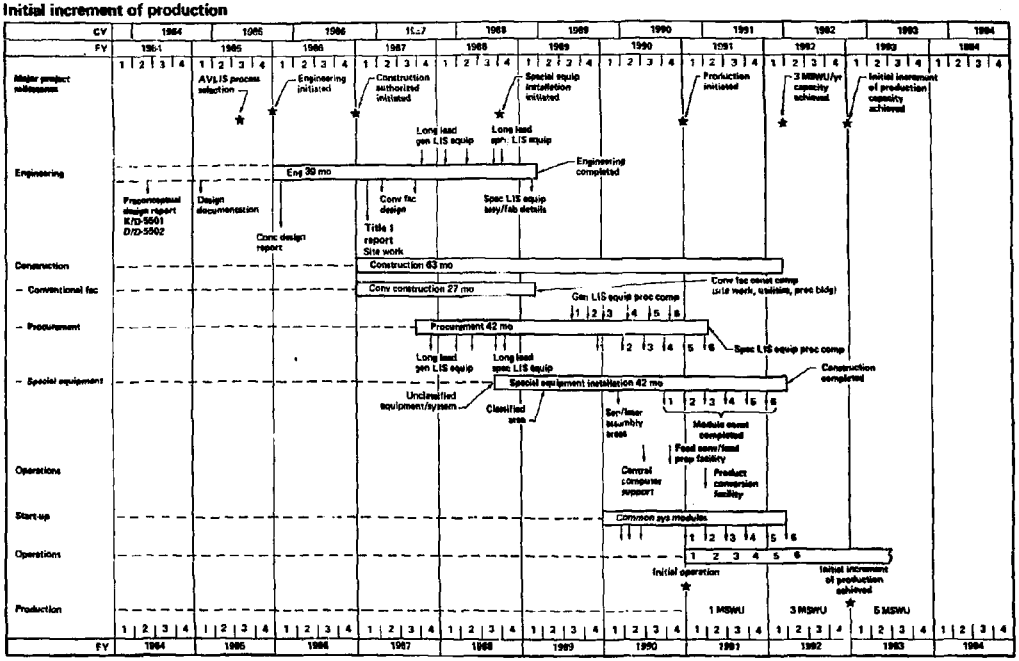


Fig. 3-10. Master schedule for the AVLIS Production Plant.

Procurement Items	Issue Dates
• Separator System	
— Facilities & services	87-3 (FY/Quarter)
— Vacuum chambers	87-4
— Refurbishment (assembly) equipment	87-4
— Extractor power supplies	88-1
— Vaporizer power supplies	88-1
— I & C long lead equipment	88-1
— Refurbishment (recycle) equipment	88-2
— Vacuum systems	88-2
— Cooling systems	88-2
— E-gun/reflux structures	88-3
— Carriage assembly	88-3
— Chamber internals (rails-liners)	88-3
— Transport equipment	88-3
— I & C panel fabrications	88-3
— Accountability system equipment	88-3
— Extractor/product collection equipment	89-1
• Laser System	
— Facilities & services	87-3
— Refurbishment (assembly) equipment	87-4
— Mounting support structures	88-1
— CVL head qual. parts/assemblies	88-1
— CVL switch qual. parts/assemblies	88-1
— CVL power qual parts/assemblies	88-1
— I & C long lead equipment	88-1
— Optical components	88-3
— Dye laser components	88-3
— CVL head hardware	88-3
— CVL power hardware	88-3
— I & C panel fabrications	88-3
— Pointing & centering	88-3
• Uranium process facilities	
— Facilities & services	87-3
— Feed conversion — long lead equipment	88-1
— Feed preparation — long lead equipment	88-1
— Uranium recovery — long lead equipment	88-3
— Product conversion — long lead equipment	88-3
— Feed conversion — support equipment/system	88-3
— Feed preparation — support equipment/system	88-3
— Uranium recovery — support equipment/system	88-4
— Product conversion — support equipment/system	88-4
— Waste management — equipment/systems	88-4
• Balance of plant	
— Facilities & services	87-3
— Plant control — long lead	88-1
— Power — long lead	88-1
— Graphite shop — long lead	88-1
— Cooling system — long lead	88-1

Fig. 3-11. AVLIS Production Plant procurements and procurement issue dates.

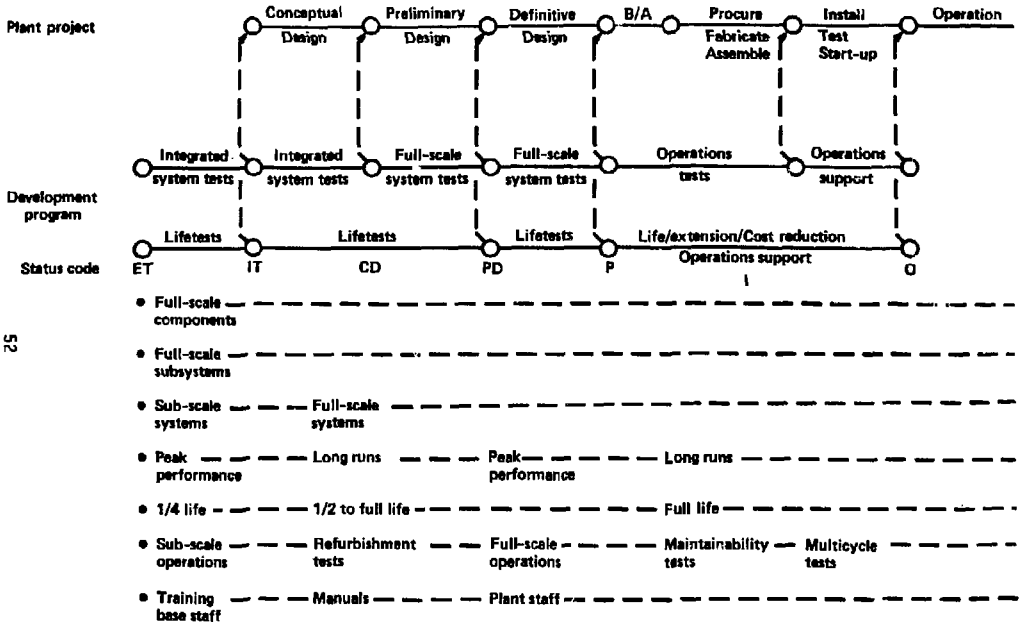


Fig. 3-12. Systems test, procurement, and deployment logic.

WBS Number	System Element	Test Date ET	System Test PD	Procurement P	First Delivery	Last Delivery	Operations O
1.2.1.1	Copper Laser System						
	Laser Head	3/86	3/87	10/87-3/88*	13-19 mos	32 mos	12/89
	Enclosure	3/86	3/87	3/88	13	26	12/89
	Pulsed Power	3/86	3/87	10/87-3/88*	13-19 mos	32	12/89
	Gas/Vacuum	3/86	3/86	3/88	13	26	12/89
	Optics	9/86	9/86	3/88	13	26	12/89
	Structures	1/85	1/85	10/87	6	18	11/88
1.2.1.2	Dye Laser System						
	Mechanical	9/84	1/85	4/88	13	26	12/89
	Pumping System	9/84	1/85	1/88	7	12	6/89
	Optics	9/86	1/85	3/88	13	26	12/89
	Dyes	1978	1/85	3/88	7	18	6/89
1.2.1.3	Optical System	2/85	2/85	4/88	13	26	12/89
1.2.1.4	Instrumentation and Control	2/85	2/85	10/87	18	33	8/89
1.2.1.5	Refurbishment						
	Optics	12/84	3/86	7/87	16	39	4/89
	Test/QA Equip.	12/84	3/86	6/87	16	39	4/89

*First date starts "first article" evaluation; second date starts full procurement

Fig. 2-13. AVLIS Production Plant laser system procurement schedules.

WBS number	System element	Test date ET	System test PD	Procurement P	First delivery	Last delivery	Operation O
1.2.2.1	Pod system						
	Vaporizer						
	E-beam system						
	Guns	6/85	6/86	10/87	18 mos	42 mos	2/90
	Power supplies	6/85	6/86	10/87	18	42	2/90
	Crucible	6/85	6/86	10/87	18	42	2/90
	Feeder/Caster	3/85	6/86	1/88	15	42	2/90
	Extractor/Collector						
	Enclosure assem	3/85	6/86	4/88	18	42	2/90
	Ion extractor	12/84	6/86	10/87	18	42	2/90
	Alignment	3/85	6/86	7/87	18	40	11/89
	Thermal system						
	Heaters	3/85	6/86	10/87	18	42	2/90
	Heater power	3/85	6/86	10/87	18	42	2/90
1.2.2.2	Instrumentation	6/85	6/86	10/87	22	37	3/90
1.2.2.3	Module system						
	Vacuum tankage	6/85	6/85	7/87	14	30	3/89
	Cooling systems	6/85	6/85	1/88	14	30	11/89
	Vacuum systems	6/85	6/85	1/88	14	30	11/89
	Air handling systems	6/85	6/85	1/88	14	30	11/89
1.2.2.4	Refurbishment/Test	3/85	6/86	7/87	16	40	9/89

Fig. 3-14. AVLIS Production Plant separator system procurement schedules.

to focus programmatic action on the resolution of the procurement problems they represent. As engineering development activities have progressed, items have been removed from and added to this list.

The current developmental materials/equipment list, with summary discussions of each item's application and its associated procurement problems, is provided in Appendix B of this document. Figure 3-15 contains the names of the current items. An up-to-date version of this list is being maintained in the Industrial Access Program data base.

Developmental materials/equipment

1. Extractor pulser for separator power conditioning (one vendor)
2. Graphite billets for separator module components (size)
3. Machining of graphite collector components for seperator module (vendor clearances)
4. Ceramic plasma tubes for large-bore copper vapor lasers (size)
5. Switching power supplies for large-bore copper vapor lasers (number of vendors)
6. Copper containment for copper vapor lasers (wick lifetime)
7. Optical coatings (reflectivity)

Fig. 3-15. List of developmental materials/equipment.

4. ACTION PLAN

4.1. POTENTIAL SUPPLIER IDENTIFICATION ACTIVITIES

AVLIS procurements will employ standard competitive procurement practices. Bidder lists for these procurements will be constructed of interested and qualified suppliers identified by several means. Some procurement needs will be advertised in trade association journals and other appropriate publications. AVLIS technical and procurement staff may directly contact some companies based on their reputation. Preliminary supplier conferences will be held to discuss general AVLIS procurement needs. Potential suppliers may themselves initiate contact with the AVLIS procurement organization. Finally, the supplier lists will be compiled using the Industrial Access Program data base lists, supplier catalogs, and procurement source books.

This Industrial Access Program document is one mechanism for providing information to interested companies that respond to these solicitations and contacts. Companies that wish to be considered as potential suppliers can fill out a short questionnaire that covers the information to be entered into the Industrial Access Program data base. In addition, copies of this document will be available from the DOE San Francisco Operations Office and Oak Ridge Operations Office Technical Information Center in Oak Ridge, Tenn.

After the solicitation phase, additional supplier conferences will be held to provide specific information about the AVLIS Production Plant procurement needs to potential suppliers. In general, these conferences will be held in Livermore, California; Oak Ridge, Tenn.; and other appropriate locations. For some procurement categories there may be both preliminary supplier conferences to orient suppliers and specific conferences to discuss actual procurement details.

Throughout the construction procurement phase for the AVLIS Production Plant, the Industrial Access Program data base will be maintained. Current copies of Data Base information will be available to interested companies.

4.2. ACTION ITEMS FOR PROCUREMENTS REQUIRING SPECIAL ATTENTION

4.2.1. Long Lead Items

The items needed for the construction of the AVLIS Production Plant that require a long lead time (due to material availability or other factors) have been identified as part of the conceptual design phase. The procurement of these items is scheduled to allow adequate time for delivery to meet AVLIS Production Plant project milestones. The timing of these procurements is given as milestones in the project procurement schedule shown in Fig. 3-10 and included in the Industrial Access Program data base.

4.2.2. Developmental Materials/Equipment

Every attempt is being made to conclude the developmental procurements, discussed in section 3.6, and summarized in Appendix B, during the engineering demonstration phase of the AVLIS development program. Preliminary solutions are currently available, but these do not yet fully meet the performance objectives for the final production facility. If fully qualified suppliers and products are not developed before AVLIS Production Plant procurement begins, acceptable quality items that are available will be used. In these cases, in particular, product improvement activities will continue into the operational phase for eventual installation during refurbishment.

There will be ongoing efforts to stimulate all AVLIS Production Plant suppliers to continue to improve facility efficiency through product and technology advances. Because of the routine recycling of equipment during plant refurbishment operations, these improvements will be integrated into the AVLIS Production Plant. The operating contractor for the AVLIS Production Plant will coordinate the program to stimulate and integrate product advances.

4.2.3. Vendor Access to Classified Technology

Some elements and configurations of AVLIS equipment are restricted by classification at this time. During the development and demonstration phases, suppliers without clearances have been used to provide components that are not classified. These components have then been assembled by AVLIS personnel into the final, classified configurations. If a supplier can make a sufficiently favorable proposal (from an economic standpoint) to provide an entire assembly for the production plant, the AVLIS program will seek clearances for the supplier so that access to the classified technology can be granted.

4.3. TECHNOLOGY TRANSFER ACTIVITIES

4.3.1. Improvements in Existing Technology

Satisfaction of the performance requirements of equipment for the AVLIS Production Plant will result in technology improvements in several fields. These improvements are generally in the areas of materials, component and system reliability, and operational lifetimes. The AVLIS technical staff is working with the suppliers, via the modified product and developmental material/equipment qualification development activities, to develop these improvements. Therefore, the transfer of some technological advances will be a direct result of AVLIS Production Plant suppliers participation in the project procurement process.

4.3.2. Other Applications of Separator/Laser Technology

The design of some AVLIS process separator subsystems was adapted from technology already in use in commercial metal refineries and processing plants for such materials as steel, tungsten, and aluminum. The advances made in this technology, therefore, can have direct application in these industries. Companies that wish to apply the metal handling processes developed for the AVLIS Production Plant will be encouraged to do so, particularly if they are AVLIS suppliers.

Conferences will be arranged with these companies, and design and performance information made available. Every effort, within classification restrictions, will be made to provide all necessary process information to interested industrial groups.

The AVLIS development program has caused significant advances to be made in the area of laser technology. The reliability, lifetime, power, and efficiency improvements in laser components resulting from the AVLIS program will both directly aid existing applications and stimulate the development of new applications. Improvements in technology will be made available to all interested in their application, if acceptable after classification issues.

4.3.3. Industrial Photo-Chemical Processing

There is potential for the use of lasers for photo-chemical processing. Rare-gas halogen lasers have already been used to produce vinyl chloride monomers. Photo catalytic processes may be further developed to produce other similar chemicals from simple feed. Lasers may prove to be economical in eliminating catalytic poisons such as H_2S during the production of methanol, methane, glycols, and other hydrocarbons. Finally, more speculative applications are possible in the control of combustion particulates, crystal and powder chemistry, and laser-induced biochemistry.

4.3.4. Application of Laser Isotope Separation in Other Areas

The AVLIS process can be used for several military- and energy-related applications involving the separation of isotopes of uranium and plutonium. One particularly fertile area is in the removal of still useful materials from radioactive waste.

AVLIS can also be used to separate the isotopes of other elements. One example is the interest that has been expressed in the enrichment of common mercury. Increasing the mass fraction of Hg-196 can substantially improve fluorescent lamp efficiency. The AVLIS program is continuing to investigate these applications while supporting their pursuit by private industry.

4.3.5. Privatization

A detailed discussion of the privatization of AVLIS technology is beyond the scope of this Industrial Access Program document, and is discussed in other AVLIS program documentation. However, the private industrial application of AVLIS, whether for uranium enrichment or other purposes, represents the ultimate achievement of technology transfer. The AVLIS program will strongly support the level of privatization activities that are sanctioned by the Federal government.

APPENDIX A: INDUSTRIAL ACCESS PROGRAM SUPPLIER LIST

This Appendix contains the current Industrial Access Program Procurement and Supplier Data Base supplier list. The list has been sorted according to procurement category: (1) bulk materials, (2) construction services, (3) data processing equipment, (4) electrical/electronic (5) engineering design services, (6) general support equipment and services, (7) instrumentation and controls, (8) laser and optical systems, and (9) mechanical. The companies listed are the actual suppliers of the AVLIS program at LLNL from the period of October 1982 through June 1984.

VENDORS - BULK ITEMS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
ALCHEMIST	B	ETHYLENE GLYCOL	94568
ALDRICH CHEMICAL CO INC	B	METHYL SULFOXIDE	53201
ALFA PRODUCT	B	IRON BROMIDE	01923
ALLIED-SYSCO	B	ALUMINUM FOIL	94544
ALPHA PRODUCTS	B	YTTERBIUM, INGOTS OF	01923
AMAX SPECIALTY METALS CORP	B	MOLYBDENUM, SHEETS & BARS	07054
AMERICAN BOA	B	FLEX CONDUIT/METAL HOSE	30130
AMERICAN STEEL	B	STEEL COLUMNS/BLACK PIPE	94623
ASHLAND CHEMICAL CO	B	FREON	94560
BAYFLEX	B	FLEX HOSE	94608
BECKLEY PERFORATING CO	B	PERFORATED TANTALUM	07027
BOLT TECHNIC	B	TUBES	77301
BOYD INDUSTR	B	PACKING MATERIAL	94579
BURDICK JACKSON LABORATORIES INC	B	2-METHOXYETHYL ETHER	49442
BURT BRICKER INC	B	CONDUCTIVE COATINGS	19899
C N C ENGINEERING	B,L/D	BUSHINGS & FASTENERS/LASER TUBES	94550
CADILLAC PLASTIC CHEM CO	B	DELRIN DISC/LEXAN SHEETS	94577
CALIFORNIA PERFORATION	B	PERFORATED TA	93270
CARBORUNDUM CO	B	BORON NITRIDE RODS	14302
CASTLE PLASTICS	M,B	PEDESTAL/TUBING	94566
CERMANICS MTL	B	BRAIDED SLEEVING	55144
CITY WIRE CLOTH INC	B	TI WIRE CLOTH	90723
COLOR SHOP INC	B	BRUSH THINNER	94710
COLUMBIA ORGANIC CHEMICALS INC	B	HEXACHLORO PROPANE	29290
COMMERICAL PLASTICS & SUPPLY CORP	B	PLASTIC	95050
COOL LIGHT CO INC	B	LAMPS, MINI-COOL	91606
COORS PORCELAIN CO	B	ALUMINA TUBES	80401
COPPER & BRASS SALES INC	B	COPPER TUBING	9460847
CORTH PLASTICS	B	PLEXIGLASS, SHEETS	95050
CTC ORGANICS	B	HEPTACHLOROPROPANE	30315
CURCO	B	STEEL PURLING/GALVANIZED ROOFING	94710
DELTA METALS	B	COPPER PLATES	94544
DIELECTIC SCIENCES	B	CABLE ASSYS	01581
DU PONT CO	B,Q	KAPTON FILM/SAMPLE KIT	19898
DYNASIL CORP OF AMERICA	B	BLANKS, 5" F.S.	08809
EASTMAN KODAK	B	RHODAMINE 101/PROJECTOR/FILM, PHOTO	94583
EJR PLASTIC	B	PVC ROD & SHEET	95035
ELECTRICAL SPECIALTY CO	B	GLASTIC, SHEET & ANGLES/SLEEVES	94080
ELECTRONIC SPACE PRODUCTS INC	B	POWDER, MOLYBDENUM METAL	90035
ERG INC.	B	TRITON GRAPHITE	UNK
ESCO CORP	M,B	WELD FITTINGS/TUBES & FITTINGS	94608
FANSTEEL METALS	B	TANTALUM FOIL	60064
FIBER MATERIALS INC	B	FIBERFORM CEMENT & BOARD	04005
FISHER CONTROLS INTL INC	M,B	SPACERS & ASBESTOS	94401
FLYNN & ENSLOW INC	B	MOLYBDENUM CLOTH	94107
FRANKEL COMPANY INC	B	SHEET TITANIUM	48018
FUTURA TITANIUM CORP	B	TITANIUM FASTENERS	91359
GATEWAY WIRE CABLE	B	CABLE	94610
GENERAL MAGNAPLATE-CALIFORNIA	M,B	LASER MOUNTS/COATINGS, HI-T-LUB	93003
GRAPHITE MACHINED PRODUCTS	B	POCO GRAPHITE	90242
GTE SYLVANIA	B	TUNGSTEN RODS	94010
GUYON ALLOYS INC	B	PIPE,SEEMLESS	91107
H. CROSS CO	B	TUNGSTEN RIBBONS	07087
HILTI INC	B,M	FASTENERS/SHOP DRILL	94577
HOSE & FITTING ETC	B	SLEEVES & NUTS	94577

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
HOSES UNLIMITED INC	B	HOSE ASSYS & FITTINGS	94610
HOUSE OF THREAD	B	FASTENERS, TA	95035
HOWARD WIRE CLOTH CO	B	WIRE CLOTH, TITANIUM	94545
HUNBOLT INSTRUMENT CO	B,M	WATER COOL BREAKER/LASER MOUNTS	94577
HYLAB ENTERPRISES	B	RIVET NUTS	94042
I.D.I.A.	B	CLEANING SOLUTION	94596
ICN K & K LABS	B	OCTACHLOROPROPANE	11003
INSULATION MATERIAL	B	SILICA	07090
K R ANDERSON CO INC	B	SILICONE FLUID	94086
KULITE TUNGSTEN CORPORATION	B	TUNGSTEN SHEETS	90606
LEAD PLASTIC	B	MACOR RODS	90021
LEED PLASTICS CORP	B	MACOR SHEETS	90021
LUSK METALS CORP OF NORTHERN CALIFO	B	PLATE,ALUM	94545
MATERIALS RESEARCH CORP	B,D	COPPER RODS/ANALYSIS OF V SAMPLES	950504
MELKES MACHINE	B	FERRO SEAL	91733
METAL BELLOW CORP	M,B	BELLOWS 6"/FLEXHOSE	91311
METALMART	B	NICKEL, INCONEL	90601
METRON INC	B	WIRE, PURE IRON	07820
MONTEDISON USA INC	B	FOMBLIN OIL	19036
MUSSER ASSOCIATES INC	B,M	INSULATION/TABLE HOIST	92708
NANMAC CORP	B	TUNGSTEN & BERYLLIUM OXIDE, CERAMIC INSUL	01701
NATIONAL ABRASIVES	B	GRIT, ALUMINA FUSED	94577
NATIONAL-STANDARD CO	B	INCONEL WIRE	90670
NATIONWIDE ADHESIVE PRODUCTS INC	D	PLASTIC SEALS	44415
NAZ-DAR CO OF CALIFORNIA	D	LACQUER	90058
NCR CORP	B	TATALUM FOIL	02146
NL INDUSTRIES CO	B	RODS, DEPLETED URANIUM	12205
NUCLEAR METAL INC	B	DEPLETED URANIUM METAL	01742
NUCOR CORP	B	NEODYMIUM INGOTS	85063
OVERLOOK INDUSTRIES (SAPON LABORATO	B	HYDROXYQUINOLIN	08804
OZARK MAHONING CO	B	MOF6 GAS	74119
PHILIPS ELECTRONIC INSTRUMENTS INC	B,Q	MOLYBDENUM PLATE/X-RAY GENERATOR	91604
PITTSBURG-DES MOINES STEEL CO	B	METAL PIPE	95201
PLANT INSULATION CO	B	FOAMGLAS	94662
PLASTIC SALES INC	D	ACRYLIC SHEETS	94124
POCO GRAPHITE INC	M,B	COLLECTOR HEATING ELEMENT/SHEET GRAPHITE	76234
POLYMER DESIGN	B	WATER COOL BREAK	02370
PORT PLASTIC INC	B	DELRIN	94086
PULBRITE COMPANY	B	FREON,CANNISTERS	95131
REMBAR COMP INC	B	TANTALUM & TITANIUM/TUNGSTEN	10522
RESEARCH CHEMICAL	B	GADOLINIUM/YTTRIUM INGOTS	85063
RHENIUM ALLOYS INC	B	TUBING, MOLYBDENUM	44036
SAES GETTERS/USA INC	B	WIRE, LUMA 12 & 20 MICRONS	00906
SAN JOSE DELTA ASSOC INC	M,B	REFLECTOR TUBES/INSULATION/MACOR RODS	95050
SAN JOSE SCIENTIFIC CO INC	M,B	VACUUM PUMP/PUMP OIL	95117
SAN LEANDRO ELECTRIC SUPPLY CO	B	HI TEMP. WIRE	94577
SATURN INDUSTRIES INC	B	TUBES-TUNGSTEN	12534
SAWYER RESEARCH PRODUCTS INC	B	CULTURED CRYSTAL QUARTZ	44094
SHERWIN WILLIAMS	B	PAINT	94580
SHIELDING TECHNOLOGY-WEST INC	B	SHIELDING MATERIAL	90701
SPECTRA GAS INC	B	EXCIMER GASES	07104
SPEX INDUSTRIES INC	G,B	LAB GLASSWARE/URANIUM 2% NITRI	95051
SPUTTERED FILMS INC	B	TORR LUBE	93103
STACKPOLE CORPORATION	M,B	TOROIDS	15827
STANDARD WIRE & CABLE CO	B	CABLE, SHIELDED	90245

VENDORS - BULK ITEMS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
STRUERS INC	B	SILICON CARBIDE	44136
TELEDYNE (WAH CHANG HUNTSVILLE)	B	TUNGSTEN SQUARES/NIOBIUM ALLOY SHEETS	35806
THERMAL AMERICAN FUSED QUARTZ CO	B	SPECTRASIL, 1" THICK	07045
TIMCO MFG CO INC	B	HI TEMP WIRE	91303
TRANS-TECH	B	FERRITE TOROID	21710
TUBESALES	B	PIPING	94544
UNION CARBIDE CORPORATION	B	BORON NITRIDE	06806
UNIQUE WIRE WEAVING CO	B	TUNGSTEN SCREEN	07205
UNITED PLASTICS CORP	B	PLASTIC TUBES	94621
VAC-HYD CORP	B	HONEYCOMB TA/BRAZE SECH'T	01923
WATER WORKS MFG	B,G	STEEL PIPE/STOCK	95901
WESTERN FLUIDLINE PRODUCTS INC	B	HOSE	95691
WILMAD GLASS CO INC	B	TUBING	08310
WILSHIRE FOAM PRODUCTS	B	FOAM, ACOUSTIC	90745
ZIPPERTUBING CO	B	TUBING	90040
ZYP COATINGS INC	B	PAINT	37830

VENDORS - CONSTRUCTION

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
A & J TRUCKING	C	CONCRETE PUMPING	94520
ABEL CUSTOM EXTERIORS	C	BUILDING EXTENSION	94541
ALL STATE CONSTRUCTION CO	C	PROJECT SUPPORT, GENERAL CONTRACTOR	90440
ALLIED METAL FABRICATORS	C	CORPORATION YARD GRATING	94450
AMCON CONSTRUCTION	C	FAB & INSTALL AWNINGS	94545
AMERICAN MECHANICAL	C	MECHANICL CONSTRUCTION	95608
BEL AIRE ENGINEERING INC	C	INSTALL ALUMINUM AWNINGS	94541
BIGGE CRANE	C,G	EQUIPMENT RENTAL, LABOR, SERVICE	94577
BITCO	C	SANDBLAST INTERIOR SURFACES & REPAIR	94802
BROOKMAN CO INC	C	DELIVER & INSTALL FLOOR	94086
BUCKLES-SMITH ELECTRIC CO	C	ACCESS ENCLOSURE	94544
BUFFALO FORGE CO	D,C	FAN DESIGN & FABRICATE	94608
CHAMBERLIN MFG CO	C	FAB, FINISH & ENGRAVE PANEL	94579
CHAPEK CONSTRUCTION	C	CONSTRUCTION	95826
CUBBLE-KIBBE GLASS CO	C	STAIR GLASS, INSTALLATION	94603
CONSTRUCTION	C	WALL COVERINGS	94607
COUSINS CONSTRUCTION CO	C	PROJECT SUPPORT, GENERAL CONTRACTOR	37800
DANVILLE HOME IMPROVEMENT CENTER	C	HOLLOW METAL DOORS	94526
DEETZ CONSTRUCTION CO INC	C	GRADING, BLDG.482	94566
E R PLUMBING	C	ACCUMULATORS	94550
ELECTRICAL POWER PRODUCTS	C	INSTALL STEEL DOOR	95058
ELECTRONIC MANUFACTURING SERVICE	C	INSTALL WIREWRAP IN AC	95050
F & H CONSTRUCT	C	BLDG 332	95205
FANFA-MULLOY INC	C	FOUNDATIONS &/OR STEEL CONSTRUCTION	94580
FORDERER CORNICE WORKS	C	DOOR FRAMES/METAL DOORS	94102
FORMS SURFACES	C	FACING PANELS	94103
GEORGE E MASKER INC	C	PAINT WALLS BLDG 402	94621
GEORGE F SCHULER INC	C	PROJECT SUPPORT, GENERAL CONTRACTOR	95201
GILBERT, E.R.	C	CONCRETE SUPPORT	94553
GRANITE MILL & FIXTURE CO	G,C	FAB/DEL/INSTALL CABINETS	84116
HABENICHT & HOWLETT	C	SIDE WINDOWS	94124
HEATHORN	C	MECHANICAL CONSTRUCTION	94580
HICKS-INGLE CONSTRUCTION	C	MECHANICAL CONSTRUCTION	37700
HOTWATT INC	C	INSULATION	01923
ILLSBRUCK USA	C	ACOUSTICAL FOAM	55412
INDUSTRIAL ASPHALT	C	ASPHALT ROCK	94566
INSCO INC	C	MODULAR COMPLEX, T1733	91761
INTERSTATE DOOR SALES	C	WOOD DOORS	94110
J A CRAWFORD CO	C	CEMENT SAWERISE	90609
J-M MANUFACTURING CO INC	C	A-C PIPING & ACCESSORIES	95206
JACK DYMOND CO.	C	ACOUSTIC PANELS	94566
JOHNSON CONSTRUCTION CO	C	INSTALL INSULATION	94550
KENDALE PLASTICS INC	C	FLOOR TILES	46755
KNICKERBOCKER	C	REMOVE & REPLACE PILASTERS	94107
LASERLINE	C	LEASE OF LASER LEVEL/LASER SYSTEM DIALGRADE	94043
LOCKWOOD GREENE	C	GENERAL CONTRACTOR/PROJECT SUPPORT	UNK
MEMORY SPRINKLER	C	SPRINKLER RISERS	94553
MODULAIRE INDUSTRIES	C	TRAILER COMPLEX	94544
MORGAN FABRICS CORP	C	WALL COVERING FABRICS	90058
NESS ELECTRIC CO	C	ELECTRICAL CONSTRUCTION	94577
NORMAN S WRIGHT EQUIPMENT CO	C	DIFFUSERS	94107
OAKLAND FENCE	C	FENCING	94540
OVERAA	C	PROJECT SUPPORT, GENERAL CONTRACTOR	94805
PACIFIC ROLLING DOOR CO	C	ROLLING DOORS	94580

VENDORS - CONSTRUCTION

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
PARTITION SPECIALITIES INC	C	INSTALL RAISED FLOORS/PARTITION GLASS	94063
PENHALL INTERNATIONAL	C	CONCRETE SAW CUTTING & LABOR	94801
PLASTIC WORKS INC	C	WINDOW SUB-ASSYS	94710
PLEASANTON ENGINEERING CONTRACTORS	C	CONSTRUCT ISOLATION SLAB	94566
PLEASANTON READYMIX CONCRETE INC	C	CONCRETE	94566
PORTOLA VALLEY	C	RELOCATE TREES	94025
PSP	C	STEEL SUPPORTS FAB	95112
QCON INC	C	PIPE INSULATION	94022
RED FEATHER CONSTRUCTION CO	C	INSTL RESTROOM FLOOR/REMODEL ROOMS	94545
REID & TARICS ASSOCIATES	C	ENGINEERING SERVICES	94102
ROADRUNNER GLASS CO	C	SECURITY GLASS	94550
ROEHLEN INDUSTRIES	C	SITE PREPARATION	87130
RPM ERECTORS INC	C	FLOORING	94545
RUST CONSTRUCTION CO	C	FOUNDATION &/or STEEL CONSTRUCTION	UNK
RUTH & GOING INC	C	PROJECT SUPPORT, ENGINEERING SERVICES	95159
SCOTSMAN MOBILE LEASE	C	TRAILER FOR CONSTRUCTION NEEDS	94568
SIERRA CRANE & HOIST CO INC	C	MECHANICAL CONSTRUCTION	95603
SOND-CEIL CO	C	ARCHITECTURAL &/or INTERIORS CONSTRUCTION	94607
STRATFORD IN	C	HOLLOW METAL DOORS	95131
SUNSET ALUMINUM PRODUCTS	C	CANOPY, FAB & INSTALL	94550
SYSKA & HENNESSSEY	C	ENGINEERING SERVICES, ENGINEERING SUPPORT	10001
TORRES ELECTRICAL SUPPLY CO INC	C	ELECTRICAL CONSTRUCTION	29606
UNISTRUT NORTHERN CALIFORNIA	C	RAISED FLOOR	94577
VITTON CONSTRUCTION CO INC	C	PROJECT SUPPORT, GENERAL SUPPORT	94546
WILSON OIL CO (WOCO SUPPLY)	C	WALL PANELS & TRIM	94523

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
AAC INC.	I&C,E	CURRENT MONITORS	11735
ABACUS ELECTRONICS CO INC	E	CABLE/TRANSFORMER	94043
ACOPIAN CORP	E	POWER MODULE/SUPPLY	18042
ACTION INSTRUMENTS CO INC	I&C,E	ACTION INSTR MAT/ISOLATE TRANSMITTER	92123
AIRPAX CORP	E	CIRCUIT BREAKER	95051
ALAMEDA ELECTRIC SUPPLY CO	E	RELAY	94545
ALL-TRONICS INC	E	RF FILTERS	11590
ALPHA-TEK	E	BRIDGE,HOLLOW CATHODE	92020
AMERICAN SCIENTIFIC PRODUCTS	I&C,E,M	TEMP CONTROLLER/LAMP CATHODE/VAC OVEN/ATOMIC ABSOR	94086
AMP PRODUCTS CORP	E	CONNECTORS	94402
ANALOG DEVICES INC	I&C,E	AMPLIFIERS, INSTRUMENTATION & OPERATIONAL	95128
ANIXTER-SANTA CLARA	E	SHIELDED CABLE	95131
ARROW ELECTRONICS INC	E	TRANSFORMERS/CHIPS,PROGRAMMABLE	94086
ASTRO SEAL INC	E	CONNHERMMULTPIN	91733
AZ INDUSTRIES INC	E	MAGNETS	92390
BARKER & WILLIAMSON INC	E	INDUCTORS	19007
BAY ASSOCIATES INC	E	CABLE, SHIELDED CONTR	94025
BERTAN ASSOCIATES INC	E	BERTAN HVPS/POWER SUPPLY	94022
BRUEL & KJAER INSTRUMENTS INC	M,E	SHAKER EQUIPMENT/AMPLIFIER, CHARGE	92805
BURR-BROWN	E	VOLTAGE CONVERTERS	95125
C & G PRECN	E	E-BEAM GUN	95119
CADDOCK ELECTRONICS INC	E	RESISTORS	92507
CALEX MANUFACTURING CO INC	E	POWER SUPPLIES	94523
CAMPBELL & GEORGE COMPANY	E	CIRCUIT BREAKERS	94010
CAP SPECIALT	E	RESISTORS	92025
CARVER SUPPLY INC	E	TRANSFORMERS	45403
CARVER SUPPLY INC	E	TRANSFORMERS	45403
CATON CONNECTOR CORP	E	HV CONNECTORS	92633
CETA CORP	E	POWER SUPPLY	94041
CITY TOOL-DIE & MFG CO	E,M	ELECTRODE ASSY/LASER SUPPORT	95050
COBER ELECTRONICS INC	E	REPAIR PULSE AMPLIFIER	06902
COMMONWEALTH SCIENTIFIC CORP	L/O,E	ION SOURCE/PWR SUPPLY,MILLATRON & PARTS	22314
CONDENSER PRODUCT CORP	E	CAPACITORS	94040
CONDOR D C POWEER SUPPLIES INC	E	POWER SUPPLIES	93010
CONNER MFG CO INC	E	POWER AMP VESSELS	85201
CONSOLIDATED ELECTRICAL DIST INC	E	DOOR LATCH KITS/POWER CONNECTORS	94080
CONTROL MASTER PRODUCTS	E	BELDEN CABLE	94518
CONVERTER CONCEPTS INC	E	POWER SUPPLIES	53954
COOPER LASERSONICS INC	D,E	DES CONTRACT/POWER SUPPLY SWITCH & COVAPLAS	94041
COVENTRY TOOL MACHINE	L/O,E	OPTICS PKG/LINEAR AMP	95035
CSI TECHNOLOGY (CAPACITORS DIV)	E	RESISTORS	92025
CUSTOM ELECTRONICS CO	E	CAPACITORS	95126
D'ARCY	E	STEPPER MOTOR	94621
DALE ELECTRONICS INC	E	RESISTORS	68601
DEERFIELD LABORATORY	E	TRANSFORMERS	94022
DSI CAPACITOR	E	CAPACITORS	92025
DUBLIN MULTILAYER INC	E	RELAY-DRIVER BOARDS	94566
DUCOMMUN INCORPORATED	E	GENERAL HARDWARE	90000
DUNIWAY CORP	E	REBUILT ION SOURCE ASSY	94303
DUNIWAY/STRIKER	E	REBUILD & CLEAN ION SOURCE ASSEMBLY	94303
DURAMAGNETIC	E	MAGNETS	43560
DYSON INDUSTRIES	E	ELECTRODE ELEMENTS	98204
E-Z HOOK	E	TEST CLIP JUMPERS	91006
EG&G INC.	I&C,E	THYRATRONS	94086

VENDORS - ELECTRICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
ELECTRICAL DISTRIBUTORS CO	I&C,E	SWITCH, INTERUPTER SAFETY	95126
ELECTRON TECHNOLOGH INC	E,L/O	RECTIFIER	07032
ELECTRONIC DEVICES INC	E,L/O	RECTIFIERS	10701
ELECTRONIC MEASUREMENTS INC	E	POWER SUPPLY	95117
ELECTRONICAL MANUFACTURING SERVICE	E	WIRE WRAP	95054
FERROXCUBE	E	CORE TOROID	12477
G M COOKE ASSOCIATES	E	ALARM SWITCHES	94719
GENERAL ELECTRIC CO.	E	CAPACITORS	94608
GIBSON ELECTRICAL SUPPLY CO	E	LIGHT FIXTURES	94606
GLOBAL EQUIPMENT CO	E,I&C	GENERAL HARDWARE	11550
GRAY ELECTRIC CO INC	E	TRANSFORMER	94604
GRAYBAR ELECTRIC CO INC	E	POWER CABLE, HIGH VOLTAGE	94607
GULTON INDUSTRIES INC	E,I&C	CONNECTORS	92627
H & M MACHINING CO	E	ELEMENT & PLATE ELECTRODE FOR OSCILLATOR	81301
HALL-MARK ELECTRONICS CO	E,I&C	CONNECTOR MB/COMPARATORS	94086
HEINEMANN ELECTRIC CO	E	CIRCUIT BREAKERS	95131
HI VOLTAGE COMPONENETS INC	E	ANODE CAPS	33540
HIPOTRONICS INC	E	HV TEST SYSTEM	10509
HOTRONICS INC	E,I&C	SYNCHRONIZER	95128
HUGIN INDUSTRIES INC	E	MULTILAM, GRID	94002
HUNTINGTON LABORATORIES	E	FEEDTHROUGH	94540
INDUSTRIAL ELECTRIC MANUFACTURING	E	SUBSTATIONS	94539
INDUSTRIAL ELECTRONIC ENG INC	M,E	PERIPHERAL ENTRY PANELS/POWER SUPPLIES	91405
INSULATION SUPPLY CO	E	INDUCTORS	90510
INTRONICS INC	E	AC/DC CONVERTERS & SOCKETS	02158
ION PHYSICS CORP	I&C,E	CURRENT MONITORS/TRANSFORMERS	01803
ISOLATION DESIGN INC	M,E	CONNECTOR HV/TERMINALS,CABLE	94086
ITT CANNON	E	P.C. CONNECTOR	92708
ITT ELECTRON TUBE DIV	T&C,E	DIODES/THYRATRON FOR ABSOLUTE VOLTAGE	18042
ITT POMONA ELECTRONICS DIV	E	POMONA BOXES	91735
J3 ASSOCIATES	E	KINETIC BASES & PINS	95008
JOHN FLUKE MFG CO INC	I&C,E	CONTROLLER/TRANSFORMER	95050
KEPCO INCORPORATED	E	BIPOLAR POWER SUPPLY	94062
KIERULFF ELECTRONICS	E	TRANSISTORS	94303
KILOVAC CORP(DOW KEY DIV)	E	HIGH VOLTAGE RELAYS	93103
KINGS ELECTRONICS INC	E	K-LOCK HPLF	10707
LAKE SHORE CRYOTRONICS	I&C,E	DIODES	43081
LAMBA PHYSIK	L/O,E	UNSTABLE RESONATOR/POWER SUPPLY	11747
LASER MAGNETICS INC	E	PULSER, THYRATRON TYPE	01801
LAZAR RESEARCH LABS INC	E	ELECTRODE	90046
LEDEX INC	E	SOLENOIDS	45377
LNC ENTERPRIZE	M,E	BRACKET DIODE & BASE PLATE/BELL JAR SUPPORT	95119
LODAM ELECTRONICS INC	E	CONNECTORS	94002
LOUIS ALLIS	E	GENERAL HARDWARE	53001
LOYOLA CONTROLS INC	E	SCR CONTROLLER	92667
M D R SYSTEMS	E	MULTIPLEXERS	92665
MAGCAP ENGINEERING INC	E	COILS, HPLF	02021
MANCO	E	POWER SUPPLIES	95051
MAXWELL LABORATORIES INC	E	POWER SUPPLY	92123
MICRONETICS INC	E	NOISE GENERATOR	07648
MILWAUKEE RESISTOR CORP	E	POWER RESISTORS	53204
MOXON ELECTRONICS	E,P	MULTIPLEXERS W/ VOICE CHANNEL/MODEMS	95131
MURATA ERIE NORTH AMERICA INC	E	CAPACITORS	30067
N A DARCY CO	E	TRANSFORMERS	94621
NEFF INSTRUMENT CORP	E	AMPLIFIERS	91016

VENDORS - ELECTRICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
NEWARK ELECTRONICS	E	RESISTORS	94621
NORTH HILLS ELECTRONICS INC	E	TRANSFORMERS	11542
NORTHWEST INDUSTRIES INC	M,E	SUPPORTS/CRUCIBLES/E-BEAM GUN	97321
NUMERIC MACHINE	L/O,E	MAGNETIC SWITCHES	94538
OCTAGON SYSTEMS CORP	E	CONVERTER	80030
OPTICAL INSTRUMENTS	L/O,E	PROJECTOR, POWER SUPPLY & ILLUMINATION SYSTEM	90621
OPTICAL RESEARCH ASSOC	D,E	LASER OPTICAL SYSTEMS STUDY/ENGINEERING DESIGN	91107
OPTICS FOR RESEARCH	L/O,E	ACHROMATIC LENS/AMP COMPONENTS	07006
P E OHAIR & CO	E	FITTINGS- ADAPTERS & SOCKETS	94621
PACIFIC POWER CONTROL INC	E	TRANSFORMERS	94404
PCD PRECISION	E	CONNECTORS	95128
PEARSON ELECTRONICS INC	E	TRANSFORMERS	94303
PERMAG SIERRA CORP	E	TRANSFORMER CORES	94086
PETERSON METAL FABRICATING	E	OUTLET BOX/ 50 KV GUN	94544
PHYSICS INTERNATIONAL CO	I&C,E	PROBE	94577
PLASMA KINETICS	E	HI VOLTAGE POWER SUPPLY	94566
PLASTIC CAPACITORS INC	E	CAPACITORS	95128
POTTER & BRU	E	RELAYS	94622
POWELL ELECTRONICS INC	E	P.C. CONNECTORS	94086
POWER MATE CORP	E	POWER SUPPLY	95008
POWER PRODUCTS	E	POWER SUPPLY MODULES	33060
POWER SEMI CONDUCTORS	E	POWER SCR	06460
POWER SPECTOR	E	PULSER, THYRATRON TRIGGER	94577
POWER SYSTEMS DISTRIBUTORS	E	TRANSFORMER ASSEMBLY	95035
POWER-ONE INC	E	POWER SUPPLIES	93010
PRECISION CONNECTION DEVICE	E	CONNECTOR	95128
PRINCETON ELECTRONIC PRODUCTS INC	E	REPAIR INTEGRATOR	08540
PRINCETON UNIVERSITY RESEARCH	E	OSCILLATOR	08544
PROMEDIA CO	E,G	POWER STATION/LOUDSPEAKERS/PAGING SYSTEM	94107
PULSE ENGINEERING INC	E	TRANSFORMERS	95126
QUALITY TRANSFORMER & ELECTRONICS	E	REPAIR & UPGRADE TRANSFORMER	95035
R D MATNIS CO	E	THOR FILAMENT COILS	90806
R G B ELECTRO-INDUSTRIAL	E	DISPENSERS, MAGNILITE (LKIO/M)	95112
RCD COMPONENTS	E	RESISTORS	95051
RELIANCE ELECTRIC CO	E	TOCCO MAINTENANCE	95110
REUTER-STOKES INC	I&C,E	DETECTOR TUBES, NEUTRON HELIUM	44128
RICHEY ELECTRONICS INC	E	CONNECTORS	95131
RKS INDUSTRIES INC	E	SURGE SENTRIES	95066
ROBISON ELECTRONICS INC	E	RELAY INSULATORS	93401
ROSS ENGINEERING CORP	E	HV RELAY	95008
SANTA BARBARA RESEARCH CENTER	E	PREAMP	93117
SCHWEBER ELECTRONICS CORP	E	TRANSISTORS	95050
SEMTECH CORPORATION	E	SEMI-CONDUCTORS	91320
SHELLEY ELECTRONICS INC	E,M	RESISTORS/CHOKES, DALE	94043
SIEMENS COMPONENTS INC	E	RECTIFIER ASSY	80020
SIEMENS-ALLIS INC	E	OVERALL & REFURBISH CIRCUIT BREAKER	94545
SORENSON CO	E	POWER SUPPLY	94022
SPELLMAN HIGH VOLTAGE ELEC CORP	E,D	SWITCHING POWER SUPPLIES/DESIGN CONTRACT	11803
SPRAGUE ELECTRIC CO	E	FILTERS	94010
STANGENES INDUSTRIES INC	E	INDUCTORS	94303
STAR TOOL & ENGINEERING INC	E	ELECTRODE SLEEVES & SPACERS	94063
STEAM & PLUMBING SERVICE CORP	E,M	ADAPTORS	94103
SUNNEX INC	E	HALOGEN LAMPS	02194
SUPERTEX INC	E	TRANSISTORS	94086
SYSTRON DONNER	E	MANUALS	94520

VENDORS - ELECTRICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
T & M RESEARCH PRODUCTS INC	E	RESISTOR	87108
TDK CORP OF AMERICA	E	CAPACITORS	95014
TESTCO INC	E	SOLENOIDS	95070
THERMOSEN INC	E	RELAY LO EMF	94070
TIME ELECTRONICS NOR/CAL	E,M	CONNECTORS & CLAMPS	94089
TOPAZ ELECTRONICS	E	U-POWER SUPPLY	95035
TRANSCAT	E	DECADE BOX, RESISTANCE, CAPACITANCE & INDUCTANCE	14606
TRI TRONICS INC	I&C,E,G	MONITORS/VIDEO PLAYER	91505
TRW INC (IRC BOONE DIV)	E	RESISTORS	28607
TRYCO VIDEO	I&C,E	VIDEO SPLITTERS	48024
TTE, INC	E	FILTERS, ACTIVE LO	90064
UNIVERSAL VOLTRONICS CORP	E	POWER SUPPLIES/BLOWER	10549
UTI-INSTRUMENT CO	I&C,E	ANALYZER	94086
VACUUM GENERAL	M,I&C,E	CONTROL MODULES/CONTROLLERS/POWER SUPPLY & CABLES	92111
VOLTAGE MULTIPLIERS	I&C,E	DIODES	93291
WAVETEK-SCIEN	L/O,E	FILTER,BANDPASS BRICKWALL	07647
WESK ELECT EQUIP MFG INC	E	SCR TRIGGER UNIT	92649
WILCOXON RESEARCH INC	E	IMPEDANCE HEADS & VIBRATION GENERATORS	20814
ZERO CORP	E	BOXES, UNTRIMMED	94303

VENDORS-ENGINEERING SERVICES

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
AEROJET ELEC	D	OPT DESIGN SUPPORT	91702
APPLIED LASER ELECTRONICS	D	DESIGN CONTRACT & POWER SUPPLY	01701
AVCO EVERETT RESEARCH LAB INC	D	LASER STUDY	02149
BECHTEL NATIONAL INC	D	ENGINEERING DESIGN & SUPPORT	94119
BUFFALO FORGE CO	D,C	FAN DESIGN & FABRICATE	94608
COOPER LASERSONICS INC	D,E	DES CONTRACT/POWER SUPPLY SWITCH & COVAPLAS	94041
CUSTOM COMPUTING SERVICES	D	CONSULTING	99352
DECISION PLANNING CORP	D	IMPACT ANALYSIS STUDY	92626
DIETERICH-POST COMPANY	D,G	DRAFTING FOR MARS/DRAFTING LITES	94107
DUSOUTH INDUSTRIES	D	STUDY/TECH ANALY	94510
ELECTRO OPTICAL SYSTEMS	D	ENGINEERING DESIGN	90045
ELECTRO-OPTICAL ENERGY SYSTEM INC	D	ELECTRO-OPTICAL ENGINEERING	90045
FAUSKE ASSOC.	D	SAFETY ANALYSIS	60521
GENERAL ELECTRIC(WESTERN SYSTEMS)	D	ENGINEERING DESIGN SERVICES	94089
INTEGRATED SYSTEMS INC	D	ENGINEERING SERVICES	94301
INTERNATIONS	D	STUDY/ENGINEERING OF GLAZES/JOINTS	94086
ISM	D	CIRCUIT BOARD DESIGN	94040
KAISER ENGINEERING	D	ENGINEERING DESIGN SERVICES	94623
LOS ALAMOS TECH ASSOC INC	D	PROCESS CONTROL SYSTEM STUDY	87544
MATERIALS RESEARCH CORP	B,D	COPPER RODS/ANALYSIS OF V SAMPLES	9505046
MATHEMATICAL SCIENCES NORTHWEST	D	STUDY-LASER INDUSTRY ENVIRONMENT,HI PWR	98004
METRO SUPPLY	D,G	DRAFTING FOR MARS/DEVELOPER	95822
OPTICAL RESEARCH ASSOC	D,E	LASER OPTICAL SYSTEMS STUDY/ENGINEERING DESIGN	91107
PIPELINE SYSTEMS INCORPORATED	D	SERVICES (PSA PSI)	94563
PRC SYSTEMS SERVICE CO	D	ENGINEERING DESIGN	32931
SAN FERNANDO LABS	D,M	COATING DEVELOPMENT/CARBURIZE CRUCIBLE	91331
SCIENCE APPLICATIONS INC	D	ENGINEERING ANALYSIS	94566
SELABS INC	D	EVALUATION/REPAIR POWER SUPPLY	95050
SHANNON OPTICAL SYSTEMS INC	D	PERSONAL SERVICES AGREEMENT	85715
SPELLMAN HIGH VOLTAGE ELEC CORP	E,D	SWITCHING POWER SUPPLIES/DESIGN CONTRACT	11803
STONE & WEBSTER ENGINEERING CORP	D	ENGINEERING	02107
UNION CARBIDE (DEGROOT DIV)	D	PLASMA HEATING STUDY	95616
VALLEY ENGINEERING	D	LINE OF SIGHT, BLDG 482	93777
VENTURE ANALYTICAL ASSOC INC	D	CONSULTING SUPPORT FOR SOFTWARE	21028

VENDORS-GENERAL SUPPORT & SERVICE

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
3-M BUSINESS PRODUCTS	G	OFFICE SUPPLIES	55133
A CONTAINER SALES	G	TRANSPORTAINER	94119
A V REPAIR COMPANY	G	CAMERA REPAIRS	94040
ACE GLASS INC	G	FLASKS	94553
ADOLF GRASSER INC.	G	CAMERAS	94101
ALLADIN	G	TELEPHONE ANSWERING MACHIE	94577
ALPATH ENTERPRISES	G	PLAZA MODEL	94553
ALPHA PHOTO PRODUCTS INC	G	SCREEN	94612
ALPHA SCIENTIFIC INC	G	RESET ISO. IND. ASSY	94544
ALVIN & CO INC	G	DRAFTING EQUIPMENT	95670
AMERICAN HOSPITAL SUPPLY CORP	G	ANALYTICAL BALANCE	94086
AMERICAN WHOLESALE TARPAULIN	G	TARPS, VINYL	90015
AMERIGAS	G	WELD KIT	94710
AMPEX CORP	G	TAPE, 1" ON PRECISION REELS	94063
ARK DISTRIBUTION CO INC	G	BEAKERS	4553
ARMSTRONG STATIONERS	G	OFFICE SUPPLIES/EQUIPMENT	94577
ARROW STAR INC	G	CABINET	11563
AUTOCLAVE ENGINEERS INC	G	REPAIR KITS FOR PUMP	94105
AVIV CORPORATION	P,G	GAUNT/TAPE CONTROLLER/MAINTENCE OF AVIV SYSTEM	94903
B & C TRUCK PARTS	G	FILTER ASSY.	94566
BALL SCREWS ACTUATORS CO INC	M,G	SHAFTS & NUTS/ENGINEER TO SERVICE MARS	95112
BASIC SYSTEMS CORP	G	RIBBON CARTRIDGE	95050
BEL AIR CAMERA & HI-FI	G	NIKON CAMERA	90024
BESS TESTLAB	G	IMPREGNATE CASTING	95050
BICKLEY FURNANCE INC	G	FURNACE REPAIR	19114
BIGGE CRANE	C,G	EQUIPMENT RENTAL, LABOR, SERVICE	94577
BIO RAD LAPORATORIES	G	ION EXCHANGE RESINS	94804
BRENTON SAFETY INC	G	DRY BOX GLOVES	94080
BRILL ELECTRONICS	G	BRUSHES,WELLER	94606
BROWN BOVERI ELECTRIC INC	G	CKT BRKR UPGRADE	94545
C M TALOR CORP	G	STANDARDS - METAL & ALLOY,HALOGEN & BENCE ALBEE &	94305
CAL-TECH METAL FINISHERS	G	BLACK OXIDE COAT	94608
CALIFORNIA ART SUPPLY INC	G	DRAFTING SUPPLIES	94610
CALUMET PHOTOGRAPHIC INC	G	CAMERA	60007
CAM DESIGNS INC	G	FILES/FURNITURE	94618
CAMPBELL DESIGN GROUP	G	CAIN BOOTHS/REPLACE GLASS	94553
CENTRAL TOOL ROOM	G	LEVELING FEET TOOLING	94545
CLARK PAINTING CO	G	PIPE, CLEANING & COATING	94518
CLARKS WOODWORKING	G	TRITON BOX & MODEL	94546
COLLINS INTE	G	WINDOW BLINDS	94546
CONTAINER STORAGE INC	G	TRANSPORTATOR	94807
CONVEYOR PRODUCTS OF CALIFORNIA	G	SWIVEL CASTERS	94404
CREATIVE OFFICE PRODUCTS INC	G	TYPEDISC/DISC HOLDERS	94608
DAVID SCHMIDT CO INC	G	DRYBOX GLOVES	94808
DENEVI CAMERA	G	CAMERAS & ACCESSORIES	94556
DICTAPHONE	G	DICTATING MACHINE	94566
DIETERICH-POST COMPANY	D,G	DRAFTING FOR MARS/DRAFTING LITES	94107
DIMENSIONAL CONTROL CORP	G,Q	CALIPERS/BRIDGEPORT KNEE	94670
DON D FLEMING CO INC	C	CLOTHES LOCKERS	94545
DRAFTETTE CORP	G	DRAFTETTE	92126
EAKINS ASSOCIATES INC	P,G	TAPE DRIVES/REPAIR DISK DRIVES	94041
EAST BAY FIXTURE CO.	G	DISPLAY CABINET	94608
EDUCATIONAL INDUSTRIAL SALES INC	G	CHAIRS	92715
ELMHURST ANODIZING MFG CO	G	BLACK OXIDE ON PART	94621

VENDORS-GENERAL SUPPORT & SERVICE

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
EQUIPMENT ASSOC CO INC	G	REFIT EXHAUST STACK	94608
FIREMASTER	G	PYROTRONICS	94080
FISHER SCIENTIFIC CO	G	BALANCE, METTLER	95050
FORMULATED RESINS INC	G	FIBER STRIPPER	02820
FRANKLIN HIGH VOLTAGE CORP	G	FUSE REPAIR SERVICE	92025
FW BELL INC	G	BATTERY PACK	95051
GALBRAITH LABORATORIES INC	G	MICROANALYSES	37921
GENE'S BUSINESS MACHINES INC	G	COPIER	94609
GENERAL RESISTANCE INC	G	REPAIR DIAL-A-SOURCE	06471
GOLDEN BEAR EQUIPMENT CO	G	DELIVERY VEHICLES	94710
GOLF CART WEST	G	DELIVERY VEHICLES	95052
GRANITE MILL & FIXTURE CO	G,C	FAB/DEL/INSTALL CABINETS	84116
GREENSTEEL INC	G	CHALK/TACK BOARDS	92806
HAKO NORCAL	G	VACUUM CLEANERS & ACCESSORIES	94002
HAMMERSLAG EQUIPMENT CO	G	FORKLIFT REPAIR	94010
HANFORD ENV.	M,G	HEPA/MSA FILTERS	99352
HAWKINS-HAWKINS CO INC	G	TRAFFIC SIGNS	94710
HEANY INDUSTRIES	G	FLAME SPRAY - METAL COUPONS	14546
HEUSSER INSTRUMENT CO	M,G	BALANCE & TABLE	94517
HEWITT PACKARD COMPUTER SUPPLIES	P,G	COMPUTERS,CALCULATORS & SUPPLIES	94088
IBM	G	OFFICE EQUIPMENT	94105
IMAGES & ANSWERS INC	G	FILM RECORDER	94952
J & J CONT	G	OFFICE FURNITURE & INSTALLATION	94611
J G PRODUCTS CO	G	DRAFTING EQUIP.	94604
JAMECO ELECTRONICS	G	SOLDERING IRON & ACCESSORIES/AMP	94002
KONTES OF CALIFORNIA	G	FLASKS	94577
KROY INDUSTRIES INC	P,G	GRAPHICS MACHINE/LIGHT TABLES	94404
LAB SAFETY SUPPLY CO	G	LAB JACK, STATIONARY	93547
LAMINAIRE CORPORATION	G	BAGS, NYLON ULTRA CLEAN	07065
LINSFA INTERNATIONAL	G	CABINET PARTS	90815
LOUVER DRAPE INC	G	VERTICAL BLINDS	94549
LUGGAGE RACK	G	CATALOG CASE	94566
LUICK QUALITY GAGE & TOOL CO	G	STIRRER ASSY	47302
MARCH METALFAB INC	G	STRAIGHTEN SHEET OF COPPER TI	94545
MARKSON SCIENCE	G	LIGHT PLATE & DRWERS	92124
MARSHALL-NEWELL SUPPLY CO	G	CALIPHERS	95050
MCMASTER-CARR SUPPLY CO	G	LOCKS/KEY CABINET/CONTROLS/SWITCHES	90670
MEASUREMENT SYSTEMS IN INC	G	CELL, PORT-A-WEIGH	98168
METAL SPECIALITIES CO	G	BENCH ACCESSORIES	94577
METRO SUPPLY	D,G	DRAFTING FOR MARS/DEVELOPER	95822
MICHAEL'S ARTIST SUPPLIES	G	DRAFTING SUPPLIES	94108
MIDWEST SYSTEM. INC	P,G	COMM INTERFACE/LOGIC MODULE/CABINETS	55337
MINE SAFETY APPLIANCES CO	M,G	MSA FILTERS/CONSULTING SERVICES	16003
MKS INSTRUMENTS INC	M,G	VALVES,PRESSURE & CONTROLS/REPAIR OF MULTIPLEXER	94022
MOBIL-TRONICS CO INC	G	UTILITY CARTS	92680
MONTGOMERY WARD	G	REFRIGERATOR	94550
MOSLER SAFE COMPANY	G	SECURITY FILING CABINETS	22209
MOTOROLA (AUTO IND ELEC GRP)	G	PAGERS/TRANSCEIVER	94404
NO CAL HALLOW	G	COUNTERS,STORAGE CABINET/LAB FURNITURE	94577
NORTHWEST TECHNICAL INDUSTRIES INC	G	TACUTA BOND, SANDWICH	98382
NUCLEAR PACIFIC INC	G	IN TANK CAMBRA FILTER	98108
OFFICE SYSTEMS INTERNATIONAL	G	FILE GUARDS	94608
OPTION ONE	G	LAB FURNITURE	94536
PARSCHE AIRBRUSH CO	G	AIR ERASER	60614
PACIFIC SAFETY EQUIPMENT CO	L/O,G	LASER EYEWEAR	92803

VENDORS-GENERAL SUPPORT & SERVICE

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
PACIFIC SAW WORKS INC	G	REPAIR/SHARPEN SAW BLADE	94615
PANEL CONCEPT INC	G	PANELS & DOORS	94711
PAT PATTESON ASSOC	M,G	SAR VAC PUMPS/REPAIR PUMP	94568
PHILLIPS MFG CO	G	CLEANER, ULTRASONIC	60626
PHOTO SHOP	C	CAMERA CASE	94566
PLASTICRAFT UNLIMITED	G	WASTE DISPOSAL BAGS	94103
POLYMETRICS INC	G	LEASE OF MIXED BED DEIONIZER	95133
PREMIER METAL PRODUCTS CO	G	CABINET DOOR	91744
PRINT-IT	G	PRINTING & PAPER	94550
PROMEDIA CO	E,G	POWER STATION/LOUDSPEAKERS/PAGING SYSTEM	94107
QUANTA-RAY	L/O,G	LASER/CRYSTALS/ETALONS/REPAIR LASER	94043
RAMTEK CORP	P,G	PRINTER/MAINTANENCE ON COLOR TERMINAL	95050
RCA SERVICE CO	G	TV CART	94621
RECOGNITION CONCEPTS INC	P,G	PIP CARD/PROCESSOR/REPAIR	89450
REDWOOD STATIONERS	G	EPSON RIBBONS	94025
RIGAKU/USA INC	G	REPAIRS	01923
ROBERTS, JG	G	CURVES ADJ	94604
S R J INTERNATIONAL	G	TUNE PHONES	94002
SAUTER DIV	M,G	BALANCE	94566
SEARS ROEBUCK &CO	G	TRIPODS/ICE MAKER/REFRIGERATOR/OVEN	94550
SEMIFAB INC	G	TABLE, LAMINAR FLOW	95053
SENCORE	G	Z-METER/BRIDGE ANALYZER & ACCESSORIES	57107
SHELTER SHED WASHINGTO INC	G	CONTAINERS, DRY, REFURBISHED	94107
SMOKEETER OF NORTHERN CALIFORNIA	G,Q	PREVENTIVE MAINT SERVICE/SMOKEETER H.C.	94560
SPECTRA OPTICS	L/O,G	LASER GOGGLES	91342
SPEX INDUSTRIES INC	G,B	LAB GLASSWARE/URANIUM 2% NITRI	95051
SS SPECIALITIES CO	G	COMPASS	45242
STANCIL CORPORATION	G	RECORDING SYS	90038
STOHLER ISOTOPE CHEMICAL INC	G	CHLLOROFORM AMPULES	02154
STRICK LEASE INC	G	LEASE OF VANS	94577
SUMNER & TAYLOR INC	G	STOOLS	95110
SUNNYVALE STATIONARY CO INC	G	FILE SYSTEMS	94086
TAB PRODUCTS CO	G	SHELVING	94103
THOMAS A SHORT CO	G,M	RUBBER BOOTS/ENCLOSURE SPONGE GASKET	94662
TOM WALSH & ASSOCIATES	G	MODULAR OFFICES/LOCKS	95035
TRI TRONICS INC	I&C,E,G	MONITORS/VIDEO PLAYER	91505
TWENTIETH CENTURY PLASTICS INC	G	FOLDERS	90016
ULTRAMET	C	CAN LINERS	91331
USA MODELS	G	MODEL	19023
VARIAN ASSOC	G	MAINTENANCE & SERVICE ON A VARIAN	72478
VELO-BIND INC	G	BINDERS	94086
VIC HUBBARD SPEED & MARINE CORP	G	BLANKET, EXPLOSIVE	94541
VIDEOMEDIA/SED INC	G	CAMERA & LENS	94086
VWR SCIENTIFIC INC	G	NYLON GLOVES/BALANCE/MICROSCOPE LENS	94119
W P KEITH INC	G	FURANCE MODIFY	90660
WATER WORKS MFG	B,G	STEEL PIPE/STOOL	95901
WAVETEK	G	MANUALS	94086
WESCO	P,G,I&C	SOFTWARE/SWITCHBOARD/VOLTMETER	95625
WESPERLINE	G	CABINETS	95050
WEST COAST CONTRACTORS INC	G	LASER ACTIVATION WORK	94533
WESTERN CONTRACT FURNISHERS	G	TABLE BASES/TABLE &INSTALLATION	95126
WESTERN DYNEX	G	REPAIR DISK DRIVE	05019
WESTERN TELEMATIC INC	G	SWITCH, 8-PORT SMART	92704
WESTINGHOUSE ELECTRIC CORP	G	SWITCHBOARD	94623
WM. A GORE CO	G	SHELVING STEEL	94607

VENDORS-GENERAL SUPPORT & SERVICE

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
WRIGHT LINE INC	G	BINDERS/DISPLAY RACKS	01605
WYLE LABS ELECTRONICS	G	COMPUTER CABINETS	95051
XEROX CORP	G,P	TYPEWRITER/SOFTWARE	94612

VENDORS - INSTRUMENTATION & CONTROLS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
A. BIEDERMAN INC.	I&C	GAUGES	94002
AAC INC.	I&C,E	CURRENT MONITORS	11735
ACTION INSTRUMENTS CO INC	I&C,E	ACTION INSTR MAT/ISOLATE TRANSMITTER	92123
ACTIVE CONTROLS INSTRUMENTATION	I&C	I-PROBE/CURRENT SENSOR	93037
ADVANCED INTEGRATED TECHNOLOGY	I&C	LOGIC MODULES/LINE CONTROLLERS	38401
ADVANCED TECHNOLOGY CO	I&C,M	VIDEO MULTIPLEXER/COLLIMATOR BASE & PLATES	91107
AMERICAN AER	I&C	CURRENT SENSOR	11735
AMERICAN MAGNETICS INC	I&C	LEVEL SENSOR	37830
AMERICAN SCIENTIFIC PRODUCTS	I&C,E,M	TEMP CONTROLLER/LAMP CATHODE/VAC OVEN/ATOMIC ABSOR	94086
AMERICOM ELECTRONICS CORP	I&C	FAB OF ALPHA SURVEY METERS	94545
ANACON INC	I&C	ANALYZER, HYDROGEN	01803
ANALOG DEVICES INC	I&C,E	AMPLIFIERS, INSTRUMENTATION & OPERATIONAL	95128
ANILAM ELECTRONICS CORP	I&C,P	READOUT SYSTEM/SOFTWARE BOARD	92806
ANTHEM ELECTRONICS INS	I&C	IC'S INTERFIL	95131
APEX MICROTECHNOLOGY CORP	I&C	POWER AMP	94022
ARROW WELDING	I&C,M	FLOWMETER FOR WELDER/SHOP CURTAIN	94621
ASSOCIATED PROCESS CONTROLS	I&C	TRITON VALVE CONTROL/AIR REGULATOR	94404
ASSOCIATED R	I&C	TRIAC(SEMICONDUCTOR)	94103
AUDIO VISUAL	I&C	VIDEO CASSETTE PLAYER/P C AUDIO	90302
AUDIOTRONICS CORP	I&C	MONITORS	91605
AZTEC ENGINEERING INC	I&C	CONTROL AMPS	94086
B W S DISTRIBUTORS INC	I&C	VELOMETER	95406
BAILEY INSTRUMENTS	I&C	CONTROL SYSTEMS & DISPLAYS	UNK
BAY SEAL CO	I&C	AMPLIFIER & SETUP	94545
BELILOVE CO	M,I&C	THERMOSWITCH/CONTROLLER SCR/HEATERS	94608
BELL INDUSTRIES	I&C	LED INDICATOR/CHIPS&CONTROLLER	91086
BERKELEY NUCLEONICS CORP	I&C	GENERATOR, DELAY	94710
BI RA SYSTEM	I&C	CAMAC POWERED CRATES	87107
BOMAR/ALI INC	I&C	METER PANELS	01720
BOSS TOOL MFG INC	I&C	ACTUATOR ASSY	95131
BROOKS INSTRUMENTS	I&C	FLOWMETERS	94070
BURKE CO	I&C,M	COUPLINGS/SCISSOR CLAMPS	94080
CALIFORNIA INSTRUMENTS	I&C	RECORDER, MULTIPOINT	90074
CALIFORNIA VIDEO SALES INC	I&C	CAMERAS	94107
CALORIMETRICS INC	I&C	CALORIMETER	90306
CANBERRA INDUSTRIES INC.	I&C	DETECTOR SYSTEM	06450
CARROLL TOUCH TECHNOLGY	I&C	TOUCH PANEL CONTROLLER	61821
CENTRONIC INC	I&C	DETECTOR, PHOTODIODE	07092
CLAUDE S GORDON CO	I&C	THERMOCOUPLES	94081
CLEAR-COM INC	I&C	COM. STATION	94107
CMS INTERNATIONAL CORP LTD	I&C	ELCOMETER, MINITECTOR & PROBE, TELESCOPIC	94080
COHERENT INC	I&C,L/O	POWER METERS	95603
COHU INC	I&C	ID GENERATOR/TV CAMERA SYSTEM	95014
COLORADO VIDEO INC	I&C	VIDEO ANALYSER	80306
COLUMBIA COMPONENTS CO	I&C	LINE DELAYS	11726
COMLINEAR CORP	I&C	AMPLIFIERS/PREAMPS	80537
CONCEPT ENGINEERING	I&C	TEMP SENSOR	06475
CONSOLIDATED ELECT WIRE & CABLE	I&C	TC CABLE	60131
CONSOLIDATED PARTS INC	I&C	MOTOR CONTROLLER	95131
CONTROL TECHNICS CORP	I&C,O	DMO-MICROMETERS/PIEZO-MIKE FOR DYE LASER	92630
COULTER ELECTRONICS INC	I&C	ANALYZER HEMOTOLOGH (BLOOD COUNTER)	94085
DAK INDUSTRIES	I&C	AMPLIFIERS	91605
DATEL INTERSIL	I&C	VOLTAGE CALIBRATOR	94086
DELTA F CORP	I&C	OXYGEN ANALYSER, TRACE	01801

VENDORS - INSTRUMENTATION & CONTROLS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
DELTA ULTRA SENSE INC	I&C	LEAK DETECTOR	94583
DENTON VACUUM INC	I&C	OPTICAL MONITOR SYSTEM	08003
DINAC	I&C	ELECTRIC AMPLIFIER	95008
DINUCCIS MACHNE SHOP	I&C	MK-IIPAC DETECTOR	94510
DRANETZ ENGINEERING LABORATORIES	I&C	LINE ANALYZER	08818
DRF ASSOCIATES INC	I&C	INTANK CAMERAS	92111
DUPONT ANALYSIS	I&C	HELIUM DETECTOR	19898
DWYER INSTRU	I&C	FLOW METERS	92801
E & I COOP	I&C	OSCILLOSCOPES	92715
EARMARK INC	I&C	HEADSETS	94612
EATON CORP-ELECTRONIC INSTRUMENT DI	I&C	LOAD CELLS & BUTTONS	48089
EBERLINE INSTRMENTS	I&C	ALPHA AIRMONITOR	87501
ECTRON CORP	I&C	DC AMPLIFIERS	94544
EG&G INC.	I&C,E	THYRATRONS	94086
EI DU PONT DE NEMOURS CO INC	I&C	LEAK DETECTOR SYSTEM	90074
EIL INSTRUMENTS INC	I&C	TC CALIBRATOR	95050
ELECTRICAL DISTRIBUTORS CO	I&C,E	SWITCH, INTERUPTER SAFETY	95126
ELECTRONIC NAVIGATION INDUSTRIES	I&C	AMPLIFIER/CAPACITORS & FOOTED BRACKETS	94040
ELGAR CORP	I&C	POWER SYSTEM/POWER SUPPLIES	95117
EMERGENCY PRODUCTS CORP	I&C	ULTASONIC CONTROL	07054
EMILE HAEFLY CIE AG	I&C	SIMULATOR,ELECTROSTATIC DISCHARGE	SWITZER
ENDEVCO CORP	I&C	PRESSURE TRANDUCER	92675
ENI INC	I&C	POWER AMP	94025
EVANS ELECTRONIC	I&C	RATIOMETER	94705
FABTECH ELECTRONICS	I&C	PHOTOLATERAL DET/CONVERTER MODULES	94513
FAR WEST ENGINEERING SALES INC	I&C	TUBE VAC GAUGES	94577
FERNSEH INC.	I&C	CONTROL PANELS	84131
FLW INC	I&C	DC AMPLIFIER	94544
FOX HARDWARE INC	I&C	MICROMETERS	94013
FOXBORO CO	I&C	TEMP. RECORDERS	94577
GALILEO ELECTR-OPTICS CORP	I&C	CHANNELTRON ELECTRON/SPIRALTRON	01518
GEN TEC	I&C	JOULEMETER	99999
GENERAL ELECTRIC SUPPLY CO	I&C	PANELBOARDS, ELECTRICAL DISTRIBUTION	94608
GENERAL ELECTRONIC SYSTEMS INC	I&C	GENLOCKER, 70G SYSTEM	94702
GENERAL SEMICONDUCTOR IND INC	I&C	PROTECTOR TRANSIENT	85201
GESI AUDIO VIDEO SYSTEMS	I&C	MONITORS	94702
GLOBAL EQUIPMENT CO	E,I&C	GENERAL HARDWARE	11550
GOULD INC (BIOMATION DIV)	I&C	REPAIR OF WAVEFORM RECORDER	95050
GOULD INC (MODICON DIV)	I&C	CONTROLLER,MODICONS & CABLE	94010
GOULD INC(INSTRUMENT DIV)	I&C	REPAIR DIGITIZER	95050
GOULD INC.	I&C	MODULE INPUTS & TAPE PROGRAMS	94010
GOW-MAC INSTRUMENT CO	I&C	DETECTOR CELL, CONDUCTIVITY	08807
GRANVILLE-PHILLIPS COMPANY	I&C	CONTROLLERS	94806
GROUP THREE ELECTRONICS	I&C	CIPHER CACHETAPE-DRIVE,CONTROLLER &CABLES	94089
GULTON INDUSTRIES INC	E,I&C	CONNECTORS	92627
HALL-MARK ELECTRONICS CO	E,I&C	CONNECTOR MS/COMPARATORS	94086
HAMAMATSU CORP	I&C	PHOTOMULTIPLIER TUBES	95128
HARREL INCORPORATED	I&C	HEATER CONTROL	06855
HARRINGTON INDUSTRIAL PLASTICS	I&C,M	DETECTORS/PUMPS	94710
HELICAL PRODUCTS CO INC	I&C,M	COUPLINGS	93456
HIGH VOLTAGE ENGINEERING CORP (ANAC	I&C	ANALYSER, HYDROGEN	01803
HITACHI DENSHI AMERICA LTD	I&C	CAMERA	90746
HONEYWELL INC	I&C	RECORDING PAPER	90040
HOTRONICS INC	E,I&C	SYNCHRONIZER	95128
HUGHES AIRCRAFT(INDUSTRIAL PRODUCTS	I&C	PROBE EYE	94705

VENDORS - INSTRUMENTATION & CONTROLS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
HUNTER TECHNOLOGY CORP	I&C	P.C. TIMING CARD	95050
HURST MANUFACTURING CORP	I&C	CONTROLLER,STEP MOTOR	47670
HY-CAL ENGINEERING	I&C	PT TEMP SENSOR	91731
IET LABS INC	I&C	TEST EQUIPMENT	11590
INDEC SYSTEMS	I&C	TESTER/TOUCH PANEL	94086
INDUSTRIAL DATA TERMINALS	I&C	TERMINAL UPGRADES	43081
INT SCIENTIFIC	I&C	MICROSCOPE, ELECTRON SCANNING	UNK
INTEC	I&C	VIDEO SPLITTERS	91720
INTEK	I&C	REPAIR CAMERA	94649
INTERFACE STANDARDS	I&C	CONTROLLER/CAMAC INTERFACE/SCANNING A/D	94539
INTERNATIONAL SCIENTIFIC INST INC	I&C	MICROSCOPE, ELECTRON SCANNING	95051
ION PHYSICS CORP	I&C,E	CURRENT MONITORS/TRANSFORMERS	01803
IRTRONICS	I&C	PYROMETER, TWO COLOR	06902
ITT ELECTRON TUBE DIV	I&C,E	DIODES/THYRATRON FOR ABSOLUTE VOLTAGE	18042
JENSEN TOOLS INC	I&C	THERMOMETER/DRILL SETS	85040
JEOL USA INC	I&C	MICROSCOPE, ELECTRON SCANNING	01960
JOERGER ENTERPRISES INC	I&C	CONTROLLERS	11731
JOHN FLUKE MFG CO INC	I&C,E	CONTROLLER/TRANSFORMER	95050
JOHNS CRYOGENICS	I&C	LN CONTROLS P/C	94550
KAMAN INSTRUMENTATION CORP	I&C	MEASUREMENT SYSTEM, DISPLACEMENT	89033
KAYE INSTRUMENT INC	I&C	CONTROL SYSTEMS & DISPLAYS	02206
KEITHLEY INSTRUMENTS INC	I&C	MICROMETER & ASS/THERMOCOUPLE SENSOR	94568
KENSINGTON LABORATORIES INC	I&C	MICROSCOPE POSITIONING SYS	94804
KINETIC SYSTEMS INC	P,I&C	CAMAC MUX/VENUS CONTROLLER & ADAPTER	94566
KOOSEN INC	I&C	DIGITIZERS	94086
KULITE SEMICONDUCTOR PRODUCTS INC	I&C	TRANSDUCERS, PRESSURE	94595
LABSPHERE	I&C	SPHERES/DETECTORS	03260
LAKE SHORE CRYOTRONICS	I&C,E	DIODES	43081
LANDIS GYR INC	I&C	COUNTER	10523
LASER PRECISION CORP	I&C	RATIOMETER/POWER METER	13502
LECROY	I&C	DATA LOGGERS, FUNCTION GENERATORS & MEMORY	94550
LECROY RESEARCH SYSTEMS CORP	I&C	DATA LOGGERS, 32 CHANNEL	94550
LIVERMORE ENGINEERING INC	I&C	CONTROL AMP	94558
LUDLUM MEASUREMENTS INC	I&C	RATEMETER, DUAL ALPHA	79556
LUXTRON	I&C	THERMOMETER WITH PROBES	94043
MARCONI INSTRUMENTS INC	I&C	POWER SCOPE	07647
MATHESON	I&C	STAINLESS REGULATOR & AS/GAUGES	94560
MAXIM ELECTRONIC SALES	I&C	CURRENT METERS, GUN BELL	95051
MEASURITE	I&C	THERMOCOUPLES/THERMOMETERS	94544
MEDICAL ELECTRONIC DESIGN INST	I&C	REPAIR RADIO INTERCOM/HEADSETS	94612
MERET INC	I&C	PHOTODETECTORS	90404
METERMASTER INC	I&C	VOLTMETERS & CONTROLLERS	94303
MICROMINT INC	I&C	REMOTE CONTROL KITS	11516
MOLECTRON CORP	L/O,I&C	LASER/METER, RADIATION	94006
MORGAN ELECTRONICS INC	I&C	RECEIVER & TRANSMITTER	94540
NADY SYSTEMS INC	I&C	VCR & CAMERA	94608
NAHM BROTHERS SPRING CO	I&C	DOOR SENSOR CLIPS	94577
OHIO SEMITRONICS INC	I&C	TRANSDUCERS	43212
OPTHOS INSTRUMENTS INC	I&C	MICROWAVE CAVITIES/LAMPS, ELECTRODLESS	20855
PAGE-GETTER PRODUCTS CO INC	I&C	VMOS DRIVER CHIPS/TRANSISTORS	94086
PACIFIC ELECTRICAL SUPPLY INC	I&C	AMMETER	94577
PACIFIC INSTRUMENTS	I&C	POWER SUPPLY	94510
PANASONIC INDUSTRIAL CO	I&C	GENERAL ELECTRICAL HARDWARE	07492
PCB PIEZTRONICS INC	I&C	ACCELEROMETER	14043
PERKINS-ELMER CORPORATION	L/O,I&C	ION GUN/ELECTRON GUN	95119

VENDORS - INSTRUMENTATION & CONTROLS

COMPANY NAME>	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
PHALO CORPORATION	I&C,I/O	OPTICAL INTERFACE/OPTIC FIBERMULTIPLEXER	95131
PHOTAMP	I&C	LIGHT TRANSDUCER	91505
PHYSICS INTERNATIONAL CO	I&C,E	PROBE	94577
POINTING PRO	I&C	VIDEO ANALYZER	60304
POLYTEC OPTRONICS INC	I&C	MICROMETERS	92630
PRECISION DIGITAL	I&C	DIGITAL METERS, CONTROL	94556
PRINTED CIRCUIT BUILDERS INC	I&C	PHOTOLATERAL DETECTOR BOARDS	95050
PYROMETER INSTRUMENT CO INC	I&C	REPAIR PYROMETER	07647
R V WEATHERFORD CO	I&C	METER PANELS/PHOTODETECTORS	94086
RADIATION MONITORING	I&C	DETECTOR, CADIUM TELLURIDE ENERGY	82172
RADIO SHACK	I&C	AMPLIFIER	94550
RASTER TECHNOLOGIES	I&C	CONTROLLERS	94086
RATEL ELECTRONICS	I&C	FILTERS	95134
RATIO CONTROLS CORP	I&C	PYYROMETER	60101
RCM INDUSTRIES	I&C	FLOWMETER	94563
REUTER-STOKES INC	I&C,E	DETECTOR TUBES, NEUTRON HELIUM	44128
ROBERT BOSCH CORP(VIDEO EQUIPMENT D	I&C	VIDEO SWITCHER	84131
ROCHESTER INSTRUMENT SYSTEMS INC	I&C	TRANSDUCERS	94610
ROWE INDUSTRIES	I&C	HV CABLES & CONNECTORS	95160
SCIENTECH INC	I&C	DIGITAL READOUT/CALORIMETER	80303
SENSYM	I&C	PRESSURE SENSOR	94086
SERVO-TEK OF CALIFORNIA INC	I&C	TACHOMETER	91402
SIECOR CORPORATION	I&C,M	OPTICAL FIBER PRODUCTS	28603
SIEGER GASAL	I&C	GAS SENSOR	74147
SLOAN TECHNOLOGY CORPORATION	I&C	MEASURING SYSTEM/ELECTRON BEAM SOURCE	95131
SOLAR ENERGY DISTRIBUTORS INC	I&C	FLOW SYSTEM CONTROL	94596
SPEEDOMETER SERVICE	I&C	TIMERS	94102
STANDARD ENGINEERING CORP	I&C	CONVERTER, ANALOG TO DIGITAL	94566
STANDARD METER LAB INC	I&C	METERS	94568
SYCON	I&C	METER DIGITAL PANEL	43302
TEGAL SCIENTIFIC INC	I&C	INTERFACE, UNIVERSAL	94524
TEKTRONICS INC	I&C	SAMPLING SCOPE	94523
TELEDYNE (HASTINGS-RAYDIST)	I&C	GAUGES/CONTROLLERS	23661
TELETRON INC	I&C	TUBE,ULTAVIOLET SENSITIVE	19518
TELTONE CORP	I&C,P	MULTIPLEXERS	95008
TENNELEC INC	I&C	PREAMP	37830
TEXNATE INC	I&C	METERS,ANALOG	92075
TIME-TROL	I&C	AC CONTROLLERS	91405
TOCCO WEST	I&C	AMPMETERS	91720
TRACOR NORTHERN INC	I&C	ANALYSIS SYSTEM & ACCESSORIES/X-RAY ANALYZER	94043
TRANSIAC CORP	I&C	AMPLIFIER & CONVERTER, 16 CHANNEL	94043
TRI TRONICS INC	I&C,E,G	MONITORS/VIDEO PLAYER	91505
TROMPETER ELECTRONICS INC	I&C	PATCH PANEL	91311
TRYCO VIDEO	I&C,E	VIDEO SPLITTERS	48024
TYLAN CORPORATION	I&C	GAS FLOW METERS	95051
UNITED DETECTOR TECHNOLOGY	I&C	PHOTODETECTOR PIN DIODES	90205
UTI-INSTRUMENT CO	I&C,E	ANALYZER	94086
VACUUM GENERAL	M,I&C,E	CONTROL MODULES/CONTROLLERS/POWER SUPPLY & CABLES	92111
VALIN	I&C	PRESSURE GAUGES	94520
VALLEY ELECT	I&C	VOLTMETERS	94568
VANZETTI SYSTEMS INC	I&C	PYROMETER, EMISSIVITY INDEPENDENT	90247
VARIAN (IND PROD OPER SERV)	I&C	SMART GAUGE	94043
VIDEO SHACK	I&C	VIDEO SYSTEM	94566
VOLTAGE MULTIPLIERS	I&C,E	DIODES	93291
WALKER SCIENTIFIC INC	I&C,Q	PROBE/GAUSSMETER & CHAMBER	01606

VENDORS - INSTRUMENTATION & CONTROLS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
WARREN COMMUNICATIONS	I&C	AIRFLOW SENSORS	07039
WAVETEK INDIANA	P,I&C	VIDEO HARDCOPY	94043
WESCO	P,G,I&C	SOFTWARE/SWITCHBOARD/VOLTMETER	95625
WESTERN MICROTECHNOLOGY INC	I&C	I.C. ANALOG CHIPS	95014
WESTERN TOOL & SUPPLY CO	I&C	INDICATORS	94601
WESTON INSTRUMENTS INC	I&C	METER PANEL/VOLTMETERS	94063
WESTRONIX LA	I&C	VOLTAGE PHASE CONTROL	92621
WYKO OPTICAL	L/O,I&C	LASER TESTER	85711
Y.C.A	I&C	CHART RECORDER	94523
YELLOW SPRINGS INSTRUMENT CO INC	I&C	TEMPERATURE MEASUREMENT CARDS & PROBES	45387
ZI-TECH INSTRUMENT CORP	I&C	SWITCHES	94025

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VENDORS - DATA PROCESSING

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
800-SOFTWARE	P	SOFTWARE	94710
A I T	P	TERMINALS, DEC VIDEO	38401
ABA SYSTEMS	P	COMPUTER PARTS	37202
ABLE COMPUTER TECH INC	P	CONVERTER	95128
ADAC CORP	P	DISK SYSTEM/MEMORY CARD	01801
AHA INC	P	PMS-RMS SOFTWARE	95062
ALANTHUS DATA COMMUNICATIONS CORP	P	VIDEO TERMINAL	94404
ALLIED BUSINESS SYSTEMS INC.	P	CALCULATOR	94583
ALPHANETICS	P	SOFTWARE	95436
AM MULTIGRAPHICS	P	PRINT MACHINE	94080
AMERICAN COMPUTER	P	SOFTWARE CARDS & SWITCHES	92806
AMERICAN TERMINAL SUPPLIES & SERVIC	P	P.C./IMPACT PRINTER & INTERFACE KIT	92806
AMTEL CORP	P	MODEMS, MODEM RACK & POWER SUPPLY	94538
ANADEX INC.	P	PRINTER/REPAIR COMPONENT BOARD ASSY	91311
ANDERSON JACOBSON INC	P	TERMINAL	95131
ANILAM ELECTRONICS CORP	I&C,P	READOUT SYSTEM/SOFTWARE BOARD	92806
APPLE COMPUTER INC	P	MICROCOMPUTER	94086
APPLIED SOFTWARE TECH	P	SOFTWARE	95030
ASUC BOOKSTORE	P	CALCULATORS	94701
AVIV CORPORATION	P,G	GAUNT/TAPE CONTROLLER/MAINTENCE OF AVIV SYSTEM	94903
B & B SALES	P	TERMINAL BLOCKS	94553
B A INC	P	SOFTWARE	90291
BARBER-COLMAN CO	P	PROGRAMMER	94563
BAY REPROGRAPHIC SUPPLY	P	PRINTER	95113
BERK SOFTWARE	P	SOFTWARE DEVELOPMENT	94709
BILES & ASSOC	P	SOFTWARE	UNK
BILL'S TV & RADIO	P	TERMINALS	95051
BLACK BOX CA	P	INTERFACE, ASYN/SYN	15241
BRUNING	P	WHITEPRINTER	94080
CALIFORNIA COMPUTER GROUP	P	TAPE SYSTEM	92626
CAMBION MIDL	P	P.C. JACKS	02140
CAPITAL SALES CO	P	COMPUTER PARTS	78750
CERTIFIED EQUIPMENT SALES CO	P	CALCULATORS	9030I
CITATION COMP SYSTEM	P	LAB INFO. SYSTEM	63043
COMPUTER CAR	P	PRINTER REPAIR	94043
COMPUTER CONVERSIONS CORP	P	ENCODERS	11731
COMPUTER MAIL ORDER	P	BOARD, COMMODORE	09449
COMPUTERLAND	P	SOFTWARE, P C 'S	9456669
COMPUTERVISION CORP	P	CADD SYSTEM	94086
CONRAC CORP.	P	COLOR MONITORS	91732
CONTEL INFORMATION SYSTEMS INC	P	RT FILE SOFTWARE	92665
CONTEXT MGT SYSTEMS	P	UPDATE FOR SOFTWARE	90505
CONTROL DATA CORPORATION	P	DISK PACK	94086
CORPORATE COPUTER SYSTEMS INC	P	SOFTWARE/MAINTENANCE	07733
CRYSTAL OFFICE SYSTEMS	P	VAX COMPUTER SYSTEM	95815
CYBERNETIC MICRO SYSTEMS	P	USER'S MANUAL	94074
DANFORD CORP	P	SOFTWARE & MAINTENANCE CONTRACT	90731
DATA LEASING CO	P	COLOR TERMINALS	95110
DATA SYSTEMS DESIGN	P	FLOPPY DISK DRIVE	95051
DATA SYSTEMS MARKETING	P	GRAPHICS PACKAGE	94043
DATA TRANSLATION	P	CLOCK CARD	01752
DATARAM CORPORATION	P	COMP CHASSIS & BACKPLANE	00512
DATUM INC	P	TIME CODE READER & DISPLAYS	95051
DAVID JAMISON CARLYLE CORP	P	GRAPHICS TERMINAL & BOARD	94563

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
DAYTON-FORES	P	PRINTER	94545
DEL REY SYSTEMS INC	P	SERVICE CONTACT-COMPUTERS & INTERLOCKS	90045
DIGIT MICROSYSTEMS	P	DIGITAL MICRO COMPUTER	94606
DIGITAL EQUIPMENT CORP	P	DP SUPPORT MATERIALS/TERMINAL, GRAPHICS/DISPLAY	03061
DISCOUNT SOFTWARE GROUP	P	CPM SOFTWARE	90020
DITECHS	P	HARDWARE & SOFTWARE	94593
DJC	P	VAX TERMINALS	94563
DRD	P	FLOPPY DISC SYSTEM	95051
DUWAYNE INDU	P	EPSON MX80/ MONITOR	94523
EAKINS ASSOCIATES INC	P,C	TAPE DRIVES/REPAIR DISK DRIVES	94041
FMJ INC	P	DISK LOCK	90510
GLENN A. BARBER ASSOC INC	P	SPEC'L SOFTWARE & SUPPORT MAT'L	91403
GRID SYSTEMS CORP	P	COMPUTER COMPASS SYSTEM	94111
HERCULES COMPUTER TECHNOLOGY	P	GRAPHICS CARD & SOFTWARE	94710
HEWITT PACKARD COMPUTER SUPPLIES	P,C	COMPUTERS,CALCULATORS & SUPPLIES	94088
HOME & BUSINESS	P	COMPILER/SOFTWARE	94566
IDM PERIPHERAL	P	PRINTER/PLOTTER	94901
IFM INC	P	POWER PACK/BREADCARD	94040
IMAGING TECHNOLOGY INC	P	CIRCUIT BOARDS	01801
INFOMAX INC	P	COMPUTER & ACCESSORIES	94596
INFOTEK SYSTEMS	P	FLOATING PRINTER & SOFWARE	92806
INMAC	P	PERSONAL COMPUTER SUPPORT MAT'L/EQUIP	94086
INNOVATIVE SOLUTIONS INC	P,I/O	INTERFACE	95815
INTEGRATED ELECTRONICS-JACO	P	ACCESS TRANZBORS	95120
INTERACTIVE RADIATION INC	P	GIMBEL MOUNTS(PC HOLDER)	07647
INTERLAN INC	P	ETHERNET	94043
INTEX MICRO SYSTEMS CORP	P	INTEX-TALKERS	48084
ITM	P	C-BASIS	94598
KENNEDY BUSINESS MACHINES	P	TAPE DRIVE, TRANSPORT DIGITAL	94086
KINETIC SYSTEMS INC	P,I&C	CAMAC MUX/VENUS CONTROLLER & ADAPTER	94566
KROY INDUSTRIES INC	P,C	GRAPHICS MACHINE/LIGHT TABLES	94404
M/A-COM ALANTHUS DATA INC	P	TERMINAL W/ VIDEO & PRINTER	94404
MDB SYSTEMS INC	P	COMPUTER & PRINTER	92665
MEDIA DISTRIBUTING	P	DISK DRIVES, FLOPPY & HARD	95066
MICRAJUST	P	PRINTER SCREEN	91409
MICRO LOGIC CORP	P	MICROPROCESSOR VIEWER	07602
MICRO TECHNOLOGY INC	P	WINCHESTER DISCS	94041
MICROAGE COMPUTER STORE	P	CARTRIDGE RIBBON	94523
MICROSOFT	P	CPM-UPDATE SOFTWARE	98004
MICROSYSTEMS ENGINEERING CORP	P	SOFTWARE	60195
MICROWARE INC	P	SOFTWARE SUPPORT	02360
MIDWEST SYSTEMS INC	P,C	COMM INTERFACE/LOGIC MODULE/CABINETS	55337
MISCO INCORP	P	DISKETTE FILES/POWER STRIPS	07746
MOORE COMPUTER SUPPLIES CATALOG	P	DISKETTE STORAGE CONTAINERS	60090
MOXON ELECTRONICS	E,P	MULTIPLEXERS W/ VOICE CHANNEL/MODEMS	95131
MPC PERIPHERALS CORP	P	MEMORY BOARD	92123
MULTI-TECH SYSTEMS INC	P	MODEMS	55112
NATIONAL INSTRUMENTS	P	PC & SOFTWARE/UNIBUS	78759
NATIONAL SEMICONDUCTOR CORP	P	MEMORY MODULE	95051
NCA CORP	P	INSTALL OF SOFTWARE	95054
NICOLET SCIENTIFIC CORP	P	PROCESSOR, MULTI-CHANNEL	95134
OKI SEMICONDUCTORS INC	P	REAL VOICE APPLICATION KIT	95051
OMNEX CORPORATION	P	ANALYST/PROGRAMMER	94303
P C SOLUTION	P	COLOR MONITOR & BOARD	94549
PDA ENGINEERING	P	USER'S MANUAL	95625

VENDORS DATA PROCESSING

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
PERITEK CORP	P	DISPLAY, MONITOR & SOFTWARE	94619
PERSONAL CAD SYSTEMS INC	P	SOFTWARE	95030
PHOTO & SOUND CO	P	SOFTWARE	94105
PLUTA AND ASSOCIATES	P	CONTROLLER, CAMAC	94566
POWER UP	P	SOFTWARE	94019
PRECISION ECHO	P	RECORDER W/ DISCASSETTE & ASS	95054
PRIORITY ONE ELECTRONICS	P	PRINTER BUFFER	91311
PRO-LOG CORP	P	PROM PROGRAMMER	93970
PROCESS CONTROL TECHNOLOGY	P	P C & ACCESSORIES	95202
PSDI	P	SOFTWARE	94111
QUME CORP	P	QUME DRIVE & CIRCUIT BOARD	94545
RACAL-VADIC INC	P	MODEMS	94086
RAMTEK CORP	P,G	PRINTER MAINTANENCE ON COLOR TERMINAL	95050
RC DATA INC	P	PRINTER	95131
RECOGNITION CONCEPTS INC	P,S	PIP CARD/PROCESSOR REPAIR	89450
RESEARCH INC	P	MICRICON OPERATOR	95050
SALES ONE	P	DISC CONTROLLER	94062
SIERRA COMPONENTS INC	P	POWER SUPPLY	95008
SIERRA COMPUTER SUPPLIES	P	POWER SUPPLY	95008
SIGMA INFORMATION SYSTEMS INC	P	CHASSIS WITH QUAD	95128
SINCLAIR OPTICS	P	SOFTWARE LICENSE	14534
SKY COMPUTERS INC	P	ARRAY PROCESSOR	95020
SOFSEARCH	P	SOFTWARE SERVICES	33908
SOFTWORD SYSTEMS	P	SOFTWARE	06108
SORCIM CORPORATION	P	SOFTWARE	95131
SORRENTO VALLEY ASSOC	P	SOFTWARE DEVELOPMENT	92121
STANFORD RESEARCH SYSTEMS INC	P	BOXCAR AVERAGER	94306
STEVEN ENGINEERING	P	SOFTWARE	94080
STONEWARE IN	P	SOFTWARE	94901
STRUCTURAL MEASUREMENT SYSTEMS	P	SOFTWARE MODELS	95134
SURLFORM	P	COMPUTER	95067
SYSTEMS INDUSTRIES INC	P	MAT'L MAINTENANCE SERVICE/COMPUTER SYS	95035
T L NORRIS & ASSOC	P	REPAIR FLOPPY DISK DRIVE	94550
TAU CORPORATION	P	SOFTWARE	95030
TECHNICAL FURNITURE SYSTEMS	P	COMPUTER CONSOLE	94087
TELESOFT	P	SOFTWARE UPDATES	92121
TELEWIRE KBL	P	MODEMS	94560
TELTONE CORP.	I&C,P	MULTIPLEXERS	95008
TEXAS INSTRUMENTS INC	P	PRINTER	94111
THRESHOLD SOFTWARE INC	P	SOFTWARE	95815
TOCCO ALABAMA INC	P,M	WORK STATION	91720
U S DESIGN CORP	P	REPAIR DISC/winCHESTER HARD DISK	20706
VERSATEC	P	PRINTER, PLOTTER & STAND/CADD PLOTTERS	94568
W A BROWN CO	P	COMPUTER HARDWARE	32800
WANG LABORATORIES INC	P	HARDWARE & SOFTWARE	94608
WAVETEK INDIANA	P,I&C	VIDEO HARDCOPY	94043
WESCO	P,G,I&C	SOFTWARE/SWITCHBOARD/VOLTMETER	95625
WESPERCORP	P	TAPE CONTROLLER	92680
WEST COAST COMPUTER EXCHANGE INC	P	DISK SYSTEM/LOGIC MODULES	95670
WEST-MICROSYSTEMS	P	PRINTER	91014
WYANT MEASUREMENTS INC	P	SOFTWARE	85749
XEROX CORP	G,P	TYPEWRITER/SOFTWARE	94612
ZACK ELECTRONICS	P	BREADBOARDING SYSTEM	94102

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
A. JAEGERS	L/O	ACHROMAT LENS	11563
AERO-SPACE WELDING CO	M,L/O	QUAD CLAMPS & BASE/4cm OSCILLATOR	95035
AEROTECH INC	L/O	MIRROR MOUNTS	15238
AIRTRON	L/O	LINEAR AMP/DYE WINDOW ASSY	07927&0
ALLIED CORPORATION	L/O	METGLAS	07054
ALPHA GROUP INC	L/O	4cm OSCILLATOR	94577
ANDOVER CORPORATION	L/O	CENTER WAVELENGTH FITLERS	01843
ANDENIEUX CORP OF AMERICA INC	L/O	3" WINDOW/LENS	03051
APPLIED OPTICS INC	L/O,M	LASER WINDOW	94523
ARDEL	L/O	TRANSLATOR	06497
ARTEL COMMUNUNICATIONS CORP	L/O	CV FIBER OPTICS	01602
ASTRO MET	L/O	POROUS TUNGSTEN TUBES	45215
AVTECH ELECTROSYSTEMS LTD	L/O	LENS	11101
BAUSCH & LOMB INC	L/O	GRATING LASER	14625
BEARING ENGINEERING CO	L/O	TELESCOPE PKG.	94103
BELDEN CORP	L/O	OPTIC FIBER CABLE	60134
BERKELEY GLASS LAB	L/O	QUARTZ TUBE/C/M LASER	94538
C N C ENGINEERING	B,L/O	BUSHINGS & FASTENERS/LASER TUBES	94550
C V I LASER CORP	L/O	LASER MIRRORS	87112
CARAL INC	L/O	3" TURNING MIRRORS	94706
CARSON OPTICAL INSTRUMENTS	L/O	INVESTOSCOPE/ZEISS SVB	94618
CAST ALUMINUM & BRASS CORP	L/O	CYL CASTING	94577
CHAMP CO.	L/O,M	TELESCOPE ASSY/COLLECTOR TANK	95008
CLEVELAND CRYSTALS INC	L/O	KDP SAMPLES	44117
COHERENT INC	I&C,L/O	POWER METERS	95401
COMMONWEALTH SCIENTIFIC CORP	L/O,E	ION SOURCE/PWR SUPPLY,MILLATRON & PARTS	22314
CONTINENTAL OPTICS CORP	L/O	CYL 3" WINDOW/SHEAR PL/BEAM SPLITTER	11788
CONTRAVES GOERZ CORP	L/O	TELESCOPE	15238
CORNING GLASS	L/O	CYL WINDOW BLANKS	14831
COVENTRY TOOL MACHINE	L/O,E	OPTICS PKG/LINEAR AMP	95035
CRYSTAL SYSTEMS INC	L/O	SAPPHIRE	01970
CRYSTAL TECHNOLOGY INC	L/O	CRYSTAL/OPTIC MODULATOR	94303
CURRENT PRODUCTS INC	L/O	3" ACHROMATIC LEN	92667
DESIGN OPTICS	L/O	MIRRORS	94086
EALING CORP	L/O	OPTICAL FILTERS	01760
EDMUND SCIENTIFIC CO	L/O	LENS TISSUE	08007
EIRCAR PROD	L/O	ALUMINA CYLNDRS	10721
ELECTRON TECHNOLOGH INC	S,L/O	RECTIFIER	07032
ELECTRONIC DEVICES INC	E,L/O	RECTIFIERS	10701
EMCEE ENTERPRIZES	L/O	LASER TUBES	94577
ESCO PRODUCTS	L/O	QUARTZ OPTICS/CONCENTRIC REDUCERS	94608
EXCITON CHEMICAL CO INC	L/O	LASER DYE	45431
EXTRANUCLEAR LABORATORIES INC	L/O	IONIZER CROSSBEAM	15238
FISHER BROWNELL	L/O	AMBER LENS	95050
FLUOROCARBON	L/O	QUARTZ TUBES & TABE	94086
FORDHAM RADIO INC	L/O	MAGNIFIER, LAMP	11788
GENERAL FIBER OPTICS	L/O,M	OPTICAL FIBERS	07006
GENERAL OPTICS INC	L/O	SUBSTRATE OPTICS	93021
HARSHAW CHEMICAL CO	L/O	NAF CRYSTAL/LASER WINDOWS	44139
HERAEUS-AMERSIL	L/O	SUPERSILS,ULTRASIL & CUTTING CHARGE	08872
HOWLAND INDUSTRIES	L/O	MIRROR MOUNTS	90680
ILC TECHNOLOGY	L/O	FLASHLAMPS	94086
INFICON LEYBOLD-HERAEUS	L/O	REPAIR AUX SENSOR	95110
INFRARED INDUSTRIES INC	L/O	IR FILTERS	32891

VENDORS - LASERS & OPTICS

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
INNOVATIVE SOLUTIONS INC	P,L/O	INTERFACE	95015
INRAD	L/O,M	CVL WINDOWS/POCKET CELLS	07647
INTEROPTICS	L/O	FIBER SYSTEM	94010
INTRAACTION CORP	L/O	MODULATORS	60104
IRCON INC	L/O	MODIFY OPTICAL PYRP	95003
ITEK CORPORATION	L/O	LASER WAVEFRONT COMPENSATION SYSTEM	02173
JANOS TECHNOLOGY INC	L/O	SALT WINDOWS/MIRRORS	05353
JODON INCORPORATED	L/O	LASER COLLIMATOR	46103
JONATHAN MFG CORP	L/O,M	CHASSIS SLIDES	92634
JVC	L/O	REMOTE CAMERA UNIT & LENS	07407
KAPTRON INC	L/O	SPLITTER	94306
KARL LAMBRECHT CORP	L/O	CYCLINDER LENS	60618
KENLAB	L/O	OPTICS MOUNTS	94577
KEUFFEL & ESSER CO	L/O	TELESCOPE	94080
KLINGER SCIENTIFIC CORP	L/O	PRISM TABLES	11418
LAGUNA LABORATORIES INC	L/O	SUBSTRATE OPTICS	92705
LAMBA PHYSIK	L/O,E	UNSTABLE RESONATOR/POWER SUPPLY	11747
LASER INC	L/O	LASER RULE	01566
LASER OPTICS INC	L/O	END MIRRORS	06810
LASER POWER OPTICS	L/O	LASER OPTICS 2"/MIRRORS	92121
LASER TECHNOLOGY INC	L/O	REPAIR OF FIZEAU WAVEMETER	87109
LECO CORP	L/O,M	POLISHER, GRINDER	92705
LUMONICS RESEARCH LTD	L/O,Q	LASER TUBES/GERMANIUM COUPLER	99999
MATERIAL PHYSICS	L/O	PINCH BEAM CUBE	
MATERIALS BY METRON INC	L/O	ROD, TANTALUM,SINGLE CRYSTAL	07820
MATH ASSOCIATES INC	L/O,M	OPTIC FIBERS	11590
MAX LEVY & CO	L/O	2" TARGETS	19144
MOLECTRON CORP	L/O,I&C	LASER/METER, RADIATION	94086
MOTION INDUSTRIES INC	L/O	RING IRD KIT FOR OPT MIXER	94544
MOTT METALLURGICAL CORP	L/O,M	FRIT FILTER	06032
NEWPORT CORP	L/O,M	MIRRORS/OPTIC MOUNTS/LASER SUPPORT/LASER TABLE	92708
NSC PRECISION CELLS	L/O	CELLS, FLUORESCENCE	11801
NUMERIC MACHINE	L/O,E	MAGNETIC SWITCHES	94538
OPTIC FAB CORP	L/O	CVL LENS COAT/MIRRORS FOR REGULIS	95050
OPTICAL COATING LAB INC	L/O	OPTICAL COATING/ZERODUR LOW SCATTER & FUSED SILICA	95401
OPTICAL INSTRUMENTS	L/O,E	PROJECTOR, POWER SUPPLY & ILLUMINATION SYSTEM	90621
OPTICO GLASS FABRICATION INC	L/O,M	LASER WINDOWS	91773
OPTICS FOR RESEARCH	L/O,E	ACHROMATIC LENS/AMP COMPONENTS	07006
OPTICS PLUS INC	L/O	OPTICS	92705
OPTO-ELECTRONICS LTD	L/O	PHOTO DETECTORS	99999
ORIEL CORP	L/O	MIRROR MOUNT	06497
PACIFIC SAFETY EQUIPMENT CO	L/O,G	LASER EYEWEAR	92803
PANAMETRICS	L/O	HTGROMETER SYSTEM	94596
PANAMOUNT INDUSTRIES INC	L/O	MIRROR MTS/BEAM PROC. TABS	53225
PERKINS-ELMER CORPORATION	L/O,I&C	ION GUN/ELECTRON GUN	95119
PHALO CORPORATION	I&C,L/O	OPTICAL INTERFACE/OPTIC FIBERMULTIPLEXER	95131
PHOENIX LASER	L/O	REPAIR PLASMA TUBE	94086
PHOTRONICS	L/O	CVL OPTICAL DELAY BEAM	11788
POMFRET RESEARCH OPTICS INC	L/O	FILTERS	06902
PRECISION QUARTZ INC	L/O	C/H LASER	95050
PRENTICE INDUSTRIAL SUPPLY INC	L/O	OPTICAL POLYCARBONATE SHEETS	95205
PRISMS UNLIMITED INC	L/O	PRISMS	92648
PTR OPTICALS CORP	L/O	MIRRORS	02154
PYRAMID OPTICAL CORP	L/O	CORNER CUBES	92714
QUANTA-RAY	L/O,G	LASER/CRYSTALS/ETALONS/REPAIR LASER	94043

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
REFRACTORY PRODUCTS CO	L/O	4cm LASER	60120
ROCKWELL INTERNATIONAL	L/O	ZERODUR LOW SCATTER & FUSED SILICA LOW SCATTER	92830
ROLYN OPTICS CO	L/O	MICROSCOPES, OBJECTIVE	91724
RTRON CORP	L/O	FILTERS	60076
SANDR INC	L/O	LENS HOLDER	94545
SCHOTT GLASS TECHNOLOGIES INC	L/O	BLANKS, 18"	18642
SIGMA RESEARCH	L/O	SAPPHIRE	99352
SMITH'S PRECISION TOOL WORKS	L/O,M	SPP-II LEN & MIRROR MOUNTS	94566
SPAWR OPTICAL RESEARCH INC	L/O	MIRRORS	91720
SPECIALTY ENGINEERING ASSOC	L/O	DISCS, QUARTZ OPTICAL GRADE	95035
SPECTRA OPTICS	L/O,G	LASER GOGGLES	91342
SPECTRA-PHYSICS INC	L/O	BEAM SPLITTERS/ACCUMULATORS	94042
SPECTRO-FILM INC	L/O	FILTERS, CENTER WAVELENGTH	01890
SPHIKON	L/O	SAPPHIRE FIBER	03055
STANDLER INC	L/O	TELESCOPE	95112
TECOPTICS	L/O	SOLID ETALONS	95128
TINSLEY LABS	L/O	CVL TELESCOPE ASSEMBLY	94710
TITAN TOOL SUPPLY	L/O	BORESCOPES	14216
TWO-SIX INCORPORATED	L/O	MIRRORS	16056
UNITED STATES FUSED QUARTZ CO INC	L/O	QUARTZ TUBES	94006
VALLEY MACHINE SHOP	L/O	8cm LASER	94550
VALTEC	L/O,M	POSITIONER ASSY.	94523
VIRGO OPTICS INC	L/O	SOLID ETALONS	33568
WAVETEK-SCIEN	L/O,E	FILTER,BANDPASS BRICKWALL	07647
WESTERN PIPING & ENGINEERING CO	M,L/O	SLUG FEEDER/LASER ASSY	94124
WESTGRY PIPE	L/O	BB AMP LASER ASSY.	94124
WILLEY CORPORATION	L/O	REFLECTANCE SAMPLES	32903
WYKO OPTICAL	L/O,I&C	LASER TESTER	85711
ZYGO CORP	L/O	MIRRORS	06455

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
A & K MFG	M	DETECTOR BASE PLATE/CONSOLE FRAME	94601
A F EQUIPMENT CO INC	M	FILTER HOUSING	94043
A M CASTLE CO	M	ANGLES	94119
A M RESEARCH	M	CLAMPS FOR LINEAR AMP	94544
ABBEON CAL INC.	M	BELLOWS	93101
ACCO INDUSTRIES INC	M	JIB CRANE	94577
ACCURATE MFG CO	M	REGULIS RIBBON POST & BACKGROUND PLATE	94550
ACCURIDE	M	SLIDES 28"	90670
ADEPT MANUFACTURING CO	M	HEPA-FILTERS	92626
ADF SERVICE CORP	M	HEATER PARTS FOR REGULIS	94608
ADVANCE CARBON PRODUCTS INC	M	PRODUCT PLATE REWORK	94005
ADVANCED INSULATIONS REFRACTORIE	M	INSULATING CYCLINERS,ALUMINA	94612
ADVANCED TECHNOLOGY CO	I&C,M	VIDEO MULTIPLEXER/COLLIMATOR BASE & PLATES	91107
AERO-SPACE WELDING CO	M,L/D	QUAD CLAMPS & BASE/4cm OSCILLATOR	95035
AEROMET INC	M	TANTALUM TUBES	07631
AEROQUIP CORP	M	CLAMPS	94577
AEROSPACE	M	FLOOR SHIELDS, MINERVA	95035
AF EQUIPMENT CO INC	M	FILTER HOUSING	94043
AGF INC	M	VACUUM FURNACE	07207
AIR & TOOL ENGINEERING CO	M	HOIST	94002
AIR FILTER CONTROL INC	M	HEPA FILTERS	94063
AIR FILTRATION CO	M	FILTER FRAME	95050
AIR PRODUCTS & CHEMICALS INC	M	CRYOPUM SYSTEM	18102
AIRCO TEMESCAL	M	BELLOWS	94043
AIRFLOAT CORP	M	VEHICLE	62526
ALASKAN COPPER & BRASS CO	M	HEAT EXCHANGER	98124
ALBEROX CORPORATION	M	E-BEAM/HV GUN INSULATOR	02745
ALCATEL VACUUM PRODUCTS	M	PUMP	94086
ALKURT METAL, INC.	M	METAL FAB TO PRINT/SPEC	24939
ALL WELD MACHINE & FABRICATION CO	M	CHAMBER NECK ASSY	95035
ALLEN P. JAME	M	M.V. LIFTING FRAME	90723
ALLIED ANALYTICAL SYSTEMS	M	NEBULIZER, TORCH & SPRAY CHAMBER	02254
ALLIED ENGINEERING & PRODUCTION COR	M	GENERAL FABRICATION	94501
ALLTECH ASSOCIATES	M	COLUMNS	94022
ALMAC CRYOGENICS INC	M	LIQUID GAS CYLINDER	94608
AMCO ENGINEERING CO	M	TRITON BEAM ENC/ALUMINUM CASTINGS	60176
AMERICAN SCIENTIFIC PRODUCTS	I&C,E,M	TEMP CONTROLLER/LAMP CATHODE/VAC OVEN/ATOMIC ABSOR	94006
AMFAC PIPE SUPPLY CO	M	FITTINGS, DYE PIPE	95035
AMPLEX CORP	M	DRILLS & CORES	06002
ANALABS INC	M	COLUMNS, ALUMINUM & STAINLESS	06473
ANDERSON TOOL ENGINEERING CO	M	QUAD MIRROR MOUNT	46013
ANSUL CO FIRE PROTECTION GROUP	M	NITROGEN CARTRIDGES	54143
APEX MACHINE TOOL CO	M	SOCKETS	94509
APPLIED FUSION INC	M	THOR COOLING JAC	94577
APPLIED OPTICS INC	L/D,M	LASER WINDOW	94523
APS-MATERIAL	M	PLASMA SPRAY	45405
APSCO MANUFACTURING	M	HAND KNOBS/FAN FEEDTHROUGH	94577
ARO CORP	M	WRENCH, IMPACT REVERSIB	91749
ARROW FASTNERS	M	SCREWS	94544
ARROW TANK WORKS	M	FUEL TANK, 380 GALS.	96007
ARROW WELDING	I&C,M	FLOWMETER FOR WELDER/SHOP CURTAIN	94621
ASSOCIATED MACHINE	M	OPTICS SUPPORTS	95050
ASSOCIATED SPRING BARNES GROUP INC.	M	SPRINGS	90248
ATLAS METAL SPRAYING CO	M	PLASMA SPRAY ON POLY SHEETS	19143

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
AVS	M	HEATING ELEMENT/HEAT SHIELDS	01432
B & T SPRAY EQUIPMENT CO	M	SPRAY GUN PARTS	94124
BAL SEAL ENGINEERING CO	M	BUSHING MATERIAL	92707
BALL SCREWS ACTUATORS CO INC	M,G	SHAFTS & NUTS/ENGINEER TO SERVICE MARS	95112
BALZERS CORP	M	MODIFY TURBO-PUMP	03051
BARSTAD DONICHT INC	M	FAB'D STORAGE RACKS FOR GAS CYLINDERS	94606
BAUMANN HAND	M	SIDE LOAD FORKLIFT	60560
BAY BOLT INC	M	BOLT SETS	94577
BAY CITIES TOOL SUPPLY	M	FASTENERS	94560
BAY CITY FOUNDRY CO	M	CASTING	95050
BAY PNEUMATIC INC	M	OIL REMOVAL FILTERS/VALVES	94577
BAY RUBBER COMPANY	M	WINDOW GASKETS	94621
BAYOX INC	M	WELDING SUPPLIES & EQUIPMENT	94608
BEEMER ENGINEERING CO	M	COUPLINGS	19034
BEIMER MACHINE WORKS	M	HPLF DOOR LATCH PLATE/CHAMBER COLLECT	94566
BELILOVE CO	M,I&C	THERMOSWITCH/CONTROLLER SCR/HEATERS	94608
BELLOFRAM CORPORATION	M	SEALS	01803
BEN W BRUNDAGE CO	M	KEYSTONE VALVES	94611
BENKISER ELECTRIC	M	SUMP PUMP, MARS	94577
BEST TOOL & MFG CO INC	M	ENTRANCE PLEUM/BEAM PROCESS TAB	64117
BIG JOE SALES & SERVICE	M	LIFT TRUCK	94401
BILLINGTON WELDING CO INC	M	CRYSTAL RETAINERS	95352
BISCO INDUSTRIES INC	M	INSERTS, PERMATHREAD	95131
BOEKEL INDUSTRIES INC	M	VAC PUMP PARTS	19106
BRANSON CLEANING EQUIPMENT CO	M	REFRIGERATION UNIT/SOLVENT REV STILL	95131
BRAY OIL CO.	M	GREASE BEARING BRAYCOTE	92714
BRIDGEPORT W	M	MILLING MACHINE & MILLING HEADS	94538
BROOKS PRODUCTS INC	M	CONCRETE TABLES	94603
BROWN, NOEL J.	M	ER-DOR-FURNACE	95008
BRUEL & KJAER INSTRUMENTS INC	M,E	SHAKER EQUIPMENT/AMPLIFIER, CHARGE	92805
BRUSH-WELLMAN INC	M	SPECIAL MATERIALS	44190
BRUWILER PRECISE SALES CO INC	M	FEED MOTORS	90029
BUEHLER LTD	M	DIAMOND SAW BLADES & ASS	60044
BURKE CO	I&C,M	COUPLINGS/SCISSOR CLAMPS	94080
BURLEIGH INSTRUMENTS INC	M	REPAIR PZ-70 AMPS/MIRROR MOUNTS	14453
C D S ENGINEERING INC	M	EXTRACTOR COOLING ASSY	95112
C H BULL CO	M	HEAT EXCHANGERS	94080
C H DISTRIBUTING CO	M	STORAGE RACKS	53204
C L HANN INDUSTRIES INC	M	COOLING PAN	95126
C V C PRODUCTS CORP	M	CONVALEX	94088
C W WARREN CO (AIRSD DIV)	M	FASTENERS	90028
CAL MAR PIPE	M	HEAT SHIELD SIDE/COLD TRAP VESSELS	94601
CAL PRECISION MFG CO	M	BASE, COVER, LIDS & PISTONS	95035
CALIFORNIA BUILDERS HARDWARD CO	M	DOORS HINGES	94107
CALIFORNIA INSTRUMENT CO	M	VALVES	94124
CALIFORNIA SERVICE TOOL CORP	M	ADAPTER/DRIVER KNOCKOUT KIT	94577
CALPACIFIC EQUIPMENT CO	M	MARK VIII FITTINGS	94710
CASHCO INC	M	REGULATOR, GAS	94596
CASTLE PLASTICS	M,B	PEDESTAL/TUBING	94566
CB PROCESS EQUIPMENT CORP	M	BEADS,GLASS/GRIT BLASTER	94070
CERADYNE INC	M	CERAMIC BRAKES	92714
CERAMASEAL INC	M	VACUUM BREAKS	12126
CERTIFIED MF	M	ARCHS	98584
CHALET TOOL CO	M	INJECTION LOCK	94501
CHAMP CO.	L/O,M	TELESCOPE ASSY/COLLECTOR TANK	95008

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
CHASSIS TRAK	M	SLIDE MECHANISM & BRACKETS	46239
CHICAGO BRIDGE & IRON CO	M	VESSEL	94184
CHROMALOX	M	HEATERS	95051
CIRCLE E SYSTEM	M	PUMPS	95826
CIRCLE SEAL	M	VALVES	92803
CITY TOOL-DIE & MFG CO	E,M	ELECTRODE ASSY/LASER SUPPORT	95050
CLARKLIFT/OAKLAND	M	CRYO FORKLIFT	94623
CLIPPER INDUSTRIES INC	M	SCISSOR LIFT	60143
COAST MARINE & INDUSTRIAL SUPPLY	M	MANLIFT	94133
COAST TOOL CO	M	SHOP DIES	94577
COKER PUMP EQUIPMENT CO	M	COOLING SYSTEM	94607
COLE PARMER	M	HEAT TAPES	60648
COLEMAN PRECISION MANUF CO INC	M	H2O COOL GAS C	95125
COLEX INTERNATIONAL LTD	M	DRILL PRESS, BENCH TOP	60637
COMPTECH INC	M	VACUUM SYSTEMS	95112
COMPUTER AIR/POWER SYSTEMS INC	M	AC UNIT	94124
CON-VAL INC	M	WATER SOLENOID VALVE	94621
CONAX BUFFALO CORP	M	SEAL TUBES, CONAX	94022
CONTINENTAL PLASTICS & CHEMICAL	M	GENERAL MATERIALS	UNK
CONTRA COSTA BUILDERS HARDWARE	M	DOOR HINGE	94520
CONTRACT OFFICE GROUP	M	TABLE TOP	95131
COOKE VACUUM PRODUCTS INC	M	CRYOGENIC ANTIMIGRATION TRAPS	95131
CORION CORP	M	FILTERS	01746
COSMODYNE	M	COOLING SYSTEM	90500
COULTER STEEL & FORGE CO	M	COPPER FORGING/STEEL TOOL	94662
CRANE CH PUMP	M	DYNAPUMP	93523
CRANE SERVICE CORPORATION	M	CRANE	94577
CRYSTALLINE CONTOURS	M	CERAMIC STANDOFF/HEATER SEGMENT	95112
CTI-CRYOGENICS	M	CRYO PUMP	95008
D & M MACHINE	M	SPACERS & MOUNTING PLATES	95008
D C TOOL CO	M	NIKE DOOR SUPPORT	90250
DANFORTH SCREW & BOLT CO	M	SOCKET SET	94070
DATA OPTICS INC	M	FILTER HOLDERS	48197
DAVID J TRIPP ASSOCS INC	M	TEM GAS FILTERS	90201
DEAN LEWIS ASSOC	M	HANDLES	94545
DEFIANCE TOOL & DIE	M	CLAMPS, RETAINERS & FLANGES FOR OPTICAL ENCLOSURE	94538
DEL-TRON PRECISION INC	M	POSITIONERS	06804
DEVAULT	M	MASTER OSCILLATOR BASE	35805
DIAMOND DEVICE	M	HEAT EXCHANGERS	95603
DIAMOND TOOL & DIE INC	M	COLLIMATOR/HPLF CRADLE ASSY	94601
DIATECH DIAMOND TOOL CO INC	M	DRILL CORE	94587
DO ALL SAN FRANCISCO CO	M	CONTOUR SAW	94010
DOUGLAS ENGINEERING CO	M	BULKHEAD CONNECTORS/ FEEDTHRU	92632
DUHIG CO	M	DYE LOOP UNIONS	94577
E D WARD CO	M	HEAT PUMP	94080
E F NORMAN ASSOC	M	HEATERS	94304
EAGEL-PITCHER INDUSTRIES INC	M	CERAMIC PARTS	74363
EARLE M JORGENSEN CO	M	GENERAL MATERIALS	90054
EAST BAY PUMP & EQUIPMENT CO	M	PUMP	94601
EATON CORP	M	OSC. TUBING (DEKORON)	90670
EDM EXOTICS	M	SLIDE SHAFT/RIBBON SUPPORTS	94545
EDWARDS HIGH VACUUM INC	M	VIBRATION PAD ISOLATORS	90245
EJ & F ENGINEE	M	HOT AIR SYSTEM	01862
ELECT AIR TOOL CO	M	TUBE FITTINGS	94306
ELECTRO-FLEX HEAT INC	M	HEATERS	06002

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
ELECTROFUSION CORP	M	WELD, ELECTRON-BEAM	94025
EMI PRECISION	M	SPDP-1"MOUNT	98036
ENGELHARD CORPORATION	M	PT CRUCIBLE/THERMOCOUPLE	07008
EQUIPTO ELECTRONICS CORP	M	RACKS, VERT. ELECTR.	60507
ESCO CORP	M,B	WELD FITTINGS/TUBES & FITTINGS	94608
EUTECTIC CORPORATION	M	WELD SUPPLIES	94621
EVANS PRECISION MACHINING	M	OSCILLATOR COVERS & GUIDE PLATES	95131
EXERGY INC.	M	HEAT EXCHANGERS	02341
EXOLON CORP	M	PUMP REPAIR/VALVES KINNEY	94002
FABRO ENGINEERING INC	M	GENERAL FABRICATIONS	95125
FALCON INDUST	M	INDUCTOR MOUNTING BRACKETS & END PLATE	94537
FALLON ENGINEERING CO	M	CLOSED LOOP PUMP	94523
FENWAL ELECT	M	THERMISTOR	01701
FERROFLUIDICS COR	M	ROTARY FEED THRU	03061
FIL-TECH INC	M	OIL DIFFUSION PUMPS	02181
FILTREX INC	M	FILTER HOUSINGS	94545
FISHER CONTROLS INTL INC	M,B	SPACERS & ASSEMBLY	94401
FLANDERS FILTERS INC	M	HEPA FILTERS	27089
FLEXICRAFT INDUSTRIES INC	M	RESERVOIR	60612
FLOW TECHNOLOGY INC	M	RECALIBRATE FLOWMETERS IN MAIN COOLING	85036
FLUID KINETICS CORP	M	DAMPER FILTER	93007
FLYING MACHINES	M	DETECTOR BASE/CAPACITOR SUPPORT	94550
FORCE ELECTRONICS	M	CRIMPING TOOL & TERMINAL	95051
FOX INDUSTRIAL SALES CO	M	ELECTRIC HOIST	94103
FRANCIS PLATING CO	M	CRUCIBLE HOUSING PLATING	94607
G D M SUPPLY	M	GRAPHITE PLATE	90242
G W COMPRESSOR REPAIR INC	M	JET PUMP & EJECTOR PACKAGE	94550
GARDNER MACHINE PRODUCTS	M	INSULATOR, LOWER	95112
GATELY STAINLESS & ALLOY CO	M	LATERALS	94124
GEM CITY SPECIAL MACHINE BUILDERS	M	GRAPHITE PARTS	45401
GENERAL FIBER OPTICS	L/O,M	OPTICAL FIBERS	07006
GENERAL INDUSTRIAL SALES	M	GENERAL MATERIALS	UNK
GENERAL MACHINERY IND SUPPLY CO	M	MILWAUKEE DRILL	94540
GENERAL MAGNAPLATE-CALIFORNIA	M,B	LASER MIRRORS/COATINGS, MI-T-LUX	93003
GILETTE MACHINE TOOL CO INC	M	LENS HOLDERS, MOUNTS & GUIDES/CLAMPS	14624
GLENDO CORP	M	TOOL SHARPNER	66801
GM ASSOCIATE	M	GAS CHOKE ASSY.	80915
GOLDEN PLASTICS CORPORATION	M	GENERAL FABRICATIONS	94403
GOULDS PUMPS INC	M	TEST PUMP	94598
GRANT SUPPLY CO	M	DYE LOOP VALVES	94510
GRAPHITE MACHINING SPECIALITIES	M	GRAPHITE VANES/CRUCIBLE	94025
GROENIGER & CO	M	H&F CAST IRON FITTINGS	94540
H & K MANUFACTURING CO	M	SUPPORTS FOR SPECTROMETER	94566
H R MACHINERY	M	LATHE CHANGE GEARS	94538
HABER AIRCRAFT	M	CLAMPS	90245
HAMILTON TOOL ENGINEERING	M	BORESCOPE MOUNT	91214
HANFORD ENV.	M,C	HEPA/MSA FILTERS	99352
HARBOLD GEAR	M	SLIDE GEARS	94002
HARDCASTLE ENGINEERING	M	VACUUM SYSTEM	95119
HARDINGE BROTHERS INC	M	LATHE PARTS	94043
HARRINGTON INDUSTRIAL PLASTICS	I&C,M	DETECTORS/PUMPS	94710
HARTWELL CORP	M	HINGES/LATCHES	92670
HEAT SYSTEMS ULTRASONICS INC	M	SCRUBBER SYSTEM	95128
HEATHS WELDING SUPPLY	M	GRINDING WHEEL/SHOP TOOLS	94568
HELICAL PRODUCTS CO INC	I&C,M	COUPLINGS	93456

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
HELLMA CELLS INC	M	DYE CELLS	11434
HENRY PRATT INC	M	BUTTERFLY VALVES	94523
HESS GREINER & POLLAND	M	HEATING COILS	94402
HEUSSER INSTRUMENT CO	M,G	BALANCE & TABLE	94517
HIGH VACUUM APPARATUS MFG CO	M	VALVE GATES/CONFLAT FLANGES	94545
HIGH VACUUM EQUIPMENT CORP	M	VACUUM SYSTEM	02043
HILTI INC.	S,M	FASTENERS/SHOP DRILL	94577
HITCO	M	REDUCER, PRESSURE	90249
HOBART CORPORATION	M	METAL SHELVES	94577
HOPPER INC	M	GENERAL MATERIALS	93303
HPS CORPORATION	M	PIPE FITTINGS/GATE VALVE	80301
HR MACHINERY	M	LATHE & ASS.	94538
HTB INC	M	HEAT SHIELD	94545
HUMBOLT INSTRUMENT CO	B,M	WATER COOL BREAKER/LASER MOUNTS	94577
HUNTINGTON MECHANICAL LABS	M	ADAPTER, FLANGE	94043
HURCO MFG CO INC	M	REPAIR MILLING MACHINE	46268
HURST LABS	M	FLANGES & GASKETS	94043
HUSSMAN CORP	M	COOLING SYSTEM	UNK
HYSPAN PRECISION PRODUCTS INC	M	EXPANSION JOINT/BELLOWS	92102
INDUSTRIAL ELECTRONIC ENG INC	M,E	PERIPHERAL ENTRY PANELS/POWER SUPPLIES	91405
INDUSTRIAL TECTONICS	M	FIXTURE & CHECKING BALLS	48106
INDUSTRIAL TOOL	M	GRIND WHEELS	95112
INRAD	L/O,M	CYL WINDOWS/POCKET CELLS	07647
INSTRUMENT L	M	FITTINGS	94301
INSTRUMENT SPECIALTIES COMPANY INC	M	SPRING STRIP, FINGER CONTACT	18327
INSTRUMENTS S A INC	M,Q	GRATING/PLASMA TORCH/HOLOGRAPHIC GRATING	95139
ISOLATION DESIGN INC	M,E	CONNECTOR HV/TERMINALS,CABLE	94086
JACO ELECTRONICS INC	M	GEARBOX	95131
JAMES WILBEE CO	M	VACUUM PUMP	94962
JERRY CARROLL MACHINING INC	M	SUPPORTS & SHIELDS	94070
JESSOP STEEL	M	GENERAL MATERIALS	UNK
JOLLIFF ENGINEERING CORP	M	BELLOWS ASSY/EXPANSION JOINTS	94545
JONATHAN MFG CORP	L/O,M	CHASSIS SLIDES	92634
JORDAN VALVE	M	VALVES	94520
JORGENSEN ST	M	STEEL TOOL, 6"2	94623
JOSEPH T RYERSON & SON INC	M	STEEL BEAMS & PLATES	94608
KAMAN BEARING SUPPLY CORP	M	LIFT FRAME	94577
KC PRECISION SHEET METAL	M	LOW FLOW CONTROL BOX	94538
KEEHNER MFG CO	M	CONSOLE FRAME	94577
KEEN-KUT PRODUCTS	M	DRILL CORE/DIAMOND WHEELS	94010
KEMLON PRODUCTS & DEVELOPMENT CO	M	SURGE PUMP KIT	77021
KENNAMETAL INC	M	TOOL HOLDER & TOOLS	90701
KEWAUNEE SCIENTIFIC EQUIPMENT CORP	M	FUME HOOD	94965
KEY PIPE & SUPPLY CO	M	FLANGES	94623
KILSBY ROBERTS	M	TUBING/PIPING	94544
KIN-LINE INC	M	SUPPORTS	94608
KING BEARING INC	M	TAPER LOCK	94536
KORFUND DYNAMICS CORP	M	VACUUM PUMP MOUNTS	11590
KURT J LESKER CO	M	VALVE/VAC. EQUIP.	94550
L & F INDUSTRIES	M	GENERAL FABRICATIONS	90802
L O SCHUELKE CO INC	M	HEAT EXCHANGER	94070
L WALHEIM ASSOC	M	SLIDE FOR LASER CABINET	94002
LANG ENGINEERING EQUIPMENT CO	M	PROCESS PUMPS	94544
LANGNETIC TOOL CO	M	FILTER BOX	94070
LECO CORP	L/O,M	POLISHER, GRINDER	92705

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
LEE SPRING CO INC	M	SPRINGS	91754
LEYBOLD-HERAEUS VACUUM PRODUCTS INC	M	TURBOPUMP	95131
LINEAR INDUSTRIES LTD	M	BALL SCREWS & REWORK	90065
LINNEY CO	M	HELI-COIL INSERT	94662
LIVERMORE COMMUNICATIONS INC	M	POWER PUNCH	94550
LNC ENTERPRIZE	M,E	BRACKET DIODE & BASE PLATE/BELL JAR SUPPORT	95119
LYRU ENGINEERING & MANUFACTURING	M	RADIATION SHIELDS	94577
LYTRON INC	M	HEAT EXCHANGERS	01801
M AND W SYSTEMS	M	CHILLER SYSTEM	94544
MACHINERY SALES CO	M	MILLING HEAD, BRIDGEPORT	94022
MACMURRAY PACIFIC	M	DOOR GUIDES	94103
MADRUGA IRON WORKS INC	M	CHAMBER TUBE	95035
MAGNET SALES & MFG CO	M	MAGNET PARTS	90404
MAGNUM INDUSTRIES	M	*SOCKET,ADJUSTABLE*	44133
MANOR RESEARCH INC	M	SPRINGS FOR OSCILLATOR	94545
MASTER APPLIANCE	M	TORCH KITS & HEATING ELEMENTS	53403
MASTER METAL PRODUCTS CO	M	MOUNT COVER & BRACKET/DRIVE SHAFTS	95110
MATH ASSOCIATES INC	L/O,M	OPTIC FIBERS	11590
MAY TOOL & MOLD CO INC	M	DYE CELL BASE, CLAMP & FLOW DIVERTER	64129
MCLAUGHLIN ASSOCIATES	M	EXHAUST FAN	94301
MCMAHON'S WELDING & FABRICATION	M	STAND & SPACER	94565
MDA SCIENTIFIC INC	M	HOOD,DUCTLESS	60025
MDC MANUFACTURING INC	M	TUBES/VALVES, PNEUMATIC GATE	94545
MEADOWS MANUFACTURING	M	CONSOLE, TRACK ACCESS DOOR	94086
MECHANICS TOOL & SUPPLY CO	M	SPRING PLUNGERS	94621
MELATX CO	M	DOORS	94540
MELLEN COMPANY INC	M	FURANCE SYSTEM	03303
MELLES GRIOT (LASER PRODUCTS DIV)	M	QUARTZ RETENTION PLATES & HARDWARE	92714
MELROSE METAL PRODUCTS	M	GENERAL FABRICATIONS	94538
MERCOID CORP	M	PRESSURE SWITCH	94610
METAL BELLOW CORP	M,B	BELLOWS 6"/FLEXHOSE	91311
METAL GOODS	M	BRAZING ALLOY	92877
MEYER MACHINERY CO	M	PRESS BRAKE	94063
MEYER TOOL & MFG INC	M	TEST FIXTURE & STAND PIPE	60453
MG LUCKE RUBBER CO	M	O RINGS	95008
MICRO-MO ELECTRONICS	M	GEARMOTOR	33701
MICROPUMP CORP	M	MAGNETIC CUPS	94584
MIDDLETON WELDERS SUPPLY CO	M	WELDERS, PARTS & ACCESSORIES	94577
MILE TECHNOLOGY INC	M	FILTER SYSTEM, VAPOR RECOVERY	95131
MILLIGAN-SPIKA CO(IND SALES DIV)	M	COOLING LINES	94621
MILLIPORE CORP	M	FREON CLEANING VESSEL & ASS.	94080
MILTON S FRANK CO INC	M	DYE PUMPS	94105
MINARIK ELECTRIC CO	M	STEP MOTORS	95054
MINE SAFETY APPLIANCES CO	M,G	MSA FILTERS/CONSULTING SERVICES	16003
MINOR RUBBER CO INC	M	GASKETS, TAB & WINDOW	75006
MIROV-TRANE SERVICE AGENCY	M	AIR CONDITIONERS & A/C UNIT SERVICE	94124
MKS INSTRUMENTS INC	M,G	VALVES,PRESSURE & CONTROLS/REPAIR OF MULTIPLEXER	94022
MONARCH-PAN PACIFIC FASTENER CO	M	ANCHOR BOLTS	94623
MONTERREY MECHANICAL CO	M	GENERAL MATERIALS	94621
MONTGOMERY BROTHERS INC	M	FILTERS, CARTRIDGE & HOUSING	94010
MOORE HANDLEY	M	GENERAL MATERIALS	35051
MOOSMAN TOOL	M	MOTOR MOUNT WELDMENT/HOUSING	95008
MORSE MANUFACTURING INC	M	DRUM DUMPER FOR CRUCIBLE	13057
MOTT METALLURGICAL CORP	L/O,M	FRIT FILTER	06032
MULTI-PLASTICS	M	MAG. SHIELDS/DIODE CHASSIS	95125

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
MUSSER ASSOCIATES INC	B,M	INSULATION/TABLE HOIST	92708
NATIONAL TANK & MFG	M	GENERAL FABRICATIONS	90020
NEO-TECH SPRING CORP	M	SPRINGS,COMPRESSION & EXTENSION	94566
NESLAB INSTRUMENTS INC	M	WATER COOLER	03801
NEWPORT CORP	L/O,M	MIRRORS/OPTIC MOUNTS/LASER SUPPORT/LASER TABLE	92708
NILES MACHINE & TOOL WORKS INC	M	BOX PLUMBING	94560
NOOTER CORP	M	VACUUM & PRESSURE VESSELS	63100
NOR CAL SUPPLY CO	M	GASKETS FOR PUMPS	94552
NOR-CAL METAL FABRICATORS	M	GLOVE BOX & HARDWARE	94607
NOR-CAL PRODUCTS	M	O RINGS	94577
NORTHEASTERN TOOL CO INC	M	DYE CELL BASES & CLAMPS	01838
NORTHWEST DICRONITE	M	FASTENERS	94040
NORTHWEST INDUSTRIES INC	M,E	SUPPORTS/CRUCIBLES/E-BEAM GUN	97321
NRC INCORPORATED	M	COLLIMATOR	02164
NSG AMERICA INC	M,Q	COLLIMATORS/CELLS, FLUORESCENCE	07066
NUCLEPORE	M	WATER FILTERS	94566
OAK BARREL WINE CRAFT	M	STAINLESS STEEL DRUM & FITTINGS	94702
OAKLAND VALVE & FITTING CO	M	VALVES	94523
OPTICO GLASS FABRICATION INC	L/O,M	LASER WINDOWS	91773
ORANGE COUNTY MACHINE WORKS	M	TANK HEADS	93030
PACIFIC COMBUTSION ENGINEERING CO	M	HEATING ELEMENTS	90032
PACIFIC SCIENTIFIC CO (BELFAB DIV)	M	BELLOWS	32020
PAN AMERICAN STEEL CORP	M	GENERAL MATERIALS	94608
PARAMOUNT MANUFACTURING CO	M	VALVES, BUTTERFLY	94703
PAT PATTESON A650C	M,C	SAR VAC PUMPS/REPAIR PUMP	94560
PAUL MUELLER CO	M	COOLING PANELS	65801
PAUL-MUNROE HYDRAULICS INC	M	CLAMPS	95050
PENWALT CORP(STOKES DIV)	M	VACUUM PUMP PARTS	91746
PIC DESIGN CORP	M	GEARS/MOTOR COUPLINGS	91486
PIEZO ELECTRIC PRODUCTS	M	FANS	08840
PLASM-THERM INC	M	PLASMA DEPOSITION & BLOWER PACKAGE	95131
PLASTIC SERVICE CENTER MFG INC	M	GENERAL MATERIALS	95050
PNEUMATIC ENGINEERING	M	PUMPS	90039
POCO GRAPHITE INC	M,B	COLLECTOR HEATING ELEMENT/SHEET GRAPHITE	76234
POLLARD TOOL & MACHINE CO	M	LASER TABLE FRAME	99999
POLYTECH CO	M	PIPELINE	94063
POST LIQUIDATION	M	SANDING MACHINE	94607
POWER MACHINE CO	M	GENERAL MATERIALS	94608
PPG INDUSTRIES INC	M	GENERAL MATERIALS	15222
PRECISION INDUSTRIAL CERAMICS INC	M	INSULATION CLAMPS	95050
PRINCETON MFG.	M	BEAM PROCESS TAB	95008
PRIZ-CO INC	M	PUMP FILTERS	94705
PRO-DEV MFG INC	M	TIE DOWN BRACKETS	94040
PROCESS EQUIPMENT CORP	M	TANK, PERMANENT TRANSFER	48809
PROCESS VALVE	M	AUTOMATIC VALVES	07033
PROTEUS	M	FLOW SWITCH	94041
QUANTEC BAY	M	REPAIR OF DYE CIRCUL [illegible]	94043
R S ERECTION	M	DOOR, ROLL-UP	94566
R W PRODUCTS	M	RINGS	95603
R W STADLER INC	M	LOCKS	94070
RADECO	M	INSPECT PUMP/VACUUM PUMP	92121
RAPIDSYN CO/DANA	M	STEP MOTORS	90670
RICHMOND LOK EQUIPMENT CO (RICHMON	M	VALVES, RELIEF/REGULATOR, CYRO	94550
ROBVON BACKING RING CO	M	FLOW TEST RINGS	07001
ROOTS BLOWER	M	OIL SEALS	47331

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ROSE ELECTRONIC	M	EQUIPMENT CABINET	94010
ROTH PUMP CO	M	DYE PUMPS	61201
RYAN HERCO PRODUCTS CORP	M	OSCILLATOR PUMP	91503
SAN FERNANDO LABS	D,M	COATING DEVELOPMENT/CARBURIZE CRUCIBLE	91331
SAN JOSE DELTA ASSOC INC	M,B	REFLECTOR TUBES/INSULATION/MACOR RODS	95050
SAN JOSE SCIENTIFIC CO INC	M,B	VACUUM PUMP/PUMP OIL	95112
SAN RAMON MFG	M	BRACKETS	94583
SANTA CLARA MACHINING CO	M	FREON TANK	95050
SARGENT INDUSTRIES	M	GLOVE PORTS/TRANSFER CANS	55066
SARGENT WELCH SCIENTIFIC OF CANADA	M	VACUUM PUMP	60076
SAUTER DIV	M,G	BALANCE	94566
SCARROTT METAL	"	BRAZE SAMPLES	90045
SCHWARZKOPF DEVELOPMENT CORP	M	*THERMAL BAFFLES*	01746
SEAL MASTER	M	SEALS,INFLATABLE	44240
SELWAY MACHINE TOOL CO	M	LATHE	94587
SEMIVAC	M	ROUGHING PUMP	95035
SERRA CORP(MACHINING DIV)	M	HPLF CONSOLE SUPPORTS, FRAME & FRONT	94538
SHELLEY ELECTRONICS INC	E,M	RESISTORS/CHOKES, DALE	94043
SIEBERT MACHINE PRODUCTS INC	M	CVL AMPLIFIER	95008
SIECOR CORPORATION	I&C,M	OPTICAL FIBER PRODUCTS	28603
SKYLINE DISPLAYS INC	M	DISPLAY RACKS	55337
SMITH CLARK	M	SEPARATOR LAVAL	94025
SMITH MACHINE	M	MIRROR BRACKETS	94608
SMITH'S PRECISION TOOL WORKS	L/D,M	SPP-11 LEN & MIRROR MOUNTS	94566
SML INC	M	THERMOCOUPLES	94566
SNAP-ON TOOLS CORP	M	TOOLS	94608
SOUTHCO INC	M	LATCHES	94545
SPACESONIC INC	M	MULTI-PASS GLOVE BOX	94063
SPECTRA-MAT INC	M	HEATERS	95076
SPOKANE METAL PRODUCTS	M	METAL FABRICATIONS	99100
STACKPOLE CORPORATION	M,B	TOROIDS	15827
STAINLESS EQUIPMENT CO	M	GLOVEBOX WELDMENT	80110
STANDARD BELLOWS CO	M	BELLOWS	06096
STANDARD STRUCTURES INC	M	GLU-LAM BEAMS	95402
STAR PRODUCTS	M	HOOD & TROUGH	95050
STEAN & PLUMBING SERVICE CORP	E,M	ADAPTORS	94103
STERLING INS	M	GEARHEADS	11040
STONEMAN EQUIPMENT CO	M	VALVES, BUTTERFLY	94520
STOVE PLUMBERS SUPPLIES CO INC	M	ACTUATOR VALVES	95052
STREETMAN PRECISION TOOL	M	MIRROR NUTS	95682
SUHNER MFG INC	M	COUPLING, SHAFT	94030
SUNSTRAND DATA CONTROL INC	M	TEST PUMP	94105
SWEDLOW INC	M	SPECIAL MATERIALS	90200
SWEPCO TUBE CORP	M	GENERAL MATERIALS	07800
SYNTHANE-TAYLOR	M	FIBERGLASS CYL'S	19456
TAP PLASTICS INC	M	DOOR, TRITON DIAGNOSITIC	94577
TEAM CO	M	PINCH-OFF PRESS	02146
TECHNICAL DISTRIBUTORS INC	M	CERAMIC TUBES	91356
TECO	M	MANIFOLDS/SOLENOID/VALVES	94063
TEMPCO EQUIPMENT CO INC	M	AIR CONDITIONER	94005
TEMPRESCO INC	M	VALVE, SOLENOID	94566
TERMINAL MANUFACTURING CO	M	ELECTR. RACKS	94103
THERMCRAFT INC	M	HEATERS, CERAMIC	27107
THERMIONICS LABORATORY INC	M	GATE VALVE FLANGES & SWITCH POSITIONER	94541
THERMO ELECTRON CORP (EBERLINE INST	M	TUBING, TANTALUM/HEATERS	01887

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
THOMAS A SHORT CO	G,M	RUBBER BOOTS/ENCLOSURE SPONGE GASKET	94662
TICO TITANIUM INC	M	TITANIUM BOLTS	48018
TIDER AIRBRUSH CO	M	AIRBRUSH	97219
TIGTECH INC	M	WELDER,THERMOCOUPLE	02173
TIME ELECTRONICS NOR/CAL	E,M	CONNECTORS & CLAMPS	94089
TITAN RUBBER & SUPPLY CO	M	FITTINGS	95112
TITANIUM ENG	*M*	*TANTALUM FASTNERS*	48224
TOCCO ALABAMA INC	P,M	WORK STATION	91720
TONY'S MACHINE	M	ANCHOR PLATE	95050
TORR VACUUM PRODUCTS INC	M	REBUILD BELLOWS	91406
TRANE CO	M	AIR HANDLING UNIT/HEAT PUMP	94124
TRANSAMERICA DELAVAL INC (PARKSDALE	M	PRESSURE SWITCH/DYE TRANSDUCERS	90620
TRI TOOL	M	LATHE & ACCESSORIES	95670
TRIAD DIE CASTING	M	GLOVE PORTS	95112
TRIMETRIC SPECIALTIES	M	BEAM PROCESS TAB	94560
TROYER DOOR	M	DOOR OPENER	94000
TRW (CUSTOMER SERVICE *DIV*)	M	STUD WELDER	94577
TURNOMAT	M	BALL BEARINGS	14606
U-C COMPONENTS	M	SCREWS	94043
ULTRA CARBON CORP	M	EXTRACTOR PNLS/ SEC. UPDATE	48707
UNBRAKO	M	FASTENERS	92702
UNITED STATES PLASTIC CORP	M	FLOW SWITCH	45805
UNITED STATES STEEL CORP	M	POWER AMP MAT	94101
UNITEK CORPORATION	M	SPOT WELDER	95050
UNIVERSAL EQUIPMENT MFG CO INC	M	GLOVES, GRIT BLASTER	94070
UNIVERSAL MAGNETICS INC	M	REPAIR DC SERVO MOTOR	91311
US INC.	M	VALVE & HEATER ASSY.	95008
VACUUM ATMOSPHERES CO	M	DRAIN PURIFIERS/VACUUM OVEN & CHAMBER	90250
VACUUM GENERAL	M,I&C,E	CONTROL MODULES/CONTROLLERS/POWER SUPPLY & CABLES	92111
VACUUM RESEARCH MFG CO	M	GENERAL MATERIALS	94583
VALLEY PRECISION MFG CO	M	DEHYDRIDING FURNANCE	96025
VALTEC	L/O,M	POSITIONER ASSY.	94523
VAPONICS INC	M	WATER STILL	02360
VEECO INDUSTRIAL EQUIPMENT DIV	M	VACCUM SYSTEMS	10087
VELMEX INCORPORATED	M	ASSEMBLIES, PRECISION LEAD SCREW	91723
VENTROD CORP	M	THERMAL SEALING MACHINES	11234
VIKING DISTRIBUTING CO INC	M	HAND TOOLS	94107
VIKING METALLURGICAL CORP	M	GENERAL FABRICATIONS/SPECIAL MATERIALS	94552
VIKING SPRAY BOOTH INC	M	SPRAY BOOTH- INCLUDES INSTALLATION	95035
VISUAL METHODS INC	M	BRACKETS	07675
VOLTAW PRECISION	M	GENERAL FABRICATIONS	92400
W & M PLASTICS	M	GENERAL MATERIALS	74301
W W GRAINGER INC	M	WASH TANK PARTS	94621
WACKER DEVELOPMENT INC	M	ELECTRON ELEMENTS	98008
WALDON DAFFY INC	M	GASKETS	94107
WALE APPARATUS CO	M	SAW	18055
WALL COLMONOY CORPORATION	M	MICROBRAZ	48203
WATLOW ELECTRIC MFG CO	M	HEATERS	63141
WEAVER INDUSTRIES INC	M	EXTRACTOR PANELS	17517
WELK BROTHERS METAL PRODUCTS	M	GENERAL FABRICATIONS	99219
WEST COAST METAL SPINNING	M	FLANGES FOR FILTERS	94550
WESTERN HARDWARE & TOOL CO	M	TOOLS	94107
WESTERN MECHANICAL CO INC	M	FAN, COIL	94549
WESTERN PIPING & ENGINEERING CO	M,L/O	SLUG FEEDER/LASER ASSY	94124
WESTERN RUBBER SUPPLY INC	M	GASKETS	94124

VENDORS - MECHANICAL

COMPANY NAME	CODE	ITEMS PURCHASED BY AVLIS	ZIP/PO
WESTERN STATES	M	DUCTWORK	94022
WESTERN WHOLESALE DISTRIBUTORS	M	SUMP TANK PUMPS	94566
WHOLESALE BUILDING SUPPLY INC	M	LOCKS	94623
WILCO SUPPLY	M	LOCKING DEV. DOOR/KEY BOXES	94609
WILLRICH ENGINEERING CO	M	LASER TABLE CLAMPS	95008
WINFRED M BERG INC	M	BEARINGS/COUPLINGS	11518
WOOD WORKS	M	WORKTABLE	66044
YALE INDUSTRIAL TRUCKS	M	FORKLIFT	94577
YORK WELDERS SUPPLY INC	M	HEATING TIPS	94566
ZIRCAR PRODUCTS INC	M	INSULATING CYLINDERS/OVEN/INSULATION	10921

APPENDIX B: DEVELOPMENTAL MATERIALS/EQUIPMENT

This Appendix contains summary discussions of the items that are still undergoing product/supplier development. Included in these summaries are a discussion of each item's use, a discussion of the development needed or the existing procurement problem, the status of the development effort, and the AVLIS program contact for the item.

Developmental Material/Equipment Item

Item Title: Extractor Pulser for Separator Module Power Conditioning

Summary Discussion of Item Use:

The extractor pulse power supply is a high voltage, high current, fast switching supply for extracting the photoionized U-235 ions created in the AVLIS process.

Discussion of Development Needed/Procurement Problem:

The extractor pulse power supply is a state of the art design being developed by an outside vendor. Its ability to meet AVLIS specifications will be verified on the Mars separator. Mars represents 1/2 plant scale, so development will continue to meet plant requirements. The plant prototypic unit can be duplicated by a number of power conditioning vendors.

Developmental Material/Equipment Item

Item Title: Graphite Billets for Separator Module Components

Summary Discussion of Item Use:

The separator collector components are fabricated from Stackpole 2020 graphite.

Discussion of Development Needed/Procurement Problem:

Stackpole 2020 is currently available only in billet lengths of 72 inches. Billet lengths of 82 inches are available at a one-time cost of $10,000. All separator components are designed to be a maximum of 80 inches long.

Developmental Material/Equipment Item

Item Title: Machining of Graphite Collector Components for the Separator Module

Summary Discussion of Item Use:

Many classified components in the extractor are made from graphite. These include the arches, roof panels, and product plates.

Discussion of Development Needed/Procurement Problem:

There are very few "Q" cleared graphite machining vendors. Currently, two commercial vendors are available, along with significant in-house capability at Oak Ridge, Hanford, and LLNL.

Developmental Material/Equipment Item

Item Title: Ceramic Plasma Tubes for Large-Bore Copper-Vapor Lasers

Summary Discussion of Item Use:

Alumina cylinders 8 cm in diameter abd 250 to 300 cm long are used in the copper-vapor laser head. The cylinders must be straight and round in cross section to within a few milimeters.

Discussion of Development Needed/Procurement Problem:

Present fabrication methods are adequate to produce alumina discharge tubes. However, straighter, rounder tubes yield improved laser performance. Accomplishing this at reduced unit cost has a major impact on operating costs. Approximately 1500 tubes per year will be needed by 1990.

Developmental Material/Equipment Item

Item Title: Switching Power Supply for Large-Bore Copper-Vapor Lasers

Summary Discussion of Item Use:

Power supplies are needed to repetitively charge capacitors to power copper-vapor laser units. The power supplies must convert 3-phase, 480 volt power to 10 kvolts dc to charge 7 to 15 nF circuits at 4.3 kHz and an average power of 8 to 15 kWatts.

Discussion of Development Needed/Procurement Problem:

These power supplies are currently being purchased from three suppliers. In this case, the development objective is to increase electrical efficiency and decrease the cost to below $ 0.60/Watt cost, while maintaining a useful life of 50,000 hours and a mean time between failures of 10,000 hours. About 5000 power supplies are needed before 1990.

Developmental Material/Equipment Item

Item Title: Copper Containment for Copper–Vapor Lasers

Summary Discussion of Item Use:

Wick material capable of operating at 1500° C is needed to condense copper onto a wetting surface and return it by capillary action back into the laser hot zone.

Discussion of Development Needed/Procurement Problem:

At present refractory cylinders are placed in the ends of the laser ceramic tube to wick condensed copper back into the hot zone. While this method works as required and appears to have long life, we believe that a refractory carbide coating can be sprayed or electro–chemically deposited on the ceramic to perform this function better and at lower cost.

Developmental Material/Equipment Item

Item Title: Optical Coatings

Summary Discussion of Item Use:

High reflectivity and transmissivity coatings with low absorptance for red to green light is needed for mirrors, windows, lenses, and polarizers made of crystal quartz, fused silica, saphire, ultra low expansion optical materials, and possibly more exotic materials, such as molybdenum and silicon carbide.

Discussion of Development Needed/Procurement Problem:

At present, adequate coatings are available. However, higher performance coatings can be manufactured and will decrease both the operating and capital costs of the AVLIS laser systems. It is desired to continue to improve the coating performance coating cost. Approximately 10,000 elements will be needed by 1990, with 2,000 to 5,000 needed annually thereafter.

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