FORM NO. 7000 (4/91)

SUBCONTRACT BETWEEN

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

(LAWRENCE LIVERMORE NATIONAL LABORATORY)

AND

IBM CORPORATION

UNIVERSITY ADDRESS:	UNIVERSITY OF CALIFORNIA LAWRENCE LIVERMORE NATIONAL LABORATORY P.O. BOX 5012, MS L-650 LIVERMORE, CA 94551
SUBCONTRACTOR ADDRESS:	IBM CORPORATION GOVERNMENT INDUSTRY 6710 ROCKLEDGE DRIVE BETHESDA, MD 20817
SUBCONTRACT NUMBER:	B331593
PRICING ARRANGEMENT:	FIRM FIXED-PRICE
SUBCONTRACT PRICE:	$93,589,824.00
TERMS OF PAYMENT:	NET 30 DAYS
SUBCONTRACT FOR:	ACCELERATED STRATEGIC COMPUTING INITIATIVE (ASCI)

FOR THE SUBCONTRACTOR:

BY: Lynne C. Savage

NAME: LYNNE C. SAVAGE

TITLE: MANAGER, CONTRACTS & PROCUREMENT GOVERNMENT INDUSTRY

DATE: August 12, 1996

FOR THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA:

BY: _____

NAME: JOHN S. HUNT

TITLE: PROCUREMENT AND MATERIEL MANAGER

DATE: AUGUST 9, 1996

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SCHEDULE

SECTION A - INTRODUCTION

This Subcontract, effective upon signature execution of this Subcontract is hereby made and entered into by and between The Regents of the University of California, a constitutional corporation and instrumentality of the State of California, hereinafter called the "University" and IBM Corporation, hereinafter called the "Subcontractor," whose principal offices are located at 6710 Rockledge Drive, Bethesda, Maryland.

The University has entered into Contract No. W-7405-ENG-48 as modified (hereinafter called the "Prime Contract") with the U.S. Government (hereinafter called the "Government") represented by the Department of Energy (hereinafter called the "DOE") for performance of certain research and development work at the Lawrence Livermore National Laboratory. This Subcontract is entered into in furtherance of the performance of the work provided in the Prime Contract.

In accepting this Subcontract, the Subcontractor agrees to perform the Subcontract work in accordance with the following terms and conditions. No other terms or conditions shall be binding upon the parties, unless accepted by them in writing.

Some of the requirements herein for University approval are imposed by the Prime Contract, statute, or government regulation. The Subcontractor recognizes that failure to obtain approvals may jeopardize its reimbursement for costs accrued hereunder. All requests for University approval hereunder shall be directed to the person designated elsewhere in this Subcontract as the Contract Administrator.

SECTION B - SUPPLIES AND SERVICES TO BE DELIVERED

The Subcontractor shall furnish qualified personnel, equipment, and facilities to perform the work described in Appendix D, the Statement of Work, dated February 12, 1996, for the Accelerated Strategic Computing Initiative, and in the Subcontractor's Technical Proposal (Volume I) dated April 25, 1996 and revised Technical Proposal dated August 3, 1996.

The Subcontractor's Technical Proposal (Volume I) dated April 25, 1996 and revised Technical Proposal dated August 3, 1996 are hereby incorporated by this reference and made a part of this Subcontract.

SECTION C - PERIOD OF PERFORMANCE

1. All work performed under this Subcontract shall be performed within forty-eight (48) months from the date identified in Section A. The Subcontractor shall perform the work called for in Section B of this Subcontract. Milestone deliveries shall be made in accordance with the Milestone Payment Schedule identified in Section F.1.b. of this Subcontract.

2. Reports called for under this Subcontract shall be delivered only to addressees identified in paragraphs a. and b. below in the quantities specified. Delivery to any individual or agency other than these addressees is not permitted unless specifically authorized in writing by the Contract Administrator.

a. One copy of all unclassified reports shall be delivered to:

University of California
Lawrence Livermore National Laboratory
Attn: Lynn Rippe
Ref: B331593
P.O. Box 5012, MS L-650
Livermore, CA 94551

b. Three copies of all unclassified reports shall be delivered to:

University of California
Lawrence Livermore National Laboratory
Attn: Mark Seager
Reef: B331593
P.O. Box 818, MS L-060
Livermore, CA 94551

SECTION D - INSPECTION AND ACCEPTANCE

Inspection and acceptance of all items delivered under this Subcontract shall be at Lawrence Livermore National Laboratory, Livermore, California 94551.

SECTION E - CONTRACT ADMINISTRATION

1. The University Contract Administrator is: Lynn Rippe Phone: (510) 423-2176

University of California
Lawrence Livermore National Laboratory
P.O. Box 5012, Mail Stop L-650
Livermore, CA 94551

2. The University Technical Representative is: Mark Seager Phone: (510) 423-3141

University of California
Lawrence Livermore National Laboratory
P.O. Box 818, Mail Stop L-060
Livermore, CA 94551

3. The Patent Counsel is:

U.S. Department of Energy
Oakland Operations Office
Office of Patent Counsel
1301 Clay Street
Oakland, CA 94612-5208

4. Address invoices to:

University of California
Lawrence Livermore National Laboratory
Accounts Payable Department, MS L-432
P.O. Box 5001
Livermore, CA 94551

5. Payments shall be mailed to:

IBM Corporation
Government Industry
6710 Rockledge Drive
Bethesda, MD 20817

SECTION F - SPECIAL PROVISIONS

1. Payment

a. The firm fixed-price of this Subcontract is NINETY-THREE MILLION, FIVE HUNDRED EIGHTY-NINE THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($93,589,824.00).

Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract.

b. Milestone payments will be made in accordance with the following schedule:

Milestones	Deliverables	Date	Payment	FY Total
FY96				
1	Initial Project Plan	Sep-96		
2	ID System Delivery (Partial)	Sep-96		
FY97				
3	ID System Delivery (Final)	Oct-96		
4	ID System memory upgrade (upgrade 256 nodes to 256 MB each, up from 128 MB each)	Oct-96		
5	Updated Project Plan	Nov-96		
6	ID App Dev Support	Nov-96		
7	FY97 Plan Review	Dec-96		
8	P2SC Upgrade	Jun-97		
9	SW Dev Tools	Nov-96		
10	SW Drop One	Dec-96		
FY98				
11	PPC 604+ @ 225MHz	Dec-97		
12	SW Drop Two	Dec-97		
13	Demonstration of Tech Refresh System	Dec-97		
14	FY98 Plan Review	Dec-97		
15	Scalable Dev Env	Jun-98		
FY99				
16	SST Demo	Dec-98		
17	SST Install & 1.5 TB Mem & 75TB Disk (Lease Pay 1)	Jan-99		
18	Additional 1TB Mem	Jan-99		
FY00				
19	SST (Lease Pay 2)	Dec-99		
Total			**93,589,824.00**	**93,589,824.00**

c. Options and Option Pricing

1	Purchase of Additional Initial Delivery System, location to be determined at time option is exercised
2	Technical Refreshes to 225 MHz for Additional Initial Delivery System
3	Optional SST upgrade to 10 TFLOPS (target)/8.2 TFLOPS guaranteed. This upgrade would be demonstrated in 12/99 and would include 1.5TB of memory and 75TB of disk. This system would remain at LLNL until 1/2002, two years after its installation (which would take place in 1/2000).
4	Additional On-site Support Personnel, per man year
5	Additional Dual-Ring FDDI adapters, each.
6	Additional HIPPI-800 adapters, each.
7	ATM-OC3 adapters, each.
8	PHIGS and PHIGS Plus Software. License is for 128 concurrent users.
9	OpenGL software. License is for 128 concurrent users.
10	IBM DataEXplorer software, Developers license. License is for 128 concurrent users.
11	IBM DataEXplorer software, run-time license. License is for 128 concurrent users.
12	Price for an optional upgrade of ID system memory (upgrade 256 nodes to 256 MB each, up from 128 MB each)

2. Order of Precedence

Any inconsistency in this Subcontract shall be resolved by giving precedence in the following order:

a. The Subcontract Schedule (excluding the Form 7500 General Provisions).

b. The Statement of Work.

c. The Subcontractor's Technical Proposal (Volume I) as revised.

d. The General Provisions including Attachment A.

e. Other Attachments and Appendices.

3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is TWELVE MILLION, FIVE HUNDRED THOUSAND AND NO/100 DOLLARS ($12,500,000.00). It is estimated that this amount is sufficient to cover performance by the Subcontractor through SEPTEMBER 30, 1996 (see General Provisions, Clause C6 entitled Limitation of University's Obligation).

4. Modifications

The Contract Administrator is the only person authorized to approve changes in any of the requirements under this Subcontract and notwithstanding any provision contained elsewhere in this Subcontract, the said authority remains solely with the Contract Administrator. No statement of any person whomsoever shall in any manner or degree modify or otherwise affect the terms of this Subcontract, except for written statements of the Contract Administrator. In the event the Subcontractor effects any such change at the direction of any person other than the Contract Administrator, the change will be considered to have been made without authority and no adjustment will be made in the Subcontract price to cover any increase in costs incurred as a result thereof.

5. Release of Information

Information regarding this Subcontract or the undertaking or any data developed hereunder shall not be released, and the name of the University, the Lawrence Livermore National Laboratory, or the Government shall not be used, in any publications, news releases, advertising, speeches, technical papers, photographs, and other releases of information, without prior written approval from the aforementioned.

6. University Technical Representative

The individual identified as the University Technical Representative (UTR) is the person designated to monitor the work performed under this Subcontract. The UTR does not possess authority to change any of the requirements, including time of delivery or place of delivery, under this Subcontract. Any direction accepted by the Subcontractor from the UTR or any individual other than the Contract Administrator, or the Contract Administrator's technical representative (CATR) if one is specifically identified herein, shall be at the sole risk of the Subcontractor. If an individual (whether or not he or she is the UTR) is designated elsewhere in this Subcontract as the CATR, the scope of authority possessed by that individual with regard to this Subcontract shall be stated in this Subcontract. If an individual is designated as the CATR but the scope of his or her authority is not stated, the individual shall have no greater authority than the University Technical Representative.

7. Priority Rating

This Subcontract is assigned a priority rating of DO-E2 and is certified for National Defense under the provisions of the Defense Priorities and Allocation System (DPAS) Regulation (15 CFR 350). You are required to follow the provisions of the DPAS regulation in obtaining controlled materials and other products and materials needed to fill the requirements of this Subcontract (see General Provisions, Clause A26 entitled Priorities and Allocations).

8. Approval Of Technical Data

If this Subcontract requires the Subcontractor to furnish any drawings, specifications, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance or test data, or other technical data for approval by the University prior to Subcontractor performance, the approval of the data by the University shall not relieve the Subcontractor from responsibility for any errors or omissions in such data, or from responsibility for complying with the requirements of this Subcontract, except as specified below. Any work done prior to such approval shall be at the Subcontractor's risk. The University shall have thirty (30) calendar days to approve such data without affecting the project critical path.

If the data includes any variations from the Subcontract requirements, the Subcontractor shall describe such variations in writing at the time of submission of the data. If the University approves any such variation(s), a change order to the Subcontract shall be issued by the University and, if appropriate, a bilateral modification to the Subcontract shall be negotiated.

9. Key Personnel

It is agreed that the below listed key personnel or other personnel approved by the University Contract Administrator as persons of substantially equal abilities and qualifications, are necessary and key to the successful performance of this Subcontract, and Subcontractor agrees to assign such employees or persons to the performance of the work under this contract and shall not reassign or remove any of them without consent of the University Contract Administrator. Whenever, for any reason, one or more of these employees is unavailable for assignment for work under this Subcontract, or has been assigned less than full time to work under this Subcontract, Subcontractor shall, with the approval of the University Contract Administrator, replace such employee with an employee of substantially equal abilities and qualifications. Approval of the University Contract Administrator shall not unreasonably be withheld.

Don Sayut, IBM Program Manager for ASCI

10. Control of Subcontractor Employees

The Subcontractor shall not employ on the work any unfit person or anyone not skilled in the work assigned to him or her and shall devote only qualified personnel to work under this Subcontract. Should the University deem anyone employed on the work incompetent or unfit for his or her duties and so inform the Subcontractor, the Subcontractor shall remove such person, at no additional cost to the University, from work under this Subcontract and he or she shall not again, without written permission of the University, be assigned to work under this Subcontract.

11. Site Preparation

a. Site preparation specifications shall be furnished in writing by Subcontractor. These specifications shall be in such detail as to ensure that the equipment to be installed shall operate efficiently.

b. The University shall prepare the site at its own expense prior to shipment and in accordance with the specifications furnished by the Subcontractor and shall maintain the site requirements throughout the period of this Subcontract.

c. Subcontractor shall inspect the site and report to University in writing the dates of the inspection, any site preparations that do not meet specifications and the reasons therefor, and the final inspection and acceptance of the site.

12. Security Clearances

Some work performed under this Subcontract may be performed in a security area or require access to classified information. All personnel intended to engage in work in a security area or with classified information shall eventually possess a DOE "L" or "Q" type access authorization. The type of access authorization required ("L" or "Q") shall be determined by the University. Be advised that to obtain a DOE "L" or "Q" access authorization, an in depth background check and detailed personal information is required. Any Subcontractor employee whose work assignment would require access but who cannot obtain a DOE "L" or "Q" access authorization shall be removed from performing such work under this Subcontract. The Subcontractor shall comply with all DOE and University security regulations.

13. Security Procedures

The terms and conditions of Appendix C, Security and Site Access, are hereby incorporated into this Subcontract.

14. Documentation Requirements

a. Subcontractor shall furnish all documentation identified and described in the Statement of Work dated February 12, 1996.

b. Title to all documentation and records provided or generated under subparagraph a shall pass directly from the Subcontractor to the Government.

15. Software Licenses

All software licenses required under this Subcontract shall include a clause whereby the license is fully assignable to the Department of Energy (DOE) for assignment to any succeeding prime contractor to the University.

16. Work on University or Government Premises

The terms and conditions of Appendix B, Work on University or Government Premises, are hereby incorporated into this Subcontract.

17. Option to Extend Term

The University reserves the unilateral option to extend the term of this Subcontract by one (1) year beyond the current performance period. Any such extension shall be for the sole purpose of acquiring additional items or services within the scope of the work described in Attachment D, Statement of Work. This provision shall in no way relieve the Subcontractor from performing the work identified in Attachment D, Statement of Work, within the forty-eight (48) month period specified in Section C of this Subcontract.

Upon University request, the Subcontractor shall submit a proposal for the option year. The University shall then provide notice to the Subcontractor of its intent to exercise an option year thirty (30) days prior to the expiration of the Subcontract. There shall be no cost or obligation to the University nor shall the Subcontractor begin work for the option year until the University awards a Subcontract modification for the option year.

18. Software and Data Developed at Subcontractor Expense

The software and related data described in the Subcontractor's Technical Proposal, Road Map to a Sustained Stewardship TeraFLOP System, section C, Software Technology Roadmap, are in existence or will have been developed at the Subcontractor's expense and will be delivered with "limited/restricted" rights pursuant to the Rights in Data - General Clause and the Additional Data Requirements Clause of the General Provisions to the extent that such software and related data meet the definitions for treatment as proprietary information.

Where data or software deliverable products result from collaboration between the Subcontractor and the University, and such data and software are developed with the Subcontractor's cost share as defined in Appendix F, then such delivered products will be subject to the copyright provisions of the ASCI Blue Intellectual Property Appendix E.

19. Taxes

The fixed prices for Milestones 1 through 15 do not include, and the University shall not be charged for, any State Sales & Use Tax, as the University holds California Seller's State Resale Permit No. SR-CHA 21-135323.

The fixed prices for Milestones 16 through 19 are subject to California State Use Tax. Such taxes are not included in the fixed price stated above, and shall be separately identified in Subcontractor's invoice.

20. Limitation of Liabilities (Consequential Damages)

In no event shall either party be liable to the other for any indirect, special, incidental or economic consequential damages, even if the party had been advised of the foreseeability of same, or liability to third parties arising from any source.

21a. Right to Substitute Products

If, during the course of this Subcontract, the Subcontractor announces commercial products that the Subcontractor determines can be substituted for products proposed herein, the Subcontractor may propose delivery of such substitutes under this Subcontract. The University shall not unreasonably withhold approval of the delivery of such substitutes. In the event that products proposed herein are no longer in new production at the required time of delivery, the Subcontractor may propose delivery of substitute commercial products provided that the functionality of the substitute product is equal to or greater than the functionality of the substituted product and provided further that the price for the substitute product is no greater than the price of the substituted for product. The University shall not unreasonably withhold approval of the substitution.

For the purposes of this clause, functionality is defined as the capability of the substitute product, as determined by the University, to meet or exceed the official IBM published specifications for the product for which the substitute is offered.

21b. Acceptance / Ownership / Risk of Loss or Damage of Purchased Equipment

Acceptance will be deemed to have occurred on the date the Subcontractor installs the machines. Ownership of each machine will pass to the University upon payment of the purchase price. After the date of acceptance, the University will have responsibility for all risk of loss of, or damage to, a machine.

22. Warranty of Equipment

The Subcontractor agrees that the materials, supplies and services furnished under this Subcontract shall be covered by the most favorable commercial warranties the Subcontractor gives to any customer for the same or substantially similar materials, supplies or services. Such warranties shall include performance, workmanship, labor, materials, Subcontractor's design or engineering contributions, and the Subcontractor shall furnish copies of same to the University, upon request. Notwithstanding any other provisions of this Subcontract, the Subcontractor also warrants that the materials, supplies or services furnished shall be of the most suitable grade and exactly as specified in this Subcontract. The rights and remedies provided by such warranties shall be in addition to and shall not limit any rights afforded to the University by any other provision of this Subcontract.

23. Licensed Internal Code

A. Subcontractor owns copyrights in Licensed Internal Code (Code) and Subcontractor owns all copies of Code, including all copies made from them. Code is an integral part of, and is required by, specified Machines (Specific Machines) and executes below the external user interface. If the University is the owner or the rightful possessor of a Specific Machine, Subcontractor grants the University a license to use the Code provided as part of, or in conjunction with, that Specific Machine. Currently, Specific Machines are the ES/9000s, 30902, 7011, 7012, 7013, 7015, 7016, 7133, 9076, 9391, 9392, 9394, 9395, 9404, 9406, 9672, 9674, and subsequently announced machines Subcontractor offers with Licensed Internal Code.

B. Each license authorizes the University:

1. to execute the Code to enable the Specific Machine to perform in accordance with the Subcontractor's official published specifications (specifications);

2. to make a backup or archival copy of the Code unless one is provided by the Subcontractor. The University may use this copy only to replace the original on the Specific Machine; and

3. to execute and display the Code as necessary to maintain the specific Machine.

C. The University may not:

1. otherwise copy, display, adapt, modify or electronically distribute the Code except as may be authorized in the specifications;

2. reverse assemble, reverse compile, decode or translate the Code; or

3. sublicense, assign or lease the Code except as provided for in General Provision A5, Assignment of Subcontracts.

D. The University will include the copyright notice(s) and any legend(s) on each authorized copy.

E. The University may transfer possession of the Code to another party only with the transfer of the Specific Machine. The University's license is discontinued when the University is no longer an owner or a rightful possessor of the Specific Machine.

24. Leased Equipment

A. Title

Title to the Equipment delivered under the lease portion of this Subcontract remains in Subcontractor, and the University will not dispose of or encumber any of Subcontractor's interest in the Equipment. Subcontractor may label the Equipment to evidence ownership and University shall, at the request of Subcontractor, join Subcontractor in executing one or more Uniform Commercial Code financing statements or other documents reasonably required by Subcontractor to evidence or perfect Subcontractor's interest in the Equipment.

B. Initial Term

Although the Milestone Payments listed above in Section F, paragraph 1.a provide for payment for the leased machines during the term from its effective date until the end of the performance period of the Subcontract, the initial term of the lease period shall be from its effective date until the end of the current University fiscal year. This Lease may be renewed by the University in accordance with Paragraph C below. Subject to such renewals, this lease shall remain in force and effect until the Period of Performance is completed as specified in the Subcontract. This Lease shall terminate only at the end of each fiscal year within the period defined in Paragraph C except in the case of University termination for convenience or default as defined in the General Provisions.

C. Renewal Option

This Lease is intended to continue throughout its Lease Term, however, because of University fiscal year constraints, the Lease is subject to renewal by the University for each applicable University fiscal year. Each fiscal year renewal shall be effected by the University giving written notice of renewal to the Subcontractor before the first day of each fiscal year or within thirty (30) days after University funds become available for renewal, whichever is later; provided the University shall have given preliminary notice in writing of its intention to renew at least sixty (60) days before the end of the then current fiscal year. Such preliminary notice shall not be deemed to commit the University to renewal. Subcontractor understands that University must rely on annually appropriated and allotted federal funds furnished under Contract W-7405-ENG-48, or successor prime operating contract, in order to make the payments required by this Subcontract. Nothing in this Subcontract shall be construed to require the University or the Department of Energy to violate the prohibitions of 31 USC 655 (Anti-Deficiency Act). Therefore, the University, at its sole option, may cancel this Subcontract at any time upon two (2) weeks written notice to Subcontractor that funds have not been or will not be provided by DOE to Contract W-7405-ENG-48, or successor prime operating contract, which may lawfully be used for the obligations under this Subcontract. Such cancellation shall be without penalty to University.

D. Nonrenewal

In the event the University does not exercise its option to renew, in accordance with Paragraph C above, all funds previously paid shall be retained by the Subcontractor. Unless stated otherwise in this Subcontract, those machines not renewed shall be returned to the Subcontractor in the original condition, as delivered, ordinary wear and tear excepted. The University shall be responsible for transportation expenses associated with the return of the equipment to the Subcontractor.

E. Risk of Loss

In the event a machine is lost, destroyed or damaged beyond repair due to general perils (excluding loss or damage caused by University negligence, nuclear reaction, nuclear radiation, radioactive contamination, war, insurrection, rebellion or weapons of war for which the University shall be solely liable) the Subcontractor shall relieve the University of liability for the lease term subsequent to the month in which the loss occurred, and this lease shall be deemed ended for the affected machines.

F. End of Lease Provisions

At the conclusion of the term of the lease, the machines shall be returned to the Subcontractor in the same condition as delivered, ordinary wear and tear excepted. The Subcontractor shall be responsible for deinstallation and transportation.

If the University decides to purchase the equipment at the end of the lease term, the Subcontractor will prepare and submit a purchase price proposal. When the University and the Subcontractor have agreed upon the terms and conditions for the purchase and the Subcontractor receives payment of the purchase price, title will pass to the University.

25. Appendices

All Appendices listed in the Table of Contents of this Subcontract and not elsewhere incorporated into the Subcontract, are hereby incorporated into the Subcontract in their entirety.

SECTION G - GENERAL PROVISIONS

General Provisions consisting of the clauses in Los Alamos National Laboratory Form 7500, December 1995, identified below are incorporated in this Subcontract.

1. All of the clauses of Section A with the exception of the following clauses which do not apply to this Subcontract:

   Clause A6, entitled Audit - Negotiation
   Clause A12, entitled Disposition of Materials
   Clause A30, entitled Security Access Authorization and Operations
   Clause A31, entitled Subcontractor Cost and Pricing Data
   Clause A32, entitled Unclassified Controlled Nuclear Information

2. The following clauses of Section B are incorporated:
   B3, B5, B7, B8, B11, B14, B19, B26, B27 (or B28 if small business), B34, B37, B39, B41, B47, B48

   Clause B35 is replaced with Attachment A to LANL Form 7500, Clause B35, Rights in Data - General, which is hereby incorporated into this Subcontract.

3. The following clauses of Section C are incorporated:
   C1, C2, C3, C4, C5 (applies to on-site maintenance and services), C6, C10, C13, C15

Form 7500

General Provisions for Subcontracts

December 1995

LOS ALAMOS
National Laboratory

Los Alamos, NM 87545

Form 7500, Definition of Terms and Preamble

Definitions

As used in this form, the following terms have the meanings stated:

(a) *Government Contracting Officer* — a representative of the Government with the authority to enter into, administer, and/or terminate Government contracts and make related determinations and findings.

(b) *DEAR* — The Department of Energy Acquisition Regulation.

(c) *DOE* — The United States Department of Energy.

(d) *FAR* — The Federal Acquisition Regulation.

(e) *Goods* — All tangible property, except land or interest in land, and including tooling, equipment, materials, supplies, etc., required for or produced in the performance of the subcontract.

(f) *Government* — The government of the United States of America.

(g) *Subcontract* — A subcontract is a legally binding agreement issued under the Prime Contract and between the University and a third party that contains the essential terms and conditions under which goods or services will be furnished to the Laboratory.

(h) *"Head of Agency"* — Means the Secretary, Deputy Secretary, or Under Secretary of the United States Department of Energy.

(i) *Subcontractor* — The party entering into the subcontract with The Regents of the University of California.

(j) *Lower-tier subcontractor* — An individual or legal entity that has entered into an agreement with a Subcontractor for the delivery of goods or services necessary for the Subcontractor's performance of the subcontract.

(k) *University* — The Regents of the University of California, a constitutional corporation and instrumentality of the State of California, which operates Los Alamos National Laboratory under Prime Contract W-7405-Eng-36 for the Department of Energy.

(l) *Contract Administrator* — The representative of the University of California authorized to address contractual issues, and execute and/or administer subcontracts on behalf of Los Alamos National Laboratory.

(m) *Schedule* — Sections A through G of the subcontract document.

Preamble

(a) Pursuant to the terms of Contract W-7405-Eng-36, the University has agreed to appropriately treat requirements of federal statutes and Presidential executive orders in procurements using funds provided under the contract. Consequently, many of the standard terms and conditions contained herein are similar to terms and conditions used by federal agencies. However, the University is not a federal agency or instrumentality; the use of similar terms and conditions is only for the administrative convenience of the University.

(b) The Subcontractor shall furnish the goods and/or services covered by the subcontract subject to all the terms and conditions set forth in the subcontract which the Subcontractor, in accepting the subcontract, agrees to be bound by and to comply with in all particulars, and no other terms or conditions shall be binding upon the parties unless hereafter accepted by them in writing. Written acceptance of shipment of all or any portion of goods or the performance of all or any portion of the services covered by the subcontract shall constitute unqualified acceptance of all University general provisions. The terms of any proposal referred to in the subcontract are included and made a part of the subcontract only to the extent of specifying the nature of the goods or services ordered, the price therefore, and the delivery thereof, and then only to the extent that such terms are consistent with the general provisions of the subcontract.

(c) This form incorporates one or more FAR and/or DEAR clauses by reference. The version of the FAR and/or DEAR clause in effect as of the effective date of the subcontract shall apply with the same force and effects as if they were given in full text. Upon request, the contract administrator will make the full text of the clauses available.

Form 7500, Section A

Section A Clauses Apply to All Subcontracts.

Unless specifically cited in the Schedule as not applying or identified in the clause as being self-deleting, the clauses listed below shall apply to all subcontracts into which this document is incorporated.

A1, Affirmative Action for Handicapped Workers (Incorporated by Reference) (FAR 52.222-36/Prime Contract Article 10, Clause 14)

(This clause applies if the subcontract exceeds $2500.)

A2, Affirmative Action for Special Disabled and Vietnam Era Veterans (Incorporated by Reference) (FAR 52.222-35/Prime Contract Article 10, Clause 12)

(The above clause applies if the subcontract exceeds $10,000.)

A3, Antikickback Procedures (FAR 52.203-7/Prime Contract Article 10, Clause 3)

(a) **Definitions.** *"Kickback,"* means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind that is provided directly or indirectly to the University, a University employee, a subcontractor, or a subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a subcontract at any tier relating to the prime contract.

"Person," means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," means contract W-7405-ENG-36 between the United Stated Department of Energy (DOE) and The University of California, Los Alamos National Laboratory (University) for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"University employee," means any officer, partner, employee, or agent of the University.

"Subcontract," means a contract or contractual action entered into by the University or a higher-tier subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under the prime contract.

"Subcontractor," means (1) any person, other than the University, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under the prime contract or under a subcontract entered into in connection with the prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the University or a higher-tier subcontractor.

"Subcontractor employee," means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 USC 51-58) (the Act) prohibits any person from

(1) Providing, attempting to provide, or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the subcontract price charged by the Subcontractor to the University, or in the subcontract price charged by a lower-tier subcontractor to the Subcontractor.

(c)(1) The Subcontractor will have in place and follow reasonable procedures designed to prevent and detect possible violation of the Act in its own operations and in its direct business relationships in connection with prime contract.

(2) When the Subcontractor has reasonable ground to believe that a violation of the Act may have occurred, the Subcontractor shall promptly report in writing the possible violation. Such reports shall be made to the Laboratory's Controller, or Laboratory's Counsel.

(3) The Subcontractor shall cooperate fully with any investigation of a possible violation of the Act.

(4) Regardless of the subcontract tier at which a kickback was provided, accepted or charged in connection with the prime contract in violation of the Act, the University may

(i) Offset the amount of the kickback against any monies owed by the University under the subcontract; and/or

(ii) Direct the Subcontractor to withhold from sums owed to a lower-tier subcontractor, the amount of the kickback. The University may direct that the monies withheld be paid to DOE or if DOE has offset the monies under the prime contract, paid to the University. In either case, the Subcontractor shall notify the University when monies are withheld.

(iii) Nothing in this clause precludes any contractual or common law remedy available to the University.

(5) The Subcontractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5), in all lower-tier subcontracts under the subcontract.

A4, Assignment of Claims (FAR 52.232-23)

(a) The subcontract or any right, remedy, or obligation hereunder is assignable in whole or in part by the University to the Government or its designee. Under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereinafter referred to as the Act), the Subcontractor may assign its rights to be paid amounts due or to become due because of the performance of the subcontract to a bank, trust company, or other financial institution, including any federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any bank, trust company, or other financial institution.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under the subcontract and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of the subcontract.

(c) The Subcontractor shall not furnish or disclose to any assignee under the subcontract any classified document, including the subcontract or information related to work under the subcontract until the University authorizes such action in writing.

A5, Assignment of Subcontracts (BUS-43, Exhibit C, Article 12)

The subcontract or any right, remedy, or obligation arising out of the subcontract is assignable in whole or in part by the University to the Government or its designee. Except as to any payment due hereunder, the subcontract is not assignable by the Subcontractor without the written approval of the University.

A6, Audit-Negotiation (FAR 52.215-2)

(This clause applies if the subcontract exceeds the amount set forth in Part 13 of the FAR and was entered into by negotiation.)

(a) **Examination of Costs.** If the subcontract is a cost-reimbursement, incentive, time-and-material, labor-hour, or price-redeterminable, or any combination of these, the Subcontractor shall maintain, and the University or representatives of the University, including employees of the Government, shall have the right to examine and audit books, records, documents, and other evidence and accounting procedures and practices, regardless of form (e.g., machine readable media such as disk, tape, etc.) or type (e.g., data bases, applications software, data base management software, utilities, etc.) sufficient to reflect properly all costs claimed to have been incurred in performing the subcontract. This right of examination shall include inspection at all reasonable times of the Subcontractor's facilities or parts of them engaged in performing the subcontract.

(b) **Cost or Pricing Data.** If, pursuant to law, the Subcontractor has been required to submit cost or pricing data in connection with pricing the subcontract or any modification to the subcontract, the University or representatives of the University, including employees of the Government, shall have the right to examine and audit all books, records, documents, and other data of the Subcontractor regardless of form (e.g., machine readable media such as disk, tape, etc.) or type (e.g., data bases, applications software, data base management software, utilities, etc.) including computations and projections related to proposing, negotiating, pricing, or performing the subcontract or modification in order to evaluate the accuracy, completeness, and currency of the cost or pricing data submitted, along with the computations and projections used. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost of pricing data submitted, along with the computations and projects used.

(c) **Reports.** If the Subcontractor is required to furnish cost, funding, or performance reports, the University or appropriately authorized representatives of the University, including employees of the Government, shall have the right to examine and audit books, records, other documents, and supporting materials for the purpose or evaluating (1) the effectiveness of the Subcontractor's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

(d) **Availability.** The Subcontractor shall make available at its office(s) at all reasonable times the materials described in paragrapns (a) and (b) above for examination, audit, or reproduction until three years after final payment under the subcontract or for any shorter period specified in Subpart 4.7 of the FAR, Contractor Records Retention, or for any longer period required by statute or by other clauses of the subcontract. In addition

(1) If the subcontract is completely or partially terminated, the records relating to the work terminated shall be made available for three years after the resulting final termination settlement; and

(2) Records relating to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the subcontract shall be made available until such appeals, litigation, or claims are disposed of.

(e) Except as otherwise provided in FAR Subpart 4.7, Contractor Records Retention, the Subcontractor may transfer computer data in machine readable form from one reliable computer medium to another. The Subcontractor's computer data retention and transfer procedure shall maintain the integrity, reliability, and security of the original data. The contractor's choice of form or type of materials described in paragraphs (a), (b), and (C) of this clause affects neither the Subcontractor's obligations nor the Government's rights under this clause.

(f) The Subcontractor shall insert a clause containing all the terms of this clause, including this paragrach

(f), in all cost reimbursable lower-tier subcontracts under this subcontract that are over the small purchase limitation in FAR Part 13, altering the clause only as necessary to identify properly the contracting parties and the University under the Government prime contract.

A7, Buy American Act - Supplies (FAR 52.225-3)

(a) The Buy American Act (41 U.S.C. 10) provides that the Government give preference to domestic end products.

(b) **Definitions.** *"Components,"* as used in this clause, means those goods incorporated directly into the end products.

"Domestic end product," as used in this clause, means (1) an unmanufactured end product mined or produced in the United States, or (2) an end product manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the products referred to in subparagraph (c)(2) or (c)(3) of this clause shall be treated as domestic. Scrap generated, collected, and prepared for processing in the Unites States is considered domestic.

"End products," as used in this clause means those goods to be acquired for public use under the subcontract.

(c) The Subcontractor shall use only domestic end products, except those

(1) For use outside the United States;

(2) That the Government determines are not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality;

(3) For which the applicable federal agency determines that domestic preference would be inconsistent with the public interest; or

(4) For which the applicable federal agency determines the cost to be unreasonable.

(The foregoing requirements are administered in accordance with Executive Order No 10582, dated December 17 1954, as amended, and Subpart 25.1 of the FAR.)

A8, Clean Air and Water (Incorporated by Reference) (FAR 52.223-2/Prime Contract Article 14, Clause 4)

(The above clause applies if the subcontract is expected to exceed $100,000.)

A9, Contract Work Hours and Safety Standards Act - Overtime Compensation (FAR 52.222-4)

(This clause applies if the subcontract exceeds $2500.)

(a) **Overtime Requirements.** No Subcontractor or lower-tier subcontractor contracting for any part of the subcontract work that may require or involve the employment of laborers or mechanics (see FAR 22.300) shall require or permit any such laborers or mechanics in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than 1.5 times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(b) **Violation, Liability for Unpaid Wages, and Liquidated Damages.** In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Subcontractor and any lower-tier subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Subcontractor and lower-tier subcontractor shall be liable to the Government (in the case of work done under subcontract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the provisions set forth in paragraph (a) of this clause in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wage required by provisions set forth in paragraph (a) of this clause.

(c) **Withholding for Unpaid Wages and Liquidated Damages.** Upon its own a... or upon written request of an authorized representative of the Department of Labor, the University shall withhold or cause to be withheld, from any moneys payable on account of work performed by the Subcontractor or lower-tier subcontractor under any such subcontract; any other Federal contract with the same Subcontractor, or any Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same Subcontractor, such sums as may be determined to be necessary to satisfy any liabilities of such Subcontractor or lower-tier subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (b) of this clause.

(d) **Payrolls and Basic Records.**

(1) The Subcontractor or lower-tier subcontractor shall maintain payrolls and basic payroll records during the course of subcontract work and shall preserve them for a period of three years from the completion of the subcontract for all laborers and mechanics working on the subcontract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Nothing in this paragraph shall require the duplication of records required to be maintained for construction work by the Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The records to be maintained under paragraph (d)(1) of this clause shall be made available by the Subcontractor or lower-tier subcontractor for inspection, copying, or transcription by authorized representatives of the University, the DOE, or the Department of Labor. The Subcontractor or lower-tier subcontractor shall permit such representatives to interview employees during working hours on the job.

(e) **Subcontracts.** The Subcontractor or lower-tier subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (e) of this clause and also a clause requiring the subcontractors to include these provisions in any lower-tier subcontracts. The Subcontractor shall be responsible for compliance by any lower-tier subcontractor with the provisions set forth in paragraphs (a) through (e) of this clause.

A10, Convict Labor (Incorporated by Reference) (FAR 52.222-3)

A11, Covenant Against Contingent Fees (FAR 52.203.5 as modified by DEAR 970.5203-1, Prime Contract Article 18, Clause 4)

(a) The Subcontractor warrants that no person or agency has been employed or retained to solicit or obtain the subcontract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the University shall have the right to annul the

subcontract without liability or, in its discretion, to deduct from the subcontract price or consideration or otherwise recover the full amount of the contingent fee.

(b) **Definitions.** *"Bona fide agency,"* as used in this clause means an established commercial or selling agency, maintained by a subcontractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts or University subcontracts nor holds itself out as being able to obtain any Government contract or University subcontract through improper influence.

"Bona fide employee," as used in this clause means a person employed by a subcontractor and subject to the subcontractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts or University subcontracts nor holds out as being able to obtain any Government contracts or University subcontract through improper influence.

"Contingent fee," as used in this clause means any commission, percentage fee, brokerage fee, or other fee that is contingent upon the success that a person or concern has in securing a Government contract or University subcontract.

"Improper influence," as used in this clause means any influence that induces or tends to induce a University or Government employee or officer to give consideration or to act regarding a Government contract or University subcontract on any basis other than the merits of the matter.

(c) **Lower-tier subcontracts.** Unless otherwise authorized by the University in writing, the Subcontractor shall cause provisions similar to the foregoing to be inserted in all lower-tier subcontracts entered into under this subcontract.

A12, Disposition of Material (LANL Internal Clause)

Upon completion or termination of all work under the subcontract, the Subcontractor shall prepare for shipment, deliver, or dispose of all goods received from the University and all residual goods produced in connection with the performance of the subcontract that may be directed by the University or as specified in other provisions of the subcontract. All goods produced or required to be delivered under the subcontract become and remain the property of the University and/or the Government.

A13, Disputes (LANL Internal Clause)

(a) Except as otherwise provided for in the subcontract, all disputes arising under or relating to the subcontract shall be resolved in accordance with this clause.

(b) **Definition.** *"Claim,"* as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter or right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this subcontract.

(c) Unless otherwise provided for in the subcontract, a claim by the Subcontractor must be filed within 30 calendar days after the Subcontractor knows, or should have known, of the facts giving rise thereto.

(d) Any claim by the Subcontractor shall first be presented to the University's procurement specialist, who shall attempt to resolve this matter. If the claim is not resolved by the University's procurement specialist in a manner satisfactory to the Subcontractor, and the Subcontractor desires to pursue further action, the claim must be presented in writing to the Laboratory's Procurement Manager for a written decision.

(e) The Laboratory's Procurement Manager shall investigate the issues involved in the claim and promptly issue a decision in writing. A copy of that decision shall be mailed to the Subcontractor and shall state the reason(s) for the decision. The decision of the Laboratory's Procurement Manager shall be the final administrative decision of the Laboratory.

(f) The decision of the Laboratory's Procurement Manager shall be reviewed exclusively through the process stated in subsequent paragraphs of this clause.

(g) A claim by the University against the Subcontractor that is signed by the Laboratory's Procurement Manager, or a decision by the Laboratory's Procurement Manager regarding a claim by the Subcontractor, may be submitted to the DOE Contracting Officer for review and a written decision. Any such submittal by the Subcontractor shall be made within 30 calendar days after the Subcontractor's receipt of the decision of the Laboratory Procurement Manager.

(h) The decision of the DOE Contracting Officer shall be issued in a reasonable amount of time and shall be final unless one of the parties appeals the decision, within 30 days from the receipt of the decision, to the DOE Board of Contract Appeals. The decision of the Board shall be final and conclusive.

(i) For Subcontractor claims of $50,000 or less, the Laboratory must, if requested in writing by the Subcontractor, render a decision within 60 days of the request. For Subcontractor claims exceeding $50,000, the Laboratory must, within 60 days, decide the claim or notify the Subcontractor of the date by which the decision will be made.

(j) Pending final resolution of any claim, request for relief, appeal, or action arising under or relating to the subcontract, the Subcontractor shall proceed diligently with performance of the subcontract and in accordance with any direction of the University's procurement specialist.

A14, Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era (Incorporated by Reference) (FAR 52.222-37/Prime Contract Article 10, Clause 13)

(The above clause applies if the subcontract exceeds $10,000.)

A15, Equal Opportunity (Incorporated by Reference) (FAR 52.222-26/Prime Contract Article 10, Clause 11)

A16, Examination of Records by Comptroller General (FAR 52.215-1 As Modified by DEAR 970.5203-2, Prime Contract Article 7, Clause 5)

(a) This clause applies if the subcontract exceeds the small purchase limitation in Part 13 of the FAR and was entered into by negotiation.

(b) The Comptroller General of the United States or a duly authorized representative from the General Accounting Office shall, until three years after final payment under this subcontract or for any shorter period specified in FAR Subpart 4.7, Contractor Records Retention, have access to and the right to examine any of the Subcontractor's directly pertinent books, documents, papers, or other records involving transactions related to this subcontract.

(c) The Subcontractor agrees to include in lower-tier subcontracts under the subcontract a clause to the

effect that the Comptroller General or a duly authorized representative from the General Accounting Office shall, until three years after final payment under the lower-tier subcontract or for any shorter period specified in FAR Subpart 4.7, have access to and the right to examine any of the lower-tier subcontractor's directly pertinent books, documents, papers, or other records involving transactions related to the lower-tier subcontract. "Lower-Tier subcontract" as used in this clause excludes (1) purchase orders not exceeding the FAR Part 13 small purchase limitation and (2) lower-tier subcontracts or purchase orders for public utility services at rates established to apply uniformly to the public, plus any applicable reasonable connection charge.

(d) The periods of access and examination in paragraphs (b) and (c) above for records relating to (1) appeals under the Disputes clause, (2) litigation or settlement of claims arising from the performance of the subcontract, or (3) costs and expenses of the subcontract to which the Comptroller General or a duly authorized representative from the General Accounting Office has taken exception shall continue until such appeals, litigation, claims, or exceptions are disposed of.

(e) Nothing in this subcontract shall be deemed to preclude an audit by the General Accounting Office of any transaction under this subcontract.

A17, Gratuities (FAR 52.203-3)

(a) The right of the Subcontractor to proceed may be terminated by written notice if, after notice and hearing, the University or DOE determines that the Subcontractor, its agent, or another representative

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the University; and

(2) Intended, by the gratuity, to obtain a subcontract or favorable treatment under a subcontract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If the subcontract is terminated under paragraph (a) above, the University is entitled

(1) To pursue the same remedies as in a breach of the subcontract, and

(2) In addition to any other damages provice by law, to exemplary damages of not less than three or more than ten times the cost incurred by the Subcontractor in giving gratuities to the person concerned, as determined by the University or DOE. (This subparagraph (c)(2) is applicable only if the subcontract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the University provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under the subcontract.

A18, Hazardous Material Identification and Material Safety Data (FAR 52.223-3/Prime Contract Clause I.4 Clause 5)

(a) As prescribed in Federal Standard No. 313B, the Subcontractor agrees to submit 5 days before delivery of the goods, a Material Safety Data Sheet (Department of Labor Form OSHA-20) for all hazardous material, whether or not listed in Appendix A of the Standard. This obligation applies to all goods delivered under the subcontract that will involve exposure to hazardous materials or items containing these materials.

Failure to comply with U.S. Department of Transportation (Title 49 of the Code of Federal Regulations) or International Air Transport Association rules and regulations governing hazardous and dangerous goods may result in the University deducting any necessary repackaging costs from the Subcontractor's invoice. If requested by the University's procurement specialist, the Subcontractor shall provide the applicable packaging certification at no additional charge. One copy of each Material Safety Data Sheet must accompany each shipment of hazardous materials.

(b) **Definition.** *"Hazardous material,"* as used in this clause, is defined in Federal Standard No 313B, in effect on the date of the subcontract.

(c) Neither the requirements of this clause nor any act or failure to act by the University shall relieve the Subcontractor of any responsibility or liability for the safety of University, Subcontractor, lower-tier subcontractor, or other personnel or property.

(d) The Subcontractor shall comply with applicable federal, state, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(e) The University's rights in data furnished under the subcontract with respect to hazardous materials are as follows:

(1) To use, duplicate, and disclose any data to which this clause applies. The purposes of this right are to (i) apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials; (ii) obtain medical treatment for those affected by the material; and (iii) have others use, duplicate, and disclose the data for the University for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (e)(1) above, in precedence over any other clause of the subcontract providing for rights in data.

(3) That the University is not precluded from using in any manner similar or identical data acquired from other sources.

(4) That the data shall not be duplicated, disclosed, or released outside the University or the Government, in whole or in part, for any acquisition or manufacturing purpose, if the following legend is marked on each piece of data to which this clause applies:

"These data are furnished under University of California, Los Alamos National Laboratory Subcontract No._____ and shall not be used, duplicated, or disclosed for any acquisition or manufacturing purpose without the permission of (*the Subcontractor*). This legend shall be marked on any reproduction of this data."

(5) That the Subcontractor shall not place the legend or any other restrictive legend on (i) any data that the Subcontractor or any lower-tier subcontractor previously delivered to the University without limitations or (ii) should be delivered without limitation under the provisions of the Rights in Data - General clause of this document.

(f) The Subcontractor shall insert this clause, including this paragraph (f), with appropriate changes in the designation of the parties, in lower-tier subcontracts (including purchase designations or subcontracts) under the subcontract involving hazardous materials.

A19, Limitation on Payments to Influence Certain Federal Transactions (FAR 52.203-12/Prime Contract Article 7, Clause 19)

(This clause applies if the subcontracts exceeding $100,000.)

(a) **Definitions.** *"Agency,"* as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(a) The awarding of any Federal contract.
(b) The making of any Federal grant.
(c) The making of any Federal loan.
(d) The entering into of any cooperative agreement
(e) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(a) An individual who is appointed to a position in the Government under title 5, United States Code, including a position under a temporary appointment.

(b) A member of the uniformed services, as defined in subsection 101(3), title 37, United States Code.

(c) A special Government employee, as defined in section . . title 18, United States Code.

(d) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.
"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or

employee for work that is not furnished to, not funded by , or not furnished in cooperation with the Federal Government.

"Reasonable payment." as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient." as used in this clause, includes the Subcontractor and all lower-tier subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed." as used in this clause, means with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) **Prohibitions.**

(1) Section 1352 of title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Subcontractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) **Agency and legislative liaison by own employees.**

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person' products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;
(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95.507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) **Professional and technical services.**

A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the

advice or analysis is rendered directly and solely in the preparation, submission, or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communication with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(iii) **Disclosure.**

(A) The Subcontractor who requests or receives from an agency a University subcontract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information rep[illegible]d includes

(B) The Subcontractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes_

(1) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(2) A change in the person(s) or individuals(s) influencing or attempting to influence a covered Federal action; or

(3) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to infl[illegible]nce a covered Federal action.

(C) The Subcontractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any lower-tier subcontract exceeding $100,000 under the subcontract.

(D) All lower-tier subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Subcontractor. The prime Subcontractor shall submit all disclosures to the Contract Administrator at the end of the calendar quarter in which the disclosure form is submitted by the lower-tier subcontractor. Each lower-tier subcontractor certification shall be retained in the subcontract file of the awarding Subcontractor

(iv) **Agreement.** The Subcontractor agrees not to make any payment prohibited by this clause.

(v) **Penalties.**

(A) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(B) Subcontractors may rely without liability on the representation made by their lower-tier subcontractors in the certification and disclosure form.

(vi) **Cost allowability.** Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

A20, Notice and Assistance Regarding Patent and Copyright Infringement (FAR 52.227-2)

(This article applies if the subcontract exceeds the amount set forth in Part 13 of the FAR.)

(a) The Subcontractor shall report to the Government, through the University, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement, based upon the performance of the subcontract, of which the Subcontractor has knowledge.

(b) In the event of any claim or suit against the University or the Government on account of any alleged patent or copyright infringement arising out of the performance of the subcontract or out of the use of any goods furnished or work or services performed under the subcontract, the Subcontractor shall furnish to the University, when requested by the University, all evidence and information in possession of the Subcontractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Subcontractor has agreed to indemnify the Government.

(c) The Subcontractor agrees to include, and require inclusion of, this clause in all lower-tier subcontracts of any tier for goods or services (including construction and architect-engineer subcontracts and those for goods, models, samples, or design or testing services) expected to exceed the small purchase dollar limitation set forth in Part 13 of the FAR.

A21, Notice of Labor Disputes (FAR 52.222-1)

(a) If the Subcontractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of the subcontract, the Subcontractor shall immediately give notice, including all relevant information, to the University.

(b) The Subcontractor agrees to insert the substance of this clause, including this paragraph (b), in any lower-tier subcontract to which a labor dispute may delay the timely performance of the subcontract; except that each subcontract shall provide that if its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the Subcontractor, as the case may be, of all relevant information concerning the dispute.

A22, Officials Not to Benefit (FAR 3.102-1)

No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of the subcontract, or to any benefit arising from it. However, this clause does not apply to the subcontract to the extent that the subcontract is made with a corporation for the corporation's general benefit.

A23, Preference for Privately Owned U.S. Flag Vessels (FAR 52.247-64/Prime Contract Article 7, Clause 24)

(a) The Cargo Preference Act of 1954 (46 U.S.C. 1241(b)) requires that Federal departments and agencies shall transport in privately owned U.S.-flag commercial vessels at least 50 percent of the gross tonnage of equipment, materials, or commodities that may be transported in ocean vessels (computed separately for dry bulk carriers, dry cargo liners, and tankers). Such transportation shall be accomplished when any equipment, materials, or commodities, located within or outside the United States, that may be transported by ocean vessel are—

(1) Acquired for a U.S. Government agency account;

(2) Furnished to, or for the acc :f. any foreign nation without provision for reimbursement;

(3) Furnished for the account of a foreign nations in connection with which the United States advances funds or credits, or guarantees the convertibility of foreign currencies; or

(4) Acquired with advance of funds, loans, or guaranties made by or on behalf of the United States.

(b) The Subcontractor shall use privately owned U.S.-flag commercial vessels to ship at least 50 percent of the gross tonnage involved under this subcontract (computed separately for dry bulk carriers, dry cargo liners, and tankers) whenever shipping any equipment, materials, or commodities under the conditions set forth in paragraph (a) above, to the extent that such vessels are available at rates that are fair and reasonable for privately owned U.S.-flag commercial vessels.

(c) (1) The Subcontractor shall submit through the University, one legible copy of a rated on-board ocean bill of lading for each shipment to both (i) the Contracting Officer, and (ii) the Division of National Cargo, Office of Market Development, Maritime Administration, U.S Department of Transportation, Washington, DC 20590.

(2) The Subcontractor shall furnish these bill of lading copies (i) within 20 working days of the date of loading for shipments originating in the United States, or (ii) within 30 working days for shipments originating outside the United States. Each bill of lading copy shall contain the following information:

(A) Sponsoring U.S. Government agency
(B) Name of vessel.
(C) Vessel flag of registry.
(D) Date of loading.
(E) Port of loading.
(F) Port of final discharge.
(G) Description of commodity.
(H) Gross weight in pounds and cubic feet if available.
(I) Total ocean freight revenue in U.S. dollars.

(d) Except for small purchases as described in 48 CFR 13 the Subcontractor shall insert the substance

of this clause, including this paragraph (d), in all lower-tier subcontracts or purchase orders under this subcontract.

(e) The requirement in paragraph (a) does not apply to —

(1) Small purchases as defined in 48 CFR 13;

(2) Cargoes carried in vessels of the Panama Canal Commission or as required or authorized by law or treaty;

(3) Ocean transportation between foreign countries of supplies purchased with foreign currencies made available, or derived from funds that are made available under Foreign Assistance Act of 1961 (22 U.S.C. 2353; and

(4) Shipments of classified supplies when the classification prohibits the use of non-Government vessels.

A24, Preference for U.S. - Flag Air Carriers (FAR 52.247-63/Prime Contract Article 8, Clause 23)

(This clause does not apply to small purchases made under small purchase procedures.)

(a) **Definitions.** *"International air transportation,"* as used in this clause, means transportation by air between a place in the United States and a place outside the United States or between two places both of which are outside the United States.

"United States," as used in this clause, means the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, and possessions of the United States.

"U.S.-flag air carrier," as used in this clause, means an air carrier holding a certificate under section 401 of the Federal Aviation Act of 1958 (49 U.S.C. 1371).

(b) Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 1517) (Fly American Act) requires that all Federal agencies and Government contractors and University subcontractors use U.S.- flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.

(c) The Subcontractor agrees, in performing work under this subcontract, to use U.S.-flag air carriers for international air transportation of personnel (and the ersonal effects) or property to the extent that service by those carriers is available.

(d) In the event that the Subcontractor selects a carrier other than a U.S.-flag air carrier for international air transportation, the Subcontractor shall include a certification on vouchers involving such transportation essentially as follows:

Certification of Unavailability of U.S.-Flag Air Carriers

I hereby certify that international air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons (see section 47.403 of the FAR). States reasons:

(End of Certification).

A25, Printing (DEAR 970.5204-19/Prime Contract Article 8, Clause 6)

(a) To the extent that duplicating or printing services may be required in the performance of this subcontract, the Subcontractor shall provide or secure such services in accordance with the Government Printing and Binding Regulations, Title 44 of the U.S. Code, and DOE Directives relative thereto.

(b) The term *"Printing"* includes the following processes: composition, platemaking, presswork, binding, microform publishing, or the end items produced by such processes. Provided, however, that performance of a requirement under this subcontract involving the duplication of less than 5,000 copies of a single page, or no more than 25,000 units in the aggregate of multiple pages, will not be deemed to be printing.

(c) Printing services not obtained in compliance with this guidance shall result in the cost of such printing being disallowed.

(d) In all lower-tier subcontracts hereunder which require printing (as that term is defined in Title I of the U.S. Government Printing and Binding Regulations), the Subcontractor shall include a provision substantially the same as this clause.

A26, Priorities and Allocations (DEAR 970.5204-33/Prime Contract Article 8, Clause 8)

(a) The Subcontractor shall follow the provisions of the Defense Priorities and Allocation System (DPAS) Regulation (15 CFR 350) in obtaining controlled materials and other products and materials needed for performance of the subcontract.

(b) A program or project under this subcontract may be eligible for priorities and allocations support as provided for by Section 101(c) of the Defense Priorities Act of 1950, as amended by the Energy Policy and Conservation Act (Public Law 94-163, 42 U.S.C. 6201 et seq.) if it is determined that its purpose is to maximize domestic energy supplies. Eligibility is dependent on an executive decision on a case-by-case basis with the decision being jointly made by the Department of Energy and Commerce.

A27, Protest After Award (FAR 52.233-3)

(a) Upon receipt of a notice of protest (as defined in 33.101 of the FAR) the University may, by written order to the Subcontractor direct the Subcontractor to stop performance of the work called for by the subcontract. The order shall be specifically identified as a stop work order issued under this clause. Upon receipt of the stop work order, the Subcontractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the University shall either

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or Termination for

Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Subcontractor shall resume work. The University shall make an equitable adjustment in the delivery schedule or contract price or both, and the contract shall be modified, in writing, accordingly, if

(1) The stop-work order results in an increase in the time required for, or in the Subcontractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Subcontractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Specialist decides the facts justify the action, the University may receive and act upon a proposal at any time before final payment under the subcontract.

(c) If a stop-work is not canceled and the work covered by the order is terminated for the convenience of the University, the University shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the University shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The University's rights to terminate this contract at any time are not affected by action taken under this clause.

A28, Required Sources for Jewel Bearings and Related Items (FAR 52.208-1)

(a) This clause applies only if the supplies to be furnished under the subcontract contain jewel bearings or related items; the supplies are to be used in the United States, its possessions and Puerto Rico; and the total price of the subcontract exceeds the small purchase dollar limitation set forth in Part 13 of the FAR.

(b) **Definitions.** *"Jewel bearing,"* as used in this clause, means a piece of synthetic corundum (sapphire or ruby) of any shape, except a phonograph needle, that has one or more polished surfaces to provide supporting surfaces or low-friction contact areas for revolving, oscillating, or sliding parts in an instrument, mechanism, subassembly, or part. A jewel bearing may be unmounted or may be mounted into a ring or bushing. Examples are watch holes - olive, watch hole - straight, pallet stones, roller jewels (jewel pins), endstones (caps), vee (cone) jewels, instrument rings, cups, and double cups.

"Plant," as used in this clause, means the Government-owned, contractor-operated William Langer Plant, Rolla, North Dakota 58367 (Phone: 701-477-3193).

"Price List," as used in this clause, means the U.S. Government Jewel Bearing Price List, published periodically by the General Services Administration for jewel bearings produced by the Plant.

"Related Item," as used in this clause, means a piece of synthetic corundum (sapphire or ruby), other than a jewel bearing, that (1) is made from material produced by the Verneuil flame fusion process, (2) has a geometric shape up to maximum of 1 inch in any dimension, (3) requires extremely close tolerances and highly polished surfaces identical to those involved in manufacturing jewel bearings, and (4) is either mounted in a retaining or supporting structure or unmounted. Examples are window, nozzle, guide, knife edge, knife edge plate, insulator corned pin, slotted insulator, sphere, ring gauge, spacer, disc, valve seat, rod, vee grove, D-shaped insulator, and notched plate.

(c) All jewel bearings and related items required for the supplies to be furnished under the subcontract (or

an equal quantity of the same type, size, and tolerances) shall be acquired from the following sources: jewel bearings from the Plant, unless the Plant declines or rejects the order; and related items from domestic manufacturers, including the Plant, if the items can be obtained from those sources. Sources other than the foregoing may be used if the foregoing sources decline or reject the order.

(1) Orders may be places with the Plant for individual contracts, for a combination of contracts, or for stock. If the order is for an individual subcontract, the prime contract number shall be placed on it.

(2) Orders, and any supplements to orders, for items listed in the price list shall refer to the most recent price list and its date.

(3) Requests for quotations for items not listed in the price list should be accompanied by drawings and forwarded to the Plant as soon as possible to ensure prompt quotation or rejection of the order.

(d) At its option, the Plant may decline or reject all or part of a Subcontractor's or subcontractor's order. If the order is declined or rejected, the Subcontractor shall notify the contract administration office cognizant of the contract promptly in writing, enclosing a copy of the rejection notice. Unless the declination or rejection has been caused by current excessive and overdue Subcontractor indebtedness to the Plant as determined by the Plant, the Contracting Officer shall evaluate the impact and make an equitable adjustment in the subcontract price, in the delivery schedule, or in both, if one is warranted. This procedure shall also apply to orders for related items rejected by any other domestic manufacturer.

(e) The Subcontractor agrees to insert this clause, including this paragraph (e), and the prime contract number in every lower-tier subcontract unless the Subcontractor has positive knowledge that the subassembly, component, or part being purchased does not contain jewel bearings or related items.

A29, Security (DEAR 952.204-2/Prime Contract Article 13, Clause 1)

(a) **Responsibility.** The Subcontractor has the duty to safeguard all classified information, special nuclear material, and other Government property. The Subcontractor shall, in accordance with DOE security regulations and requirements, be responsible for safeguarding all classified information, and protecting against sabotage, espionage, loss, and theft the classified documents and material in the Subcontractor's possession in connection with the performance of work under the subcontract. Except as otherwise expressly provided in the subcontract, the Subcontractor shall, upon completion or termination of the subcontract, transmit to the University any classified matter in the possession of the Subcontractor or any person under the Subcontractor's control in connection with performance of the subcontract. If retention by the Subcontractor of any classified matter is required after the completion or termination of the subcontract and such retention is approved by the University, the Subcontractor will complete a certificate of possession to be furnished to the University specifying the classified matter to be retained. The certification shall identify the items and types or categories of matter retained, the conditions governing the retention of the matter, and the period of retention, if known. If the retention is approved by the University, the security provisions of the subcontract will continue to apply to the matter retained. Special nuclear material will not be retained after the completion or termination of the subcontract.

(b) **Regulations.** The Subcontractor agrees to conform to all security regulations and requirements of the DOE.

(c) **Definitions.** *"Classified information."* means Restricted Data, Formerly Restricted Data, or National Security Information.

"Restricted Data," means all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the Restricted Data category pursuant to Section 142 of the Atomic Energy Act of 1954, as amended.

"Formerly Restricted Data." means all data removed from the Restricted Data category under Section 142 d. of the Atomic Energy Act of 1954, as amended.

"National Security Information," means any information or material, regardless of its physical form or characteristics, that is owned by, produced for or by or is under the control of the Government, that has been determined pursuant to Executive Order 12356 or prior Orders to require protection against unauthorized disclosure, and that is so designated.

"Special Nuclear Material (SNM)." means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, has been determined to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

(d) **Security Clearance of Personnel.** The Subcontractor shall not permit any individual to have access to any classified information, except in accordance with the Atomic Energy Act of 1954, as amended, Executive Order 12356, and the DOE's regulations or requirements applicable to the particular level and category of classified information to which access is required.

(e) **Criminal Liability.** It is understood that disclosure of any classified information relating to the work or services ordered hereunder to any person not entitled to receive it or failure to safeguard any classified information that may come to the Subcontractor or any person under the Subcontractor's control in connection with work under the subcontract may subject the Subcontractor, its agents, employees, or subcontractors to criminal liability under the laws of the United States. (See the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et. seq.; 18 U.S.C. 793 and 794; and Executive Order 12356.)

(f) **Subcontracts and Purchase Orders.** Except as otherwise authorized in writing by the University, the Subcontractor shall insert provisions similar to the foregoing in all lower-tier subcontracts and purchase orders under the subcontract.

A30, Security Access Authorization and Operations Security (LANL Internal Article)

(a) **Access Authorization.** Subcontractor personnel engaged in the performance of work under a subcontract on University property, government premises, or offsite facilities are required to possess a DOE access authorization ("L" or "Q" clearance), and must comply with the following requirements. The Subcontractor shall be responsible for

(1) Completing and submitting all necessary application forms for authorized access in advance of the need. Application forms may be obtained from the University Operational Security and Safeguards (OS) Division. All personnel granted an access authorization will be briefed, by the University, on access to classified matter, security areas, and security requirements;

(2) Safeguarding information that may come into the Subcontractor's possession or within the purview of its work. Unless otherwise authorized by the University in writing, within 30 days of completion or termination of the order, the Subcontractor shall (a) return to the University all classified matter and badges in the possession of the Subcontractor or person under the Subcontractor's control, and (b) furnish to the

University a Certificate of Nonpossession (for Offsite Facilities) as well as the Security Termination Statements (Form 5631.29) for all affected personnel; and

(3) Ensuring all cleared employees comply with DOE's security requirements including the provisions of DOE Order 5631.1B, "Security Education and Awareness Program."

(b) **Operations Security Program.** The Subcontractor agrees to implement and sustain a DOE Operations Security (OPSEC) Program in accordance with the provisions of the Laboratory's OPSEC Guidance for LANL Contractors Manual when awarded subcontracts involving access to and protection of classified or sensitive information, nuclear materials or other safeguards and security interests.

(c) Whenever the work under this order requires the issuance of "Q-cleared," "L-cleared," or "Escort Required" badges, the University may withhold final payment to the Subcontractor until all such badges are returned to the contract specialist as required in paragraph (a)(2) above.

A31, Subcontractor Cost or Pricing Data (DEAR 970.5204-24)

(a) The following clause shall be inserted in all subcontracts where such subcontracts exceed the cost or pricing data threshold at FAR 15.804-(2)(a)(1), even though the original amount of the subcontract was below the threshold.

CERTIFIED COST OR PRICING DATA (December 1994)

(a)(1) The Subcontractor shall require under the situations described in (2) below, unless exempted under the exceptions set forth in (3) below, each lower-tier subcontractor under this subcontract to submit cost or pricing data and to certify that, to the best of his knowledge and belief, such cost or pricing data are accurate, complete and current.

(2) Except as provided in (a)(3) of this clause, certified cost or pricing data shall be submitted prior to (i) (I) the award of each lower-tier subcontract, the price of which is expected to exceed the cost or pricing data threshold at FAR 15.804-2(a)(1), and (II) the negotiation of the price of each change or modification to the lower-tier subcontract under this subcontract for which the price adjustment is expected to exceed the cost or pricing data threshold at FAR 15.804-2(a)(1).

(3) Certified cost or pricing data need not be furnished pursuant to this paragraph (a) where (i) the subcontractor has not been required to furnish cost or pricing data; or (ii) the price adjustment is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or the prices are set by law or regulation; and the Subcontractor states in writing the basis for applying this exception.

(4) In submitting the cost or pricing data, the lower-tier subcontractor shall use the form of certificate set forth in paragraph (b) below and shall certify that the data are accurate, complete, and current. Such certificate and data (actual or identified, as provided in the certificate prescribed below) shall be submitted by lower-tier subcontractors to the Subcontractor, as applicable, for retention.

(b) The certificates required by this clause shall be in the form set forth below.

Subcontractor's Certificate of Current Cost or Pricing Data

This is to certify that, to the best of my knowledge and belief, cost or pricing data submitted in writing, or specifically identified in writing if actual submission of the data is impracticable (see FAR 15.804-6(d)), to the University in support of _____* are accurate, complete, and current as of _____**.

Firm Name Title
Date of Execution***

* Identify the proposal, quotation, request for price adjustment, or other submission involved.

** Insert the day, month, and year when price negotiations were concluded and price agreement was reached.

*** Insert the day, month, and year of signing, which should be as close as practicable to the date when the price negotiations were concluded and the subcontract price was agreed to.

(c) For purposes of verifying that certified cost or pricing data submitted in conjunction with the negotiation of this subcontract change or other modification involving an amount in excess of the cost or pricing data threshold at FAR 15.804-2(a)(1) were accurate, complete, and current, DOE shall, until the expiration of 3 years from the date of final payment under this subcontract, have the right to examine those books, records, documents, papers, and other supporting data which involve transactions related to this subcontract or which will permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.

(d) If the original price of this subcontract exceeds the cost or pricing data threshold at FAR 15.804-2(a)(1) or the price of any change or other modification to this subcontract is expected to exceed the cost or pricing data threshold at FAR 15.804-2(a)(1), the Subcontractor agrees to furnish the University certified cost or pricing data, using the certificate set forth in paragraph (b) above, unless the price is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation.

(e) The requirement for submission of certified cost or pricing data with respect to any change or other modification does not apply to any lower-tier subcontractor change or other modification, at any tier, where the subcontract is firm fixed-price or fixed-price with escalation unless such change or other modification result from a change or modification to the subcontract, nor does it apply to a lower-tier subcontract change or modification, at any tier, where the subcontract is not firm fixed-price or fixed-price with escalation unless the price for such change or other modification becomes reimbursable under the subcontract.

(f) The Subcontractor agrees to insert paragraph (c) without change and the substance of paragraph (a), (b), (c), (d), (e), and (f) of this clause in each lower-tier subcontract of hereunder in excess of the cost or pricing data threshold at FAR 15.804-2(a)(1) and in each lower-tier subcontrac of the cost or pricing data threshold at FAR 15.804-2(a)(1) a change or other mocification thereto in excess of the cost or pricing data threshold at FAR 15.804-2(a)(1).

(g) If the University determines that any price, including profit or fee, negotiated in connection with this subcontract or any cost reimbursable under this subcontract was increased by any significant sums because the Subcontractor, or any lower-tier subcontractor pursuant to this clause or any lower-tier subcontract clause herein required, furnished incomplete or inaccurate cost or pricing data, then such prices or cost shall be reduced accordingly and the subcontract shall be modified in writing to reflect such reduction.

(h) Failure of the Subcontractor and the lower-tier subcontractor to agree on any of the matters in

paragraph (g) above shall be a dispute concerning a question of fact subject to the Disputes provisions of this subcontract.

NOTE: Since the subcontract is subject to reduction under this clause by reason of defective cost or pricing data submitted in connection with certain lower-tier subcontracts, it is expected that the Subcontractor may wish to include a clause in each such lower-tier subcontract requiring the lower-tier subcontractor to appropriately indemnify the Subcontractor. It is also expected that any lower-tier subcontractor subject to such indemnification will generally require substantially similar indemnification for defective cost or pricing data required to be submitted by its lower-tier subcontractors.

This clause may also be used for subcontracts in which the amount of the subcontract is less than the cost or pricing data threshold at FAR 15.804-2(a)(1), if a certificate of cost or pricing data is obtained; if so used, the amount stated in the clause should be appropriately modified.

The contract administrator, for subcontracts estimated to be within the limits of delegated authority, may without power of redelegation, approve the waiver cited in FAR 15.804-3(l).

A32, Unclassified Controlled Nuclear Information (UCNI) (LANL Internal Use)

(a) Documents originated by the subcontractor or furnished by the Government through the University to the subcontractor in connection with this project may contain Unclassified Controlled Nuclear Information (UCNI) as defined in Section 148 of the Atomic Energy Act of 1954, as amended. Therefore, the following limitation notice is stamped or typed on the cover of the documents:

"NOT FOR PUBLIC DISSEMINATION. THIS DOCUMENT CONTAINS INFORMATION THAT MAY BE SUBJECT TO SECTION 148 OF THE ATOMIC ENERGY ACT, AS AMENDED."

The subcontractor shall be responsible for protecting such information from authorized dissemination in accordance with DOE regulations, requirement, and instructions.

(b) UCNI may only be made available to authorized individuals. "Individuals" for purposes of this subcontract, means only U. S. citizens who have a need to know in the performance of official duties or DOE authorized activities and who are employees of the Government, employees of a Government contractor or subcontractors, or employees of a prospective Government contractor or subcontractor for the purpose of bidding on a Government contract.

(c) All parties receiving UCNI shall be obliged under penalty of law to protect such information as required by 10 CFR 1017.17, such responsibility including but not limited to the following:

(1) **General.** UCNI requires protection from unauthorized dissemination. UCNI must be protected and controlled in a manner consistent with that customarily accorded other types of unclassified but sensitive information (e.g., proprietary business information, personnel, or medical records of employees, attorney-client information). The subcontractor shall establish and maintain a system for the protection of UCNI in its possession or under its control that is consistent with the physical protection standards established in this section. Each authorized individual or person granted special access to UCNI who receives, acquires, or produces UCNI or a document or material containing UCNI shall take reasonable and prudent steps to ensure that it is protected from unauthorized dissemination.

(2) **Protection in Use or Storage.** An authorized individual or a person granted special access to

UCNI shall maintain physical control over any document or material containing an UCNI notice that is in use so as to prevent unauthorized access to it. When any document or material containing an UCNI notice is not in use, it must be stored in a secure container (e.g., locked desk or file cabinet) or in a location where access is limited (e.g., locked or guarded office or controlled access facility).

(3) **Reproduction.** A document or material containing an UCNI notice may be reproduced to the minimum extent necessary consistent with the need to carry out official duties without permission of the originator, provided that the reproduced document or material is marked and protected in the same manner as the original document or materials.

(4) **Destruction.** A document of material containing an UCNI notice may be disposed of by any method that ensure sufficiently complete destruction to prevent its retrieval (provided that the disposal is authorized by the archivist of the United State under 41 CFR 101-11.4 and by agency records disposition schedules).

(5) **Transmission.**

(A) A document or material containing an UCNI notice must be packaged to prevent disclosure of the presence of UCNI when transmitted by a means that could allow access to the document or material by a person who is not an authorized individual or a person granted special access to UCNI. The address and return address must be indicated on the outside of the package.

(B) A document or material containing an UCNI notice may be transmitted by the following means:

(i) U.S. first class, express, certified or registered mail;
(ii) Any means approved for the transmission of classified documents or material;
(iii) An authorized individual or a person granted special access to UCNI when he or she can control access to the document or material being transmitted; or
(iv) Any other means determined by the Assistant Secretary for Defense Programs to be sufficiently secure.

(C) UCNI may be discussed or transmitted over an unprotected telephone or telecommunications circuit when required by operational considerations. More secure means of communication should be used whenever possible.

(6) **Automated Data Processing (ADP).** UCNI may be process or produced on any ADP system that is certified for classified information or that complies with the guidelines of Office of Management and Budget Circular No. A-71, "Security of Federal Automated Information Systems, or that has been approved for such use in accordance with the provisions of applicable DOE directives.

(d) **Civil Penalty.** Any person who violates Section 148 of the Atomic Energy Act or any regulation or order of the Secretary issued under Section 148 of the Atomic Energy Act, including these regulations, is subject to a civil penalty. The Assistant Secretary for Defense Programs may recommend to the Secretary imposition of this civil penalty, which shall not exceed $100 000 for each violation.

A33, Utilization of Labor Surplus Area Concerns (FAR 52.220-3)

(a) **Applicability.** This clause is applicable if this subcontract exceeds the appropriate small purchase limitation in Part 13 of the FAR.

(b) **Policy.** It is the policy of the University and the Government to award contracts and subcontracts to

concerns that agree to perform substantially in labor surplus areas (LSAs) when this can be done consistent with the efficient performance of the subcontract and at prices no higher than are obtainable elsewhere. The Subcontractor agrees to use its best efforts to place lower-tier subcontracts in accordance with this policy.

(c) **Order of Preference.** In complying with paragraph (a) above and with paragraph (b) of the clause entitled Utilization of Small Business Concerns and Small Disadvantaged Business Concerns, the Subcontractor shall observe the following order of preference in awarding lower-tier subcontracts: (1) small business concerns that are LSA concerns, (2) other small business concerns, and (3) other LSA concerns.

(d) **Definitions.** *"Labor surplus area."* as used in this clause means a geographical area identified by the Department of Labor in accordance with 20 CFR 654, Subpart A, as an area of concentrated unemployment or underemployment or an area of labor surplus.

"Labor surplus area concern," as used in this clause means a concern that together with its first-tier subcontractors will perform substantially in labor surplus areas. Performance is substantially in labor surplus areas if the costs incurred under the subcontract on account of manufacturing, production, or performance of appropriate services in labor surplus areas exceed 50 percent of the subcontract price.

A34, Utilization of Small Business Concerns and Small Disadvantaged Business Concerns (FAR 52.219-8)

(a) It is the policy of the University and the Government that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in performing contracts and subcontracts let by any Federal agency. It is further the policy of the government that its contractors and subcontractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their lower-tier subcontracts with small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals.

(b) The Subcontractor hereby agrees to carry out this policy in the awarding of lower-tier subcontracts to the fullest extent consistent with efficient subcontract performance. The Subcontractor further agrees to cooperate in any studies or surveys that may be conducted by the United States Small Business Administration, the DOE, or the University that may be necessary to determine the extent of the Subcontractor's compliance with this clause.

(c) As used in this subcontract, the term *"small business concern"* shall mean a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals" shall mean a small business concern.

(1) That is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or, in the case of any publicly owned business, at least 51 percent of the stock of which is unconditionally owned by one or more socially and economically disadvantaged individuals; and

(2) Whose management and daily business operations are controlled by one or more of such individuals.

This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one of these entities which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Hawaiian organization, and which meets the requirements of 13 CFR 124.

The Subcontractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans and other minorities, or any other individual found to be disadvantaged by the Administration pursuant to Section 8(a) of the Small Business Act. The Subcontract shall presume that socially and economically disadvantaged entities also include Indian Tribes and Native Hawaiian organizations.

(d) Subcontractors acting in good faith may rely on written representations by their lower-tier subcontractors regarding their status as either a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals.

A35, Utilization of Women-Owned Small Businesses (FAR 52.219-13)

(a) **Definitions.** *"Women-Owned Small Businesses,"* as used in this clause means small business concerns that are at least 51 percent owned by women who are United States citizens and who also control and operate the business.

"Control," as used in this clause means exercising the power to make policy decisions.

"Operate," as used in this clause means being actively involved in the day-to-day management of the business.

"Small business concern," as used in this clause means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts or subcontracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) It is the policy of the University and the Government that women-owned small businesses shall have the maximum practicable opportunity to participate in performing contracts and subcontracts awarded by any Federal agency.

(c) The Subcontractor agrees to use its best efforts to give women-owned small businesses the maximum practicable opportunity to participate in the lower-tier subcontracts it awards to the fullest extent consistent with the efficient performance of its subcontract.

(d) The Subcontractor may rely on written representations by its lower-tier subcontractors regarding their status as women-owned small businesses.

A36, Walsh-Healey Public Contracts Act (Incorporated by Reference) (FAR 52.222-20)

(If the subcontract is for the manufacturing or furnishing of materials, supplies, articles, or equipment in an amount that exceeds or may exceed $10,000 and is subject to the Walsh-Healey Public Contracts Act, as amended (41 U.S.C. 35-45), the above article applies.)

Form 7500, Section B

Section B Clauses Apply to All Subcontracts.

The clauses listed below are appropriate to all types of subcontracts regardless of pricing arrangement. Clauses in this section are incorporated into subcontracts by specifically citing clause numbers in the Schedule.

B1, Accounts, Records, and Inspection (DEAR 970-5204-9)

(a) **Accounts.** The Subcontractor shall maintain a separate and distinct set of accounts, records, documents, and other evidence showing and supporting all allowable costs incurred, or anticipated to be incurred, revenues or other applicable credits, fixed-fee accruals, and the receipt, use, and disposition of all Government property coming into the possession of the Subcontractor under this subcontract. The system of accounts employed by the Subcontractor shall be satisfactory to DOE and in accordance with generally accepted accounting principles and consistently applied.

(b) **Inspection and Audit of Accounts and Records.** All books of account and records relating to this subcontract shall be subject to inspection and audit by DOE at all reasonable times, before and during the period of retention provided for in (d) below, and the subcontractor shall afford DOE and/or the University proper facilities for such inspection and audit.

(c) **Audit of Lower-tier Subcontractor's Records.** The Subcontractor also agrees, with respect to any lower-tier subcontracts (including fixed-price or unit-price subcontracts or purchase orders) where, under the terms of the lower-tier subcontract, costs incurred are a factor in determining the amount payable to the lower-tier subcontractor at any tier, to either conduct an audit of the lower-tier subcontractor's costs or arrange for such an audit to be performed by the cognizant government audit agency through the DOE contracting officer.

(d) **Disposition of Records.** Except as agreed upon by the University and the Subcontractor, all financial and cost reports, books of account and supporting documents, and other data evidencing costs allowable, revenues, and other applicable credits under this subcontract, shall be delivered to the University or otherwise disposed of by the Subcontractor either as the University from time to time direct during the progress of work or, in any event, as the University shall direct upon completion or termination of this subcontract and final audit of accounts hereunder. Except as provided in this subcontract, all other records in the possession of the Subcontractor relating to this subcontract shall be preserved by the Subcontractor for a period of three (3) years after final payment under this subcontract or otherwise disposed of in such manner as may be agreed upon by the University and the Subcontractor.

(e) **Reports.** The Subcontractor shall furnish such progress reports and schedules, financial and cost reports, and other reports covering the work under this subcontract as the University may from time to time require.

(f) **Inspections.** The DOE and the University shall have the right to inspect the work and activities of the Subcontractor under this subcontract at such time and in such manner as it shall deem appropriate.

(g) **Lower-tier Subcontracts.** The Subcontractor further agrees to require the inclusion of provisions similar to those in paragraphs (a) through this paragraph (g) of this clause in all lower-tier subcontracts (including fixed-price or unit-price subcontracts or purchase orders) of any tier entered into hereunder where, under the terms of the lower-tier subcontract, costs incurred are a factor in determining the amount payable to the lower-tier subcontractor. The Subcontractor further agrees to include an audit clause, the substance of which is Clause B5, Price Reduction for Defective Cost or Pricing Data.

B2. Additional Paragraph (h) to Clause B1 for (a) all cost-type subcontracts (or lower-tier subcontracts) involving an estimated cost exceeding $5 million and expected to run more than two (2) years, and (b) any other cost-type subcontract (or lower-tier subcontract) where deemed advisable by DOE advisable by the University and when the Subcontractor (or lower-tier subcontractor) already has an established internal audit organization.

(h) **Internal Audits.** The Subcontractor agrees to conduct an internal audit and examination satisfactory to DOE and the University of the records, operations, expenses, and the transactions with respect to costs claimed to be allowable under this subcontract annually and at such other times as may be mutually agreed upon. The results of such audit, including the working papers, shall be submitted or made available to the DOE Contracting Officer and/or the University.

B3, Additional Data Requirements (FAR 52.227-16)

(This clause does not apply if the subcontract is for the conduct of basic or applied research as set out elsewhere in the subcontract to be performed solely by a college or university and the estimated cost is not in excess of $500,000.)

(a) In addition to the data as defined in the Rights in Data - General clause or other equivalent included in the subcontract and specified elsewhere in the subcontract to be delivered, the University may, at any time during subcontract performance or within a period of three years after acceptance of all items to be delivered under the subcontract, order any data first produced or specifically used in the performance of the subcontract.

(b) The Rights in Data - General clause or other equivalent included in the subcontract is applicable to all data ordered under this Additional Data Requirements clause. Nothing contained in this clause shall require the Subcontractor to delivery any data the withholding of which is authorized by the Rights in Data or other equivalent clause of the subcontract or data that are specifically identified in the subcontract as not subject to this clause.

(c) When data are to be delivered under this clause, the Subcontractor will be compensated for converting the data into the prescribed form for reproduction and for delivery.

(d) The University may release the Subcontractor from the requirements of this clause for specifically identified data items at any time during the three-year period set forth in paragraph (a) above.

B4, Administration of Cost Accounting Standards (FAR 52.230-5/Prime Contract Article 7, Clause 10)

For the purpose of administering the Cost Accounting Standards (CAS) requirements under this subcontract, the Subcontractor shall take the steps outlined in paragraphs (a) through (f) of this clause:

(a) Submit to the cognizant Contracting Officer or the University a description of any accounting change, the potential impact of the change on subcontracts containing a CAS clause, and if not obviously immaterial, a general dollar magnitude cost impact analysis of the change that displays the potential shift of costs between CAS-covered subcontracts by contract type (i.e., firm-fixed-price, incentive, cost-plus-fixed-fee, etc.) and other Subcontractor business activity. As related to CAS-covered subcontracts, the analysis should display the potential impact of funds of the various Agencies/Departments (e.g., Department of Energy, National Aeronautics and Space Administration, Army, Navy, Air Force, other Department of Defense, other Government) as follows:

(1) For any change in cost accounting practices required to comply with a new CAS in accordance with paragraphs (a)(3) and (a)(4)(i) of the CAS clause within 60 days (or such other date as may be mutually agreed to) after award of a subcontract requiring this change.

(2) For any change in cost accounting practices proposed in accordance with subparagraph (a)(4)(ii) or (a)(4)(iii) of the Cost Accounting Standards clause or with subparagraph (a)(3) of the Disclosure and Consistency of Cost Accounting Practices clause, not less than 60 days (or such other date as may be mutually agreed to) before the effective date of the proposed change.

(3) For any failure to comply with an applicable CAS or to follow a disclosed practice as contemplated by paragraph (a)(5) of the Cost Accounting Standards clause or by paragraph (a)(4) of the Disclosure and Consistency of Cost Accounting Practices clause within 60 days (or such other date as may be mutually agreed to) after the date of agreement of noncompliance by the Subcontractor.

(b) Submit a cost impact proposal in the form and manner specified by the cognizant Contracting Officer or the University within 60 days (or such other date as may be mutually agreed to) after the date of determination of the adequacy and compliance of a change submitted pursuant to paragraph (a) of this clause

(c) Agree to appropriate subcontract and lower-tier subcontract amendments to reflect adjustments established in accordance with subparagraphs (a)(4) and (a)(5) of the clause or with subparagraphs (a)(3) or (a)(4), of the CAS Disclosure and Consistency of Cost Accounting Practices clause.

(d) For all lower-tier subcontracts subject either to the Cost Accounting Standards clause or to the Disclosure and Consistency of Cost Accounting Practices clause -

(1) So state in the body of the lower-tier subcontract, in the letter of award, or in both (self-deleting clauses shall not be used); and

(2) Include the substance of this clause in all negotiated lower-tier subcontracts. In addition, within 30 days after award of the lower-tier subcontract, submit the following information to the Subcontractor's cognizant contract administration office for transmittal to the contract administration office cognizant of the lower-tier subcontractor's facility:

(i) Lower-tier subcontractor's name and lower-tier subcontract number;

(ii) Dollar amount and date of award;

(iii) Name of Subcontractor making the award; and

(iv) Any changes the lower-tier subcontractor has made or proposes to make to accounting practices that affect prime contracts or subcontracts containing the CAS clause or Disclosure and Consistency of Cost Accounting Practices clause, unless these changes have already been reported. If award of the lower-tier subcontract results in making one or more CAS effective for the first time, this fact shall also be reported.

(e) Notify the University in writing of any adjustments required to lower-tier subcontracts under the subcontract and agree to an adjustment based on them to the subcontractor's price or estimated cost and fee. This notice is due within 30 days after proposed lower-tier subcontract adjustments are received and shall include a proposal for adjusting the higher-tier subcontract or the subcontract appropriately.

(f) For lower-tier subcontracts containing the CAS clause, require the lower-tier subcontractor to comply with all Standards in effect on the date of award or of final agreement on price, as shown on the lower-tier subcontractor's signed Certificate of Current Cost or Pricing Data, whichever is earlier.

B5, Authorization and Consent (FAR 52.227-1)

(a) The Government authorizes and consents to all use and manufacture, in performing the subcontract at any tier of any invention described in and covered by a United States patent (1) embodied in the structure of composition of any clause, the delivery of which is accepted by the University for the Government under the subcontract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Subcontractor or a lower-tier subcontractor with (i) specifications or written provisions forming a part of the subcontract or (ii) specific instructions given by the University's procurement specialist directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the Patent indemnity clause, if any, included in the subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Subcontractor agrees to include and require inclusion of this clause, suitably modified to identify the parties, in all lower-tier subcontracts for goods or services (including construction, architect-engineer services, goods, models, samples, and design or testing services) expected to exceed $25,000; however, omission of this clause from any lower-tier subcontract under or over $25,000 does not affect this authorization and consent.

B6, Authorization for Subcontractor's Use of Government Supply Sources (DEAR 970.7104-31)

The University may issue the Subcontractor an authorization to use Government supply sources in the performance of the subcontract. Title to all property acquired by the Subcontractor under such an authorization shall vest in the Government unless otherwise specified in the subcontract. Such property shall not be considered to be Government-furnished property as distinguished from Government property. The provisions of the Property clause, except its paragraphs (a) and (b), shall apply to all property acquired under such authorization.

B7, Classification (DEAR 952.204-70)

In the performance of the work under the subcontract, the Subcontractor shall ensure that an Authorized Original Classifier or Derivative Classifier shall assign classifications to all documents, material, and goods originated or generated under the subcontract in accordance with classification regulations and guidance furnished to the Subcontractor by the University. Every lower-tier subcontract and purchase order issued hereunder involving the origination or generation of classified documents, material, or goods shall include a provision to the effect that in the performance of such subcontract or purchase order, the lower-tier subcontractor or supplier shall ensure that an Authorized Original Classifier or Derivative Classifier shall assign classifications to all such documents, materials, and goods in accordance with classification regulations and guidance furnished to such lower-tier subcontractor or supplier by the Subcontractor.

B8, Competition in Subcontracting (FAR 52.244-5)

The Subcontractor shall select lower-tier subcontractors (including suppliers) on a competitive basis to the maximum practical extent consistent with the objectives and requirements of the subcontract.

B9, Cost Accounting Standards (FAR 52.230-2 Prime Contract Article 7, Clause 8))

(a) Unless the subcontract is exempt under FAR 30.201-1 and 30.201-2, the provisions of Federal Acquisition Regulation (FAR) Subpart 30.3 are incorporated herein by reference and the Subcontractor, in connection with this subcontract shall -

(1) (CAS-covered Subcontracts Only) By submission of a Disclosure Statement, disclose in writing the Subcontractor's cost accounting practices as required by FAR 30.202-1 through 30.202-5 including methods of distinguishing direct costs from indirect costs and the basis used for allocating indirect costs. The practices disclosed for the subcontract shall be the same as the practices currently disclosed and applied on all other subcontracts and lower-tier subcontracts being performed by the Subcontractor and that contain a Cost Accounting Standards (CAS) clause. If the Subcontractor has notified the Government Contracting Officer or the University that the Disclosure Statement contains trade secrets and commercial or financial information that is privileged and confidential, the Disclosure Statement will be protected and will not be released outside of the University or the Government.

(2) Follow consistently the Subcontractor's cost accounting practices in accumulating and reporting performance cost data concerning the subcontract. If any change in cost accounting practices is made for the purposes of any subcontract or lower-tier subcontract subject to CAS requirements, the change must be applied prospectively to the subcontract and the Disclosure Statement must be amended accordingly. If the subcontract price or cost allowance of the subcontract is affected by such changes, adjustment shall be made in accordance with subparagraph (a)(4) or (a)(5) below, as appropriate.

(3) Comply with all CAS including any modifications indicated thereto contained in FAR Subpart 30.4, in effect on the date of award of this subcontract or, if the Subcontractor has submitted cost or pricing data, on the date of final agreement on price as shown on the Subcontractor's signed certificate of current cost or pricing data. The Subcontractor shall also comply with any CAS (or modifications to CAS) which hereafter become applicable to a subcontract or lower-tier subcontract of the Subcontractor. Such compliance shall be required prospectively from the date of applicability of such subcontract or lower-tier subcontract.

(4) (i) Agree to an equitable adjustment as provided in the Changes clause of the subcontract if the subcontract cost is affected by a change that, pursuant to paragraph (a)(3) above, the Subcontractor is required to make to the Subcontractor's established cost accounting practices.

(ii) Negotiate with the Government Contracting Officer or the University to determine the terms and conditions under which a change may be made to a cost accounting practice, other than a change made under other provisions of this paragraph (a)(4), provided that no agreement may be made under this provision that will increase costs paid by the University or the Government.

(iii) When the Government Contracting Officer or the University and the Subcontractor agree to a change to a cost accounting practice, other than a change under paragraph (a)(4)(i) above, negotiate an equitable adjustment as provided in the Changes clause of the subcontract.

(5) Agree to an adjustment of the subcontract price or cost allowance, as appropriate, if the Subcontractor or a lower-tier subcontractor fails to comply with an applicable Cost Accounting Standard or to follow any cost accounting practice consistently and such failure results in any increased costs paid by the University or the Government. Such adjustment shall provide for recovery of the increased costs to the University or the Government together with interest thereon computed at the annual rate established under section 6621 of the Internal Revenue Code of 1986 (26 U.S.C. 6621) for such period, from the time the payment by the United States was made to the time the adjustment is effected. In no case shall the Government recover costs greater than the increased cost to the Government, in the aggregate, on the relevant contracts subject to the price adjustment, unless the Subcontractor made a change in its cost

accounting practices of which it was aware or should have been aware at the time of price negotiations and which it failed to disclose to the University or the Government.

(b) If the Government Contracting Officer or the University and the Subcontractor fail to agree whether the Subcontractor or a lower-tier subcontractor has complied with an applicable CAS in FAR Subpart 30.4 or a CAS rule or regulation in FAR Subpart 30.3 and as to any cost adjustment demanded by the University or the Government, such failure to agree shall be a dispute concerning a question of fact within the meaning of the Disputes clause of t scontract under the Contract Disputes Act (41 U.S.C. 601).

(c) The Subcontractor shall permit any authorized representatives of the DOE, the University, the CASB, or the Comptroller General of the United States to examine and make copies of any documents, papers, or records relating to compliance with the requirements of this clause.

(d) The Subcontractor shall include the substance of this clause except paragraph (b) in all negotiated lower-tier subcontracts that the Subcontractor enters into and shall require such inclusion in all other lower-tier subcontracts, including the obligation to comply with all CAS in effect on the award date of the lower-tier subcontract or, if the lower-tier subcontractor has submitted cost or pricing data, on the date of final agreement on price as shown on the lower-t r subcontractor's signed Certificate of Current Cost or Pricing Data. This requirement shall apply only to gotiated lower-tier subcontracts exceeding $500,000 where the price negotiated is not based on

(1) Established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(2) Prices set by law or regulation, and except that the requirement shall not apply to negotiated lower-tier subcontracts otherwise exempt from the requirement to include a CAS clause as specified in FAR 30.201-1.

Note (1): New or modified CAS shall apply to both national defense and nondefense CAS-covered subcontracts upon award of a new national defense CAS-covered subcontract containing the new Standard. The award of a new nondefense CAS-covered subcontract shall not trigger application of new CAS or modification to CAS.

Note (2): Lower-tier subcontractors shall be required to submit their Disclosure Statements to the Subcontractor. However, if a lower-tier subcontractor has previously submitted its Disclosure Statement to a Government Administrative Contracting Officer (ACO), it may satisfy that requirement by certifying to the Subcontractor the date of the Statement and the address of the ACO.

Note (3): In any case where a lower-tier subcontractor determines that the Disclosure Statement information is privileged and confidential and declines to provide it to the University, the Subcontractor, or higher-tier subcontractor, the Subcontractor may authorize direct submission of that lower-tier subcontractor's Disclosure Statement to the same Government offices to which the Subcontractor was required to make submission of its Disclosure Statement. Such authorization shall in no way relieve the Subcontractor of liability as provided in paragraph (a)(5) of this clause. In view of the foregoing and because the subcontract may be subject to adjustment under this clause by reason of any failure to comply with rules, regulations, and Standards as specified in FAR Subparts 30.3 and 30.4 in connection with covered subcontracts, it is expected that the Subcontractor may wish to include a clause in each such lower-tier subcontract requiring the lower-tier subcontractor to appropriately indemnify the Subcontractor. However, the inclusion of such a clause and the terms thereof are matters of negotiation and agreement between the Subcontractor and the lower-tier subcontractor, provided that they do not conflict with the duties of the Subcontractor under its subcontract with the University. It is also expected that any lower-tier subcontractor subject to such indemnification will generally require substantially similar indemnification to be submitted by its subcontractors.

Note (4): If the lower-tier subcontractor is a business unit that, pursuant to FAR 30.201-2(b) is entitled to elect modified subcontract coverage and to follow FAR 30.401 and 30.402, the Disclosure and Consistency of Cost Accounting Practices clause shall be inserted instead of this clause.

Note (5): The terms defined in FAR 30.301 and 31.001 shall have the same meanings herein. As there defined, "negotiated subcontract" means any subcontract except a firm-fixed-price subcontract made by a Subcontractor or lower-tier subcontractor after receiving offers from at least two persons not associated with each other or with such Subcontractor or lower-tier subcontractor, provided that (1) the solicitation to all competitors is identical, (2) price is the only consideration in selecting the lower-tier subcontractor from among the competitors solicited, and (3) the lowest offer received in compliance with the solicitation from among those solicited is accepted.

B10, Disclosure and Consistency of Cost Accounting Practices (FAR 52.230-3)

(a) The Subcontractor, in connection with this subcontract, shall -

(1) Comply with the requirements of 48 CFR Subpart 9904.401, Consistency in Estimating, Accumulating and Reporting Costs, and 48 CFR, Subpart 9904.402, Consistency in Allocating Costs Incurred for the Same Purpose in effect on the date of award of the subcontract as indicated in 48 CFR, Part 9904;

(2) (CAS-covered Subcontracts Only) If it is a business unit of a company required to submit a Disclosure Statement, disclose in writing its cost accounting practices as required by 48 CFR, Subparts 9903.202-1 through 9903.202-5. If the Subcontractor has notified the Contracting Officer or the University that the Disclosure Statement contains trade secrets and commercial or financial information that is privileged and confidential, the Disclosure Statement will be protected and will not be released outside of the Government.

Note (1): Lower-tier subcontractors shall be required to submit their Disclosure Statements to the Subcontractor. However, if a lower-tier subcontractor has previously submitted its Disclosure Statement to a Government Administrative Contracting Officer (ACO), it may satisfy that requirement by certifying to the Subcontractor the date of the Statement and the address of the ACO.

Note (2): In any case where a lower-tier subcontractor determines that the Disclosure Statement information is privileged and confidential and declines to provide it to the Subcontractor or higher-tier subcontractor, the Subcontractor may authorize direct submission of the lower-tier subcontractor's Disclosure Statement to the same Government offices to which the Subcontractor was required to make submission of its Disclosure Statement. Such authorization shall in no way relieve the Subcontractor of liability if it or a lower-tier subcontractor fails to comply with an applicable Cost Accounting Standard (CAS) or to follow any practice disclosed pursuant to this paragraph and such failure results in any increased costs paid by the University or the Government. In view of the foregoing and since the subcontract may be subject to adjustment under this clause by reason of any failure to comply with rules, regulations, and Standards of the CASB in connection with CAS-covered lower-tier subcontracts, it is expected that the Subcontractor may wish to include a clause in each such subcontract requiring the lower-tier subcontractor to appropriately indemnify the Subcontractor. However, the inclusion of such a clause and the terms thereof are matters for negotiation and agreement between the Subcontractor and lower-tier subcontractor, provided that they do not conflict with the duties of the Subcontractor under its subcontract with the University. It is also expected that any lower-tier subcontractor subject to such indemnification will generally require substantially similar indemnification to be submitted by its subcontractors.

Note (3): The terms defined in 4 CFR 331 20 shall have the same meanings in this clause. As there defined, "negotiated subcontract" means any lower-tier subcontract except a firm-fixed-price subcontract made by a Subcontractor or lower-tier subcontractor after receiving offers from at least two persons not associated with each other or such Subcontractor or lower-tier subcontractor, provided that (1) the solicitation to all competitors is identical, (2) price is the only consideration in selecting the lower-tier subcontractor from among the competitors solicited, and (3) the lowest offer received in compliance with the solicitation from among those solicited is accepted.

(3) (i) Follow consistently the Subcontractor's cost accounting practices. A change to such practices may be proposed, however, by the Government Contracting Officer, the University, or the Subcontractor, and the Subcontractor agrees to negotiate with the Government Contracting Officer or the University the terms and conditions under which a change may be made. After the terms and conditions under which the change is to be made have been agreed to, the change must be applied prospectively to the subcontract, and the Disclosure Statement, if affected, must be amended accordingly.

(ii) The Subcontractor shall, when the Government Contracting Officer or the University and the Subcontractor agree to a change to a cost accounting practice and the Contracting Officer has made the finding required in 48 CFR, Subpart 9903.21-6(b), that the change is desirable not detrimental to the interests of the University or Government, negotiate an equitable adjustment as provided in the Changes clause of the subcontract. In the absence of the required finding, no agreement may be made under this subcontract clause that will increase costs paid by the University or the Government.

(4) Agree to an adjustment of the subcontract price or cost allowance, as appropriate, if the Subcontractor or a lower-tier subcontractor fails to comply with the applicable CAS or to follow any cost accounting practice, and such failure results in any increased costs paid by the University or the Government. Such adjustment shall provide for recovery of the increased costs to the Univers[illegible] or the Government together with interest thereon computed at the annual rate determined by the Secretary of the Treasury pursuant to P L. 92-41, 85 Stat. 97 from the time the payment by the University or the Government was made to the time the adjustment is effected.

(b) If the Government Contracting Officer or the University and th[illegible]bcontractor fail to agree whether the Subcontractor has complied with an applicable CAS, rule, [illegible]egulation as specified in 48 CFR, Parts 9903 and 9904, and as to any cost adjustment demanded by the University or the Government, such failure to agree shall be a dispute within the meaning of the Disputes clause of the subcontract.

(c) The Subcontractor shall permit any authorized representatives of the DOE, the University, the CASB or the Comptroller General of the United States to examine and make copies of any documents, papers, and records relating to compliance with the requirements of this clause.

(d) The Subcontractor shall include in all negotiated lower-tier subcontracts that the Subcontractor enters into the substance of this clause, except paragraph (b), and shall require such inclusion in all other subcontracts of any tier, except that

(1) If the lower-tier subcontract is awarded to a business unit that pursuant to 48 CFR, Subparts 9903.201 is required to follow all CAS, the Cost Accounting Standards clause shall be inserted instead of this clause; or

(2) This requirement shall apply only to negotiated lower-tier subcontracts exceeding $500,000 where the price negotiated is not based on

(i) Established catalog or market prices of commercial items sold in substantial quantities to the

general public: or

(ii) Prices set by law or regulation: or

(3) The requirement shall not apply to negotiated lower-tier subcontracts otherwise exempt from the requirement to include a CAS clause as specified in 48 CFR. Subparts 9903.201-1.

B11, Disclosure of Information (DEAR 952.204-72)

(a) It is mutually expected that the activities under the subcontract will not involve classified information. It is understood, however, that if in the opinion of either party, this expectation changes before the expiration or termination of all activities arising under the subcontract, that the party shall notify the other party accordingly in writing without delay. In any event, the Subcontractor shall classify, safeguard, and otherwise act with respect to all classified information in accordance with applicable law and the requirements of DOE and shall promptly inform the University in writing if and when classified information becomes involved or, in the mutual judgment of the parties, it appears likely that classified information or material may become involved. In such event, the Subcontractor shall have the right to terminate performance of the work under the subcontract, and the provisions of the subcontract regarding termination for the convenience of the University shall apply.

(b) The Subcontractor shall not permit any individual to have access to classified information except in accordance with the Atomic Energy Act of 1954, as amended, Executive Order 12356, and DOE's regulations or requirements.

(c) The term *"Restricted Data."* as used in this clause means all data concerning the design, manufacture, or utilization of atomic weapons, the production of special nuclear material, or the use of special nuclear material in the production of energy. The term shall not include data declassified or removed from the Restricted Data category pursuant to Section 142 of the Atomic Energy Act of 1954, as amended.

B12, Facilities Capital Cost of Money (FAR 52.216-30)

Facilities capital cost of money will be an allowable cost under the contemplated subcontract, if the criteria for allowability in subparagraph 31.205-10(a)(2) of the FAR are met and facilities capital cost of money was included in the offer resulting in the subcontract.

B13, Filing of Patent Applications on Classified Subject Matter (FAR 52.227-10)

(a) Before filing or causing to be filed a patent application in the United States disclosing any subject matter of the subcontract classified "Secret" or higher and by citing the 30-day provision below, the Subcontractor shall transmit the proposed application to the University. The University and/or the Government shall determine whether, for reasons of national security, the application should be placed under an order of secrecy, sealed in accordance with the provision of 35 U.S.C. 181-188, or whether the issuance of a patent should be otherwise delayed under pertinent Government statutes or regulations. The Subcontractor shall observe any instructions of the University regarding the manner of delivery of the patent application to the United States Patent Office, but the Subcontractor shall not be denied the right to file the application if the University fails to give any such instructions within 30 days from the date of mailing or other transmittal of the proposed application, the Subcontractor may file the application.

(b) Before filing a patent application in the United States disclosing any subject matter of the subcontract

classified "Confidential," the Subcontractor shall furnish to the University a copy of the application for determination whether, for reasons of national security, the application should be placed under an order of secrecy or the issuance of a patent should be otherwise delayed under pertinent Government statutes or regulations.

(c) When the subject matter of the subcontract is classified for reasons of security, the Subcontractor shall not file or cause to be filed in any country other than in the United States as provided in paragraphs (a) and (b) of this clause, an application or registration for a patent containing any of the subject matter of the subcontract without first obtaining written approval of the University.

(d) When filing any patent application coming within the scope of this clause, the Subcontractor shall observe all applicable security regulations covering the transmission of classified subject matter and shall promptly furnish to the University the serial number, filing date, and name of the country of any such application. When transmitting the application to the United States Patent Office, the Subcontractor shall identify by separate letter and identify by agency and number the subcontract(s) that require security classification markings to be placed on the application.

(e) The Subcontractor agrees to include and require the inclusion of this clause in all lower-tier subcontracts that cover or are likely to cover classified subject matter.

B14, Foreign Ownership, Control, or Influence Over Subcontractor (DEAR 952.204-74/Prime Contract Article 8, Clause 26

(a) For purposes of this clause, a foreign interest is defined as any of the following:

(1) A foreign government or foreign government agency;

(2) Any form of business enterprise organized under the laws of any country other than the United States or its possessions;

(3) Any form of business enterprise organized or incorporated under the laws of the U.S., or a State or other jurisdiction within the U.S., that is owned, controlled, or influenced by a foreign government, agency, firm, corporation, or person; or

(4) Any person who is not a U.S. citizen.

(b) Foreign ownership, control, or influence (FOCI) means the situation where the degree of ownership, control, or influence over a Subcontractor by a foreign interest is such that a reasonable basis exists for concluding that the compromise of classified information or a significant quantity of special nuclear material, as defined in 10 CFR Part 710, may result.

(c) For purposes of this clause "Subcontractor" means any subcontractor at any tier.

(d) The Subcontractor shall immediately provide the University written notice of any changes in the extent and nature of FOCI over the Subcontractor that would affect the answers to the questions in the Certification submitted for the solicitation that resulted in the subcontract. Further, notice of changes in ownership or control that are required to be reported to the Securities and Exchange Commission, the Federal Trade Commission, or the Department of Justice shall also be furnished concurrently to the University.

(e) In those cases where a Subcontractor has changes involving FOCI, the DOE must determine whether

the changes will pose an undue risk to the common defense and security. In making this determination, the DOE shall consider proposals made by the Subcontractor to avoid or mitigate foreign influences.

(f) If the DOE at any time determines that the Subcontractor is or is potentially subject to FOCI, the Subcontractor shall comply with such instructions that the University shall provide in writing to safeguard any classified information or significant quantity of special nuclear material.

(g) The Subcontractor agrees to insert terms that conform substantially to the language of this clause, including this paragraph (g), in all lower-tier subcontracts under the subcontract that will require access to classified information or a significant quantity of special nuclear material. The Subcontractor shall also require such lower-tier subcontractors to submit a completed certification required in DEAR 952.204-73 and covered in University Form 812 before award of a lower-tier subcontract. Information to be provided by a lower-tier subcontractor pursuant to this clause will be submitted to the University.

(h) Information submitted by a Subcontractor as required pursuant to this clause shall be treated by the University and the DOE to the extent permitted by law as business or financial information submitted in confidence to be used solely for purposes of evaluating FOCI.

(i) The requirements of this clause are in addition to the requirement that a Subcontractor obtain and retain the security clearances required by the subcontract. This clause shall not operate as a limitation on the University's or the DOE's rights, including the University's right to terminate the subcontract.

(j) The University may terminate the subcontract for default if

(1) The Subcontractor fails to meet obligations imposed by this clause, e.g., provide the information required by this clause, comply with the University's instructions about safeguarding classified information, or make this clause apply to lower-tier subcontractors; or

(2) In the University's judgment, the Subcontractor creates a FOCI situation to avoid performance or a termination for default. (The University may terminate the subcontract for convenience if the Subcontractor becomes subject to FOCI and for reasons other than avoidance of performance of the subcontract cannot or chooses not to avoid or mitigate the FOCI problem.)

B15. **Foreign Travel** (DEAR 952.247-70)

(a) Foreign travel, when charged directly, shall be subject to the prior approval of the DOE Contracting Officer for each separate trip regardless of whether funds for such travel are contained in an approved budget. Foreign travel is defined as any travel outside of Canada and the United States and its territories and possessions.

(b) Request for approval shall be submitted at least 60 days prior to the planned departure date, be on a Request for Approval of Foreign Travel form, and when applicable, include a modification for proposed Soviet-bloc travel.

(c) Failure to obtain prior approval for foreign travel shall be cause for all costs relating to an unapproved trip being unallowable under this subcontract.

(d) If personal time is taken in a foreign location under an approved trip, and such personal time exceeds the business time during the trip, all costs for such trip will be unallowable under this subcontract.

(e) Reimbursement of travel costs shall be subject to limitations established by the United States Department of

State for the period during which a trip is made

B16, Inspection of Research and Development (Short Form) (FAR 52.246-9)

The University has the right to inspect and evaluate the work performed or being performed under the subcontract and the premises where the work is being performed at all reasonable times and in a manner that will not unduly delay the work. If the University performs inspection or evaluation on the premises of the Subcontractor or a lower-tier subcontractor, the Subcontractor shall furnish and shall require lower-tier subcontractors to furnish all reasonable facilities and assistance for the safe and convenient performance of these tasks.

B17, Labor Surplus Area Subcontracting Program (FAR 52.220-4/Prime Contract Article 8, Clause 16)

(a) **Definitions.** *"Labor surplus area"* as used in this clause means a geographical area identified by the Department of Labor in accordance with 20 CFR 654, Subpart A, as an area of concentrated unemployment or underemployment or an area of labor surplus.

"Labor surplus area concern" as used in this clause means a concern that together with its first-tier subcontractors will perform substantially in labor surplus areas. Performance is substantially in labor surplus areas if the costs incurred under the subcontract on account of manufacturing, production, or performance of appropriate services in labor surplus areas exceed 50 percent of the subcontract price.

(b) The Subcontractor agrees to establish and conduct a program to encourage labor surplus area (LSA) concerns to compete for lower-tier subcontracts within their capabilities when the lower-tier subcontracts are consistent with the efficient performance of the subcontract at prices no higher than obtainable elsewhere. The Subcontractor shall

(1) Designate a liaison officer who will (i) maintain liaison with authorized representatives of the Government on LSA matters, (ii) supervise compliance with the Utilization of Labor Surplus Area Concerns clause, and (iii) administer the Subcontractor's labor surplus area subcontracting program.

(2) Provide adequate and timely consideration of the potentialities of LSA concerns in all make-or-buy decisions.

(3) Ensure that LSA concerns have an equitable opportunity to compete for subcontracts, particularly by arranging solicitations, time for the preparation of offers, quantities, specifications, and delivery schedules to facilitate the participation of LSA concerns.

(4) Include the Utilization of Labor Surplus Area Concerns clause in lower-tier subcontracts that offer substantial LSA subcontracting opportunities, and

(5) Maintain records showing (i) the procedures adopted and (ii) the Subcontractor's performance, to comply with this clause. The records will be kept available for review by the Government until the expiration of one year after the award of this subcontract, or for such longer period as may be required by any other clause of this subcontract or by applicable law or regulations.

(c) The Subcontractor further agrees to insert in any related subcontract that may exceed $500,000 and

that contains the Utilization of Labor Surplus Area Concerns clause. terms that conform substantially to the language of this clause including this paragraph (c), and to notify the University of the names of lower-tier subcontractors

B18, Limitation of Liability (FAR 52.246-23)

(a) Except as provided in paragraphs (b) and (c) below and except for remedies expressly provided elsewhere in the subcontract, the Subcontractor shall not be liable for loss of or damage to property of the University or the Government including the goods delivered under the subcontract) that (1) occurs after University acceptance of the goods delivered under the subcontract and (2) results from any defects or deficiencies in the goods.

(b) The limitation of liability under paragraph (a) above shall not apply when a defect or deficiency in or the University's acceptance of the goods results from willful misconduct or lack of good faith on the part of any of the Subcontractor's managerial personnel. The term "Subcontractor's managerial personnel" as used in this clause means the Subcontractor's directors, officers, and any of the Subcontractor's managers, superintendents, or equivalent representatives who have supervision or direction of

(1) All or substantially all of the Subcontractor's business;

(2) All or substantially all of the Subcontractor's operations at any one facility at which the subcontract is being performed; or

(3) A separate and complete major industrial operation connected with the performance of the subcontract.

(c) If the Subcontractor carries insurance or has established a reserve for self-insurance covering liability for loss or damage suffered by the University or the Government through the purchase or use of the goods required to be delivered under the subcontract and to the extent of such insurance or reserve, the Subcontractor shall be liable to the University or the Government for loss of or damage to property of the University or the Government occurring after University acceptance of and resulting from any defects or deficiencies in the goods delivered under the subcontract.

(d) The Subcontractor shall include this clause, including this paragraph (d) and supplemented as necessary to reflect the relationship of the contracting parties, in all lower-tier subcontracts.

B19, Limitation of Liability - High-Value Items (FAR 52.246-24)

(This clause shall apply only to those items identified in the subcontract as being subject to this clause.)

(a) Notwithstanding any other provision of the subcontract and except as provided in paragraphs (b) through (e) below, the Subcontractor shall not be liable for loss of or damage to property of the University or the Government including the goods delivered under the subcontract) that (1) occurs after University acceptance of the goods delivered under the subcontract and (2) results from any defects or deficiencies in the goods.

(b) The limitation of liability under paragraph (a) above shall not apply when a defect or deficiency in or the University's acceptance of the goods results from willful misconduct or lack of good faith on the part of any of the Subcontractor's managerial personnel. The term 'Subcontractor's managerial personnel' as used in this

clause means the Subcontractor's directors, officers, and any of the Subcontractor's managers, superintendents, or equivalent representatives who have supervision or direction of

(1) All or substantially all of the Subcontractor's business;

(2) All or substantially all of the Subcontractor's operations at any one facility at which the subcontract is being performed; or

(3) A separate and complete major industrial operation connected with the performance of the subcontract.

(c) If the Subcontractor carries insurance or has established a reserve for self-insurance covering liability for loss or damage suffered by the University or the Government through the purchase or use of the goods required to be delivered under the subcontract and to the extent of such insurance or reserve, the Subcontractor shall be liable to the University or the Government for loss of or damage to property the University or the Government occurring after University acceptance of and resulting from any defects or deficiencies in the goods delivered under the subcontract.

(d) (1) This clause does not diminish the Subcontractor's obligations, to the extent that they arise otherwise under the subcontract, relating to correction, repair, replacement, or other relief for any defect or deficiency in the goods delivered under the subcontract.

(2) Unless this is a cost-reimbursement subcontract, if loss or damage occurs and correction, repair, or replacement is not feasible or desired by the University, the Subcontractor shall, as determined by the University

(i) Pay the University the amount it would have cost the Subcontractor to make correction, repair, or replacement before the loss or damage occurred; or

(ii) Provide other equitable relief.

(e) This clause shall not limit or otherwise affect the University's rights under clauses, if included in this subcontractor, that cover

(1) Warranty of technical data;

(2) Ground and flight risks or aircraft flight risks; or

(3) Government property

(f) In each lower-tier subcontract, except a lower-tier subcontract covered by paragraph (g) below, the Subcontractor shall insert the appropriate clause, supplemented as necessary to reflect the relationship of the contracting parties, as follows:

(1) In lower-tier subcontracts for high-value items only, after obtaining the Contract Administrator's advance written approval, insert this clause, including this paragraph (f)

(2) In lower-tier subcontracts for other end items only, insert the clause at FAR 52.246-23, Limitation of Liability.

(g) In any lower-tier subcontract for both high-value items for which this clause is appropriate, and other end items for which the clause B20 is appropriate, after obtaining the University's advance written approval to use this clause, the Subcontractor shall (1) include both clauses, (2) identify high-value items by line item, and (3) insert the following preamble before paragraph (a) of this clause as used in that lower-tier subcontract:

(This clause shall apply only to those items identified in this subcontract as being subject to this clause.)

B20, Limitation of Liability - Services (FAR 52.246-25)

(a) Except as provided in paragraphs (b) and (c) below and except to the extent that the Subcontractor is expressly responsible under the subcontract for deficiencies in the services required to be performed under it (including any materials furnished in conjunction with those services), the Subcontractor shall not be liable for loss of or damage to property of the University or the Government that (1) occurs after University acceptance of services performed under the subcontract and (2) results from any defects or deficiencies in the services performed or materials furnished.

(b) The limitation of liability under paragraph (a) above shall not apply when a defect or deficiency in or the University's acceptance of services performed or materials furnished results from willful misconduct or lack of good faith on the part of any of the Subcontractor's managerial personnel. The term "Subcontractor's managerial personnel" as used in this clause means the Subcontractor's directors, officers, and any of the Subcontractor's managers, superintendents, or equivalent representatives who have supervision or direction of

(1) All or substantially all of the Subcontractor's business;

(2) All or substantially all of the Subcontractor's operations at any one facility at which the subcontract is being performed; or

(3) A separate and complete major industrial operation connected with the performance of the subcontract.

(c) If the Subcontractor carries insurance, or has established a reserve for self-insurance, covering liability for loss or damage suffered by the University or the Government through the Subcontractor's performance of services or furnishing of materials under the subcontract, the Subcontractor shall be liable to the University or the Government, to the extent of such insurance or reserve, for loss of or damage to property of the University or the Government occurring after University acceptance of and resulting from any defects or deficiencies in services performed or materials furnished under the subcontract.

(d) The Subcontractor shall include this clause, including this paragraph (d), supplemented as necessary to reflect the relationship of the contracting parties, in all lower-tier subcontracts over $25,000.

B21, Limitation on Subcontracting (FAR 52.219-14)

(a) This clause does not apply to the unrestricted portion of a partial set-aside.

(b) By submission of an offer and execution of a subcontract, the Subcontractor agrees that in performance of the subcontract in the case of a subcontract for —

(1) Services (except construction). At least 50 percent of the cost of subcontract performance incurred for personnel shall be expended for employees of the concern.

(2) Supplies (other than procurement from a regular dealer in such supplies). The concern shall perform

work for at least 50 percent of the cost of manufacturing the supplies, not including the cost of materials

(3) General construction. The concern will perform at least 15 percent of the cost of the subcontract, not including the cost of materials, with its own employees.

(4) Construction by special trade contractors. The concern will perform at least 25 percent of the cost of the subcontract, not including the cost of materials, with its own employees.

B22, Notice of Partial Small Business Set-Aside (FAR 52.219-7)

(a) **Definitions.** *"Labor surplus area,"* as used in this clause means a geographical area identified by the Department of Labor as an area of labor surplus

"Labor surplus area concern," as used in this clause means a concern that, together with its first-tier subcontractors, will perform substantially in labor surplus areas.

"Perform substantially in labor surplus areas," as used in this clause means that the costs incurred under the subcontract because of manufacturing, production, and performance of services in labor surplus areas exceed 50 percent of the subcontract price.

"Small business concern," as used in this clause means a concern including its affiliates that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts or subcontracts, and qualified as a small business under the size standards in the solicitation.

(b) **General.**

(1) As identified elsewhere in the solicitation, a portion of this requirement has been set aside for award to one or more small business concerns.

(2) Offers on the non-set-aside portion will be evaluated first and award will be made on that portion in accordance with the provisions of the solicitation.

(3) The set-aside portion will be awarded at the highest unit price(s) in the subcontract(s) for the non-set-aside portion and adjusted to reflect transportation and other costs appropriate for the selected Subcontractor(s).

(4) (i) The Subcontractor(s) for the set-aside portion will be selected from among the small business concerns that submitted responsive offers on the non-set-aside portion. These concerns fall into two groups:

(A) Group 1 - Small business concerns that are also labor surplus area concerns or

(B) Group 2 - Other small business concerns.

(ii) Negotiations will be conducted with the concern in Group 1 that submitted the lowest responsive offer on the non-set-aside portion. If the negotiations are not successful or if only part of the set-aside portion is awarded to that concern, negotiations will be conducted with the concern that submitted the second-lowest responsive offer on the non-set-aside portion. This process will continue,

first with concerns in Group 1 and then with concerns in Group 2, until a subcontract or subcontracts are awarded for the entire set-aside portion.

(5) The University reserves the right to not consider token offers or offers designed to secure an unfair advantage over other offerors eligible for the set-aside portion.

(c) **Agreement.**

(1) If awarded a subcontract as a small business - labor surplus area concern, the Subcontractor agrees that it will perform or cause the subcontract to be performed substantially in areas classified as labor surplus areas at the time of award or performance of the subcontract. However, if an area selected by the Subcontractor is no longer classified as a labor surplus area at the time of performance, the Subcontractor will try to select another area for performance that is classified at the time as a labor surplus area.

(2) The offeror agrees that, if awarded a contract that exceeds the small purchase limitation, it will submit a report to the Contract Administrator within 30 days after the date of award (or a longer period of time, if prescribed by the University) that contains the following information:

(i) The dollar amount of the subcontract.

(ii) Identification of each labor surplus area in which subcontract (and lower-tier subcontract) performance is taking or will take place.

(iii) The total costs incurred and the total costs to be incurred under the subcontract on account of manufacturing, production, and performance of services in each of the labor surplus areas by (A) the Subcontractor and (B) lower-tier subcontractors.

(iv) The total dollar amount attributable to performance in labor surplus areas.

(3) A manufacturer or regular dealer submitting an offer in its own name agrees to furnish, in performing the subcontract, only end items manufactured or produced by small business concerns inside the U.S., its territories and possessions, the Commonwealth of Puerto Rico, the Trust Territory of the Pacific Islands, or the District of Columbia. However, this requirement does not apply in connection with construction or service subcontracts.

B23, **Notice of Total Small Business Set-Aside** (FAR 52.219-6)

a) **Definition.** "Small business concern" as used in this clause means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts or subcontracts, and qualified as a small business under the size standards defined in Section 3 of the Small Business Act (15 U.S.C. 632).

b) **General.**

(1) Offers are solicited only from small business concerns. Offers received from concerns that are not small business concerns shall be considered nonresponsive and will be rejected.

(2) Any award resulting from the solicitation will be made to a small business concern.

(c) **Agreement.** A manufacturer or regular dealer submitting an offer in its own name agrees to furnish, in performing the subcontract, only end items manufactured or produced by small business concerns inside the United States, its territories and possessions, the Commonwealth of Puerto Rico, the Trust Territory of the Pacific Islands, or the District of Columbia. However, this requirement does not apply in connection with construction or service subcontracts.

B24, Nuclear Hazards Indemnity Agreement (DEAR 952.250-70/Prime Contract Article 17, Clause 2)

(a) **Authority.** This clause is incorporated into the subcontract pursuant to the authority contained in subsection 170d. of the Atomic Energy Act of 1954, as amended (hereinafter call the Act).

(b) **Definitions.** The definitions set out in the Act shall apply to this clause.

(c) **Financial protection.** Except as hereafter permitted or required in writing by DOE or the University, the Subcontractor will not be required to provide or maintain, and will not provide or maintain at Government expense, any form of financial protection to cover public liability, as described in paragraph (d)(2) below. DOE or the University may, however, at any time require in writing that the Subcontractor provide and maintain financial protection of such a type and in such amount as DOE or the University shall determine to be appropriate to cover such public liability, provided that the costs of such financial protection are reimbursed to the Subcontractor by DOE or the University.

(d) **Indemnification.**

(1) To the extent that the Subcontractor and other persons indemnified are not compensated by any financial protection permitted or required by DOE or the University, DOE or the University will indemnify the Subcontractor and other persons indemnified against (i) claims for public liability as described in subparagraph (d)(2) of this clause, and (ii) such legal costs of the Subcontractor and other persons indemnified as are approved by DOE or the University, provided that DOE's and the University's liability, including such legal costs, shall not exceed the amount set forth in section 170e.(1)(B) of the Act in the aggregate for each nuclear incident or precautionary evacuation occurring within the United States or $100 million in the aggregate for each nuclear incident occurring outside the United States, irrespective of the number of persons indemnified in connection with the subcontract.

(2) The public liability referred to in subparagraph (d)(1) of this clause is public liability as defined in the Act which (i) arises out of or in connection with the activities under the subcontract, including transportation, and (ii) arises out of or results from a nuclear incident or precautionary evacuation, as those terms are defined in the Act.

(e) **Waiver of Defenses.**

(1) In the event of a nuclear incident, as defined in the Act, arising out of nuclear waste activities, as defined in the Act, the Subcontractor, on behalf of itself and other persons indemnified, agrees to waive any issue or defense as to charitable or government immunity.

(2) In the event of an extraordinary nuclear occurrence which

(i) Arises out of, results from, or occurs in the course of the construction, possession, or operation of a production or utilization facility, or

(ii) Arises out of, results from, or occurs in the course of transportation of source material.

by-product material, or special nuclear material to or from a production or utilization facility; or

(iii) Arises out of or results from the possession, operation, or use by the Subcontractor or a lower-tier subcontractor of a device utilizing special nuclear material or by-product material, during the course of the subcontract activity; or

(iv) Arises out of, results from, or occurs in the course of nuclear waste activities, the Subcontractor, on behalf of itself and other persons indemnified, agrees to waive

(A) Any issue or defense as to the conduct of the claimant (including the conduct of persons through whom the claimant derives its cause of action) or fault of persons indemnified, including but not limited to

(1) Negligence;
(2) Contributory negligence;
(3) Assumption of risk; or
(4) Unforeseeable intervening causes, whether involving the conduct of a third person or an act of God.

(B) Any issue or defense as to charitable or governmental immunity; and

(C) Any issue or defense based on any statute of limitations, if suit is instituted within 3 years from the date on which the claimant first knew, or reasonably could have known, of his injury or damage and the cause thereof. The waiver of any such issue or defense shall be effective regardless of whether such issue or defense may otherwise be deemed jurisdictional or relating to an element in the cause of action. The waiver shall be judicially enforceable in accordance with its terms by the claimant against the person indemnified.

(v) The term extraordinary nuclear occurrence means an event which DOE has determined to be an extraordinary nuclear occurrence as defined in the Act. A determination of whether or not there has been an extraordinary nuclear occurrence will be made in accordance with the procedures in 10 CFR part 840.

(vi) For the purposes of that determination, "offsite" as that term is used in 10 CFR part 840 means away from "the subcontract location" which phrase means any DOE facility, installation, or site at which contractual activity under the subcontract is being carried on, and any Subcontractor-owned or controlled facility, installation, or site at which the Subcontractor is engaged in the performance of contractual activity under the subcontract.

(3) The waivers set forth above

(i) Shall be effective regardless of whether such issue or defense may otherwise be deemed jurisdictional or relating to an element in the cause of action;

(ii) Shall be judicially enforceable in accordance with its terms by the claimant against the person indemnified;

(iii) Shall not preclude a defense based upon a failure to take reasonable steps to mitigate damages.

(iv) Shall not apply injury or damage to a claimant or to a claimant's property which is intentionally

sustained by the claimant or which results from a nuclear incident intentionally and wrongfully caused by the claimant;

(v) Shall not apply to injury to a claimant who is employed at the site of and in connection with the activity where the extraordinary nuclear occurrence takes place, if benefits therefor are either payable or required to be provided under any workmen's compensation or occupational disease law;

(vi) Shall not apply to any claim resulting from a nuclear incident occurring outside the United States;

(vii) Shall be effective only with respect to those obligations set forth in this clause and in insurance policies, contracts or other proof of financial protection; and

(viii) Shall not apply to, or prejudice the prosecution or defense of, any claim or portion of claim which is not within the protection afforded under (A) the limit of liability provisions under subsection 170e of the Act, and (b) the terms of this agreement and the terms of insurance policies, contracts, or other proof of financial protection.

(f) **Notification and litigation of claims.** The Subcontractor shall give immediate written notice to DOE and the University of any known action or claim filed or made against the Subcontractor or other person indemnified for public liability as defined in paragraph (d)(2). Except as otherwise directed by DOE through the University, the Subcontractor shall furnish promptly to DOE, copies of all pertinent papers received by the Subcontractor or filed with respect to such actions of claims. DOE and the University shall have the right to, and may collaborate with, the Subcontractor and any other person indemnified in the settlement or defense of any action or claim and shall have the right to (1) require the prior approval of DOE and the University for the payment of any claim that DOE University may be required to indemnify hereunder; and (2) appear through the Attorney General on behalf of the Contractor or other person indemnified in any action brought upon any claim that DOE and the University may be required to indemnify hereunder, take charge of such action, and settle or defend any such action. If the settlement or defense of any such action or claim is undertaken by DOE or the University, the Subcontractor shall furnish a reasonable assistance in effecting a settlement or asserting a defense.

(g) **Continuity of DOE obligations.** The obligations of DOE and the University under this clause shall not be affected by any failure on the part of the Subcontractor to fulfill its obligation under the subcontract and shall be unaffected by the death, disability, or termination of the Subcontractor, or by the completion, termination or expiration of the subcontract.

(h) **Effect of other clauses.** The provisions of this clause shall not be limited in any way by, and shall be interpreted without reference to, any other clause of the subcontract, including the clause entitled Contract Disputes, provided, however, that this clause shall be subject to the clauses entitled Covenant Against Contingent Fees, Officials Not to Benefit, and Examination of Records by the Comptroller General, and any provisions that are later added to the subcontract as required by applicable Federal law, including statutes, executive orders and regulations, to be included in Nuclear Hazards Indemnity Agreements.

(i) **Civil Penalties. Reserved.**

(j) **Criminal penalties.** Any individual director, officer, or employee of the Subcontractor or of its lower-tier subcontractors and suppliers who are indemnified under the provisions of this clause are subject to criminal penalties, pursuant to 223c. of the Act, for knowing and willful violation of the Atomic Energy Act of 1954, as amended, and applicable DOE nuclear safety-related rules, regulations, or orders which violation results in, or, if undetected, would have resulted in a nuclear incident.

(k) **Inclusion in subcontracts.** The Subcontractor shall insert this clause in any lower-tier subcontract which may involve the risk of public liability, as that term is defined in the Act and further described in paragraph (d)(2) above. However, this clause shall not be included in lower-tier subcontracts in which the lower-tier subcontractor is subject to Nuclear Regulatory Commission (NRC) financial protection requirements under section 170b of the Act or NRC agreements of indemnification under 170c. or k. of the Act for the activities under the subcontract.

B25, Organizational Conflicts of Interest (DEAR 952.209-72/ Prime Contract Article 7 Clause 17)

(a) **Purpose.** The primary purpose of this clause is to ensure that the Subcontractor (1) is not biased because of its past, present, or currently planned interests (financial, contractual, organizational, or otherwise) that relate to the work under the subcontract, and (2) does not obtain any unfair competitive advantage over other parties by virtue of its performance of the subcontract.

(b) **Scope.** Subject to paragraph (h) of this clause, the restrictions described herein shall apply to performance or participation by the Subcontractor and any of its affiliates or their successors in interest (herein collectively referred to as "Subcontractor") in the activities covered by this clause as a Subcontractor, lower-tier subcontractor, cosponsor, joint venturer, consultant, or in any similar capacity.

(1) **Technical Consulting and Management Support Services.**

(i) The Subcontractor shall be ineligible to participate in any capacity in DOE contracts, subcontracts, or proposals therefor (solicited or unsolicited) which stem directly from the Subcontractor's performance of work under this subcontract. Furthermore, unless so directed in writing by the University, the Subcontractor shall not perform any technical consulting or management support services work under this subcontract on any of its products or services or the goods or services of another firm if the Subcontractor is or has been substantially involved in their development or marketing. Nothing in this subparagraph shall preclude the Subcontractor from competing for follow-on contracts or subcontracts for technical consulting and management support services.

(ii) If the Subcontractor, in the performance of the subcontract, prepares a complete or essentially complete statement of work or specifications to be used in competitive acquisitions, the Subcontractor shall be ineligible to perform or participate in any capacity in any contractual effort which is based on such statement of work or specifications. The Subcontractor shall not incorporate its products or services in such statement of work or specifications unless so directed in writing by the University, in which case the restriction in this subparagraph shall not apply.

(iii) Nothing in this paragraph (b)(1) shall preclude the Subcontractor from offering or selling its standard commercial items to the University or the Government.

(2) **Access To and Use of Information.**

(i) If the Subcontractor, in the performance of this subcontract, obtains access to information, such as University or DOE plans, policies, reports, studies, financial plans, internal data protected by the Privacy Act of 1974 (P.L. 93-579), or data that have not been released or otherwise made available to the public, the Subcontractor agrees that without prior written approval of the University it shall not use such information for any private purpose unless the information has been released or otherwise

made available to the public: (b) compete for work for the University or DOE based on such information for a period of six months after the completion of this subcontract or until such information is released or otherwise made available to the public, whichever is first; (c) submit an unsolicited proposal to the University or the Government which is based on such information until after such information is released or otherwise made available to the public; and (d) release such information unless such information has previously been released or otherwise made available to the public by the University or the DOE.

(ii) In addition, the Subcontractor agrees that to the extent it receives or is given access to proprietary data, data protected by the Privacy Act of 1974 (P.L. 93-579), or other confidential or privileged technical, business, or financial information under this subcontract, it shall treat such information in accordance with any restrictions imposed on such information.

(iii) The Subcontractor shall have, subject to patent, data, and security provisions of this subcontract, the right to use technical data it first produces under this subcontract for its private purpose consistent with the Rights in Data provisions of this subcontract.

(c) **Disclosure After Award.**

(1) The Subcontractor agrees that if after award it discovers an organizational conflict of interest with respect to this subcontract, an immediate and full disclosure shall be made in writing to the University which shall include a description of the action which the Subcontractor has taken or proposes to take to avoid or mitigate such conflicts. The University may, however, terminate the subcontract for convenience if it deems such termination to be in the best interest of the University or the Government.

(2) In the event that the Subcontractor was aware of an organizational conflict of interest prior to the award of this subcontract and did not disclose the conflict to the University, the University may terminate the subcontract for default.

(d) **Lower-Tier Subcontracts.**

(1) The Subcontractor shall include this clause, including this paragraph (d), in subcontracts of any tier which involve performance or work of the type specified in paragraph (b)(1) above or access to information of the type covered in paragraph (b)(2) above. The terms "subcontract," "Subcontractor" and "University" shall be appropriately modified to preserve the University's and the Government's rights.

(2) If a lower-tier subcontract is to be issued for evaluation services or activities, technical consulting, or management support services work as defined in DEAR 909.570, the Subcontractor shall obtain for the University a disclosure statement or representation in accordance with DOE regulations in effect at the time, from each intended lower-tier subcontractor or consultant. The Subcontractor shall not enter into any lower-tier subcontract nor engage any consultant unless the University shall have first notified the Subcontractor that there is little or no likelihood that an organizational conflict of interest exists or that despite the existence of a conflict of interest, the award is in the best interests of the University and the Government.

(e) **Remedies.** For breach of any of the above restrictions or for nondisclosure or misrepresentation of any relevant facts required to be disclosed concerning the subcontract, the University may terminate the subcontract for default, may disqualify the Subcontractor for subsequent related contractual efforts and pursue such other remedies as may be permitted by law or this subcontract.

(f) **Waiver.** Requests for waiver under this clause shall be directed in writing to the University and shall include a full description of the requested waiver and the reasons in support thereof. If it is determined to be in the best interests of the University and the Government, the University shall grant such a waiver in writing

(g) **Modifications.** Prior to a subcontract modification when the statement of work is modified to add new work, the period of performance is significantly increased, or the parties to the subcontract are changed, the University will request and the Subcontractor is required to submit either an organizational conflict of interest disclosure or representation or an update of the previously submitted disclosure or representation.

B26. Patent Indemnity (FAR 52.227-3/Prime Contract Article 12, Clause 2)

(a) The Subcontractor shall indemnify the University and the Government and its officers, agents, and employees against liability, including costs, for infringement of any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of the manufacture or delivery of goods, the performance of services, or the construction, alteration, modification, or repair of real property (hereinafter referred to as "construction work") under the subcontract, or out of the use or disposal by or for the account of the Government of such goods or construction work.

(b) This indemnity shall not apply unless the Subcontractor shall have been informed as soon as practicable by the University and/or the Government of the suit or action alleging such infringement and shall have been given such opportunity that is afforded by applicable laws, rules, or regulations to participate in its defense. Further, this indemnity shall not apply to

(1) an infringement resulting from compliance with specific written instructions of the University directing a change in the goods to be delivered or in the material or equipment to be used, or directing a manner of performance of the subcontract not normally used by the Subcontractor;

(2) an infringement resulting from addition to or change in goods furnished or construction work performed that was made subsequent to delivery or performance; or

(3) a claimed infringement that is unreasonably settled without the consent of the Subcontractor, unless required by final decree of a court of competent jurisdiction.

B27. Patent Rights (Long Form) (Reference DEAR 927.300(a) and 41 CFR 9-9.107-5(a))

(a) **Definitions.** "*Subject invention*" means any invention or discovery of the Subcontractor conceived or first actually reduced to practice in the course of or under this subcontract, and includes any art, method, process, machine, manufacture, design or composition of matter, or any new and useful improvement thereof or any variety of plants, whether patented or unpatented under the Patent Laws of the United States of America or any foreign country.

"*Subcontract*" means any subcontract, grant, agreement, understanding, or other arrangement, which includes research, development, or demonstration work, and which includes any assignment or substitution of parties.

"*States and domestic municipal governments*" means the States of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, and any political subdivision and agencies thereof.

"*Government agency*" includes an executive department, independent commission, board, office, agency, administration, authority, government corporation, or other government establishment of the Executive Branch of the government of the United States of America.

"*To the point of practical application*" means to manufacture (in the case of a composition or product), to practice (in the case of a process), or to operate (in the case of a machine) and under such conditions to establish that the invention is being worked and that its benefits are reasonably accessible to the public.

"*Patent Counsel*" means the Department of Energy Patent Counsel assisting the University

(b) **Allocation of Principal Rights.**

(1) **Assignment to the Government.** The Subcontractor agrees to assign to the Government the entire right, title, and interest throughout the world in and to each subject invention, except to the extent that rights are retained by the Subcontractor under paragraphs (b)(2) and (c) of this clause.

(2) **Greater Rights Determinations.** The Subcontractor or the employee-inventor with authorization of the Subcontractor may request greater rights than the nonexclusive license and the foreign patent rights provided in paragraph (c) of this clause on identified inventions in accordance with 41 CFR 9-9.109-6(d). Such requests must be submitted to Patent Counsel (with notification by Patent Counsel to the University) at the time of the first disclosure pursuant to paragraph (e)(2) of this clause, or not later than nine months after conception or first actual reduction to practice, whichever occurs first, or such longer periods that may be authorized by Patent Counsel (with notification by Patent Counsel to the University) for good cause shown in writing by the Subcontractor.

(c) **Minimum Rights of the Subcontractor.**

(1) **Subcontractor License.** The Subcontractor reserves a revocable, nonexclusive, paid-up license in each patent application filed in any country on a subject invention and any resulting patent to which the Government acquires title. The license shall extend to the Subcontractor's domestic subsidiaries and affiliates, if any, within the corporate structure of which the Subcontractor is a part and shall include the right to grant sublicenses of the same scope to the extent the Subcontractor was legally obligated to do so when the subcontract was awarded. The license shall be transferable only with the approval of DOE except when transferred to the successor of that part of the Subcontractor's business to which the invention pertains

(2) **Revocation Limitations.** The Subcontractor's nonexclusive license retained pursuant to paragraph (c)(1) of this clause and sublicenses granted under it may be revoked or modified either in whole or in part by DOE but only to the extent necessary to achieve expeditious practical application of the subject invention under DOE's published licensing regulations (10 CFR 781) and only to the extent an exclusive license is actually granted. This license shall not be revoked in that field of use and/or geographical areas in which the Subcontractor or its sublicensee has brought the invention to the point of practical application and continues to make the benefits of the invention reasonably accessible to the public, or is expected to do so within a reasonable time

(3) **Revocation Procedures.** Before modification or revocation of the license or sublicense pursuant to paragraph (c)(2) of this clause, DOE shall furnish the Subcontractor a written notice of its intention to modify or revoke the license and any sublicense thereunder, and the Subcontractor shall be allowed 30 days (or such longer periods that may be authorized by the Patent Counsel (with notification by Patent Counsel to the University)) to show cause why the license or any sublicense should not be modified or revoked. In accordance with 10 CFR 781, the Subcontractor shall have the right to appeal any decision concerning the modification or revocation of its license or any sublicense.

(4) **Foreign Patent Rights.** Upon written request to Patent Counsel (with notification by Patent Counsel to the University) and subject to DOE security regulations and requirements, there shall be reserved to the Subcontractor or to the employee-inventor with authorization to the Subcontractor the patent

rights to a subject invention in any foreign country where the Government has elected not to secure such rights, provided that

(i) When specifically requested by DOE and three years after issuance of a foreign patent disclosing said subject invention, the recipient of such rights shall furnish DOE a report setting forth the commercial use that is being made or is intended to be made of said invention and the steps taken to bring the invention to the point of practical application or to make the invention available for licensing.

(ii) The Government shall retain at least an irrevocable, nonexclusive, paid-up license to make, use, and sell the invention throughout the world by or on behalf of the Government, including any Government agency, and domestic municipal governments of the states, unless the Head of the Agency or designee determines that it would not be in the public interest to acquire the license for the states and domestic municipal governments.

(iii) Subject to the rights granted in (c)(1), (2) and (3) of this clause, the Head of the Agency or designee shall have the right to terminate the foreign patent rights granted in this paragraph (c)(4) in whole or in part unless the recipient of such rights demonstrates to the satisfaction of the Head of the Agency or designee that effective steps necessary to accomplish substantial utilization of the invention have been taken or will be taken within a reasonable time

(iv) Subject to the rights granted in paragraphs (c)(1), (2) and (3) of this clause, commencing four years after foreign patent rights are accorded under this paragraph (c)(4), the Head of the Agency or designee shall have the right to require the granting of a nonexclusive or partially exclusive license to a responsible applicant or applicants, upon terms reasonable and appropriate under the circumstances to terminate said foreign patent rights, in whole or in part, following a hearing upon notice to the public and upon a petition by an interested person justifying such hearing:

(A) Upon review of such material as he deems relevant and after the recipient of such rights or other interested person has had the opportunity to provide such relevant and material information as the Head of the Agency or designee may require, if the Head of the Agency or designee determines that such foreign patent rights have tended substantially to lessen competition or to result in undue market concentration in any section of the United States in any line of commerce to which the technology relates, or

(B) Unless the recipient of such rights demonstrates to the satisfaction of the Head of the Agency or designee at such hearing that the recipient has taken effective steps or within a reasonable time thereafter is expected to take such steps necessary to accomplish substantial use of the invention.

d) **Filing of Patent Applications.**

(1) Regarding each subject invention in which the Subcontractor or the inventor requests foreign patent rights in accordance with paragraph (c)(4) of this clause, a request may also be made for the right to file and prosecute the U.S. application on behalf of the US Government. If such request is granted, the Subcontractor or inventor shall file a domestic patent application on the invention within six months after the request for foreign patent rights is granted or such longer period of time that may be approved by the Patent Counsel for good cause shown in writing by the requester. Regarding the invention, the requester shall promptly notify the Patent Counsel (with notification by Patent Counsel to the University) of any decision not to file an application.

(2) For each subject invention on which a domestic patent application is filed by the Subcontractor or

inventor, the Subcontractor or inventor shall

(i) Within two months after the filing of a patent application or within two months after submission of the invention disclosure if the patent application has been filed previously, deliver to the Patent Counsel a copy of the application as filed including the filing date and serial number;

(ii) Within six months after filing the application or within six months after submitting the invention disclosure if the application has been filed previously, deliver to the Patent Counsel a duly executed and approved assignment to the Government on a form specified by the Government;

(iii) Provide the Patent Counsel with the original patent grant promptly after a patent is issued on the application; and

(iv) Not less than 30 days before the expiration of the response period for any action required by the Patent and Trademark Office, notify the Patent Counsel of any decision not to continue prosecution of the application.

(3) Regarding each subject invention for which the Subcontractor or inventor has requested foreign patent rights, and in accordance with applicable statutes and regulations, the Subcontractor or inventor shall file a patent application on the invention in each foreign country in which such request is granted, within one of the following periods:

(i) Eight months from the date of filing a corresponding United States application or, if such an application is not filed, six months from the date the request was granted.

(ii) Six months from the date a license is granted by the Commissioner of Patents and Trademarks to file the foreign patent application when such filing has been prohibited by security reasons; or

(iii) Such longer periods that may be approved by the Patent Counsel for good cause shown in writing by the Subcontractor or inventor

(4) Subject to the license specified in paragraphs (c)(1), (2) and (3) of this clause, the Subcontractor or inventor agrees to convey to the Government, upon request, the entire right, title, and interest in any foreign country in which the Subcontractor or inventor fails to have a patent application filed in accordance with paragraph (d)(3) of this clause or decides not to continue prosecution or to pay any maintenance fee covering the invention. To avoid forfeiture of the patent application or patent and not less than 60 days before the expiration period for any action required by any patent office, the Subcontractor or inventor shall notify the Patent Counsel of such failure or decision, and shall deliver to the Patent Counsel the executed instruments necessary for the conveyance specified in this paragraph.

(e) **Identification of Invention, Disclosures, and Reports.**

(1) The Subcontractor shall establish and maintain active and effective procedures to ensure that subject inventions are promptly identified and timely disclosed. These procedures shall include maintaining laboratory notebooks or equivalent records and other records that are reasonably necessary to document the conception and/or the first actual reduction to practice of subject inventions, and records that show that the procedures for identifying and disclosing the inventions are followed. Upon request, the Subcontractor shall furnish DOE a description of these procedures so that it may evaluate and determine their effectiveness.

(2) The Subcontractor shall furnish the following to the Patent Counsel (with notification by the Patent Counsel to the University) on a DOE approved form:

( ) A written report containing full and complete technical information concerning each subject invention within six months after conception or first actual reduction to practice, whichever occurs first during or under the subcontract, but in any event before any sale, public use, or public disclosure of such invention known to the Subcontractor. The report shall identify the subcontract and inventor and shall be sufficiently complete in technical detail and appropriately illustrated by sketch or diagram to convey to one skilled in the art to which the invention pertains a clear understanding of the nature, purpose, operation, and, to the extent known, the physical, chemical, biological, or electrical characteristics of the invention. The report should also include any request for foreign patent rights under paragraph (c)(4) of this clause and any request to file a comestic patent application under (d)(1) of this clause; however, such request shall be made within the period set forth in paragraph (b)(2) of this clause. When an invention is reported under this paragraph (e)(2)(i), it shall be presumed to have been conceived or first actually reduced to practice in the course of or under the subcontract, unless the Subcontractor contends it was not so made, in accordance with paragraph (g)(2)(ii) of this clause.

(ii) Upon request, but not more than annually, interim reports on a DOE-approved form listing subject inventions and subcontracts awarded containing a Patent Rights clause for that period and certifying that

(A) The Subcontractor's procedures for identifying and disclosing subject inventions as required by this paragraph (e) have been followed throughout the reporting period,

(B) All subject inventions have been disclosed or that there are no such inventions, and

(C) All lower-tier subcontracts containing a Patent Rights clause have been reported or that no such subcontracts have been awarded;

(iii) A final report on a DOE-approved form within three months after completion of the subcontract work listing all subject inventions and all lower-tier subcontracts awarded containing a Patent Rights clause and certifying that

(A) All subject inventions have been disclosed or that there were no such inventions and

(B) All lower-tier subcontracts containing a Patent Rights clause have been reported or that no such subcontracts have been awarded.

(3) To effect the provisions of this clause, the Subcontractor shall obtain patent agreements from all persons in its employ who perform any part of the work under the subcontract except nontechnical personnel, such as clerical employees and manual laborers.

(4) The Subcontractor agrees that the University and the Government may duplicate and disclose subject invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this clause. If the Subcontractor is to file a foreign patent application on a subject invention, the Government agrees, upon written request, to use its best efforts to withhold publication of such invention disclosures until the expiration of the time period specified in paragraph (d)(1) of this clause, but the Government or its employees shall never be liable for any publication thereof.

f. **Publication.** It is recognized that during the course of the work under the subcontract, the Subcontractor or its employees may from time to time desire to release or publish information regarding scientific or technical developments conceived or first actually reduced to practice during or under the subcontract. So that public disclosure of such information will not adversely affect the patent interests of DOE

or the Subcontractor, patent approval for release or publication shall be secured from Patent Counsel before any such release or publication

(g) **Forfeiture of Rights in Unreported Subject Inventions.**

(1) At the request of the Head of the Agency or designee, the Subcontractor shall forfeit to the Government all rights in any subject invention that the Subcontractor fails to report to Patent Counsel (with notice by Patent Counsel to the University) within six months after the time the Subcontractor

(i) Files or causes to be filed a United States or foreign patent application on subject invention; or

(ii) Submits the final report required by paragraph (e)(2)(iii) of this clause, whichever is later.

(2) However, the Subcontractor shall not forfeit rights in a subject invention if, within the time specified in paragraph (1)(i) or (1)(ii) of this paragraph (g), the Subcontractor

(i) Prepares a written decision based upon a review of the record that the invention was neither conceived nor first actually reduced to practice during or under the subcontract and delivers the same to Patent Counsel (with notification by Patent Counsel to the University) or

(ii) Contending that the invention is not a subject invention, nevertheless discloses the invention and all facts pertinent to this contention to the Patent Counsel (with notification by Patent Counsel to the University); or

(iii) Establishes that the failure to disclose did not result from the Subcontractor's fault or negligence.

(3) Pending written assignment of the patent application and patent on a subject invention determined by the Head of the Agency or designee to be forfeited (such determination to be a final decision under the Disputes clause of FAR 52.233-1), the Subcontractor shall be deemed to hold the invention and the patent applications and patents pertaining thereto in trust for the Government. The forfeiture provision of this paragraph (g) shall be in addition to and shall not supersede other rights and remedies that the Government may have regarding subject inventions.

(h) **Examination of Records Relating to Inventions.**

(1) Until the expiration of three years after final payment under the subcontract, DOE or its authorized representative shall have the right to examine any books, including laboratory notebooks, records, documents, and other supporting data of the Subcontractor that DOE or its authorized representatives reasonably deem pertinent to the discovery or identification of subject inventions or to determine compliance with the requirements of this clause.

(2) DOE or its authorized representatives shall have the right to examine all books, including laboratory notebooks, records and documents of the Subcontractor about the conception or first actual reduction to practice of inventions in the same field of technology as the work under this subcontract to determine whether any such inventions are subject inventions if the Subcontractor refuses or fails to

(i) Establish the procedures of paragraph (e)(1) of this clause, or

(ii) Maintain and follow such procedures, or

(ii) Correct or eliminate any material deficiency in the procedures within 30 days after the University or DOE notifies the Subcontractor of such a deficiency.

(i) **Withholding of Payment.** ***(Not applicable to lower-tier subcontracts).***

(1) Any time before final payment of the amount of the subcontract, and if it deems such action warranted, the University may withhold payment until a reserve not exceeding $50,000 or five percent of the amount of the subcontract, whichever is less, shall have been set aside if, in the opinion of DOE, the Subcontractor fails to

(i) Establish, maintain, and follow effective procedures for identifying and disclosing subject inventions pursuant to paragraph (e)(1) of this clause; or

(ii) Disclose any subject invention pursuant to paragraph (e)(2)(i) of this clause; or
(iii) Deliver the interim reports pursuant to paragraph (e)(2)(ii) of this clause; or

(iv) Provide the information regarding subcontracts pursuant to paragraph (j)(5) of this clause; or

(v) Using a DOE-approved form, convey to the Government the title and/or rights of the Government in each subject invention as required by this clause.

(2) The reserve or balance shall be withheld until DOE has determined that the Subcontractor has rectified whatever deficiencies exist and has delivered all reports, disclosures, and other information required by this clause.

(3) Final payment under this subcontract shall not be made by the University before the Subcontractor delivers to the Patent Counsel all disclosures of subject inventions and other information required by paragraph (c)(2)(i) of this clause, the final report required by paragraph (c)(2)(iii) of this clause, and the Patent Counsel has issued a patent clearance certification to the University.

(4) At its discretion, the University may decrease or increase the sums withheld up to the maximum authorized above. If the Subcontractor is a nonprofit organization, the maximum amount that may be withheld under this paragraph shall not exceed $50,000 or one percent of the amount of the subcontract, whichever is less. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the subcontract. The withholding of any amount or subsequent payment of it shall not be construed as a waiver of any rights accruing to the Government under the subcontract.

(j) **Lower-Tier Subcontracts.**

(1) The Subcontractor will include the Patent Rights -Small Business Firms or Nonprofit Organizations clause, suitably modified to identify the parties, in all lower-tier subcontracts regardless of the tier, for experimental, developmental, demonstration, or research work to be performed by a small business firm or domestic nonprofit organization. In all other lower-tier subcontracts, regardless of the tier, for experimental, developmental, demonstration, or research work, the Subcontractor will include this Patent Rights clause modified to identify the parties. If a lower-tier subcontractor refuses to accept the clause or if, in the opinion of the Subcontractor, the clause is inconsistent with DOE's patent policies, the Subcontractor shall:

(i) Promptly submit written notice to DOE through the University setting forth the reasons for the lower-tier subcontractor refusal and other pertinent information that may expedite disposition of the matter; and

(ii) Not proceed with the lower-tier subcontract without the written authorization of the University.

(2) Except as may be otherwise provided in this clause, the Subcontractor shall not acquire any rights in its lower-tier subcontractor's subject invention for the Subcontractor's own use (as distinguished from such rights that may be required solely to fulfill the Subcontractor's subcontract obligations to the University in the performance of the subcontract) in any lower-tier subcontract by using a subcontract as consideration therefore

(3) All invention disclosures, reports, instruments, and other information required to be furnished by the Subcontractor to the University and DOE under the provisions of a Patent Rights clause in any lower-tier subcontract hereunder may, at the discretion of the University, be furnished to the Subcontractor for transmission to the University and the DOE.

(4) The Subcontractor shall promptly notify DOE through the University in writing upon the award of any lower-tier subcontract containing a Patent Rights clause by identifying the lower-tier subcontractor, the work to be performed under the lower-tier subcontract, and the dates of award and estimated completion. Upon the request of the University or the DOE, the Subcontractor shall furnish a copy of the lower-tier subcontract.

(5) The Subcontractor shall identify all subject inventions of the lower-tier subcontractor of which it acquires knowledge in the performance of the subcontract and shall notify the Patent Counsel (with notification by the Patent Counsel to the University) promptly upon the identification of the inventions.

(6) It is understood that the Government is the third party beneficiary of any lower-tier subcontract clause granting rights to the Government in subject inventions, and the Subcontractor hereby assigns to the Government all rights that the Subcontractor would have to enforce the lower-tier subcontractor's obligations for the benefit of the Government regarding subject inventions. The Subcontractor shall not be obligated to enforce the agreements of any lower-tier subcontractor hereunder relating to the obligations of the lower-tier subcontractor to the Government regarding subject inventions.

(k) **Background Patents.** *(Applies if the subcontract is for $250,000 or more.)*

(1) *"Background patent"* means a domestic patent covering an invention or discovery that is not a subject invention and that is owned or controlled by the Subcontractor at any time through the completion of the subcontract

(i) That the Subcontractor, but not the Government, has the right to license to others without obligation to pay royalties thereon, and

(ii) Infringement of which cannot reasonably be avoided upon the practice of any specific process, method, machine, manufacture, or composition of matter (including relatively minor modifications) that is a subject of research, development, or demonstration work performed under the subcontract.

(2) The Subcontractor agrees to and does hereby grant to the Government a royalty-free, nonexclusive license under any background patent to practice a subject invention of the subcontract by or for the Government in research, development, and demonstration work only.

(3) The Subcontractor also agrees that upon written application by DOE, it will grant to responsible parties for purposes of practicing a subject invention of the subcontract, nonexclusive licenses under any background patent on terms that are reasonable under the circumstances. If, however, the Subcontractor

believes that exclusive or partially exclusive rights are necessary to achieve expeditious commercial development or utilization, then a request may be made to DOE for DOE approval of such licensing by the Subcontractor.

(4) Notwithstanding the foregoing paragraph (k)(3), the Subcontractor shall not be obligated to license any background patent if the Subcontractor demonstrates to the satisfaction of the Head of the Agency or designee that

(i) A competitive alternative to the subject matter covered by said background patent is commercially available or readily introducible from one or more other sources or

(ii) The Subcontractor or its licensees are supplying the subject matter covered by background patent in sufficient quantity and at reasonable prices to satisfy market needs or have taken effective steps or within a reasonable time are expected to take effective steps to so supply the subject matter.

(l) **Atomic Energy.**

(1) No claim for pecuniary award or compensation under the provisions of the Atomic Energy Act of 1954, as amended, shall be asserted by the Subcontractor or its employees regarding any invention or discovery made or conceived in the course of or under the subcontract.

(2) Except as otherwise authorized in writing by DOE, the Subcontractor will obtain patent agreements to effect the provisions of paragraph (1)(1) from all persons who perform any part of the work under the subcontract, except nontechnical personnel, such as clerical employees and manual laborers.

(m) **Limitation of Rights.** Nothing contained in this Patent Rights clause shall be deemed to give the Government any rights regarding any invention other than a subject invention except as set forth in the Patent Rights clause of the subcontract regarding background patents and, if included, the facilities license.

B28, Patent Rights - Small Business Firms or Nonprofit Organizations (DEAR 952.227-71/Prime Contract Article 12, Clause 1)

(a) **Definitions.** *"Invention."* means any invention or discovery that is or may be patentable or otherwise protectable under Title 35 of the United States Code (U.S.C.) or any novel variety of plant that is or may be protected under the Plant Variety Protection Act (7 USC 2321 et seq.).

"Subject invention." means any invention of the Subcontractor conceived or first actually reduced to practice in the performance of work under the subcontract, provided that in the case of a variety of plant, the date of determination (as defined in Section 44(d) of the Plant Variety Protection Act, 7 USC 2401(d)) must also occur during the period of subcontract performance.

"Practical application." means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system, and, in each case, under such conditions as to establish that the invention is utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

"Made," when used in relation to any invention, means the conception or first reduction to practice of such invention.

"*Small business firm.*" means a small business concern as defined at Section 2 of P.L. 85-536 (15 USC 632) and implementing regulations of the Administrator of the Small Business Administration. For this clause, the size standard for small business concerns involved in Government procurement and subcontracting at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.

"*Nonprofit organization.*" means a university or other institution of higher education or an organization of the type described in Section 501(c)(3) of the Internal Revenue Code of 1954 (26 USC 501(c)) and exempt from taxation under Section 501(a) of the Internal Revenue Code (26 USC 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

"*Patent Counsel.*" means the Department of Energy (DOE) Patent Counsel assisting the University.

(b) **Allocation of Principal Rights.** The Subcontractor may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 USC 203. With respect to any subject invention in which the Subcontractor retains title, the Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

(c) **Invention Disclosure, Election of Title, and Filing of Patent Application by Subcontractor.**

(1) The Subcontractor will disclose each subject invention to the Patent Counsel within two months after the inventor discloses it in writing to Subcontractor personnel responsible for patent matters. The disclosure to the Patent Counsel shall be in the form of a written report and shall identify the subcontract under which the invention was made and the inventor(s). The disclosure shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological, or electrical characteristics of the invention. The disclosure shall also identify any publication on sale or public use of the invention; whether a manuscript describing the invention has been submitted for publication; and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the Patent Counsel, the Subcontractor will promptly notify the Patent Counsel of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Subcontractor.

(2) The Subcontractor will elect in writing whether to retain title to any such invention by notifying the Patent Counsel within two years of disclosure to the Patent Counsel. However, in any case in which publication, on sale or public use, has initiated the one-year statutory period during which valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the Patent Counsel to a date that is no more than sixty days before the end of the statutory period.

(3) The Subcontractor will file its initial patent application on a subject invention to which it elects to retain title within one year after election of title or, if earlier, before the end of any statutory period during which valid patent protection can be obtained in the United States after a publication on sale or public use. The Subcontractor will file patent applications in additional countries or international patent offices either within ten months of the corresponding initial patent application or within six months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications when such filing has been prohibited by a Secrecy Order.

(4) Requests for extension of the time for disclosure to the Patent Counsel, election, and filing under subparagraphs (c)(1), (2), and (3) may, at the discretion of the Patent Counsel, be granted.

(d) **Conditions Under Which the Government May Obtain Title.** The Subcontractor will convey to the DOE, upon written request, title to any subject invention

(1) If the Subcontractor fails to disclose or elect title to the subject invention within the times specified in paragraph (c) above or elects not to retain title, provided that the DOE may only request title within 60 days after learning of the failure of the Subcontractor to disclose or elect within the specified times.

(2) In those countries in which the Subcontractor fails to file patent applications within the times specified in paragraph (c) above, provided, however, that if the Subcontractor has filed a patent application in a country after the time specified in paragraph (c) above prior to its receipt of the written request of the Patent Counsel, the Subcontractor shall continue to retain title in that country; or

(3) In any country in which the Subcontractor decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in a reexamination or opposition proceeding on a patent on a subject invention.

(e) **Minimum Rights to Subcontractor and Protection of the Subcontractor's Rights to File.**

(1) The Subcontractor will retain a nonexclusive, royalty-free license throughout the world in each subject invention to which the Government obtains title except if the Subcontractor fails to disclose the subject invention within the times specified in paragraph (c) above. The Subcontractor's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the Subcontractor is a part and includes the right to grant sublicenses of the same scope to the extent that the Subcontractor was legally obligated to do so at the time the subcontract was awarded. The license is transferable only with the approval of DOE except when transferred to the successor of the part of the Subcontractor's business to which the invention pertains.

(2) The Subcontractor's domestic license may be revoked or modified by DOE to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR 404 and 10 CFR 781. This license will not be revoked in that field of use or the geographical areas in which the Subcontractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of DOE to the extent the Subcontractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, DOE will furnish the Subcontractor a written notice of its intention to revoke or modify the license, and the Subcontractor will be allowed thirty days (or such other time as DOE may authorize for good cause shown by the Subcontractor) after the notice to show cause why the license should not be revoked or modified. The Subcontractor has the right to appeal, in accordance with 37 CFR 404 and 10 CFR Part 781, any decision concerning the revocation or modification of its license.

(f) **Subcontractor Action to Protect the Government's Interest.**

(1) The Subcontractor agrees to execute or to have executed and promptly deliver to the Patent Counsel all instruments necessary to

(i) Establish or confirm the rights the Government has throughout the world in those subject inventions to which the Subcontractor elects to retain title, and

(ii) Convey title to DOE when requested under paragraph (d) above and to enable the Government to obtain patent protection throughout the world in that subject invention.

(2) The Subcontractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Subcontractor each subject invention made under the subcontract so that the Subcontractor can comply with the disclosure provisions of paragraph (c) above and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. The disclosure format should require, as a minimum, the information required by paragraph (c)(1) above. The Subcontractor shall instruct such employees through its employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit filing patent applications before United States or foreign statutory bars.

(3) The Subcontractor will notify the Patent Counsel of any decision not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent in any country not less than thirty days before the expiration of the response period required by the relevant patent office.

(4) The Subcontractor agrees to include, within the specification of any United States patent applications and any patent issuing thereon covering a subject invention, the following statement:

"The invention was made with Government support under [identify the subcontract] awarded by the University of California. The Government has certain rights in this invention."

(5) Upon request, the Subcontractor agrees to

(i) Provide a report prior to the close-out of the subcontract listing all subject inventions or stating that there were none;

(ii) Provide a copy of the patent application, filing date, serial number and title, patent number, and issue date for any subject invention in any country in which the Subcontractor has applied for a patent; and

(iii) Provide not more than annually listings of all subject inventions that were disclosed to DOE during the applicable reporting period.

(g) **Lower-tier Subcontracts.**

(1) The Subcontractor will include this clause, suitably modified to identify the parties, in all lower-tier subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or a domestic nonprofit organization. The lower-tier subcontractor will retain all rights provided for the Subcontractor in this clause and the Subcontractor will not, as part of the consideration for awarding the subcontract, obtain rights in the lower-tier subcontractor's subject inventions.

(2) The Subcontractor will include in all other lower-tier subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work the patent rights clause of 41 CFR 9-9.107-5(a) or 9-9.107-6 as appropriate, modified to identify the parties.

(3) In the case of subcontracts at any tier, DOE, the lower-tier subcontractor, and the Subcontractor agree that the mutual obligations of the parties created by this clause constitute a subcontract between the lower-tier subcontractor and DOE with respect to those matters covered by this clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (j) of this clause.

(h) **Reporting on Utilization of Subject Inventions.** The Subcontractor agrees to submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Subcontractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Subcontractor, and such other data and information that DOE may reasonably specify. The Subcontractor also agrees to provide additional reports that DOE may request in connection with any march-in proceeding undertaken by DOE in accordance with paragraph (j) of this clause. As required by 35 USC 202(c)(5), DOE agrees that it will not disclose such information to persons outside the Government without permission of the Subcontractor.

(i) **Preference for United States Industry.** Notwithstanding any other provision of this clause, the Subcontractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject inventions in the United States unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by DOE upon a showing by the Subcontractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) **March-in Rights.** The Subcontractor agrees that with respect to any subject invention in which it has acquired title, DOE has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of DOE to require the Subcontractor, an assignee, or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants upon terms that are reasonable under the circumstances, and if the Subcontractor, assignee, or exclusive licensee refuses such a request, DOE has the right to grant such a license itself if DOE determines that

(1) Such action is necessary because the Subcontractor or assignee has not taken or is not expected to take within a reasonable time effective steps to achieve practical application of the subject invention in such field of use;

(2) Such action is necessary to alleviate health or safety needs that are not reasonably satisfied by the Subcontractor, assignee, or their licensees;

(3) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Subcontractor, assignee, or licensees; or

(4) Such action is necessary because the agreement required by paragraph (i) of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

(k) **Special Provisions for Subcontracts with Nonprofit Organizations.** If the Subcontractor is a nonprofit organization, it agrees that

(1) Rights to a subject invention in the United States may not be assigned without the approval of DOE, except where such assignment is made to an organization that has as one of its primary functions the management of inventions, provided that such assignee will be subject to the same provisions as the Subcontractor;

(2) The Subcontractor will share royalties collected on a subject invention with the inventor, including

Federal employee co-inventors (when DOE deems it appropriate) when the subject invention is assigned in accordance with 35 USC 202(e) and 37 CFR 401.10;

(3) The balance of any royalties or income earned by the Subcontractor with respect to subject inventions after payment of expenses (including payments to inventors) incidental to the administration of subject inventions will be utilized for the support for scientific research or education; and

(4) It will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms and that it will give a preference to a small business firm when licensing a subject invention if the Subcontractor has determined that the small business firm has a plan or proposal for marketing the invention that, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms, provided that the Subcontractor is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the Subcontractor. However, the Subcontractor agrees that the Secretary of Commerce may review the Subcontractor's licensing program and decisions regarding small business applicants, and the Subcontractor will negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary of Commerce's review discloses that the Subcontractor could take reasonable steps to implement more effectively the requirements of this paragraph (k)(4).

(l) **Communications.** The DOE central point of contact for communications or matters relating to this clause is the Patent Counsel.

B29, Price Reduction for Defective Cost or Pricing Data (FAR 52.215-22)

(a) If any price, including profit or fee, negotiated in connection with the subcontract or any cost reimbursable under the subcontract was increased by any significant amount because (1) the Subcontractor or a lower-tier subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data; (2) a lower-tier subcontractor or prospective lower-tier subcontractor furnished the Subcontractor cost or pricing data that were not complete, accurate, and current as certified in the Subcontractor's Certificate of Current Cost or Pricing Data; or (3) any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the subcontract shall be modified to reflect the reduction.

(b) Any reduction in the subcontract price under paragraph (a) above due to defective data from a prospective lower-tier subcontractor that was not subsequently awarded the lower-tier subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual lower-tier subcontract or (2) the actual cost to the Subcontractor, if there was no lower-tier subcontract, was less than the prospective lower-tier subcontract cost estimate submitted by the Subcontractor, provided that the actual lower-tier subcontract price was not itself affected by defective cost or pricing data.

(c) (1) If the University determines under paragraph (a) of this clause that a price or cost reduction n should be made, the Subcontractor agrees not to raise the following matters as a defense

(i) The Subcontractor or lower-tier subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the subcontract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The University should have known that the cost or pricing data in issue were defective even

though the Subcontractor or lower-tier subcontractor took no affirmative action to bring the character of the data to the attention of the University.

(iii) The subcontract was based on an agreement about the total cost of the subcontract and there was no agreement about the cost of each item procured under the subcontract.

(iv) The Subcontractor or lower-tier subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) (i) Except as prohibited by subdivision (c)(2)(ii) of this clause, an offset in an amount determined appropriate by the University based upon the facts shall be allowed against the amount of a contract price reduction if

(A) The Subcontractor certifies to the University that, to the best of the Subcontractor's knowledge and belief, the Subcontractor is entitled to the offset in the amount requested; and

(B) The Subcontractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if

(A) The understated data was known by the Subcontractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or

(B) The University or the Government proves that the facts demonstrate that the subcontract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.

(c) If any reduction in the subcontract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Subcontractor shall be liable to and shall pay the University at the time such overpayment is repaid. Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Subcontractor to the date the University is repaid by the Subcontractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of The Treasury under 26 U.S.C. 6621(a)(2).

B30. Price Reduction for Defective Cost or Pricing Data - Modifications (FAR 52.215-23)

(a) This clause shall become operative only for any modification to the subcontract involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2.(a)(1), except that this clause does not apply to any modification for which the price is

(1) Based on adequate price competition.

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit or fee, negotiated in connection with any modification under this clause or

any cost reimbursable under the subcontract was increased by any significant amount because (1) the Subcontractor or a lower-tier subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data; (2) a lower-tier subcontractor or prospective lower-tier subcontractor furnished the Subcontractor cost or pricing data that were not complete, accurate, and current as certified in the Subcontractor's Certificate of Current Cost or Pricing Data; or (3) any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the subcontract shall be modified to reflect the reduction. This right to a price reduction is limited to that reduction resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the subcontract price under paragraph (b) above because of defective data from a prospective lower-tier subcontractor that was not subsequently awarded the lower-tier subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual lower-tier subcontract or (2) the actual cost to the Subcontractor, if there was no lower-tier subcontract, was less than the prospective lower-tier subcontract cost estimate submitted by the Subcontractor, provided that the actual lower-tier subcontract price was not itself affected by defective cost or pricing data.

(d) (1) If the University determines under paragraph (b) of this clause that a price or cost reduction should be made, the Subcontractor agrees not to raise the following matters as a defense:

(i) The subcontractor or lower-tier subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the subcontract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The University should have known that the cost or pricing data in issue were defective even though the Subcontractor or lower-tier subcontractor took now affirmative action to bring the character of the data to the attention of the Contracting Officer.

(iii) The subcontract was based on an agreement about the total cost of the subcontract and there was no agreement about the cost of each item procured under the subcontract.

(iv) The Subcontractor or lower-tier subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) (i) Except as prohibited by subdivision (d)(2)(ii) of this clause, an offset in an amount determined appropriate by the University based upon the facts shall be allowed against the amount of a contract price reduction if

(A) The Subcontractor certifies to the University that, to the best of the Subcontractor's knowledge and belief, the Subcontractor is entitled to the offset in the amount requested; and

(B) The Subcontractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if --

(A) The understated data was known by the Subcontractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or

(B) The University or the Government proves that the facts demonstrate that the subcontract

price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price

(e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification ion reflecting the price reduction, the Subcontractor shall be liable to and shall pay the University at the time such overpayment is repaid. Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Subcontractor to the date the Government is repaid by the Subcontractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of The Treasure under 26 U.S.C. 6621(a)(2).

B31, Privacy Act Notification (FAR 52.224-1))

The Subcontractor will be required to design, develop, or operate a system of records on individuals, to accomplish a federal agency function subject to the Privacy Act of 1974, P. L. Law 93-579, as amended (5 U.S.C. 552a), and applicable agency regulations. Violation of the Act may involve the imposition of criminal penalties.

B32, Privacy Act (FAR 52.224-2/Prime Contract Article 11, Clause 3)

(a) **Definitions.** *"Operation of a system of records,"* as used in this clause means performance of any of the activities associated with maintaining the system of records, including the collection, use, and dissemination of records.

"Record," as used in this clause means any item, collection or grouping of information about an individual that is maintained by or on behalf of a Government agency, including but not limited to education, financial transactions, medical history, and criminal or employment history and that contains the person's name or the identifying number, symbol, or other identifying particular assigned to the individual, such as a fingerprint, voiceprint, or a photograph

"System of records on individuals," as used in this clause means a group of any records under the control of any Government agency from which information is retrieved by the name of the individual or by some identifying number, symbol, or other identifying particular assigned to the individual.

(b) The Subcontractor agrees to

(1) Comply with the Privacy Act of 1974 (the Act) and the rules and regulations of the DOE issued under the Act in the design, development, or operation of any system of records on individuals to accomplish a Government agency function when the subcontract specifically identifies the systems of records and the design, development, or operation work that the Subcontractor is to perform

(2) Include the Privacy Act notification contained in the subcontract, in every solicitation and resulting lower-tier subcontract, and in every lower-tier subcontract awarded without a solicitation when the statement of work in the proposed lower-tier subcontract requires the design, development, or operation of a system of records on individuals that is subject to the ACT, and

(3) Include this clause, including this subparagraph (3), in all lower-tier subcontracts awarded under the subcontract that requires the design, development, or operation of such a system of records.

(c) If the Act is violated, a civil action may be brought against the Government agency involved when the

violation concerns the design, development, or operation of a system of records on individuals to accomplish a Government agency function, and criminal penalties may be imposed upon the officers or employees of the Government agency when the violation concerns the operation of a system of records on individuals to accomplish a Government agency function. For purposes of the Act, when the subcontract is for the operation of a system of records on individuals to accomplish a Government agency function, the Subcontractor and any employee of the Subcontractor is considered to be an employee of the Government agency.

B33, Property Furnished "As Is" (FAR 52.245-19)

(a) The University makes no warranty whatsoever with respect to Government property furnished "as is," except that the property is in the same condition as when placed at the f.o.b. point specified in the solicitation as when inspected by the Subcontractor pursuant to the solicitation or, if not inspected by the Subcontractor, as when last available for inspection under the solicitation.

(b) The Subcontractor may repair any property made available on an "as is" basis. Such repair will be at the Subcontractor's expense except as otherwise provided in this clause. Such property may be modified at the Subcontractor's expense, but only with the written permission of the University. Any repair or modification of property furnished "as is" shall not affect its title with the Government.

(c) If there is any change in the condition of Government property furnished "as is" from the time inspected or last available for inspection under the solicitation to the time placed on board at the location specified in the solicitation and if such change will adversely affect the Subcontractor, the Subcontractor shall, upon receipt of the property, notify the University detailing the facts and, as directed by the University, either
(1) Return such property at the University's expense or otherwise dispose of the property; or

(2) Effect repairs to return the property to its condition when inspected under the solicitation or, if not inspected, last available for inspection under the solicitation. After completing the directed action and upon written request of the Subcontractor, the University shall equitably adjust any contractual provisions affected by the return, disposition, or repair in accordance with the procedures provided for in the Changes clause of the subcontract. The foregoing provisions for adjustment are the exclusive remedy available to the Subcontractor, and the University shall not be otherwise liable for any delivery of Government property furnished "as is" in a condition other than that in which it was originally offered.

(d) Except as otherwise provided in this clause, Government property furnished "as is" shall be governed by the Property clause of the subcontract.

B34, Reporting of Royalties (Prime Contract Article 12, Clause 4)

If any royalty payments are reflected in the subcontract cost to the University, the Subcontractor agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the University) during the performance of this subcontract and prior to its completion or final settlement, the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this subcontract together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as shall permit the identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the University at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made. The provisions of this clause, appropriately modified as to parties, shall be included in all lower-tier subcontracts that exceed $25,000 unless otherwise approved by the University.

B35, Rights in Data - General (FAR 52.227-14/Prime Contract Article 12, Clause 7)

(a) **Definitions.** *"Computer Software."* as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Limited Rights Data," as used in this clause, means data (other than computer software) developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged.

"Technical Data," as used in this clause, means data (other than computer software) which are of a scientific or technical nature.

"Restricted Computer Software," as used in this clause, means computer software developed at private expense and that is a trade secret, is commercial or financial and is confidential or privileged, or is published copyrighted computer software, including minor modifications of such computer software.

"Unlimited Rights," as used in this clause, means the right of the Government and/or the University to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

"Limited Rights," as used in this clause, means the rights of the Government and/or the University in limited rights data, as set forth in paragraph (f) hereof.

"Restricted Rights," as used in this clause, means the rights of the Government and/or the University in restricted computer software, including minor modifications of such computer software, as set forth in paragraph (f) hereof.

(b) **Allocation of Rights.**

(1) The Government shall have

(i) Ownership of all technical data and computer software first produced in the performance of this subcontract.

(ii) The right to inspect technical data and computer software first produced or used in the performance of this subcontract at all reasonable times (for which inspection of the proper facilities shall be afforded DOE by the Subcontractor and its lower-tier subcontractors).

(iii) The right to have all technical data and computer software first produced or specifically used in the performance of this subcontract delivered to the University or otherwise disposed of by the Subcontractor, either as the University may from time to time direct during the progress of the work or in any event as the University shall direct upon completion or termination of this subcontract, provided that nothing contained in this paragraph shall require the Subcontractor to deliver any technical data or computer software the delivery of which is excused by this Rights in Data - General clause.

(iv) Unlimited Rights in technical data and computer software specifically used in the performance

of this subcontract, except as provided herein regarding copyright, and except for technical data and computer software pertaining to items of standard commercial design provided, that if such data are Limited Rights Data or Restricted Computer Software the rights of the Government and/or the University in such data shall be governed solely by the provisions of paragraph (f) hereof ("Rights in Limited Rights Data") and ("Rights in Restricted Computer Software"); and

(v) The right to remove, cancel, correct or ignore any markings not authorized by the terms of this subcontract on any data furnished hereunder if, in response to a written inquiry by the University concerning the propriety of the markings, the Subcontractor fails to respond thereto within 60 days or fails to substantiate the propriety of the markings. In either case the University will notify the Subcontractor of the action taken.

(2) The Subcontractor shall have

(i) The right to withhold its Limited Rights Data and Restricted Computer Software in accordance with the provisions of this clause;

(ii) The right to use for its internal purposes, subject to patent, security or other provisions of this subcontract, data it first produces in the performance of this subcontract, except for data in DOE's Uranium Enrichment Technology, including diffusion, centrifuge, and atomic vapor laser isotope separation, provided the data requirements of this subcontract have been met as of the date of the internal use of such data; and

(iii) The right to assert copyright subsisting in scientific and technical articles as provided in paragraph (d) of this clause.

The Subcontractor agrees that for Limited Rights Data or Restricted Computer Software or other technical business or financial data in the form of recorded information which it receives from, or is given access to by DOE, the University, or a third party, including a DOE Contractor or Subcontractor, and for technical data or computer software it first produces under this subcontract which is authorized to be marked by DOE, the Subcontractor shall treat such data in accordance with any restrictive legend contained thereon.

Nothing contained in this clause shall imply a license to the Government or the University under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government or the University under any patent.

(c) **Copyright (General).**

(1) The Subcontractor agrees not to mark, register or otherwise assert a copyright in any data in a published or unpublished work, other than as set forth in paragraph (d) below.

(2) Except for material to which the Subcontractor has obtained the right to assert copyright in accordance with paragraph (d) hereof, the Subcontractor agrees not to include in the data delivered under this subcontract any material copyrighted by the Subcontractor and not to knowingly include any material copyrighted by others without first granting or obtaining at no cost a license therein for the benefit of the Government and the University of the same scope as set forth in paragraph (d) below. If the Subcontractor believes that such copyrighted material for which the license cannot be obtained must be included in the data to be delivered, rather than incorporated therein by reference, the Subcontractor shall obtain the written authorization of the University to include such material in the data prior to its delivery.

(d) **Copyrighted Works (Scientific and Technical Articles).** The Subcontractor shall have the right to

assert, without prior approval of the University, copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this subcontract, and published in academic, technical or professional journals, symposia proceedings or similar works. When assertion of copyright is made, the Subcontractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship, including contract number, on the data when such data are delivered to the University as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. The Subcontractor grants to the Government, and others acting on its behalf, including the University, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

(e) **Copyrighted Works (Other than Scientific and Technical Articles).**

(1) The Subcontractor may obtain permission to assert copyright subsisting in technical data and computer software first produced by the Subcontractor in performance of this subcontract, where the Subcontractor can show that commercialization would be enhanced by such copyright protection, subject to the following:

(i) **Subcontractor Request to Assert Copyright.**

(A) For data other than scientific and technical articles, the Subcontractor shall submit in writing to the University for approval by the DOE Patent Counsel its request to assert copyright in data first produced in the performance of this subcontract pursuant to this clause. Each request by the Subcontractor to be complete must include: (1) the identity of the data (including any computer program) for which the Subcontractor requests permission to assert copyright, as well as an abstract which is descriptive of the data and is suitable for dissemination purposes; (2) whether the data is subject to export control; (3) a statement that the Subcontractor plans to commercialize the data within five (5) years of obtaining permission to assert copyright; and (4) for data other than computer software, a statement explaining why the assertion of copyright is necessary to enhance commercialization.

(B) Permission of the Subcontractor to assert copyright in excepted categories of data as determined by DOE is expressly withheld. Such excepted categories include data whose release: (1) would be detrimental to national security, i.e., involve classified information or data or sensitive information under Section 148 of the Atomic Energy Act of 1954, as amended, or are subject to export control for nonproliferation and other nuclear related national security purposes; (2) would not enhance the appropriate transfer or dissemination and commercialization of such data; (3) would have a negative impact on U.S. industrial competitiveness; (4) would prevent DOE from meeting its obligations under treaties and international agreements, or (5) would be detrimental to one or more of DOE's programs. Additional excepted categories may be added by DOE. Where data are determined to be under an export control restriction, the Subcontractor may still obtain permission to assert copyright in such restricted data for purposes of limited commercialization within the constraints provided by the export control statutes and regulations subject to the provisions of this clause. However, notwithstanding any other provision of this subcontract, all data developed with Naval Reactors' funding and those data that are classified fall within the above excepted categories and permission to assert copyright will not be granted by DOE for those data. Additionally, the rights of the Subcontractor in data subject to the disposition of data rights in the treaties and international agreements identified under this subcontract as well as those additional treaties and international agreements which DOE may from time to time identify, such amendment listing added treaties and international agreements, is effective only for data which is developed after the date such treaty or international agreement is added to this subcontract. Also, the Subcontractor will not be permitted to

assert copyright in data in the form of various technical reports generated by the Subcontractor under the subcontract without first obtaining the advanced written permission of the University.

(ii) DOE Review and Response to Subcontractor's Request. The DOE Patent Counsel shall use its best efforts to respond in writing within 90 days of receipt of a complete request by the Subcontractor to assert copyright in technical data and computer software pursuant to this clause. Such response shall either give or withhold DOE's permission for the Subcontractor to assert copyright or advise the Subcontractor that DOE needs additional time to respond and the reasons therefor.

(iii) **Permission for Subcontractor to Assert Copyright.**

(A) For computer software, the Subcontractor shall furnish to the Contractor designated by DOE to serve as the DOE centralized software distribution and control point, at the time permission to assert copyright is given under (ii) above: (1) an abstract describing the software suitable for publication, (2) the source code for each software program, and (3) the object code and at least the minimum support documentation needed by a technically competent user to understand and use the software. The DOE Patent Counsel, for good cause shown by the Subcontractor, may allow the minimum support documentation to be delivered within 60 days after permission to assert copyright is given or at such time the minimum support documentation becomes available. The Subcontractor acknowledges that the above-identified DOE-designated Contractor may provide a technical description of the software in an announcement identifying its availability from the copyright holder.

(B) Unless otherwise directed by the University, for data other than computer software to which the Subcontractor has received permission to assert copyright under paragraph (ii) above, the Subcontractor shall within sixty (60) days of obtaining such permission furnish to DOE's Office of Scientific and Technical Information (OSTI) a copy of such data as well as an abstract of the data suitable for dissemination purposes. The Subcontractor acknowledges that OSTI may provide an abstract of the data in an announcement to DOE, its contractors and to the public identifying its availability from the copyright holder.

(C) For a period of five (5) years beginning on the date the Subcontractor is given permission to assert copyright in data, the Subcontractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

(D) After the five (5) year period set forth in (C) above, or if, prior to the end of such period, the Subcontractor abandons commercialization activities pertaining to the data to which the Subcontractor has been given permission to assert copyright, the Subcontractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, distribute copies to the public, prepare derivative works, perform publicly and display publicly and to permit others to do so.

(E) Whenever the Subcontractor obtains permission to assert copyright in data, the Subcontractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 on the copyrighted data and also an acknowledgment of the Government sponsorship and license rights of paragraph (C) and (D) above. Such action shall be taken when the data are delivered to the Government, published, licensed, or deposited for registration as a published work in the U.S. Copyright Office. The acknowledgment of Government sponsorship and license rights shall be as follows:

NOTICE. The Government is granted for itself and others acting on its behalf a paid-up, nonexclusive, irrevocable worldwide license in this data to reproduce, prepare derivative works, and perform publicly

and display publicly. Beginning five (5) years after (date permission to assert copyright was obtained) the Government is granted for itself and others acting on its behalf a paid-up, nonexclusive, irrevocable worldwide license in this data to reproduce, prepare derivative works, distribute copies to the public, perform publicly and display publicly, and to permit others to do so. Neither the United States nor the United States Department of Energy, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

(F) With respect to any data to which the Subcontractor has received permission to assert copyright, the DOE has the right, during the 5-year period set forth in subparagraph (e)(1)(i)(A) above, to request the Subcontractor to grant a nonexclusive, partially exclusive or exclusive license in any field of use to a responsible applicant(s) upon terms that are reasonable under the circumstances, and if the Subcontractor refuses such request, to grant such license itself, if the DOE determines that the Subcontractor has not made a satisfactory demonstration that either it or its licensee(s) is actively pursuing commercialization of the data as set forth in subparagraph (e)(1)(i)(A) above. Before licensing under this paragraph (F), DOE shall furnish to the Subcontractor a written request for the Subcontractor to grant the stated license, and the Subcontractor shall be allowed thirty (30) days (or such longer period as may be authorized by the DOE for good cause shown in writing by the Subcontractor) after such notice to show good cause why the license should not be granted. The Subcontractor shall have the right to appeal the decision of the DOE to grant the stated license to the Invention Licensing Appeal Board as set forth in 10 CFR 781.65 - "Appeals."

(G) No costs shall be allowable for maintenance of copyrighted data, primarily for the benefit of the Subcontractor and/or a licensee and which exceeds University/DOE program needs, except as expressly provided in writing by the University. The Subcontractor may use its net royalty income to effect such maintenance costs.

(H) At any time the Subcontractor abandons commercialization activities for data for which the Subcontractor has received permission to assert copyright in accordance with this clause, it shall advise OSTI and DOE Patent Counsel and upon request assign the copyright to the Government so that the Government can distribute the data to the public.

(3) It is the responsibility of the Subcontractor to obtain from employees of lower-tier subcontractors data and rights therein necessary to fulfill the Subcontractor's obligations to the Government and the University with respect to such data including at least

(i) A written acknowledgment by each employee that the Production of Data required by the subcontract is within the scope of the employee's employment; and

(ii) An assignment to the Subcontractor of the employee's rights in copyrights subsisting in data expressly including Computer Software first produced by the employee while employed by Subcontractor under the subcontract; and

(iii) An agreement from the employee to execute all necessary and proper papers to assign to the Subcontractor such rights subsisting in data, expressly including Computer Software, upon request by the Subcontractor.

(f) **Subcontracting.**

(1) The Subcontractor agrees to use a Rights in Data clause as directed by the University in lower-tier subcontracts having as a purpose the conduct of research, development, and demonstration work and in lower-tier subcontracts for supplies.

(2) It is the responsibility of the Subcontractor to obtain from its lower-tier subcontractors data and rights therein, on behalf of the Government and/or the University, necessary to fulfill the Subcontractor's obligations to the Government and/or the University with respect to such data. In the event of refusal by a lower-tier subcontractor to Subcontractor to accept a clause affording the Government such rights, the Subcontractor shall:

(i) Promptly submit written notice to the University setting forth reasons for the lower-tier subcontractor's refusal and other pertinent information which may expedite disposition of the matter; and

(ii) Not proceed with the subcontract without written authorization of the University.

(g) **Rights in Limited Rights Data.** Except as may be otherwise specified in this subcontract as data which are not subject to this paragraph, the Subcontractor agrees to and does hereby grant to the Government and the University an irrevocable, nonexclusive paid-up license and right to use by or for the Government, any Limited Rights Data of the Subcontractor specifically used in the performance of the subcontract; provided, however, that to the extent that any Limited Rights Data when furnished or delivered is specifically identified by the Subcontractor at the time of initial delivery to the University, such data shall not be used within or outside the Government or University except as provided in the "Limited Rights Notice" set forth below. All such Limited Rights Data shall be marked with the following "Limited Rights Notice":

LIMITED RIGHTS NOTICE

These data contain "limited rights data", furnished under Subcontract no. _____ with the University which may be duplicated and used by the Government with the express limitations that the "limited rights data" may not be disclosed outside the Government and/or University or be used for purposes of manufacture without prior permission of the Subcontractor, except that further disclosure or use may be made solely for the following purposes:

(a) This "limited rights data" may be disclosed for evaluation purposes under the restriction that the "limited rights data" be retained in confidence and not be further disclosed.

(b) This "limited rights data" may be disclosed to other lower-tier subcontractors participating in the Government's or University's program of which this subcontract is a part for information or use in connection with the work performed under their contracts and under the restriction that the "limited rights data" be retained in confidence and not be further disclosed; and

(c) This "limited rights data" may be used by the Government, the University, or others on their behalf for emergency repair or overhaul work under the restriction that the "limited rights data" be retained in confidence and not be further disclosed.

This Notice shall be marked on any reproduction of this data, in whole or in part.

(END OF NOTICE)

(h) **Rights in Restricted Computer Software.**

(1) Except as may be otherwise specified in this purchase order as data which are not subject to this

paragraph the Subcontractor agrees to and does hereby grant to the Government and the University an irrevocable, nonexclusive paid-up license and right to use by or for the Government, any restricted computer software of the Subcontractor specifically used in the performance of this subcontract, provided, however, that to the extent that any restricted computer software when furnished or delivered is specifically identified by the Subcontractor at the time of initial delivery to the University or a representative of the University, such data shall not be used with or outside the Government or University except as provided in the 'Restricted Rights' set forth below. All such restricted computer software shall be marked with the following 'Restricted Rights Notice"

RESTRICTED RIGHTS NOTICE (long form)

(a) This computer software is submitted with restricted rights under Subcontract no. _____ with the University. It may not be used, reproduced, or disclosed by the Government or the University except as provided in paragraph (b) of this notice.

(b) This computer software may be

(1) Used, or copied for use, in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;

(2) Used, copied for use, in a backup or replacement computer if any computer for which is was acquired is inoperative or is replaced;

(3) Reproduced for safekeeping (archives) or backup purposes;

(4) Modified, adapted, or combined with other computer software, provided that only the portions of the derivative software consisting of the restricted computer software are to be made subject to the same restricted rights; and

(5) Disclosed to and reproduced for use by lower-tier subcontractors under a service subcontract (of the type defined in FAR 37.101) in accordance with subparagraphs (b)(1) through (4) of this Notice, provided the Government and University makes such disclosure or reproduction subject to these restricted rights.

(c) Notwithstanding the foregoing, if this computer software has been published under copyright, it is licensed to the Government and University, without disclosure prohibitions, with the rights set forth in the restricted rights notice above.

d. This Notice shall be marked on any reproduction of this computer software, in whole or in part.

(END OF NOTICE)

(2) Where it is impractical to include the Restricted Right Notice on Restricted Computer Software, the following short-form Notice may be used in lieu thereof:

RESTRICTED RIGHTS NOTICE (short form)

Use, reproduction, or disclosure is subject to restrictions set forth in the Long Form Notice of Subcontract no. _____ with _____ (name of Subcontractor).

(END OF NOTICE)

(3) If the software is embedded, or if it is commercially impractical to mark it with human readable text, then the symbol R and the clause date (mo/yr) in brackets or a box, a [R- o/yr], may be used. This will be read to mean Restricted Computer Software, subject to the rights of the Government and University as described in the Long Form Notice, in effect as of the date indicated next to the symbol. The symbol shall not be used to mark human readable material. In the event this Contract contains any variation to the rights in the Long Form Notice, then the contract number must also be cited.

(4) If Restricted Rights Computer Software is delivered with the copyright notice of 17 U.S.C. 401, the software will be presumed to be published copyrighted computer software licensed to the Government and University without disclosure prohibitions, with unlimited rights, unless the Subcontractor includes the following statement with such copyright notice: "Unpublished _ rights reserved under the Copyright Laws of the United States."

B36, Rights in Data - Special Works (FAR 52.227-17)

(a) **Definition.** *"Data,"* as used in this clause, means recorded information regardless of form or characteristic, such as writings, sound recordings, pictorial reproductions, drawings, or other graphic representations, and works of similar nature (whether or not copyrighted) that are specified to be delivered under the subcontract. The term includes data such as management studies and data produced under support services subcontracts but does not include financial reports, cost analyses, and other information incidental to subcontract administration.

(b) All data first produced or composed in the course of or under the subcontract shall be the sole property of the Government. Except with the prior written permission of the University, the Subcontractor agrees not to assert any rights at common law or in equity or to establish any claim to statutory copyright in such data. The Subcontractor shall not publish or reproduce such data in whole or in part or in any manner or form, or authorize others so to do without the written consent of the University or until such time as the University or the Government may have released such data to the public.

(c) The Subcontractor hereby grants to or will obtain for the Government a royalty-free, nonexclusive, and irrevocable license throughout the world

(1) To publish, translate, reproduce, deliver, perform, use, and dispose of, in any manner, any and all data that are not first produced or composed in the performance of the subcontract but that are incorporated in the work furnished under the subcontract, and

(2) To authorize others to do so.

(d) The Subcontractor shall indemnify and save and hold harmless the University and the Government and its officers, agents, and employees acting within the scope of their official duties against any liability including costs and expenses

(1) For violation of proprietary rights, copyrights, or rights of privacy, arising out of the publication, translation, reproduction, delivery, performance, use, or disposition of any data furnished under the subcontract; or

(2) Based upon libelous, defamatory, or other unlawful matter contained in such data.

(e) Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government under any patent.

B37. Rights in Proposal Data (DEAR 952.227-82)

Except for technical data contained on pages * of the Subcontractor's proposal dated * that are asserted by the Subcontractor as being proprietary data, it is agreed that as a condition of the award of the subcontract and notwithstanding the provisions of any notice appearing on the proposal, the University and the Government shall have the right to use, duplicate, and disclose the technical data contained in the proposal upon which the subcontract is based and have other do so for any purpose whatsoever.

*Identified in Section F of the Schedule.

B38, Sensitive Foreign Nations Controls (DEAR 952.204-71/Prime Contract Article 10, Clause 4)

(a) In connection with any activities in the performance of the subcontract, the Subcontractor agrees to comply with the "Sensitive Foreign Nations Controls" requirements relating to those countries which from time to time are identified to the University by written notice from DOE as sensitive nations. The Subcontractor shall have the right to terminate according to the termination for convenience clause of these terms and conditions, this subcontract if the University determines that it is unable, without substantially interfering with its policies or without adversely effecting its performance of this work under this subcontract as a result of such notification.

(b) The Subcontractor agrees to incorporate this clause, including this paragraph (b) in all lower-tier subcontracts under this subcontract.

B39, Small Business and Small Disadvantaged Business Subcontracting Plan (FAR 52.219-9)

(a) This clause does not apply to small business concerns.

(b) **Definitions.** *"Commercial product."* as used in this clause means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product that, in the opinion of the University, differs only insignificantly from the Subcontractor's commercial product.

"Subcontract." as used in this clause means any agreement (other than one involving an employer-employee relationship) entered into by a Government prime contractor or subcontractor calling for goods or services required to perform the contract or subcontract.

(c) The Subcontractor, upon request by the University, shall submit and negotiate a subcontracting plan where applicable which separately addresses subcontracting with small business concerns and with small disadvantaged business concerns. If the Subcontractor is submitting an individual subcontract plan, the plan must separately address subcontracting with small business concerns and with small disadvantaged business concerns with a separate part for the basic subcontract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant subcontract. The subcontracting plan shall be negotiated within the time specified by the University. Failure to submit and negotiate the subcontracting plan shall make the Subcontractor ineligible for award of a subcontract.

(d) The Subcontractor's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns and small disadvantaged business concerns as lower-tier subcontractors. The Subcontractor shall include all lower-tier subcontracts that contribute to subcontract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of —

(i) Total dollars planned to be subcontracted.

(ii) Total dollars planned to be subcontracted to small business concerns, and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns.

(3) A description of the principal types of goods and services to be subcontracted and an identification of the types planned for subcontracting to small business concerns and to small disadvantaged business concerns.

(4) A description of the method used to develop the subcontracting goals in (1) above.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System [PASS] of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small and small disadvantaged business concerns trade associations).

(6) A statement about whether the Subcontractor included indirect costs in establishing subcontracting goals and a description of the method used to determine the proportionate share of indirect costs to be incurred with small business concerns and with small disadvantaged business concerns.

(7) The name of the person employed by the Subcontractor who will administer the Subcontractor's subcontracting program and a description of the duties of that person.

(8) A description of the efforts the Subcontractor will make to ensure that small business concerns and small disadvantaged business concerns have an equitable opportunity to compete for lower-tier subcontracts.

(9) Assurances that the Subcontractor will include the Utilization of Small Business Concerns and Small Disadvantaged Business Concerns clause in all subcontracts that offer further subcontracting opportunities and that the Subcontractor will require all lower-tier subcontractors (except small business concerns) who receive subcontracts exceeding $500,000 ($1,000,000 for construction of any public facility) to accept a plan similar to the plan agreed to by the Subcontractor.

(10) Assurances that the Subcontractor will

(i) Cooperate in any studies or surveys that may be required by the University;

(ii) Submit periodic reports to allow the University or the Government to determine the extent of compliance by the Subcontractor with the subcontracting plan;

(iii) Submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts (SF 295 is not required), in accordance with instructions on the forms, and

(iv) Ensure that its lower-tier subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records, including establishing source lists, the Subcontractor will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan and a description of its efforts to locate small and small disadvantaged business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis unless otherwise indicated):

(i) Source lists, guides, and other data that identify small and small disadvantaged business concerns;

(ii) Organizations contacted in an attempt to locate sources that are small or small disadvantaged business concerns;

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, and indicating (A) whether small business concerns were solicited and if not, why not; (B) whether small disadvantaged business concerns were solicited and if not, why not; and (C) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact trade associations, business development organizations, and conferences and trade fairs to locate small and/or small disadvantaged business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a subcontract-by-subcontract basis, records to support award data submitted by the Subcontractor to the University or the Government, including the name, address, and business size of each lower-tier subcontractor. Subcontractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient subcontract performance, the Subcontractor shall perform the following functions:

(1) Assist small business and small disadvantaged business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules to facilitate the participation by such concerns. When the Subcontractor's lists of potential small business and small disadvantaged subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business and small disadvantaged business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small and small disadvantaged business firms.

(4) Provide notice to lower-tier subcontractors concerning penalties and remedies for

misrepresentations of business status as small business or small disadvantaged business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Subcontractor's subcontracting plan.

(f) A master subcontracting plan on a facility-wide or division-wide basis that contains all the elements, except goals, required by (d) above may be incorporated by reference as a part of the subcontracting plan required of the Subcontractor by this clause, provided that (1) the master plan has been approved (2) the Subcontractor provides copies of the approved master plan and evidence of its approval to the University, and (3) goals and any deviations from the master plan deemed necessary by the University to satisfy the requirements of the subcontract are set forth in the individual subcontracting plan.

(g) (1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the Subcontractor's production generally for both commercial and noncommercial products rather than solely to the subcontract. In these cases, and with the concurrence of the Government, the Subcontractor shall submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the Federal agency awarding the Subcontractor its first prime contract requiring a subcontracting plan during the fiscal year or by an agency satisfactory to the University.

(3) The approved plan shall remain in effect during the Subcontractor's fiscal year for all of the Subcontractor's commercial products.

(h) Prior compliance of the Subcontractor with other such subcontracting plans under previous subcontracts will be considered by the University in determining the responsibility of the Subcontractor for award of the subcontract.

(i) The failure of the Subcontractor or lower-tier subcontractor to comply in good faith with (1) the Utilization of Small Business Concerns and Small Disadvantaged Business Concerns clause of the subcontract, or (2) an approved plan required by this clause, shall be a material breach of the subcontract.

B40, Special Test Equipment (FAR 52.245-18)

(a) "*Special test equipment*," as used in this clause means either single or multipurpose integrated test units engineered, designed, fabricated, or modified to accomplish special purpose testing in performing a subcontract. It consists of items or assemblies of equipment, including standard or general purpose items or components, that are interconnected and interdependent so as to become a new functional entity for special testing purposes. It does not include material, special tooling, facilities (except foundations and similar improvements necessary for installing special test equipment), and plant equipment items used for general facility testing purposes.

(b) The Subcontractor may either acquire or fabricate special test equipment at University expense when the equipment is not otherwise itemized in the subcontract and when the prior approval of the University has been obtained. At least 30 days in advance, the Subcontractor shall provide the University with a written notice of the Subcontractor's intention to acquire or fabricate the special test equipment. As a minimum, the notice shall include an estimated aggregate cost of all items and components of the equipment, the individual cost of which is less than $5,000, and shall include the following information on each item or component of equipment costing $5,000 or more:

(1) The end use application and function of each proposed special test unit and identification of

special characteristics and the reasons for the classifications of the test unit as special test equipment;

(2) A complete description of the items to be acquired and the items to be fabricated by the Subcontractor;

(3) The estimated cost of the item of special test equipment or component; and

(4) A statement that intraplant screening of the Subcontractor's and Government-owned special test equipment and components has been accomplished and that no such equipment or components are available for use in performing the subcontract.

(c) The University may furnish any special test equipment or components rather than approve their acquisition or fabrication by the Subcontractor. Such University-furnished items shall be subject to the Property clause, except that the University shall not be obligated to deliver such items any sooner than the Subcontractor could have acquired or fabricated them after expiration of the 30-day period for notice in paragraph (b) of this clause. However, unless the University notifies the Subcontractor of its decision to furnish the items within the 30-day period and subject to any other applicable provisions of the subcontract, the Subcontractor may proceed to acquire or fabricate the equipment or components.

(d) In any lower-tier subcontract that provides that special test equipment or components may be acquired or fabricated for the University, the Subcontractor shall insert provisions that conform substantially to the language of this clause, including this paragraph (d). The Subcontractor shall furnish the names of such lower-tier subcontractors to the University.

(e) If an engineering change requires either the acquisition or fabrication of new special test equipment or substantial modification of existing special test equipment, the Subcontractor shall comply with paragraph (b) above. In so complying, the Subcontractor shall identify the change order that requires the proposed acquisition, fabrication, or modification.

B41, State of New Mexico Gross Receipts and Compensating Tax (FAR 52.229-10/Prime Contract Article 7, Clause 15)

This clause applies if (1) the subcontract directs or authorizes the Subcontractor to acquire tangible personal property as a direct cost under the subcontract and title to such property passes directly to and vests in the United States upon delivery of the property by the Subcontractors, and (2) the subcontract is for services to be performed in whole or in part within New Mexico.

(a) Within thirty days after award of the subcontract, the Subcontractor shall advise the State of New Mexico of the subcontract by registering with the State of New Mexico, Taxation and Revenue Department, Revenue Division, pursuant to the Tax Administration Act of the State of New Mexico, and shall identify the subcontract number.

(b) The Subcontractor shall pay the New Mexico gross receipts taxes, pursuant to the Gross Receipts and Compensating Tax Act of New Mexico, assessed against the subcontract fee and costs paid for performance of the subcontract, or of any part or portion thereof, within the State of New Mexico. The allowability of any gross receipts taxes or local option taxes lawfully paid to the State of New Mexico by the Subcontractor or its lower-tier subcontractors will be determined in accordance with the Allowable Cost and Payment clause of the subcontract except as provided in paragraph (d) of this clause.

(c) The Subcontractor shall submit applications for Nontaxable Transaction Certificates, Form CSR-3C.

to the State of New Mexico Taxation and Revenue Department, Revenue Division, P.O. Box 630, Santa Fe, New Mexico, 87509. When the Type 15 Nontaxable Transaction Certificate is issued by the Revenue Division the Subcontractor shall use these certificates strictly in accordance with the subcontract and the agreement between DOE and the New Mexico Taxation and Revenue Department.

(d) The Subcontractor shall provide Type 15 Nontaxable Transaction Certificates to each vendor in New Mexico selling tangible personal property to the Subcontractor for use in the performance of the subcontract. Failure to provide a Type 15 Nontaxable Transaction Certificate to vendors will result in the vendor's liability for the gross receipts taxes and those taxes, which are then passed on to the Subcontractor, shall not be reimbursable as an allowable cost by the University.

(e) The Subcontractor shall pay the New Mexico compensating user tax for any tangible personal property that is purchased pursuant to a Nontaxable Transaction Certificate if such property is not used for Federal purposes.

(f) Out-of-state purchase of tangible personal property by the Subcontractor that would be otherwise subject to compensating tax shall be governed by the principles of this clause. Accordingly, compensating tax shall be due from the Subcontractor only if such property is not used for Federal purposes.

(g) The University may receive information regarding the Subcontractor from the Revenue Division of the New Mexico Taxation and Revenue Department and, at the discretion of the University, may participate in any matters or proceedings pertaining to this clause or the above mentioned Agreement. This shall not preclude the Subcontractor from having its own representative nor does it obligate the University to represent its Subcontractor.

(h) The Subcontractor agrees to insert the substance of this clause, including this paragraph (h), in each lower-tier subcontract that meets the criteria in FAR 29.401-6 (b)(1) through (3).

(i) Paragraphs (a) thcugh (h) of this clause shall be null and void should the Agreement referred to in paragraph (c) of this clause be terminated; provided, however, that such termination shall not nullify obligations already incurred before the date of termination.

B42, Subcontractor Cost or Pricing Data (FAR 52.215-24)

(a) Before awarding any lower-tier subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1) when entered into, or before pricing any lower-tier subcontract modification involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1), the Subcontractor shall require the lower-tier subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is

(1) Based on adequate price competition.

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public, or

(3) Set by law or regulation.

(b) The Subcontractor shall require the lower tier subcontractor to certify in substantially the form prescribed in Subsection 15.804-4 of the FAR that, to the best of its knowledge and belief, the data submitted under paragraph (a) above were accurate, complete, and current as of the date of agreement on the negotiated price of the lower-tier subcontract or lower-tier subcontract modification.

(c) In each lower-tier subcontract that exceeds the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1) when entered into, the Subcontractor shall insert either

(1) The substance of this clause, including this paragraph (c), if paragraph (a) above requires submission of cost or pricing data for the lower-tier subcontract; or

(2) The substance of the clause entitled Subcontractor Cost or Pricing Data -Modifications.

B43, Subcontractor Cost or Pricing Data - Modifications (FAR 52.215-25)

(a) The requirements of paragraphs (b) and (c) of this clause shall become operative only for any modification to the subcontract involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1), and shall be limited to such modifications.

(b) Before awarding any lower-tier subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1) when entered into, or pricing any lower-tier subcontract modification involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1), the Subcontractor shall require the lower-tier subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Subcontractor shall require the lower-tier subcontractor to certify in substantially the form prescribed in Subsection 15.804-4 of the FAR that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the lower-tier subcontract or lower-tier subcontract modification.

(d) The Subcontractor shall insert the substance of this clause, including this paragraph (d), in each lower-tier subcontract that exceeds the threshold for submission of cost or pricing data at FAR 15.804-2(a)(1), when entered into.

B44, Termination for Convenience (Applies to Educational and Other Nonprofit Institutions) (FAR 52.249-5)

(a) The University may terminate performance of work under the subcontract in whole or, from time to time, in part if the University determines that a termination is in the University's or the Government's interest. The University shall terminate by delivering to the Subcontractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination and, except as directed by the University, the Subcontractor shall immediately proceed with the following obligations:

(1) Stop work as specified in the notice.

(2) Place no further lower-tier subcontracts or orders except as necessary to complete the continued

portion of the subcontract.

(3) Terminate all applicable lower-tier subcontracts and cancel or divert applicable commitments covering personal services that extend beyond the effective date of termination.

(4) As directed by the University, assign to the University all right, title, and interest of the Subcontractor under the lower-tier subcontracts terminated, in which case the University shall have the right to settle or pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the University, settle all outstanding liabilities and termination settlement proposals arising from the termination of lower-tier subcontracts; approval or ratification will be final for purposes of this clause.

(6) As directed by the University, transfer title (if not already transferred) and deliver to the University any information and items that, if the subcontract had been completed, would have been required to be furnished, including (i) goods produced, in process, or acquired for the work terminated and (ii) completed or partially completed plans, drawings, and information.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary or that the University may direct to protect and preserve the property related to the subcontract that is in the possession of the Subcontractor and in which the University or the Government has or may acquire an interest.

(9) As directed or authorized by the University, use its best efforts to transfer or dispose of termination inventory other than that retained by the University under subparagraph (6) above, provided however, that the Subcontractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by and at prices approved by the University. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the University under the subcontract, credited to the price or cost of the work, or paid in any other manner directed by the University.

(c) After termination, the Subcontractor shall submit a final termination settlement proposal to the University in the form and with the certification prescribed by the University. The Subcontractor shall submit the proposal promptly but no later than one year from the effective date of termination unless extended in writing by the University upon written request of the Subcontractor within this one-year period. If the Subcontractor fails to submit the termination settlement proposal within the time allowed, the University may determine, on the basis of information available, the amount, if any, due the Subcontractor because of the termination and shall pay the amount determined.

(d) Subject to paragraph (c) above, the Subcontractor and the University may agree upon the whole or any part of the amount to be paid because of the termination. This amount may include reasonable cancellation charges incurred by the Subcontractor and any reasonable loss on outstanding commitments for personal services that the Subcontractor is unable to cancel, provided that the Subcontractor exercised reasonable diligence in diverting such commitments to other operations. The subcontract shall be amended and the Subcontractor paid the agreed amount.

(e) The cost principles and procedures in Subpart 31.3 of the FAR, in effect on the date of the subcontract, shall govern all costs claimed, agreed to, or determined under this clause, however, if the Subcontractor is not an educational institution and is a nonprofit organization under Office of Management and Budget (OMB) Circular A-122, Cost Principles for Nonprofit Organizations, these cost principles shall apply

provided that if the Subcontractor is a nonprofit institution listed in Attachment C of OMB Circular A-122, the cost principles at FAR Subpart 31.2 for commercial organizations shall apply to such subcontractor.

(f) Under the terms and conditions it prescribes, the University may make partial payments against costs incurred by the Subcontractor for the terminated portion of the subcontract if the University believes the total of these payments will not exceed the amount to which the Subcontractor will be entitled.

(g) The Subcontractor has the right of appeal as provided under the Disputes clause of the subcontract, except that if the Subcontractor failed to submit the termination settlement proposal within the time provided in paragraph (c) and failed to request a time extension, there is no right of appeal.

B45, Waiver of Facilities Capital Cost of Money (FAR 52.215-31)

The Subcontractor did not include facilities capital cost of money as a proposed cost of this subcontract. Therefore, it is an unallowable cost under this subcontract.

B46, Waiver of Indemnity (FAR 52.227-5)

Any provision or clause of the subcontract to the contrary notwithstanding, the Government hereby authorizes and consents to the use and manufacture, solely in performing the subcontract, of any invention covered by the United States patents identified in the schedule and waives indemnification by the Subcontractor regarding such patents.

B47, Whistleblower Protection (DEAR 970.5204-59)

(a) The Subcontractor shall comply with the requirements of the "DOE Contractor Employee Protection Program" at 10 CFR Part 708, with respect to work performed on University or Government Premises.

(b) The Subcontractor shall insert or have inserted the substance of this clause, including this paragraph (b) in subcontracts, at all tiers, with respect to work performed on University or Government premises.

B48, Work on University or Government Premises (LANL Internal Clause)

To the extent that the Subcontractor's work under the subcontract involves performance by the Subcontractor or its lower-tier subcontractors at University or Government-owned sites or facilities, the following provisions shall apply:

(a) **Liens.** The Subcontractor agrees that, at any time upon the request of the University, it will submit a sworn statement setting forth the services performed or goods furnished by lower-tier subcontractors and the amount due and to become due to each. The Subcontractor further agrees that before the final payment called for hereunder, it will, if requested, submit to the University a complete set of vouchers showing what payments have been made for goods and labor used in connection with the work called for hereunder.

(b) **Indemnify and Hold Harmless.**

(1) The Subcontractor shall indemnify and hold harmless the University and the Government from all claims, demands, causes of action, or suits, of whatever nature, arising out of the services, labor, and goods furnished by the Subcontractor or its lower-tier subcontractors under the subcontract, and from all laborer's, materialmen's, and mechanic's liens upon the real property upon which the work is located or any other property of the University or the Government; and

(2) Promptly notify the University in writing, of any claim, demands, causes of action, or suits brought to its attention. The Subcontractor shall forward with such notification copies of all pertinent papers received by the Subcontractor with respect to any such claims, demands, cause of action or suits, or liens. The Subcontractor, at the request of the University, shall do all things and execute and deliver all appropriate documents and assignments in favor of the University or the Government of all the Subcontractor's rights and claims growing out of such asserted claims as will enable the University and the Government to protect their respective interests by litigation or other means.

The final payment shall not be made until the Subcontractor, if required, shall deliver to the University a complete release of all liens arising out of the subcontract or receipts in full in lieu thereof as the University may require, and if required in either case, an affidavit that as far as it has knowledge or information the receipts include all the labor and goods for which a lien could be filed. But the Subcontractor may, if any lower-tier subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the University to indemnify it against any claim by lien or other means. If any lien or claim remains unsatisfied after all payments are made, the Subcontractor shall refund to the University all moneys that the latter may be compelled to pay in discharging such lien or claim, including all costs and reasonable attorney's fees.

(c) **Cleaning Up.** The Subcontractor shall at all times keep University or Government premises and adjoining premises where the work is performed free from accumulations of waste material or rubbish caused by its employees' work of its employees, or work of any of its lower-tier subcontractors. At the completion of the work, the Subcontractor shall remove all rubbish from and about the building and all of its and its lower-tier subcontractor's tools, scaffolding, and surplus materials and shall leave the work area "broom clean" or its equivalent, unless more exactly specified. In cases of a dispute between the Subcontractor and lower-tier subcontractors employed on or about the structure or structures upon which the work is to be done, as herein provided, as to responsibility for the removal of the rubbish, or in case the same is not promptly removed as herein required, the University may remove the rubbish and charge the cost to the Subcontractor.

(d) **Employees.** The Subcontractor shall not employ for the work any unfit person or anyone not skilled in the work assigned to the person and shall devote only its best qualified personnel to work under the subcontract. Should the University deem anyone employed on the work incompetent or unfit for duty and so inform the Subcontractor, the Subcontractor shall immediately remove such person from work under the subcontract, and that person shall not again, without written permission of the University, be assigned to work under the subcontract.

(e) **Insurance.** The Subcontractor shall maintain with reputable companies insurance in amounts required by or of the subcontract sufficient to protect the University and the Government from any and all public liability and Workmen's Compensation claims at all times during the performance of the subcontract. If requested, the Subcontractor shall supply the University with one copy of certificates of insurance covering policies required hereunder and shall obtain satisfactory evidence of lower-tier subcontractors compliance with these provisions before their participation in the work. In the absence of more specific direction from the University, the Subcontractor shall maintain additional insurance to the extent consistent with sound business practice.

(f) **Envrionment, Safety, Health, and Fire Protection.**

(1) The Subcontractor shall take all reasonable precautions in the performance of the work under the subcontract to protect the safety and health of employees and members of the public and shall comply with all health, safety, fire protection, and environmental regulations and requirements, including reporting requirements, of the University and DOE. The University shall notify the Subcontractor in writing of any noncompliance with the provisions of this clause and the corrective action to be taken. After receipt of such

notice, the Subcontractor shall immediately take corrective action. If the Subcontractor fails to comply with said regulations or requirements of the University and DOE, the University may, without prejudice to any other legal or contractual rights of the University, issue a stop-work order stopping all or any part of the work; thereafter, a start work order for resumption of the work may be issued at the discretion of the University. The Subcontractor shall make no claim for an extension of time or for compensation or damages by reason of or in connection with such work stoppage.

(2) The Subcontractor shall take all reasonable measures and precautions at all times to prevent injuries to or the death of its employees or any other person who enters upon University or Government premises. Such measures and precautions shall include, but shall not be limited to, all safeguards and warnings necessary to protect workers and others against any conditions on University or Government premises which could be dangerous and to prevent accidents of any kind whenever work is being performed in proximity to any moving or operating machinery, equipment, or facilities, whether such machinery, equipment, or facilities are the property of or are being operated by the Subcontractor, its lower-tier subcontractors, the University, or other persons.

B49, Workplace Substance Abuse Programs at DOE Sites (DEAR 970.5204-58)

(a) **Program Implementation.** Consistent with 10 CFR 707, Workplace Substance Abuse Programs at DOE Sites, incorporated herein by reference with full force and effect, the Subcontractor shall develop, implement, and maintain a workplace substance abuse program for performance of subcontracts involving access to or handling of classified information or special nuclear materials; high risk of danger to life, the environment, public health and safety, or national security; or transportation of hazardous materials to or from a DOE site.

(b) **Remedies.** In addition to any other remedies available to the University, the Subcontractor's failure to comply with the requirements of 10 CFR Part 707 or to perform in a manner consistent with its approved program may render the Subcontractor subject to: suspension of subcontract payments, or, when applicable, a reduction in award fee; termination for default; and suspension or debarment.

(c) **Lower-tier Subcontracts.**

(1) The Subcontractor agrees to notify the University reasonably in advance of, but not later than 30 days prior to, the award of any lower-tier subcontract the Subcontractor believes may be subject to the requirements of 10 CFR Part 707.

(2) The University requires all subcontracts subject to the provisions of 10 CFR Part 707 to agree to develop and implement a workplace substance abuse program that complies with the requirements of 10 CFR Part 707, Workplace Substance Abuse Programs at DOE Sites, as a condition for award of the subcontract. The University shall review and approve each Subcontractor's program, and shall periodically monitor each Subcontractor's implementation of the program for effectiveness and compliance with 10 CFR Part 707.

(3) The Subcontractor agrees to include, and require the inclusion of the requirements of this clause in all lower-tier subcontracts, at any tier, that are subject to the provisions of 10 CFR Part 707.

Form 7500, Section C

Section C Clauses Apply to Fixed-Price Subcontracts.

The clauses listed below apply to fixed-price type subcontracts. Clauses in this section appropriate to the pricing arrangement and the Subcontractor's business category shall be incorporated into subcontracts by specific citing of the clause number in the Schedule.

C1. Changes (FAR 52.243-1)

(a) At any time, by written change order and without notice to the sureties, if any, the University may make changes within the general scope of the subcontract in any one or more of the following:

(1) Drawings, designs, or specifications.
(2) Method of shipment or packing; or
(3) Place of inspection, delivery, or acceptance

(b) If any such change causes an increase or decrease in the cost of an item or the time required for performing any part of the work under the subcontract, whether or not changed by the change order, the University shall make an equitable adjustment in the subcontract price, the time of performance or both; and (2) other affected terms of the subcontract, and shall modify the subcontract accordingly

(c) The Subcontractor must submit any "proposal for adjustment" (hereafter referred to as "proposal") under this clause within 30 days from the date of receipt of the written change order. However, if the University decides that the facts justify the action, the University may receive and act upon a proposal submitted before final payment of the subcontract.

(d) If the Subcontractor's proposal includes the cost of property made obsolete or excess by the change, the University shall have the right to prescribe the manner of the disposition of the property

(e) Failure to agree to any adjustment shall be a dispute under the Disputes clause. However, nothing in this clause shall excuse the Subcontractor from proceeding with the subcontract as changed

C2. Default (FAR 52.249-9)

(a) (1) Subject to paragraphs (c) and (d) below, by written Notice of Default to the Subcontractor, the University may terminate the subcontract in whole or in part if the Subcontractor fails to

(i) Perform the work under the subcontract within the time specified in the subcontract or any extension

(ii) Prosecute the work so as to endanger performance of the subcontract (but see subparagraph (a)(2) below); or

(iii) Perform any of the other provisions of the subcontract (but see subparagraph (a)(2) below)

(2) The University's right to terminate the subcontract under paragraphs (1)(ii) and (1)(iii) above may be exercised if the Subcontractor does not cure such failure within ten days (or more, if authorized in writing by the University) after receipt of the notice from the University specifying the failure

(b) If the University terminates the subcontract in whole or in part, it may acquire, under the terms and in the manner the University considers appropriate, work similar to the work terminated, and the Subcontractor will be liable to the University for any excess costs for the similar work. However, the Subcontractor shall continue the work not terminated

(c) Except for defaults of lower-tier subcontractors at any tier, the Subcontractor shall not be liable for any excess costs if the failure to perform the subcontract arises from causes beyond the control and without the fault or negligence of the Subcontractor. Examples of such causes include: (1) acts of God

or of the public enemy, (2) acts of the Government in either its sovereign or contractual capacity, (3) fires, (4) floods, (5) epidemics, (6) quarantine restrictions, (7) strikes, (8) freight embargoes, and (9) unusually severe weather. In each instance the failure to perform must be beyond the control and without the fault or negligence of the Subcontractor.

(d) If the failure to perform is caused by the default of a lower-tier subcontractor at any tier, and if the cause of the default is beyond the control of both the Subcontractor and lower-tier subcontractor and without the fault or negligence of either, the Subcontractor shall not be liable for any excess costs for failure to perform, unless the subcontracted goods or services were obtainable from other sources in sufficient time for the Subcontractor to meet the required delivery schedule or other performance requirements.

(e) If the subcontract is terminated for default, the University may require the Subcontractor to transfer title to the Government and deliver to the University, as directed by the University, any (1) completed or partially completed work not previously delivered to and accepted by the University and (2) other property, including subcontract rights, specifically produced or acquired for the terminated portion of the subcontract. Upon direction of the University, the Subcontractor shall also protect and preserve property in its possession in which the University has an interest.

(f) The University shall pay the subcontract price, if separately stated, for completed work it has accepted and the amount agreed upon by the Subcontractor and the University for (1) completed work for which no separate price is stated, (2) partially completed work, (3) other property described above that it accepts, and (4) the protection and preservation of the property. Failure to agree will be a dispute under the Disputes clause. The University may withhold from these amounts any sum that the University determines to be necessary to protect the University against loss from outstanding liens or claims of former lien holders.

(g) If, after termination, it is determined that the Subcontractor was not in default or that the default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the University.

(h) The rights and remedies of the University in this clause are in addition to any other rights and remedies provided by law or under the subcontract.

C3, Federal, State, and Local Taxes (FAR 52.229-3)

(a) **Definitions.** "*Contract date,*" as used in this clause, means the effective date of this subcontract or modification.

"*All applicable federal, state, and local taxes and duties,*" as used in this article, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this subcontract.

"*After-imposed Federal Tax,*" as used in this article, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the subcontract date but whose exemption was later revoked or reduced during the subcontract period, on the transactions or property covered by this subcontract that the Subcontractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"*After-Relieved Federal Tax*," as used in this article, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this subcontract, but which the Subcontractor is not required to pay or bear, or for which the Subcontractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the subcontract date.

(b) The subcontract price includes all applicable Federal, State, and local taxes and duties.

(c) The subcontract price shall be increased by the amount of any after-imposed Federal tax, provided the Subcontractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the subcontract price, as a contingency reserve or otherwise.

(d) The subcontract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The subcontract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Subcontractor is required to pay or bear, or does not obtain a refund of, through the Subcontractor's fault, negligence, or failure to follow instructions of the University.

(f) No adjustment shall be made in the subcontract price under this article unless the amount of the adjustment exceeds $250.

(g) The Subcontractor shall promptly notify the University of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the subcontract price and shall take appropriate actions as the University directs.

(h) The University shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Subcontractor requests such evidence and a reasonable basis exists to sustain the exemption.

C4, Inspection of Research and Development (FAR 52.246-7)

(a) The Subcontractor shall provide and maintain an inspection system covering the work under the subcontract and that is acceptable to the University. Complete records of all inspection work performed by the Subcontractor shall be maintained and made available to the University during subcontract performance and for as long afterwards as the subcontract requires.

(b) The University has the right to inspect and test all work called for by the subcontract to the extent practicable at all places and times, including the period of performance, and in any event before acceptance. The University may also inspect the premises of the Subcontractor or any lower-tier subcontractor engaged in subcontract performance. The University shall perform inspections and tests in a manner that will not unduly delay the work.

(c) If the University performs any inspection or test on the premises of the Subcontractor or a lower-tier subcontractor, the Subcontractor shall furnish and shall require lower-tier subcontractors to furnish, without additional charge, all reasonable facilities and assistance for the safe and convenient performance of these duties. Except as otherwise provided in the subcontract, the University shall bear the expense of University inspections or tests made at other than the Subcontractor's or lower-tier subcontractor's premises.

(d) The University shall accept or reject the work as promptly as practicable after delivery, unless otherwise specified in the subcontract. University failure to inspect and accept or reject the work shall not relieve the Subcontractor from responsibility nor impose liability on the University for nonconforming work. Work is nonconforming when it is defective in material or workmanship or does not otherwise conform with subcontract requirements.

(e) The University has the right to reject nonconforming work. If the Subcontractor fails or is unable to correct or to replace nonconforming work within the delivery schedule (or such later time that the University may authorize), the University may accept the work and make an equitable price reduction. Failure to agree on a price reduction shall be a dispute under the Disputes clause.

(f) Inspection and test by the University does not relieve the Subcontractor from responsibility for defects or other failures to meet the subcontract requirements that may be discovered before acceptance. Acceptance shall be conclusive, except for latent defects, fraud, gross mistakes amounting to fraud, or as otherwise specified in the subcontract. If acceptance is not conclusive for any of these causes and in addition to any other rights and remedies provided by law or under other provisions of the subcontract, the University shall have the right to require the Subcontractor (1) at no increase in subcontract price, to correct or replace the defective or nonconforming goods at the original point of delivery or at the Subcontractor's facility at the University's election, and in accordance with a reasonable delivery schedule that may be agreed upon between the Subcontractor and the University, provided the University may require a reduction in subcontract price if the Subcontractor fails to meet such delivery schedule; or (2) within a reasonable time after the Subcontractor's receipt of notice of defects or nonconformance, to repay such portion of the subcontract price that is equitable under the circumstances if the University elects not to require correction or replacement. When goods are returned to the Subcontractor, the Subcontractor shall bear transportation costs from the original point of delivery to the Subcontractor's facility and return to the original point of delivery when that point is not the Subcontractor's facility.

C5, Inspection of Services - Fixed-Price (FAR 52.246-4)

(a) **Definitions.** "*Services.*" as used in this clause, includes services performed, workmanship, and material furnished or utilized in the performance of services.

(b) The Subcontractor shall provide and maintain an inspection system acceptable to the University covering the services under this subcontract. Complete records of all inspection work performed by the Subcontractor shall be maintained and made available to the University during subcontract performance and for as long afterwards as the subcontract requires.

(c) The University has the right to inspect and test all services called for by the subcontract, to the extent practicable at all times and places during the term of the subcontract. The University shall perform inspections and tests in a manner that will not unduly delay the work.

(d) If the University performs inspections or tests on the premises of the Subcontractor or lower-tier subcontractor, the Subcontractor shall furnish, and shall require lower-tier subcontractors to furnish, without additional charge, all reasonable facilities and assistance for the safe and convenient performance of these duties.

(e) If any of the services do not conform with subcontract requirements, the University may require the

Subcontractor to perform the services again in conformity with subcontract requirements, at no increase in subcontract amount. When the defects in services cannot be corrected by reperformance, the Subcontractor may (1) require the Subcontractor to take necessary action to ensure that future performance conforms to subcontract requirements and (2) reduce the subcontract price to reflect the reduced value of the services performed.

(c) If the Subcontractor fails to promptly perform the services again or to take the necessary action to ensure future performance in conformity with subcontract requirements, the University may (1) by subcontract or otherwise, perform the services and charge to the Subcontractor any cost incurred by the University that is directly related to the performance of such service or (2) terminate the subcontract for default.

C6, Limitation of University's Obligation (LANL Internal Clause)

(a) Of the total price of the items listed in Section B of the schedule, the sum listed in Section F of the schedule is presently available for payment and allotted to the subcontract. It is anticipated that from time to time additional funds will be allotted to the subcontract until the total price of these items is allotted.

(b) The Subcontractor agrees to perform or have performed work on the items up to the point at which, in the event of termination of the subcontract pursuant to the Termination for Convenience clause of the subcontract, the total amount payable by the University (including amounts payable in respect of lower-tier subcontracts and settlement costs) pursuant to paragraph (a) of the clause would, in the exercise of reasonable judgment by the Subcontractor, approximate the total amount of the time allotted to the subcontract. The Subcontractor will not be obligated to continue performance of the work beyond that point. The University will not be obligated in any event to pay or reimburse the Subcontractor in excess of the amount from time to time allotted to the subcontract, regardless of anything to the contrary in the Termination for Convenience clause of the subcontract.

(c) It is contemplated that the funds presently allotted to the subcontract will cover the work to be performed, as limited by the provisions of (b) above, until the dated specified in Section B of the subcontract. If funds allotted are considered by the Subcontractor to be inadequate to cover the work to be performed until the above date, the Subcontractor will notify the University in writing when, within the next 30 days, the work will reach a point at which, in the event of termination of the subcontract pursuant to the Termination for Convenience clause of the subcontract, the total amount payable by the University (including amount payable in respect of lower-tier subcontracts and settlement costs) pursuant to paragraph (a) of this clause will approximate 85 percent of the total amount then allotted to the subcontract. The notice will state

(1) the estimated date when that point will be reached, and

(2) the estimated amount of additional funds required to continue performance to the above date.

After such latter notification, the Subcontractor shall advise the University in writing as to the estimated amount of additional funds which will be required for the timely performance of the subcontract for a further period as may be specified in the subcontract or otherwise agreed to by the parties. If additional funds are not allotted by the date above written, the University will, upon written request of the Subcontractor, terminate the subcontract on that date or the date set forth in the request, whichever is later, pursuant to the provisions of the Termination for Convenience clause of the subcontract.

(d) When additional funds are allotted from time to time for continued performance of the work under the subcontract, the parties will agree as to the applicable period of subcontract performance that will be covered by the funds. The provisions of (b) and (c) above will apply in like manner to the additional allotted funds, and the subcontract will be amended accordingly.

(e) If the Subcontractor incurs additional costs or is delayed in the performance of the work under the subcontract solely by reason of failure of the University to allot additional funds in amounts sufficient for timely performance of the subcontract, and if additional funds are allotted, an equitable adjustment will be made in the price or prices (including appropriate target, billing, and ceiling prices where applicable) of the items or in the time of delivery or both. Failure to agree to any such equitable adjustment hereunder will be a dispute within the meaning of the Disputes clause.

(f) The University may at any time before termination and, with the consent of the Subcontractor after notice of termination, allot additional funds for the subcontract.

(g) The provisions of this clause with respect to termination will not be deemed to limit the rights of the University under the Default clause. The provisions of this clause are limited to the work on and obligation of funds for the items set forth in (a) above. This clause will become inoperative upon the obligation of funds for the total price of the work except for rights and obligations then existing under this clause.

(h) Nothing in the clause affects the right of the University to terminate this subcontract pursuant to the Termination for Convenience clause.

C7, Limitation on Withholding of Payments (FAR 52.232-9)

(a) If more than one clause or schedule provision of the subcontract authorizes the temporary withholding of amounts otherwise payable to the Subcontractor for goods delivered or services performed, the total of the amounts withheld at any one time shall not exceed the greatest amount that may be withheld under any one clause or schedule provision at that time, provided that this limitation shall not apply to

(1) Withholdings pursuant to any clause relating to wages or hours of employees;

(2) Withholdings not specifically provided for by the subcontract;

(3) The recovery of overpayments, and

(4) Any other withholding mandated by law or regulation.

C8, Lower-Tier Subcontracts (FAR 52.244-1)

(a) This clause does not apply to firm fixed-price subcontracts and to fixed-price subcontracts with economic price adjustment. However, it does apply to lower-tier subcontracts resulting from unpriced modifications to such subcontracts.

(b) "*Lower-tier subcontract*" as used in this clause includes but is not limited to purchase orders and changes and modifications to purchase orders. The Subcontractor shall notify the University reasonably in advance of entering into any lower-tier subcontract if the Subcontractor does not have a Government approved purchasing system and if the lower-tier subcontract

(1) Is to be a cost-reimbursement, time-and-material, or labor-hour subcontract estimated to exceed $25,000 including any fee; or

(2) Is proposed to exceed $100,000; or

(3) Is one of a number of lower-tier subcontracts with a single lower-tier subcontractor under the subcontract for the same or related goods or services that in the aggregate are expected to exceed $100,000.

(c) The advance notification required by paragraph (b) above shall include

(1) A description of the goods or services to be subcontracted;

(2) Identification of the type of subcontract to be used.

(3) Identification of the proposed lower-tier subcontractor and an explanation of why and how the proposed lower-tier subcontractor was selected, including the competition obtained.

(4) The proposed price of the lower-tier subcontract and the Subcontractor's cost or price analysis.

(5) The lower-tier subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other provisions of the subcontract;

(6) The lower-tier subcontractor's Disclosure Statement or certificate relating to Cost Accounting Standards when such data are required by other provisions of the subcontract; and

(7) A negotiation memorandum reflecting

(i) The principal elements concerning price negotiations of the lower-tier subcontract;

(ii) The most significant considerations controlling establishment of initial or revised prices.

(iii) The reason cost or pricing data were or were not required;

(iv) The extent, if any, to which the Subcontractor did not rely on the lower-tier subcontractor's cost or pricing data in determining the price objective and in negotiating the final price.

(v) The extent, if any, to which it was recognized in the negotiation that the lower-tier subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Subcontractor and lower-tier subcontractor; and the effect of any such defective data on the total price negotiated;

(vi) The reasons for any significant difference between the Subcontractor's price objective and the price negotiated; and

(vii) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(d) The Subcontractor shall obtain the University's written consent before placing any lower-tier subcontract for which advance notification is required under paragraph (b) above. However, the University may ratify in writing any such lower-tier subcontract. Ratification shall constitute the consent of the University.

(e) Even if the Subcontractor's purchasing system has been approved, the Subcontractor shall obtain the University's written consent before placing lower-tier subcontracts that have been selected for special surveillance and so identified in the schedule of the subcontract.

(f) Unless the consent or approval is specifically provided otherwise, neither consent by the University to any lower-tier subcontract nor approval of the Subcontractor's purchasing system shall constitute a determination (1) of the acceptability of any lower-tier subcontract terms or conditions, (2) of the acceptability of any lower-tier subcontract price or of any amount paid under any lower-tier subcontract, or (3) to relieve the Subcontractor of any responsibility for performing the subcontract.

(g) No lower-tier subcontract placed under the subcontract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement subcontracts shall not exceed the fee limitations in Subsection 15.903(d) of the FAR.

(h) The University and the Government reserve the right to review the Subcontractor's purchasing system as set forth in FAR Subpart 44.3 and DEAR 944.3.

C9, Additional Paragraph (i) to Clause C8, Lower-Tier Subcontracts (FAR 52.244-1)

(i) Paragraphs (b) and (c) of Clause C8 do not apply to the lower-tier subcontracts that were evaluated during negotiations and are listed in the schedule.

C10, Payment Under Fixed-Price Research and Development Subcontracts (FAR 52.232-2)

The University shall pay the Subcontractor the prices stipulated in the subcontract for work delivered or rendered and accepted, less any deductions provided in the subcontract, after submission of proper invoices or vouchers. Unless otherwise specified, payment shall be made after acceptance of any portion of the work delivered or rendered for which a price is separately stated in the subcontract.

C11, Property (Incorporated by Reference) (FAR 52.245-2 including Alternates I or II, as applicable)

C12, Refund of Royalties (FAR 52.227-9)

(a) The subcontract price includes certain amounts for royalties payable by the Subcontractor or lower-tier subcontractors or both, which amounts have been reported to the University.

(b) The term "royalties" as used in this clause refers to any costs or charges in the nature of royalties, license fees, patent or license amortization costs, or the like, for the use of or for rights in patents and patent applications in connection with performing the subcontract or any lower-tier subcontract hereunder.

(c) Before final payment under the subcontract, the Subcontractor shall furnish to the University, a statement of royalties paid or required to be paid in connection with performing the subcontract and lower-tier subcontracts hereunder together with the reasons.

(d) The Subcontractor will be compensated for royalties reported under paragraph (c) above only to the extent that such royalties were included in the subcontract price and are determined by the University to be properly chargeable to the University and allocable to the subcontract. The subcontract price shall be reduced to the extent that any royalties that are included in the subcontract price are not in fact paid by the Subcontractor or are determined by the University not to be properly chargeable to the University and allocable to the subcontract. Repayment or credit to the University shall be made as the University directs.

(e) If, at any time within three years after final payment under the subcontract, the Subcontractor for any reason is relieved in whole or in part from the payment of the royalties included in the final subcontract price as adjusted pursuant to paragraph (d) above, the Subcontractor shall promptly notify the University of that fact and shall reimburse the University in a corresponding amount.

(f) The substance of this clause, including this paragraph (f), shall be included in any lower-tier subcontract in which the amount of royalties reported during negotiation of the lower-tier subcontract exceeds $250.

C13, Stop-Work Order (FAR 52.212-13)

(a) The University may, at any time, by written order to the Subcontractor, require the Subcontractor to stop all or any part of the work called for by the subcontract for a period of 90 days after the stop-work order is delivered to the Subcontractor, and for any further period to which the parties may agree. The stop-work order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the stop-work order, the Subcontractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the stop-work order during the period of work stoppage. Within a period of 90 days after a stop-work order is delivered to the Subcontractor or within any extension of that period to which the parties shall have agreed, the University shall either

(1) Cancel the stop-work order or

(2) Terminate the work covered by the stop-work order as provided in the Default or the Termination for Convenience clause of the subcontract.

(b) If a stop-work order issued under this clause is canceled or the period of the stop-work order or any extension thereof expires, the Subcontractor shall resume work. The University shall make an equitable adjustment in the delivery schedule or subcontract price or both and the subcontract shall be modified in writing accordingly, if

(1) The stop-work order results in an increase in the time required for, or in the Subcontractor's cost properly allocable to the performance of any part of the subcontract; and

(2) The Subcontractor asserts a claim for the adjustment within 30 days after the end of the period of work stoppage; provided that if the University decides the facts justify the action, the University may receive and act upon the claim asserted at any time before final payment under the subcontract.

(c) If a stop-work order is not canceled and if the work covered by the stop-work order is terminated for convenience, the University shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the stop-work order is terminated for default, the University shall allow, by equitable adjustment or other means, reasonable costs resulting from the stop-work order.

C14, Taxes - Foreign Fixed-Price Subcontracts (FAR 52.229-6)

(a) To the extent that the subcontract provides for furnishing goods or for performing services outside the United States, its possessions, and Puerto Rico, this clause applies instead of any Federal, State, and local taxes clause of the subcontract.

(b) **Definitions.** *"Subcontract date,"* as used in this clause means the date set for bid opening or, if this is a negotiated subcontract or a modification, the effective date of the subcontract or modification.

"Country concerned," as used in this clause means any country other than the United States, its possessions, and Puerto Rico, in which expenditures under the subcontract are made.

"Tax," and "taxes," as used in this clause include fees and charges for doing business that are levied by the government of the country concerned or by its political subdivisions.

"All applicable taxes and duties," as used in this clause means all taxes and duties, in effect on the date of the subcontract, that the taxing authority is imposing and collecting on the transactions or property covered by the subcontract pursuant to written ruling or regulation.

"After-imposed tax," as used in this clause means any new or increased tax or duty, or any tax, other than excepted tax, that was exempted or excluded on the subcontract date but whose exemption was later revoked or reduced during the subcontract period on the transactions or property covered by the subcontract and that the Subcontractor must pay or bear because of legislative, judicial, or administrative action taking effect after the subcontract date.

"After-relieved tax," as used in this clause means any amount of tax or duty, other than an excepted tax, that would otherwise have been payable on the transactions or property covered by the subcontract but which the Subcontractor is not required to pay or bear or for which the Subcontractor obtains a refund because of legislative, judicial, or administrative action taking effect after the subcontract date.

"Excepted tax," as used in this clause means social security or other employment taxes, net income and franchise taxes, excess profits taxes, capital stock taxes, transportation taxes, unemployment compensation taxes, and property taxes. "Excepted tax" does not include gross income taxes levied on or measured by sales or receipts from sales, property taxes assessed on completed goods covered by the subcontract, or any tax assessed on the Subcontractor's possession of, interest in, or use of property, title to which vests in the U.S. Government.

(c) Unless otherwise provided in the subcontract, the subcontract price includes all applicable taxes and duties, except taxes and duties that the Government of the United States and the government of the country concerned have agreed shall not apply to expenditures in such country by or on behalf of the United States Government.

(d) The subcontract price shall be increased by the amount of any after-imposed tax or of any tax or

duty specifically excluded from the subcontract price by a provision of the subcontract that the Subcontractor must pay or bear, including any interest or penalty, if the Subcontractor states in writing that the subcontract price does not include any contingency for such tax and if liability for such tax, interest, or penalty was not incurred through the Subcontractor's fault, negligence, or failure to follow instructions of the University or the United States Government or to comply with the provisions of paragraph (i) below.

(e) The subcontract price shall be decreased by the amount of any after-relieved tax, including any interest or penalty. The University shall be entitled to interest received by the Subcontractor incident to a refund of taxes to the extent that such interest was earned after the Subcontractor was paid by the University for such taxes. The University shall be entitled to repayment of any penalty refunded to the Subcontractor to the extent that the penalty was paid by the University.

(f) The subcontract price shall be decreased by the amount of any tax or duty, other than an excepted tax, that was included in the subcontract and that the Subcontractor must pay or bear or does not obtain a refund of through the Subcontractor's fault, negligence, or failure to follow instructions of the University or the United States Government or to comply with the provisions of paragraph (i) below.

(g) No adjustment shall be made in the subcontract price under this clause unless the amount of the adjustment exceeds $100.

(h) If the Subcontractor obtains a reduction in tax liability under the United States Internal Revenue Code (Title 26, U.S.C.) because of the payment of any tax or duty that either was included in the subcontract price or was the basis of an increase in the subcontract price, the amount of the reduction shall be paid or credited to the University as the University directs.

(i) The Subcontractor shall take all reasonable action to obtain exemption from or refund of any taxes or duties, including interest or penalty, from which the United States Government, the University, the Subcontractor, any lower-tier subcontractor, or the transactions or property covered by the subcontract are exempt under the laws of the country concerned or its political subdivisions or that the governments of the United States and of the country concerned have agreed shall not apply to expenditures in such country by or on behalf of the United States Government.

(j) The Subcontractor shall promptly notify the University of all matters relating to taxes or duties that reasonably may be expected to result in either an increase or decrease in the subcontract price and shall take appropriate action as the University directs. At the direction of the University, the subcontract price shall be equitably adjusted to cover the costs of action taken by the Subcontractor, including any interest, penalty, and reasonable attorneys' fees.

C15, Termination for Convenience (FAR 52.249-2)

(a) The University may terminate performance of work under the subcontract in whole or, from time to time, in part if the University determines that a termination is in the Government's interest. The University shall terminate by delivering to the Subcontractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the University, the Subcontractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause.

(1) Stop work as specified in the notice.

(2) Place no further lower-tier subcontracts or orders (referred to as lower-tier subcontracts in this clause) for goods, services, or facilities, except as necessary to complete the continued portion of the subcontract

(3) Terminate all lower-tier subcontracts to the extent they relate to the work terminated.

(4) Assign to the University, as directed by the University, all right, title, and interest of the Subcontractor under the lower-tier subcontracts terminated, in which case the University or the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the University, settle all outstanding liabilities and termination settlement proposals arising from the termination of lower-tier subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the University, transfer title to the Government and deliver to the University (i) the fabricated or unfabricated parts, work in process, completed work, and other goods produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the subcontract had been completed, would be required to be furnished to the University.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the University may direct, for the protection and preservation of the property related to the subcontract that is in the possession of the Subcontractor and in which the University or the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the University, any property of the types referred to in subparagraph (6) above, provided, however, that the Subcontractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by and at prices approved by the University. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the University under the subcontract, credited to the price or cost of the work, or paid in any other manner directed by the University.

(c) After expiration of the "plant clearance period" (see FAR Subpart 45.6) the Subcontractor may submit to the University a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the University. The Subcontractor may request the University to remove those items or enter into an agreement for their storage. Within a reasonable time, the University, on behalf of the Government, will accept title to those items and remove them or enter into a storage agreement. The University may verify the list upon removal of the items, or if stored, within 90 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(d) After termination, the Subcontractor shall submit a final termination settlement proposal to the University in the form and with certification prescribed by the University. The Subcontractor shall submit the proposal promptly, but no later than one year from the effective date of termination, unless extended in writing by the University upon written request of the Subcontractor within this one-year period. However, if the University determines that the facts justify the action, a termination settlement

proposal may be received and acted on after one year or any extension. If the Subcontractor fails to submit the proposal within the time allowed, the University may determine, on the basis of information available, the amount, if any, due the Subcontractor because of the termination and shall pay the amount determined.

(e) Subject to paragraph (d) above, the Subcontractor and the University may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (e) or paragraph (f) below, exclusive of costs shown in subparagraph (f)(3) below, may not exceed the total subcontract price as reduced by (1) the amount of payments previously made and (2) the subcontract price of work not terminated. The subcontract shall be amended and the Subcontractor paid the agreed amount. Paragraph (f) below shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(f) If the Subcontractor and the University fail to agree on the whole amount to be paid because of the termination of work, the University shall pay the Subcontractor the amounts determined by the University as follows, but without duplication of any amounts agreed on under paragraph (e) above:

(1) The subcontract price for completed goods or services accepted by the University (or sold or acquired under subparagraph [(c)][(9)] above) not previously paid for, adjusted for any saving of freight and other charges.

(2) The total of

(i) The costs incurred in the performance of the work terminated, including initial costs and preparatory expense allocable thereto, but excluding any costs attributable to goods or services paid or to be paid under subparagraph (f)(1) above;

(ii) The cost of settling and paying termination settlement proposals under terminated lower-tier subcontracts that are properly chargeable to the terminated portion of the subcontract if not included in subparagraph (i) above; and

(iii) A sum, as profit on subparagraph (i) above, determined by the University under Section 49.202 of the FAR to be fair and reasonable; however, if it appears that the Subcontractor would have sustained a loss on the entire subcontract had it been completed, the University shall allow no profit under the subparagraph (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(3) The reasonable costs of settlement of the work terminated, including

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of lower-tier subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of termination inventory.

(g) Except for normal spoilage, and except to the extent that the University or the Government expressly

assumed the risk of loss, the University shall exclude from the amounts payable to the Subcontractor under paragraph (f) above the fair value, as determined by the University, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the University or to a purchaser.

(h) The costs principles and procedures of Part 31 of the FAR shall govern all costs claimed, agreed to, or determined under this clause.

(i) The Subcontractor shall have the right of appeal, under the Disputes clause, from any determination made by the University under paragraph (d), (f), or (k) except that if the Subcontractor failed to submit the termination settlement proposal within the time provided in paragraph (d) or (k), and failed to request a time extension, there is no right of appeal. If the University has made a determination of the amount due under paragraph (d), (f) or (k), the University shall pay the Subcontractor (1) the amount determined by the University if there is no right of appeal or if no timely appeal has been taken, or (2) the amount finally determined on an appeal.

(j) In arriving at the amount due the Subcontractor under this clause, there shall be deducted

(1) All unliquidated payments to the Subcontractor under the terminated portion of the subcontract;

(2) Any claim that the University has against the Subcontractor under the subcontract; and

(3) The agreed price for or the proceeds of sale of goods or other things acquired by the Subcontractor or sold under the provisions of this clause and not recovered by or credited to the University.

(k) If the termination is partial, the Subcontractor may file a proposal with the University for an equitable adjustment of the price(s) of the continued portion of the subcontract. The University shall make any equitable adjustment agreed upon. Any proposal by the Subcontractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the University.

(l) (1) Under the terms and conditions it prescribes, the University may make partial payments and payments against costs incurred by the Subcontractor for the terminated portion of the subcontract if the University believes the total of these payments will not exceed the amount to which the Subcontractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Subcontractor shall repay the excess to the University upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215 (b)(2). Interest shall be computed for the period from the date the excess payment is received by the Subcontractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Subcontractor's termination settlement proposal because of retention or other disposition of termination inventory until ten days after the date of the retention or disposition or a later date determined by the University because of the circumstances.

(m) Unless otherwise provided in the subcontract or by statute, the Subcontractor shall maintain all records and documents relating to the terminated portion of the subcontract for three years after final settlement. This includes all books and other evidence bearing on the Subcontractor's costs and expenses under the subcontract. The Subcontractor shall make these records and documents available to the University or the Government at the Subcontractor's office at all reasonable times and

without any direct charge. If approved by the University, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

ATTACHMENT A

B35, Rights in Data - General

(a) *Definitions.* "Computer software," as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data," as used in this clause, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software, it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited rights," as used in this clause, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of subparagraph (g)(2) if included in this clause.

"Limited rights data," as used in this clause, means data (other than computer software) developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged.

"Restricted computer software," as used in this clause, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software, including minor modifications or such computer software.

"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of subparagraph (g)(3) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made a part of the subcontract, including minor modifications of such computer software.

"Technical data," as used in this clause, means data (other than computer software) which are of a scientific or technical nature.

"Unlimited rights," as used in this clause, meant the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(b) *Allocation of rights.*

(1) Except as provided in paragraph (c) of this clause regarding copyright, the Government shall have unlimited rights in -

(i) Data first produced in the performance of the subcontract;
(ii) Form, fit, and function data delivered under the subcontract;
(iii) Data delivered under this subcontract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the subcontract; and
(iv) All other data delivered under the subcontract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (g) of this clause.

(2) The Subcontractor shall have the right to -

(i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Subcontractor in the performance of the subcontract unless provided otherwise in paragraph (d) of this clause;
(ii) Protect from unauthorized disclosure and use those data which are limited rights data or restricted computer software to the extent provided in paragraph (g) of this clause;
(iii) Substantiate use of, add or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and
(iv) Establish claim to copyright subsisting in data first produced in the performance of the subcontract to the extent provided in subparagraph (c)(1) of this clause.

(c) *Copyright.*

(1) Data first produced in the performance of the subcontract. Unless provided otherwise in paragraph (d) of this clause, the Subcontractor may establish, without prior approval of the University, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of the subcontract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the University is required to establish claim to copyright subsisting in all other data first produced in the performance of the subcontract. When claim to copyright is made, the Subcontractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including subcontract number) to the data when such data are delivered to the University as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software, the Subcontractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Subcontractor grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, or perform publicly or display publicly by or on behalf of the Government.

(2) *Data not first produced in the performance of the subcontract.* The Subcontractor shall not, without prior written permission of the University, incorporate in data delivered under the subcontract any data not first produced in the performance of the subcontract and which contains the copyright notice of 17 U.S.C. 401 or 402, unless the Subcontractor identifies such data and

grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause; *provided,* however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(3) of this clause if included in the subcontract or as otherwise may be provided in a collateral agreement incorporated in or made part of the subcontract.

(3) *Removal of copyright notices.* The University agrees not to remove any copyright notices placed on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(d) *Release, publication and use of data.*

(1) The Subcontractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Subcontractor in the performance of the subcontract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph of this clause or expressly set forth in the subcontract.

(2) The Subcontractor agrees that to the extent it receives or is given access to data necessary for the performance of the subcontract which contains restrictive markings, the Subcontractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the University.

(3) The Subcontractor agrees not to establish claim to copyright in computer software first produced in the performance of the subcontract without prior written permission of the University. When such permission is granted, the University shall specify appropriate terms to assure dissemination of the software. The Subcontractor shall promptly deliver to the University or to the Patent Counsel designated by the University a duly executed and approved instrument fully confirmatory of all rights to which the Government is entitled, and other terms pertaining to the computer software to which claim to copyright is made.

(e) *Unauthorized marking of data.*

(1) Notwithstanding any other provisions of the subcontract concerning inspection or acceptance, if any data delivered under the subcontract are marked with the notices specified in subparagraph (g)(2) or (g)(3) of this clause, or if such data bears any other restrictive or limiting markings not authorized by the subcontract, the University may at any time either return the data to the Subcontractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The University shall make written inquiry to the Subcontractor affording the Subcontractor 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Subcontractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the University for good cause shown), the University shall have the right to cancel or ignore the markings at any

time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Subcontractor provides written justification to substantiate the propriety of the markings within the period set in subdivision (e)(1)(i) of this clause, the University shall consider such written justification and determine whether or not the markings are to be canceled or ignored. If the University determines that the markings are authorized, the Subcontractor shall be so notified in writing. If the University determines, with the concurrence of the DOE Contracting Officer, that the markings are not authorized, the University shall furnish the Subcontractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Subcontractor files suit in a court of competent jurisdiction within 90 days of receipt of the University's decision. The University shall continue to abide by the markings under this subdivision (c)(1)(ii) until final resolution of the matter either by the University's determination becoming final (in which instance the University shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedure set forth in subparagraph (e)(1) of this clause may be modified in accordance with DOE regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) This paragraph (e) does not apply if this subcontract is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard agency subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

(4) Except to the extent the University's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Subcontractor is not precluded by this paragraph (e) from bringing a claim under the Disputes clause of the subcontract that may arise as the result of the University removing or ignoring authorized markings on data delivered under the subcontract.

(f) *Omitted or incorrect markings.*

(1) Data delivered to the University without either the limited rights or restricted rights notice as authorized by paragraph (g) of this clause, or the copyright notice required by paragraph (c) of this clause, shall be deemed to have been furnished with unlimited rights, and the University assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the University or the Government, the Subcontractor may request, within 6 months (or a longer time approved by the University for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Subcontractor's expense, and the University may agree to do so if the Subcontractor-

(i) Identifies the data to which the omitted notice is to be applied;
(ii) Demonstrates that the omission of the notice was inadvertent;
(iii) Establishes that the use of the proposed notice is authorized; and

(iv) Acknowledges that the University has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice resulting from the omission of the notice.

(2) The University may also (i) permit correction at the Subcontractor's expense of incorrect notices if the Subcontractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(g) *Protection of limited rights data and restricted computer software.*

(1) When data other than that listed in subdivisions (b)(1)(i), (ii), and (iii) of this clause are specified to be delivered under the subcontract and qualify as either limited rights data or restricted computer software, if the Subcontractor desires to continue protection of such data, the Subcontractor shall withhold such data and not furnish them to the University under the subcontract. As a condition to this withholding, the Subcontractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the University are to be treated as limited rights data and not restricted computer software.

(h) *Subcontracting.* The Subcontractor has the responsibility to obtain from its lower-tier subcontractors all data and rights therein necessary to fulfill the Subcontractor's obligations to the University under the subcontract. If a lower-tier subcontractor refuses to accept terms affording the University such rights, the Subcontractor shall promptly bring such refusal to the attention of the University and not proceed with lower-tier subcontract award without further authorization.

(i) *Relationship to patents.* Nothing contained in this clause shall imply a license to the University or Government under any patent or be construed as affecting the scope of any license of other right otherwise granted to the University or the Government.

(j) The Subcontractor agrees, except as may be otherwise specified in the subcontract for specific data items listed as not subject to this paragraph, that the University may, up to three years after acceptance of all items to be delivered under the subcontract, inspect at the Subcontractor's facility any data withheld pursuant to paragraph (g)(1) of this clause, for purposes of verifying the Subcontractor's assertion pertaining to the limited rights or restricted rights status of the data or for evaluating work performance. Where the Subcontractor whose data are to be inspected demonstrates to the University that there would be a possible conflict of interest if the inspection were made by a particular representative, the University shall designate an alternate inspector.

B35a, Additional Paragraph (g)(2) to Clause B35, Rights in Data-General

(2) Notwithstanding subparagraph (g)(1) of this clause, the subcontract may identify and specify the delivery of limited rights data, or the University may require by written request the delivery of limited rights data that has been withheld or would otherwise be withholdable. If delivery of such data is so required, the Subcontractor may affix the following "Limited Rights Notice" to the data and the University will thereafter treat the data, subject to the provisions of paragraphs (e) and (f) of this clause, in accordance with such Notice:

LIMITED RIGHTS NOTICE

(a) These data are submitted with limited rights under Subcontract No. _____ (and lower-tier subcontract, if appropriate). These data may be reproduced and used by the University and the Government with the express limitation that they will not, without written permission of the Subcontractor, be used for purposes of manufacture nor disclosed outside the University or the Government; except that the University or the Government may disclose these data outside the University or the Government for the following purposes, if any; provided that the University and the Government makes such disclosure subject to prohibition against further use and disclosure:*

(b) This Notice shall be marked on any reproduction of these data in whole or in part.

(End of Notice)

***The purposes shall be identified in the subcontract schedule when this clause is used.**

B35b, Additional Paragraph (g)(3) to Clause B35, Rights in Data - General

(3)(i) Notwithstanding subparagraph (g)(1) of this clause, the subcontract may identify and specify the delivery of restricted computer software, or the University may require by written request the delivery of restricted computer software that has been withheld or would otherwise be withholdable. If delivery of such computer software is so required, the Subcontractor may affix the following "Restricted Rights Notice" to the computer software, the University will thereafter treat the computer software, subject to paragraphs (e) and (f) of this clause, in accordance with the Notice:

RESTRICTED RIGHTS NOTICE

(a) This computer software is submitted with restricted rights under Subcontract No. _____ (and lower-tier subcontract _____ if appropriate). It may not be used, reproduced, or disclosed by the University or the Government except as provided in paragraph (b) of this Notice or as otherwise expressly stated in the subcontract.

(b) This computer software may be -

(1) Used or copied for use in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;

(2) Used or copied for use in a backup computer if any computer for which it was

acquired is inoperative;

(3) Reproduced for safekeeping (archives) or backup purposes;

(4) Modified, adapted, or combined with other computer software, *provided* that the modified, combined, or adapted portions of the derivative software incorporating restricted computer software are made subject to the same restricted rights;

(5) Disclosed to and reproduced for use by support service Contractors or Subcontractors in accordance with subparagraphs (b)(1) through (4) of this clause, provided the University or the Government makes such disclosure or reproduction subject to these restricted rights; and

(6) Used or copied for use in or transferred to a replacement computer.

(c) Notwithstanding the foregoing, if this computer software is published copy-righted computer software, it is licensed to the Government, without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause.

(d) Any other rights or limitations regarding the use, duplication, or disclosure of this computer software are to be expressly stated or incorporated in, the subcontract.

(e) This Notice shall be marked on any reproduction of this computer software, in whole or in part.

(End of Notice)

(ii) Where it is impractical to include the Restricted Rights Notice on restricted computer software, the following short-form Notice may be used in lieu thereof:

RESTRICTED RIGHTS NOTICE SHORT FORM

Use, reproduction, or disclosure is subject to restrictions set forth in Subcontract No. _____(and lower-tier subcontract _____, if appropriate) with _____ (name of Subcontractor and lower-tier subcontractor).

(End of Notice)

(iii) If restricted computer software is delivered with the copyright notice of 17 U.S.C. 401, it will be presumed to be published copyrighted computer software licensed to the University and the Government without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause, unless the Subcontractor includes the following statement with such copyright notice: "Unpublished - rights reserved under the Copyright Laws of the United States."

APPENDIX A

REPORT PREPARATION INSTRUCTIONS

These instructions apply to all formal reports (i.e., other than letter reports or those specifically identified in the Subcontract schedule as informal reports) called for in SECTION B of the Subcontract schedules.

1. Reports shall fairly and completely describe the efforts applied to and the results obtained toward the achievement of the objectives of the work called for by the Subcontract. If an objective or objectives are not accomplished, such failure(s) shall be fully documented and explained in the report.

2. Reports shall be in the following format:

   a. A brief abstract describing the overall objective of the work effort and the results attained toward achieving the objective(s).

   b. A statement of each objective and description of the effort performed and accomplishments toward achieving the objective.

   c. A list of any publication or any other information release made of material developed or maintained through the performance of the Subcontract.

   d. Any other information pertinent to the progress and/or accomplishment of the Subcontract objectives.

APPENDIX B

UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

WORK ON UNIVERSITY OR GOVERNMENT PREMISES
(Long-Term or High Risk)

The following clauses shall apply to any work performed by the Subcontractor or its lower-tier subcontractors under this Subcontract at a University controlled or Government owned or leased premises:

A. LIENS

1. The Subcontractor agrees that, at any time upon the request of the University, it will submit a sworn statement setting forth the services performed or goods furnished by its lower-tier subcontractors and suppliers, and the amount due and to become due to each, and that before the final payment called for hereunder, it will, if requested, submit to the University a complete set of vouchers showing what payments have been made for goods and labor used in connection with the work called for hereunder.

2. The Subcontractor shall indemnify and hold harmless the University and the Government from all claims, demands, causes of action, or suits, of whatever nature, arising out of the services, labor, and materials furnished by the Subcontractor or its lower-tier subcontractors under this Subcontract, that relate to all laborers', materialmen's, and mechanics' liens upon the real property upon which the work is located or any other property of the University or the Government.

3. The Subcontractor shall promptly notify the University, in writing, of any such claims, demands, causes of action, or suits brought to its attention. The Subcontractor shall forward with such notification copies of all pertinent papers received by the Subcontractor with respect to any such claims, demands, causes of action, or suits and, at the request of the University, shall do all things and execute and deliver all appropriate documents and assignments in favor of the University or the Government of all Subcontractors' rights and claims growing out of such asserted claims as will enable the University and the Government to protect their respective interests by litigation or otherwise.

4. The final payment shall not be made until the Subcontractor, if required, shall deliver to the University a complete release of all liens arising out of this Subcontract, or receipts in full in lieu thereof, as the University may require, and if required in either case, an affidavit that as far as it has knowledge or information, the receipts include all the labor and goods for which a lien could be filed; but Subcontractor may, if any lower-tier subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the University to indemnify it against any claim by lien or other means. If any lien or claim remains unsatisfied after all payments are made, the Subcontractor shall refund to the University all money that the latter may be compelled to pay in discharging such lien or claim, including all costs and reasonable attorney's fees.

B. CLEANING UP

The Subcontractor shall at all times keep the University or Government premises and adjoining premises where the work is performed free from accumulations of waste material or rubbish caused by its employees or work of any of its lower-tier subcontractors; and at the completion of the work, the Subcontractor shall remove all rubbish from and about the building and all of its and its subcontractor's tools, scaffolding, and surplus materials and shall leave the work area "broom clean" or its equivalent, unless more exactly specified. In cases of a dispute between the Subcontractor and its lower-tier subcontractors employed on or about the structure or structures upon which the work is to be done, as herein provided, as to responsibility for the removal of rubbish, or, in case the same is not promptly removed as herein required, the University may remove the rubbish and charge the cost to the Subcontractor.

C. EMPLOYEES

1. The Subcontractor shall not employ on the work any unfit person or anyone not skilled in the work assigned to the person and shall devote only its best qualified personnel to work under this Subcontract. Should the University deem anyone employed on the work incompetent or unfit for duty and so inform the Subcontractor, the Subcontractor shall remove such person from work under this Subcontract and that person shall not again, without written permission of the University, be assigned to work under this Subcontract.

2. It is understood that if the employees of the University shall perform any acts for the purpose of discharging the responsibility undertaken by the Subcontractor hereunder, whether requested by the Subcontractor or not, such employees of the University while performing such acts shall be considered the agents and servants of the Subcontractor, subject to the exclusive control of the Subcontractor.

D. INDEMNIFICATION & INSURANCE

1. Indemnification

The Subcontractor shall defend, indemnify and hold harmless the University and the U.S. Government, their officers, employees and agents from and against all losses and expenses (including costs of attorney's fees) by reason of liability imposed by law for damages because of personal injury, including death at any time resulting therefrom, sustained by any person or persons, and damage to property, including loss of use thereof, arising out of or in consequence of the performance of this Subcontract, provided such injuries to persons or damage to property are due or claimed to be due, in whole or in part, to the negligence or willful acts or omissions of the Subcontractor, its officers, employees, agents, subcontractors or anyone directly or indirectly employed by them, or any person or persons under the Subcontractor's direction and control.

2. Insurance

The Subcontractor shall at its expense obtain, keep in force, and maintain insurance to cover its performance under this Subcontract in amounts set forth below. Further, the Subcontractor agrees that the University and the U.S. Department of Energy (DOE) shall be **"additional named insureds"** on public liability and property damage insurance coverage, and said insurance coverage shall be primary over any other valid collectible insurance of the University or DOE.

Such insurance shall be maintained in full force and effect during the performance of work required by this Subcontract:

(a) Business Auto Liability:	
Bodily Injury:	$ 100,000 (per person)
Property Damage:	$ 100,000 (per occurrence)
Combined Single Limit:	$1,000,000
(b) Worker's Compensation:	As required by law of state of employment
(c) General Liability Insurance:	
General Aggregate	$ 500,000 (per occurrence)
Products & Completed Operations Aggregate	$3,000,000
Personal and Advertising Injury	$1,000,000
Each Occurrence	$ 500,000
Fire Damage	$ 50,000 (per occurrence)
(OR)	
(d) Commercial Form with Aggregate Limit:	$3,000,000

Upon award of this Subcontract, the Subcontractor shall furnish to the University, upon request, certificates of insurance evidencing compliance with all requirements of insurance coverage as indicated above. The certificates of insurance shall indicate that the Subcontractor's insurers are to notify the University at least thirty (30) days prior to cancellation of or change in any of the said insurance coverage.

Before permitting any lower-tier subcontractor, other than a seller or vendor of standard commercial items and supplies, to perform any work under this Subcontract, the Subcontractor shall require the lower-tier subcontractor to furnish to the Subcontractor satisfactory evidence that the lower-tier subcontractor has obtained and maintains insurance consistent with the above specified types and amounts for all such equipment that the lower-tier subcontractor will use on the Subcontract work.

All such insurance policies shall include a "Waiver of Subrogation" in favor of the University and the Government.

E. ENVIRONMENT, SAFETY, HEALTH, AND FIRE PROTECTION

1. The Subcontractor shall take all reasonable precautions in the performance of the work under this Subcontract to protect the health and safety of employees and of members of the public; minimize danger from all hazards to life and property; and, to the extent compliance is required, shall comply with all health, safety, fire protection, and environmental regulations and requirements, including reporting requirements, of the University and DOE. The University shall notify the Subcontractor in writing of any noncompliance with the provisions of this clause and the corrective action to be taken. After receipt of such notice, the Subcontractor shall immediately take corrective action. This corrective action shall include, as a minimum, that the Subcontractor promptly submit a management program and implementation plan to the University for review and approval. In the event that the Subcontractor fails to comply with said regulations or requirements of the University or DOE, the University may, without

prejudice to any other legal or contractual rights of the University or DOE, issue an stop-work order stopping all or any part of the work; thereafter, a start order for resumption of the work may be issued at the discretion of the University. The Subcontractor shall make no claim for an extension of time or for compensation or damages by reason of or in connection with such work stoppage.

2. The Subcontractor shall take all reasonable measures and precautions at all times to prevent injuries to or death of its employees or any other person in the proximity of where the work is being performed. Such measures and precautions shall include, but shall not be limited to, all safeguards and warnings necessary to protect workers and others against any conditions on University or Government premises which could be dangerous and to prevent accidents of any kind whenever work is being performed in proximity to any moving or operating machinery, equipment, or facilities, whether such machinery, equipment, or facilities are the property of or are being operated by the Subcontractor, its lower-tier Subcontractors, the University, or other persons.

F. SECURITY – ON-SITE PERSONNEL

The Subcontractor and its personnel performing work or services at the Lawrence Livermore National Laboratory or other University-controlled sites must be U. S. citizens, must comply with applicable Government and University site access and security requirements, and may be required to work under security escort, unless they possess a proper security clearance and the Subcontractor has a DOE-approved foreign ownership, control, and influence (FOCI) certification.

G. VEHICLE OPERATION

Subcontractor personnel operating any vehicle on University-controlled sites are required to possess a valid driver's license issued by the State of California or other state, if appropriate. In addition, all vehicles shall be operated in a safe manner, in accordance with the California Motor Vehicle Code, and in compliance with the posted traffic regulations of the University, including parking restrictions. Failure to comply with these requirements may result in the University revoking the on-site driving privileges of the offending Subcontractor personnel.

H. HEALTH HAZARDS AND HOLD HARMLESS INDEMNIFICATION

(Applicable if any work is performed at the Lawrence Livermore National Laboratory's Site 300.)

1. Representations

The Subcontractor represents that it is aware that the Lawrence Livermore National Laboratory's Site 300 area, located in San Joaquin County, has dirt formations which contain spores of Coccidioidomycosis ("Valley Fever") which is common to San Joaquin County. The Subcontractor further represents that appropriate precautionary measures will be taken by the Subcontractor, including its lower-tier-subcontractor's, to protect the health of employees, other workers, including University of California employees, or other individuals or personnel who may be involved with the Subcontractor's work or services at Site 300 under this Subcontract.

Certain precautionary measures are described in a pamphlet entitled "Coci (Coccidioidomycosis) -- Facts About Your Lungs" published by the American Lung Association. The pamphlet may be obtained from the American Lung Association located in the county in which the Subcontractor's or lower-tier subcontractor's business is established.

2. Indemnification

The Subcontractor agrees to indemnify and hold harmless the University and the Government from any or all claims and expenses, including reasonable legal fees, arising from personal injury, including death, which may be asserted against the University or the Government by the employees of the Subcontractor or its lower-tier subcontractor' who have visited or may visit the Site 300 area, or other individuals exposed by such employees resulting from the natural occurrences of the risks enumerated above, provided the Subcontractor or its lower-tier subcontractor, as appropriate, is given written notice by registered mail of any claim instituted against the University or the Government regarding the subject matter indemnified herein.

3. Insurance

The Subcontractor agrees to maintain such public liability, employer's liability, and compensation insurance as will protect the University and the Government from the risks enumerated above and from any and all claims under any Worker's Compensation Acts, Occupational Disease Acts, and similar state and/or federal statutes enacted for the benefit of employees. Each such policy must contain a provision waiving any right of subrogation against the University and the Government which may arise by reason of any payment under the policy.

I. WHISTLEBLOWER PROTECTION FOR SUBCONTRACTOR EMPLOYEES

1. The Subcontractor shall comply with the requirements of the "DOE Contractor Employee Program" at 10 CFR Part 708.

2. The Subcontractor shall insert or have inserted the substance of this clause, including this paragraph 2, in subcontracts, at all tiers, with respect to work performed on-site at a DOE-owned or leased facility, as provided in 10 CFR Part 708.

APPENDIX C

LAWRENCE LIVERMORE NATIONAL LABORATORY
PROCUREMENT & MATERIEL

SECURITY AND SITE ACCESS PROVISIONS

The following provisions are applicable to the University's Lawrence Livermore National Laboratory (LLNL) or Site 300 facilities. The LLNL is located at 7000 East Avenue, Livermore, CA; Site 300 is located off of Corral Hollow Road, 4 Miles SW of Interstate 580, 10 miles SW of Tracy, CA. As used herein, the term "Laboratory" includes both facilities; provisions pertaining to one of the facilities are so indicated.

1.0 SECURITY AREAS & ACCESS REQUIREMENTS

"CONTROLLED" AREAS. The LLNL and Site 300 are enclosed by a perimeter fence establishing a "Controlled" area.

All unescorted persons within the Controlled Area of the Laboratory are required to be United States citizens, to have executed a Department of Energy (DOE) Personnel Security Questionnaire (short form) and a fingerprint card, and to have undergone security processing and issued a badge, as further described in Section 2.0, below.

(a) Naturalized citizens must provide proper evidence of their naturalization.

(b) Aliens are not permitted within the Controlled Area of the Laboratory without the written consent of DOE obtained through the University under applicable DOE Security Regulations

(c) Personnel making normal truck deliveries for vendors shall be United States citizens and carry a current operators license. Such personnel will be issued a temporary truck pass, but security processing will not be required.

"OPEN" AREAS are certain areas within the "Controlled" Area of the LLNL that are open to uncontrolled access between the hours of 7:30 a.m. and 5 p.m., Monday through Friday.

In general, security processing and badges will not be required in Open Areas of the LLNL between the hours of 7:30 am and 5 p.m., Monday through Friday, but all Subcontractor's personnel within an Open Area must be United States citizens.

"LIMITED" AND "EXCLUSION" AREAS are security areas within the Controlled Areas enclosed by 8-foot high security fences, access to which is controlled by guarded entry/exit posts or controlled access by individual number (CAIN) Booths.

In addition to the requirements for access to the Controlled Areas, any work within a Limited or Exclusion Area shall also be conducted under University-provided Protective Services escort. Therefore, it is required that at least 48-hours notice be given to the University's LLNL Contract Badge Office or Site 300 Badge Office, as applicable, prior to the Subcontractor's scheduled entry into a Limited or Exclusion Area. Such notice shall include an estimate of the amount of time required to complete the work therein.

"PROTECTED" (SUPERBLOCK) AREA is a security area within the "Controlled" Area of the LLNL enclosed by 8-foot high security fences and other physical barriers, access to which is controlled by controlled access by individual number (CAIN) booths, metal detectors, and vehicle sally ports.

Any work within the Protected (Superblock) Area shall be conducted by personnel who (1) have executed an "Authority to Conduct Background Investigation and Release Information and Records" document, (2) had a preliminary background investigation completed, and (3) have received a clearance.

Any work within the Protected (Superblock) Area shall also be conducted under University-provided Protective Services escort. Therefore, it is required that at least 48-hours notice be given to the University's LLNL Contract Badge Office prior to the Subcontractor's scheduled entry into the "Protected" (Superblock) Area. Such notice shall include an estimate of the amount of time required to complete the work therein.

2.0 SECURITY PROCESSING; BADGING

2.1 The Subcontractor shall notify the University's LLNL Contract Badge Office (510/422-7554) or Site 300 Badge Office (510/423-5221), as applicable, 48-hours prior to initial entry to the Laboratory. At this time, the Subcontractor shall state the number of people to be processed.

2.2 At the time of initial entrance to the Laboratory, the Subcontractor's personnel shall report to the LLNL Contract Badge Office in Building 615, located off of East Avenue between the Building 411 shipping/receiving entrance and Greenville Road, or the Site 300 Badge Office in Building T-8806, located off of Corral Hollow Road west of the Main Entrance Gate, as applicable, for security processing.

2.2.1 All personnel appearing at the Badge Office for entry processing shall present the following information: Subcontractor's company name, location of work site, and the Subcontractor's Subcontract number.

2.2.2 The Subcontractor and its personnel will immediately thereafter be provided access to the Controlled Area, with the understanding that the continued presence of the Subcontractor and its personnel at the Laboratory is subject to review by the University based upon a check of appropriate records of law enforcement agencies.

2.2.3 The Subcontractor and its personnel shall wear badges above the waist and in plain sight at all times while working within the limits of the Laboratory.

2.3 Sufficient badges will be supplied to the Subcontractor at no cost. The badges shall remain

the property of the Government. The Subcontractor and its personnel shall return the badges to the Badge Office upon termination of employment at the Laboratory.

2.4 Subcontractor's personnel will be processed without charge to the Subcontractor. The Subcontractor will not be reimbursed for the cost of "lost time" required for the processing of its personnel.

3.0 WORK CONDITIONS & RESTRICTIONS

3.1 All Subcontractor personnel assigned for work at the Laboratory, including lower-tier subcontractors, shall be made aware of and shall comply at all times with these Security and Site Access Provisions. Permission for access to the Laboratory for any and all persons who violate these Security and Site Access Provisions shall be revoked.

3.2 Subcontractor's personnel access to the Laboratory shall be limited to the work site area(s) specified in the Subcontract. Personnel working on outside projects are prohibited from entering any buildings within the area of work, except when granted permission by the University.

3.3 All personal belongings of the Subcontractor's employees, including briefcases, lunch boxes, handbags, and vehicles driven by Subcontractor's employees, are subject to search for prohibited items, upon entering and leaving the Laboratory, at the discretion of the Laboratory Security Department. In addition, subcontractors, materialmen, and vendors entering and leaving the Laboratory are also subject to search for prohibited items.

3.4 Except as otherwise provided in the Subcontract, work operations shall be limited to the hours between 7:30 a.m. and 5:00 p.m. Mondays through Fridays, at the LLNL, and between 8:00 a.m. and 5:00 p.m. Mondays through Fridays, at Site 300, except on Laboratory holidays. Requests for approval from the University to work at times other than the time stated herein shall be submitted at least 48 hours in advance.

3.5 Materials, parked vehicles or equipment, trailers, or temporary storage buildings shall not be located within 50 feet of any existing fence, or within 25 feet of power poles or manholes. Exceptional circumstances shall be as indicated in the Subcontract.

3.6 Objects shall not be picked up or removed from the limits of the Laboratory, except for Subcontractor's materials, or materials removed in and designated by the Subcontract to be removed from the Laboratory.

3.7 All materials for installation and conduct of the work shall be brought into the Laboratory so as to minimize interference with the activities of the Laboratory and other work at the Laboratory.

4.0 PROHIBITED ITEMS

4.1 Except as otherwise provided herein, the following items shall not be brought within the limits of the Laboratory without proper authorization:

4.1.1 Firearms or other weapons.

4.1.2 Explosives or incendiary devices.

4.1.3 Cameras.

4.1.4 Binoculars or telescopes.

4.1.5 Narcotics and dangerous drugs, marijuana, LSD, cocaine, and other hallucinatory substances.

4.1.6 Alcoholic beverages.

4.1.7 Poisonous or corrosive solids, liquids, or gasses.

4.1.8 Electronic transmitting or receiving devices, except radio equipment that is installed in vehicles and operating on frequencies assigned by the Federal Communications Commission (FCC). Citizens Band radios and mobile telephones may be used only for communication between elements of a Subcontractor's organization.

All prohibited items listed above may be confiscated if they are brought into the Laboratory without permission or if they are being used for other purposes than those stated in the request.

4.2 Written permission from the Laboratory Security Department shall be obtained for each prohibited item brought into the Laboratory if such items are required for execution of the work.

4.2.1. Permission shall be requested through the University's Technical Representative or Technical Release Representative, including a statement of need, the period of time that the item will be required, and the person responsible for its use.

4.2.2 The items shall be removed from the Laboratory immediately upon termination of their need or termination of the period stated in the Subcontractor's request.

5.0 FENCE PENETRATIONS

5.1 No penetrations shall be made over, under, or through existing security fences located within or on the perimeter of the Laboratory without the permission of the University.

5.2 All required security fence penetrations shall be conducted under Protective Services escort.

5.3 Temporary barricades shall be installed for all penetrations when work requiring Protective Services escort is not in progress. These barricades shall be located at the existing fence line, and the Subcontractor shall use panel inserts supplied by the University, or other approved materials.

5.4 The installed barricades shall be approved by the Laboratory Security Department and shall

provide the same degree of security protection as afforded by the existing fence.

6.0 USE OF EXISTING ROADS

6.1 All Subcontractor's personnel, and other persons assigned for work at the Laboratory, shall be made aware of and shall comply at all times with the following requirements:

6.1.1 Posted speed limits

6.1.2 All signs and posted notices.

6.2 Points of access to the work for vehicles and personnel shall be as designated on the Subcontract drawings or as stated in the Subcontract.

6.3 Only vehicles with pneumatic tires shall be allowed on existing roads.

6.4 All motorized equipment shall be equipped with mufflers.

6.5 Use of Laboratory roads for heavy traffic shall be minimized.

6.6 Only certain existing roads within the Laboratory shall be designated for the Subcontractor's use. Other roads shall not be used without first obtaining permission from the University.

6.7 All Laboratory roads shall be kept open at all times. When obstructions on existing Laboratory roads are required because of the work, approval shall be obtained from the University and complete detours or other temporary measures shall be established prior to the start of other work.

6.8 Suitable temporary barricades, fences, or other structures as required shall be provided and maintained for the protection of the public, traffic, and personnel about the work site; walks around any obstruction made in public places shall be provided; and sufficient light on or near the work-area shall be maintained to protect workers, travelers, and other personnel from injury during all hours of darkness.

6.8.1 All barricades shall be provided with battery-operated warning lights during hours of darkness.

6.8.2 No lighting with open flames shall be permitted.

6.9 The Subcontractor is responsible for all damage to utilities, streets, curbs, and gutters resulting from its work, and shall at its own expense repair all such damage at the completion of this work, or sooner if directed by the University.

7.0 PARKING

7.1 Subcontractor's Vehicles

7.1.1 Vehicles and equipment shall be parked only in areas completely off the existing

Laboratory roads, or in areas designated for parking within the work-area limits. Access for other types of vehicles may be requested through the University.

7.1.2 Cranes, booms, drilling rigs, and similar tall equipment shall be kept clear of overhead electrical conductors. The Subcontractor shall be responsible, and shall hold the University harmless, for any damage or injury caused by unsafe acts of its operators.

7.2 Personal Vehicles. Parking space for the private vehicles of the Subcontractor's personnel will be available within the established parking lots of the Laboratory, or entirely off the Laboratory site. No private vehicles are allowed into any other areas of the Laboratory, except as specifically stated in the Subcontract or with the permission of the University. The Subcontractor shall transport its personnel to the job site in Subcontractor vehicles.

8.0 WORK-AREA LIMITS FOR ROADS AND UNDERGROUND UTILITIES

8.1 The work-area limits for road work shall extend 100 feet from the top of all cuts and the toe of all fills on each side of the road.

8.2 The work-area for underground utilities and overhead power lines shall extend 100 feet on each side of the service to be installed. This shall apply when the utility or power line extends beyond a designated building work-area limit.

9.0 BLASTING AND HAULING OF EXPLOSIVES

9.1 Blasting of rock and other materials is not permitted at the LLNL, and is not contemplated at Site 300. However, if it becomes evident that the use of explosives at Site 300 is required, the Subcontractor shall notify the University 24 hours in advance of each blasting operation, stating the quantities and type of explosives proposed, and shall obtain approval from the University for each blasting operation. Explosives exceeding 6 pounds for each detonation will not be permitted. All blasting operations shall be conducted in accordance with the requirements of the State of California CRR Title 8, Chapter 4 Subchapter. 7 - General Industry Safety Orders.

9.2 Explosives shall not be brought, hauled, or moved into, within, or away from the boundaries of Site 300 without first obtaining permission in writing from the University.

9.2.1 Approval shall be requested from the University 24 hours in advance for every haul or move required, and all explosives shall be removed at the end of the working day.

9.2.2 The quantities and type of all explosives delivered to Site 300, quantities used for each detonation, and quantities removed from Site 300 at the end of the working day will be checked by the University.

9.2.3 All vehicles used for hauling explosives shall be properly marked and shall comply with the applicable State of California Highway Safety Requirements.

(END OF PROVISIONS)

APPENDIX D

ACCELERATED STRATEGIC COMPUTING INITIATIVE

(ASCI)

STATEMENT OF WORK

Attachment 2

STATEMENT OF WORK

ACCELERATED STRATEGIC COMPUTING INITIATIVE

(ASCI)

C6939RFP6-3X

LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS, NEW MEXICO

February 12, 1996

Table of Contents

Definitions

Particular paragraphs of the Statement of Work have the following designations and definitions

(a) **Mandatory requirements designated as (MR)**
Mandatory requirements, indicated with the verb "shall", are items that are essential to the University requirements and reflect the minimum qualifications an offeror must meet in order to have their proposal evaluated further for selection (see also Attachment 4, Evaluation Criteria).

(b) **Mandatory Option requirements designated as (MO)**
Mandatory Option requirements deal with features, components, performance characteristics, or upgrades whose availability as an option is deemed a Mandatory Requirement by the University. Hence, a proposal not meeting a Mandatory Option will be deemed technically nonresponsive. Because the University may variously elect to include or exclude such options in resulting orders, each should appear as a separately identifiable item in the Price and Administration Proposal. Exception: Offeror need only respond to either Specification 5.1.3.1.1 or Specification 5.1.3.1.2

(b) **Target Requirements designated as (TR).**
Each paragraph so labeled deals with features, components, performance characteristics or other properties that is considered a desirable part of the ASCI system but will not be a determining factor of response compliance. Requirements in the Statement of Work indicated with the verb "may" are targets. Target Requirement responses will be considered as part of the evaluation of Technical Excellence (see Attachment 4, Evaluation Criteria).

1.0 Introduction

1.1 Background

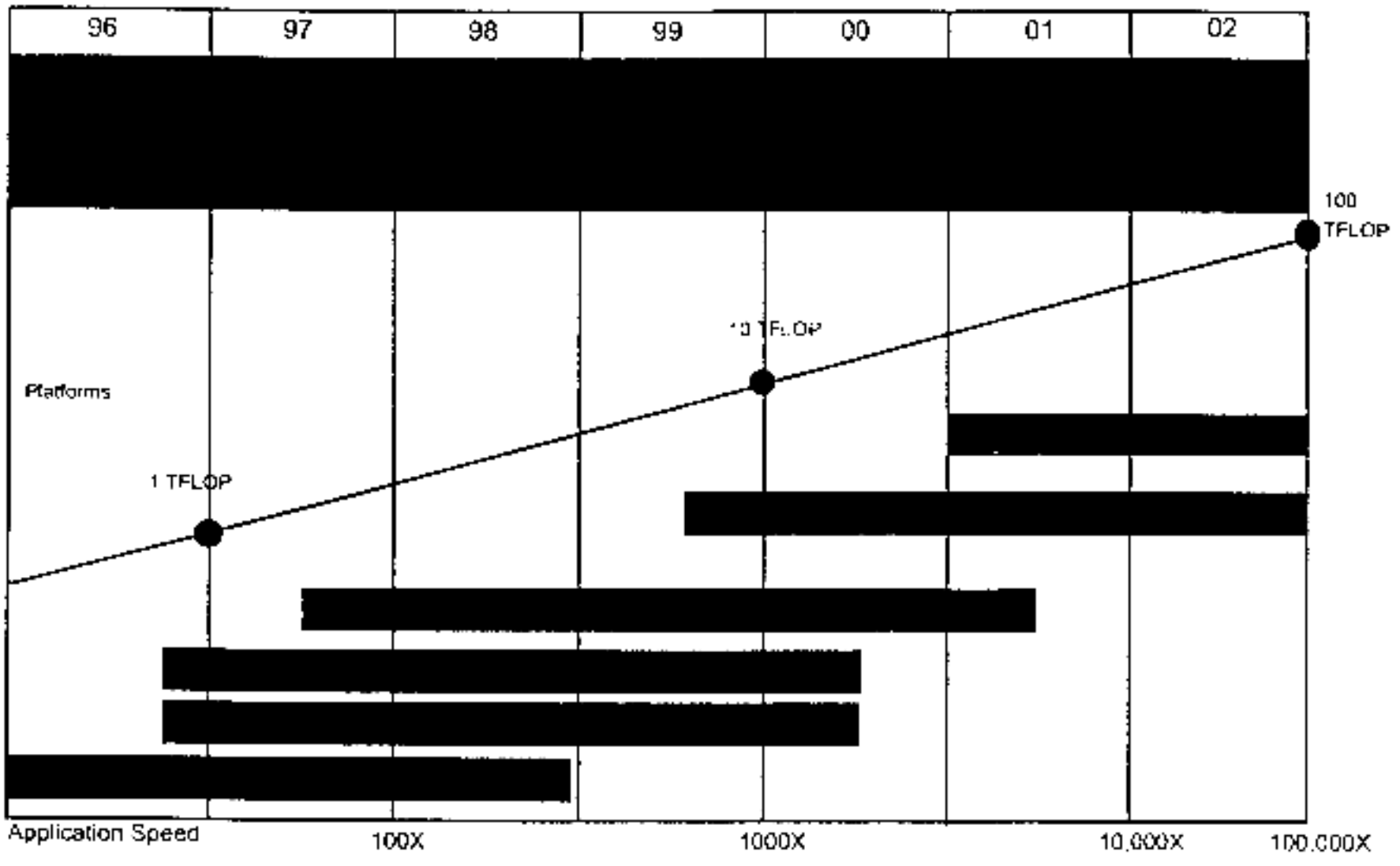
The Lawrence Livermore National Laboratory (LLNL) and the Los Alamos National Laboratory (LANL), operated by the University of California for the United States Department of Energy (DOE), as part of DOE's Accelerated Strategic Computing Program (ASCI, which also includes Sandia National Laboratories) are jointly seeking to accelerate the development of Tera-scale computing capability on clusters of shared memory multiprocessors (SMPs). This activity is known as ASCI Blue.

This effort is part of the focused DOE Accelerated Strategic Computing Initiative of the Stockpile Stewardship Program. Because of the US commitment to ending underground nuclear testing, dramatic advances in computer technology are required to make virtual testing and prototyping viable alternatives to traditional nuclear and non nuclear test-based methods.

To economically accommodate full support of new 3-D massively parallel applications we require the achievement of sustained TeraFLOP/s performance for a representative Stockpile Stewardship problem on a scalable cluster of SMPs, a scalable software/middleware environment that supports large-scale code execution and development, a high bandwidth, low latency cluster interconnect, and siting of equipment at one of the Laboratories for at least two years.

The US commitment to ending underground nuclear testing, constraints on non-nuclear testing, and loss of production capability call for new means of verifying the safety, reliability, and performance of the US nuclear stockpile. One of these means is compute-based virtual testing and prototyping of nuclear weapon systems. ASCI is one element of DOE's Stockpile Stewardship Program, designed to advance DOE/Defense Programs computational capabilities to help meet the future needs of stockpile stewardship. ASCI will create the leading-edge computational modeling capabilities that are essential for maintaining the safety, reliability, and performance of the US nuclear stockpile in the absence of underground testing.

ASCI applications require immediate computational throughput gains of 100 or more over current supercomputer capability and future enhancements well beyond the TeraFLOP/s range over the next several years.



R & D Contract [redacted]

It is important to emphasize that the driving force for ASCI is the Stockpile Stewardship Program. This motivates the need for the development of suitable application codes, the supporting computational problem solving environment, as well as hardware platforms upon which the applications can be executed.

The purpose of this activity is the realization of large scale numerical simulations sufficient to support the Stockpile Stewardship Program. Although the ultimate goal of the ASCI program is a computational capability far beyond TeraFLOP/s, the initial research objective targets a performance level of one to tens of TeraFLOP/s sustained performance on ASCI applications. The culmination of the R &D activity will be a reliable, robust system capable of delivering Tera-scale performance on large scale ASCI applications.

However, this is not a standard hardware procurement, but rather Subcontractor research and development. The Subcontractor's ability to provide the very high performance computing capability necessary to support Science-Based Stockpile Stewardship (SBSS) computing applications, together with the University's expertise in applications development, is expected to produce the desired result: Tera-scale computing. Accomplishing the aggressive ASCI goals will require significant monetary investment by the University and execution of a highly complex research and development strategy by the Subcontractor.

1.2 Description of Work

The objective of this R & D activity is the development of a scalable SMP cluster-based system, including all hardware and software, that will provide sufficient capacity and capability to develop, debug, and execute large simulation codes at the TeraFLOP/s performance level in support of SBSS.

The Subcontractor shall:

1.2.1 Detailed Project Plan (MR)
Provide a detailed project plan for the ASCI Blue development project.

1.2.2 Execute Development Plan (MR)
Accomplish the milestones of the Subcontract; accelerate the development of hardware and software for the purpose of achieving the stated Tera-scale performance goals.

1.2.3 Install ID System(s) (MR)
Configure, install, support and maintain the Initial Delivery (ID) system, including hardware and software, at LANL or LLNL. At the option of the University, install an additional ID system.

1.2.4 Technology Refresh (TR)
Provide hardware and software technology refresh to those systems as available.

1.2.5 On-site Support (MR)
Provide on-site assistance to Laboratory applications developers.

1.2.6 Scalable Development Environment Goal (MR)
Demonstrate the scalability of essential software capabilities in the application development environment across the clustered SMP system.

1.2.7 Sustained TeraFLOP Performance Goal (MR)
Demonstrate sustained TeraFLOP/s performance on the sPPM Science-Based Stockpile Stewardship application.

1.2.8 Three Peak TeraFLOP Performance Goal (MR)
Demonstrate a machine with the sum of peak and sustained performance of at least four (4.0).

1.2.9 Install Sustained Stewardship TeraFLOP (SST) System (MR)
Configure, install, support, and maintain the TeraFLOP/s scalable clusters at LANL or LLNL.

1.2.10 Memory Upgrade (MO)

At the option of the University, upgrade the TeraFLOP/s scalable clusters as described in paragraph 6.2.15.

1.2.11 Performance Reviews (MR)

Apply Laboratory-provided metrics (including quarterly reviews) during the course of the contract to gauge progress.

1.2.12 Successful Project Completion (MR)

Demonstrate the achievement of the development objectives at the conclusion of the contract.

End of Section 1

2.0 ASCI Applications Overview

ASCI applications codes will generally perform complex time-dependent three-dimensional simulations of multiple physical processes, where often the processes are tightly coupled and will require physics models linking microscale phenomena to macroscopic response. These codes will address nuclear weapons issues relating to safety, performance, aging, and remanufacturing which are of interest to the DOE Weapons Laboratories in support of SBSS. The ASCI codes will include multi-material shock hydrodynamics, radiation and particle transport, atomic physics, material properties, and structural response.

Demanding stockpile stewardship issues are expected to drive intense development of ASCI applications codes and advanced numerical algorithms and will require innovative software techniques to achieve the necessary delivered performance on advanced computing platforms. Current application characteristics and expected trends are described below, although ASCI applications codes and numerical algorithms are expected to evolve rapidly.

Current ASCI applications are generally based on finite difference algorithms on 3D geometries represented by regular Cartesian, logically-regular hexahedral, or unstructured tetrahedral meshes. Regular mesh codes are likely to include time-dependent adaptive mesh refinement (AMR) whereas unstructured mesh codes already support reconnections. Finite element-based applications are possible as well. Time-dependent simulations will be the norm. They include explicit, and coupled explicit-implicit algorithms. Many applications will simulate multiple coupled physical processes collectively in time. Some of the processes may be localized to particular spatial domains or even in time. There will be applications that simulate continuous fields and some that simulate discrete particles or states.

Multi-material hydrodynamics codes based on Eulerian, Lagrangian, and arbitrary-Lagrangian-Eulerian (ALE) formulations tend to be explicit in time, use nearest-neighbor spatial differencing, and employ sophisticated material property models. Eulerian codes usually have interface tracking and reconstruction. Multiple strategies for AMR support in Eulerian codes are being explored. The radiation and particle transport methods under investigation include diffusion, P_n, simplified P_n, discrete ordinates, and Monte Carlo formulations. The diffusion, P_n, and simplified P_n algorithms all resemble typical standard finite difference diffusion methods. Discrete ordinates algorithms may involve a direct-solve wavefront solution strategy. The Monte Carlo algorithms involve discrete particle tracking. Atomic physics codes involve electronic state calculations. Material properties codes involve molecular dynamics style simulations at the microscopic or grain level. Structural codes handle material deformation and flow, energy dissipation, and stress and strain modeling at the macroscopic scale and are typically finite element based.

The major emphasis for ASCI applications will be on the design, development, refinement, and execution of parallel 3D codes on large parallel computer systems; in addition, they may be portable to machines as small as single processor workstations to facilitate code development. The codes will be written in standard Fortran 90, Fortran 77, C, and C++, with this ordering reflecting the expected usage of each language. Mixtures of these languages, especially

Fortran and C, are typical. Use of typical extensions to Fortran 77, such as automatic arrays, pointers, and MIL STD 1753 extensions, are common. Parallel code implementations are expected to use both explicit domain decomposition with MPI message passing and some form of shared memory multitasking on SMP systems. It is also likely that some codes will use MPI message passing simultaneously both within an SMP and across SMPs. Access to shared memory multitasking is expected to be through automatic or directive-based compiler support or through system calls for explicit thread management and control (e.g., POSIX threads). Some exploratory usage of High Performance Fortran (HPF) or of parallel C languages might also occur.

End of Section 2

3.0 Vision for Tera-Scale Computing

3.1 Hardware Environment

The approach taken by this effort is based on providing the requisite computational resources through clusters of shared-memory multi-processor systems, or so-called SMPs. We view clustering of SMPs as an economically viable mechanism for achieving the multiple TeraFLOP/s levels of performance required by stockpile stewardship applications. We do not necessarily mean to indicate by SMP the narrower concept of bus-based Symmetric Multi-Processors. Rather, our concept of clusters of SMPs has six components to it:

- a **hierarchical** system of memories and latencies;
- multiple high-performance **distributed** systems;
- **shared-memory** over a significant and economical computational resource with low-latency, high-performance memory access;
- **multi-processor**, supporting a shared-memory environment across multiple processors;
- **commodity priced** SMPs which represent high-end systems of a regular commercial product line (they are not special purpose designs);
- **commodity priced** (third-party) **peripherals**.

Shared-memory, high-end, microprocessor-based, multi-processor compute servers in the context of this activity are typical examples of the envisioned SMP machines.

The emerging clustered SMP computing environment will ultimately support a hierarchical distributed computing paradigm covering the full range of the memory and latency hierarchies encountered in clusters. We envision these SMP clusters to be assembled from building blocks whose size is determined by market economics. The approach we wish to take extends beyond the MPP strategy for large scale parallelism in which up to thousands of processors are interconnected in a homogeneous, flat, distributed memory system in which inter-CPU communication is handled by message passing. This ASCI activity will accommodate applications targeted for MPPs but its real advantage lies in the ability to exploit the computational power of multiple system aggregation strategies.

The ideal size for the SMP building block in this approach is determined by a balance of cost effectiveness, reliability, hardware/software scalability, the number of processors per SMP and number of SMPs in the clusters. We anticipate that this balance may change over the lifetime of the contract. Our preference is for the capability on ASCI applications of a single SMP to be as large as economically viable.

Clusters of SMP systems that can address the anticipated stockpile stewardship application requirements are anticipated to scale according to the following ratios. These ratios were developed through the Laboratories' multi-year experience with addressing challenging computational problems on high performance computing systems from a variety of application domains.

1 FLOP/s peak performance /
.5 - 1 byte memory size /
10 -100 byte disk storage /
4-16 byte per second L1-L2-cache bandwidth /
1-3 byte per second memory bandwidth /
0.1-1.0 bit per second communications bandwidth /
0.01 - 0.1 byte per second disk bandwidth

Building and delivering a Tera-scale computing resource is a daunting task. Within the context of a research and development contract it is anticipated that a well balanced hardware approach will follow the following four notional phases: 1) an Initial Delivery (ID) system for ASCI application code development; 2) technology refresh as the ID system ages and fruits of the ASCI project become available; 3) a TeraFLOP/s system with a peak plus sustained performance of at least four (4.0) TeraFLOP/s; and 4) memory upgrade.

Due to SBSS programmatic requirements, the University has developed a general schedule for delivery of hardware and software assets. Of prime consideration are the decoupling of compute and memory SST deliveries and the timeliness of an Initial Delivery (ID) system for code development.

Target Delivery Date	System	Metrics
90 days after contract award	Initial Delivery (1st System)	100 GFLOP/s Peak Performance, 50 GB Main Memory, 2.5 TB RAID Disk
90 days after contract award	Initial Delivery (Optional 2nd System)	100 GFLOP/s Peak Performance, 50 GB Main Memory, 2.5 TB RAID Disk
2Q CY 1998	SST Delivery	Sustained sPPM TFLOP/s performance. Memory to Peak FLOP/s ratio is 0.167. At least 25 TB RAID Disk
2Q CY 1998	SW Scalability	Scalability of the application development environment tools across the clustered SMP system.
Q1 CY 1999	Memory Upgrade	Increase memory to Peak FLOP/s of SST from 0.167 up to 0.5. Additional 50 TB RAID Disk.

3.2 Software Environment

The spirit of ASCI is "One Program—Three Labs." All three National Laboratories will participate in applications development, testing and applying the resources. This has tremendous impact on the software environment which, of course, is the key to the success of this activity. Effectiveness is expected to occur through system integration and the development of "middleware" software which allows clusters of SMPs to effectively support a single computation. Hardware transparency is essential in many areas if we are to preserve the investment in the applications beyond the lifetime of the hardware.

As has been previously stated, the objective of this requirement is to provide a platform for ASCI applications that is over two orders of magnitude more powerful than that available at LANL and LLNL today. To put it more directly, the purpose of this activity is to provide a Tera-scale computing environment for the very demanding applications required for Science-Based Stockpile Stewardship. A truly usable Tera-scale computing resource requires a software environment that scales as well as the hardware and provides a rich scalable code development environment. This point can not be overemphasized.

The University is aware that a Tera-scale software environment is an enormous expectation. The software requirements are aimed at setting out our vision of what is necessary to achieve the ASCI program goals. However, just as in the case of the hardware, the very high performance computing market must significantly stretch to meet these objectives. Therefore, it is our strategy to encourage the Subcontractor to accelerate software development necessary to achieve these objectives. It is anticipated that activities related to this Subcontract will have at least three general phases. These phases are purely notional (i.e., they don't correspond to contract milestones) and are intended for informational purposes only.

In the first phase, there will be intensive applications code development on the ID system. In addition, it is anticipated that there will be a Subcontractor effort to advance the code development environment and system management tools. In this phase basic ASCI applications development will take place either within an SMP utilizing the SMP programming paradigm (explicit parallelism exploited with POSIX threads or implicit parallelism exploited by the compiler) or utilizing message passing via MPI both intra-SMP and intra-cluster. The choice will depend on the best implementation for specific physics packages. ASCI applications will be combinations of many physics packages and will contain both styles of parallelism. On the systems side, it is anticipated that development will be needed to assure robustness and extend the features of the code development environment on a single SMP. This will include compilers, loaders, debuggers, performance analysis tools, gang scheduling, resource management, DCE and system administration to name but a few. This is mostly an interactive code development environment.

In the second phase, it is anticipated that the applications will need more "batch" computing time as well as interactive code development cycles. Development, on the system side, will be extending the cluster notion to provide more of a "single system image" and operation as a

single unit. Basic development of SMP cluster wide reliability, availability and serviceability (RAS), gang scheduling, resource management and performance analysis tools will be extended from an SMP-specific focus to cluster-wide. To give a specific non-trivial example, it is anticipated that a cluster wide process and session identification space will have to be developed to support the single system image, gang scheduling and resource management.

In the third phase, it is anticipated that most of the exploratory code development environment and the system software development will be completed. It is in this phase that the software productization activities will dominate. That is to say, the third phase will be dominated by extending and productizing the good ideas (and implementations) and discarding the weak ones.

Having given this general anticipated progression of activities, the Subcontractor shall be responsible for clearly delineating a coherent and credible software development strategy to achieve the ASCI project goals.

End of Section 3

4.0 SST High-Level Technical Requirements

The end product of the ASCI Blue research and development activity is a well balanced compute resource over one hundred times more powerful than those currently available at either LLNL or LANL. It will be focused on solving the initial critical problems, that is, the large-scale application problems at the edge of our understanding of weapon physics. This Sustained Stewardship TeraFLOP (SST) system must be useful in the sense of being able to deliver a large fraction of peak performance to a diverse scientific and engineering workload. It must also be useful in the sense that the code development and production environments are robust and facilitate the dynamic workload requirements.

The specifications below define a Sustained Stewardship TeraFLOP/s SMP scalable cluster based on the performance of the sPPM demonstration code identified in Section 6.4. Obviously, the Subcontractor will necessarily have to estimate the efficiency of sPPM on the proposed system in order to determine what to actually bid, price and ultimately deliver to meet the mandatory requirement identified in Section 4.1.1.1. If the efficiency of sPPM on the proposed system is below 33% then more than three peak TeraFLOP/s of computational resources will be required. However, if the sPPM efficiency is greater than 33%, the Subcontractor will deliver less than three peak TeraFLOP/s to meet section 4.1.1.1. In any event, the sum of peak plus sPPM sustained performance must be at least 4.0 TeraFLOP/s. In the University's view, this issue will motivate additional Subcontractor innovation during contract execution.

Due to the classified and unclassified ASCI programmatic requirements the SST system must function in the classified (RED) and unclassified (BLACK) network environments. In addition, we anticipate the frequent (on the order of once a week) switching between the RED and BLACK environments. We require that the transition time between RED and BLACK (and vice-versa) be less than sixty minutes. The intense code development effort involved in the ASCI program requires a stable ASCI code development environment (CoDE) be available concurrently in the RED and BLACK network environments. To be useful, this CoDE must have a minimum representation of all the key hardware features of the larger migratable SST compute resources and allow for the full application development cycle (edit, compile, link and debug). These requirements imply that no CPU or SMP local disks may be employed. The disk and external networking requirements in this Statement of Work are for the aggregate of both RED and BLACK network environments.

Development of the SST shall comply with the requirements identified in section 6.0, Implementing a Sustained Stewardship TeraFLOP/s.

The specific hardware and software Mandatory Requirements the SST system shall meet are delineated in sections 4.1 and 4.2 with (MR) designation.

In addition to the mandatory hardware and software requirements, the Subcontractor may deliver any Target Requirements (TR) for the SST, and any additional features consistent with the objectives of this project and Subcontractor's Research and Development Plan, which the Subcontractor believes will be of benefit to the project.

4.1 SST Hardware High-Level Requirements

4.1.1 Scalable Cluster of SMPs

4.1.1.1 Sustained Stewardship TeraFLOP SMP Scalable Cluster (MR)

The Subcontractor shall provide a Sustained Stewardship TeraFLOP/s (SST) system composed of multiple Shared memory Multi-Processors (SMPs) connected via a scalable intra-cluster communications technology. The system shall have a peak plus sustained performance on the sPPM benchmark of at least four (4.0) TeraFLOP/s. The Subcontractor shall provide a best effort to obtain a sustained performance of one (1.0) TeraFLOP/s (1.0×10^{12} floating point operations per second) on the sPPM benchmark.

Example: If "p" is the peak performance of the system and "s" is the sustained on sPPM performance of the system, and if we define the machine efficiency as $e = s/p$, then the above equation becomes:

$$p(e) \geq 4.0/(1.0 \div e)$$

Hence,

$$p(1/2) \geq 4/1.5 = 2.67,\ p(1/3) \geq 4/1.33 = 3.0 \text{ and } p(1/5) \geq 4/1.2 = 3.3$$

4.1.1.2 SST Component Scaling (MR)

In order to provide the maximum flexibility to the Subcontractor in meeting the goals of the ASCI project the exact configuration of the SST SMP scalable cluster is not specified. Rather the SST configuration is given in terms of lower bounds on component attributes. The SST SMP scalable cluster configuration shall meet or exceed the following parameters:

- Memory Size ≥ 0.5 TB
- Disk Space ≥ 75 TB
- Cache Bandwidth/Peak FP (Byte/s/FLOP/s) ≥ 4
- Memory Bandwidth/Peak FP (Byte/s/FLOP/s) ≥ 1
- Intra-Cluster Network Bi-Section Bandwidth ≥ 0.5 Tb/s
- System Peak Disk I/O Bandwidth ≥ 90 GB/s

4.1.1.2.1 Additional Intra-Cluster Network Bi-Section Bandwidth (TR)

The Subcontractor may provide a configuration identical to that specified in Requirement 4.1.1.2, but with an Intra-Cluster Network Bi-Section Bandwidth ≥ 1.5 Tb/s.

4.1.1.3 SST Applications Memory (MO)
The Subcontractor shall install at least 1.5 TB of memory in the SST as an option.

4.1.1.4 Cluster Wide High Resolution Event Sequencing (TR)
The SST may include hardware support for a cluster-wide real-time clock or other hardware mechanism for cluster-wide event sequencing. The resolution of this mechanism may be less than 1.0 micro-second ($1x10^{-6}$ seconds). This facility would be used for parallel program debugging and performance monitoring.

4.1.1.5 Cluster Interconnect Reliability and Performance (TR)
If interconnect components fail (e.g., SMP network interface, network stage link, router or switch), each SMP may still be able to communicate with all other SMPs over the cluster interconnect. That is, there may be multiple interconnect paths or routes between SMPs so that, in the event of interconnect component failure, each SMP can still communicate with all other SMPs. The SMP interconnect may have the ability to segregate network traffic so that operating system related traffic (e.g., I/O service, OS to OS communication) does not interfere with user data communication traffic.

4.1.1.6 Cluster Interconnect Link Bandwidth (TR)
The network bandwidth available to each SMP may be capable of sustaining at least 0.1 GB/s per peak GFLOP/s of processing power.
Example: If the Subcontractor proposes 59 SMPs each with 64 processors rated at 0.8 GFLOP/s peak, then each SMP link bandwidth may be rated at 64*0.8*0.1 GB/s = 5.12 GB/s. This would require 51.2 HIPPI (800 Mb/s) ports.

4.1.1.7 Cluster Interconnect Latency (TR)
The cluster interconnect latency, as measured by sending a minimum length MPI message from user program memory on one processor in the SMP cluster to user program memory on any other processor in the cluster and receiving back an acknowledgment divided by two (standard MPI user space ping-pong test), may be less than 5.0 micro-seconds ($5x10^{-6}$ seconds).

4.1.1.8 Remote Memory Access (TR)
The system may include support for remote memory reads and writes. A remote memory read returns the same data that a processor residing in the SMP with the remote memory location would have seen if it had read the location at the same time. Similarly, a remote memory write updates the location in a remote memory in the same way that a local processor memory write would have done. This remote memory access mechanism may include hardware memory protection that protects the memory space of each individual user from all other users within the cluster.

4.1.2 Shared Memory Multi-Processor

4.1.2.1 SMP Platform (MR)

The Shared memory Multi-Processor (SMP) platforms shall be a set of CPUs sharing random access memory within the same memory address space. The CPUs shall be connected via a high speed, extremely low latency mechanism to the set of hierarchical memory components. The memory hierarchy consists of at least processor registers, cache and memory. The cache may also be hierarchical. If there are multiple caches, they shall be kept coherent automatically by the hardware. The main memory may be a Non-Uniform Memory Access (NUMA) architecture. The access mechanism to every memory element shall be the same from every processor. More specifically, all memory operations shall be accomplished with load/store instructions issued by the CPU to move data to/from registers from/to the memory.

4.1.2.2 CPU Characteristics (MR)

Each SMP shall be an aggregate of homogeneous general purpose computers (CPUs) consisting of high-speed arithmetic, logic units, and memory, together with the necessary control circuitry and interprocessor communications mechanism(s). Each shall execute fixed and IEEE 754 floating-point arithmetic, logical, branching, index, and memory reference instructions. A 64-bit data word size shall directly handle IEEE 754 floating-point numbers whose range is at least 10^{-305} to 10^{+305} and whose precision is at least 14 decimal digits. The CPUs and memory hierarchy shall provide an appropriate mechanism for interprocessor communication, interrupt, and synchronization.

4.1.2.3 Minimum CPU Performance (TR)

The minimum single CPU performance, as measured by peak performance, may be at least five hundred million 64-bit floating point operations per second (500 MFLOP/s).

4.1.2.4 Minimum SMP Performance (TR)

The minimum SMP performance, as measured by peak performance, may be at least six billion 64-bit floating point operations per second (6 GFLOP/s).

4.1.2.5 IEEE 754 32-Bit Floating Point Numbers (TR)

The CPUs may have the ability to operate on 32-bit IEEE 754 floating-point numbers whose range is at least 10^{-35} to 10^{+35} and whose precision is at least 6 decimal digits, for improved memory utilization and improved execution times.

4.1.2.6 Test-And-Set Instruction (TR)

The Subcontractor may provide sufficient atomic instructions (e.g., test-and-set or load-and-clear) along with some atomic incrementing instruction (e.g., test-and-add or fetch-and-increment/fetch-and-decrement) so that the usual higher level synchronizations (i.e., critical section, barrier, etc.) can be constructed. Additionally, these synchronization instructions or their higher-level equivalents may be directly accessible from user programs.

4.1.2.7 Programmable Clock (TR)

There may be a real-time clock per CPU capable of causing a hardware interrupt after a preset interval (i.e., a programmable clock). The clock frequency may be at least one megahertz and the preset interval may be capable of being set in increments of 10 microseconds or less. There may be at least 16 seconds allocated for the time interval. This clock may have at least 24 bits.

4.1.2.8 Hardware Interrupt (TR)

The SMP may have hardware support for interrupting given subsets of computational processors based on conditions noted by the operating system or by other computational processors within the subset executing the same user application.

4.1.2.9 Hardware Performance Monitors (TR)

The CPUs may have hardware support for monitoring system performance. As much of this data as possible may be made available directly to applications programmers and to code development tools. Memory hierarchy behavior, counting floating point operations and message passing performance are of particular interest.

4.1.2.10 Hardware Debugging Support (TR)

The CPUs may have hardware support for debugging, and in particular, hardware that enables setting data watch points (e.g., hardware interrupts on read/write to a specific virtual memory location).

4.1.3 Memory Hierarchy

4.1.3.1 Shared Main Memory (MR)

The main memory (as distinct from cache memory) shall be high-speed, single-byte addressable, random access, single-bit correcting, double-bit detecting (SECDED). All components of the main memory (e.g., local and remote) shall be addressable by a single mechanism, (i.e., load/store instructions), from all compute CPUs in the SMP. Memory which is directly addressable by only a subgroup of the processors shall be part of a cache, if present. Note that this does not require that the distance (as measured in latency or bandwidth) to every memory element be the same from every processor.

4.1.3.2 Memory Hierarchy Latency (TR)

Each SMP may include a memory hierarchy of at least processor registers; cache; main memory. The cache may be hierarchical. The main memory may be a Non-Uniform Memory Access (NUMA) architecture. The load and store latency between processor registers and the slowest cache component may be no larger than 10 processor clocks. The load and store latency between processor registers and main memory may be no larger than 100 processor clocks if the slowest cache component is at least 4.0 MB in size and no larger than 20 clocks if the cache is less than 4.0 MB in size. If main memory is NUMA, then this requirement is between the processor registers and the most distant (slowest) memory element in the SMP address space, assuming a best case memory access scenario.

4.1.3.3 Additional Physical Address Space (TR)

Each SMP may have the capability to directly address at least ten (10.0) TB of physical memory with at least 44 bits of physical address space.

4.1.3.4 Memory Consistency Model (TR)

Within an SMP, a weak memory consistency model is allowed if there are specific hardware constructs (available to application programs) that can enforce a strong (sequential) memory consistency model for sequences of instructions (i.e., synchronization). This is sometimes known as a weak memory reference ordering model with additional hardware support for synchronization.

4.1.4 RED/BLACK Resource Usage Model

4.1.4.1 RED/BLACK Code Development Environments (MO)

The Subcontractor shall provide sufficient resources to support independent concurrent classified and unclassified code development environments (CoDEs). The majority of the SST compute resource shall migrate between the two CoDEs. Each CoDE shall consist of some portion of the disk I/O and external networking resources. The CoDE shall have sufficient computational capability to directly compile and debug applications that implement the full hierarchical distributed memory model (i.e., it must have representative portions from the entire memory latency and bandwidth hierarchy).

4.1.4.2 RED/BLACK I/O Resources (MR)

The disk space provided to meet requirement 4.1.1.2 shall be split into two separate independent, external network and disk I/O subsystems (one RED and one BLACK). The aggregation of these two I/O environments are used to compute the total external network interface and disk resources provided. The SMP cluster shall be able to boot from either of these I/O subsystems.

4.1.4.3 RED/BLACK Migration (MR)

The SST compute resources shall migrate between classified (RED) and unclassified (BLACK) usage in less than sixty (60) minutes. The migration shall consist of at least the following steps: SST compute resource shutdown (and possible power cycling when migrating from RED to BLACK); the I/O and external network interface resources associated with one classification environment be physically decoupled from the SMP cluster and the external network interface resources associated with the other classification environment reconnected; and reboot the SST compute resources. Decoupling shall be by a physical separation of at least 1.0 foot. There shall be no writeable (by any user other than privileged users) non-volatile memory in the system except in the detachable, independent RED/BLACK file storage subsystems.

4.1.4.4 SST RAID Arrays (TR)

All disk resources provided may be RAID 3 or RAID 5 arrays. The RAID units may have high availability characteristics. These include redundant failover power supplies and fans, hot swapable disks, the capability to run in degraded mode (one disk/RAID

string failure), and the capability to rebuild a replaced disk on the fly with minimal performance impact.

4.1.4.5 Single Sustained I/O Bandwidth (TR)

The minimum sustained transfer rate for reading or writing of a single 1.0 GB file to or from a single logical file system may be no less than 20 MB/s.

4.1.4.6 Parallel Sustained I/O Bandwidth (TR)

The minimum sustained parallel I/O transfer rate for reading or writing of a parallel 10.0 GB file to a parallel file system may be no less than 0.002 Byte/s per peak FLOP/s.

Example: A 3.0 TFLOP/s SST system may deliver 0.002*3000 = 6.0 GB/s parallel I/O bandwidth to a single application running on the entire SST. This would allow a code to write a 0.5 TB restart dump in a little under 2 minutes.

4.1.4.7 Cluster High Speed External Network Interfaces (TR)

The SST system may include a minimum of 0.00125 Bit/s per peak FLOP/s of aggregate external networking bandwidth. The system may also include at least 4 HIPPI connections (2 for the RED partition and 2 for the BLACK). The Subcontractor may work with the University to assure these connections will be capable of interoperating with existing or future LANL or LLNL systems and network gateways.

Example: A 3.0 TFLOP/s SST system may have 0.00125*3,000,000 = 3750 Mb/s external network bandwidth. This can be accomplished with approximately 6 OC-12 (650 Mb/s) external network interfaces.

4.1.4.8 Cluster I/O Upgradeability (TR)

The disk capacity may be field upgradeable to twice the initial system capacity.

4.1.5 Reliability, Availability, Serviceability and Maintenance

4.1.5.1 Power Cycling (TR)

The system may be able to tolerate power cycling at least once per week over its life cycle.

4.1.5.2 Hot Swap Capability (TR)

Hot swapping of failed Field Replaceable Units (FRUs) may be possible without power cycling the cabinet in which the FRU is located. The maximum number of components (such as CPUs, memory, disks and power supplies) contained in or on one FRU may be less than 1% of the components of that type in the system.

4.1.5.3 Production Level System Stability (TR)

The system (both hardware and software) may execute 100 hour capability jobs (jobs exercising at least 90% of the computational capability of the system) to successful completion 95% of the time.

4.1.5.4 System Down Time (TR)
Over any four week period, the system may have an effectiveness level of at least 95%. The effectiveness level is computed as the average of period effectiveness levels. A new period of effectiveness starts whenever the operational configuration changes (e.g., a component fails or a component is returned to service). Period effectiveness level is computed as University operational use time times max[0, (p-2d)/p] divided by the period wall clock time. Where p is the number of CPUs in the system and d are the number disabled. Scheduled Preventive Maintenance (PM) is not included in University operational use time.

4.1.5.5 FRU Diagnostics (TR)
Diagnostics may be provided that, at a minimum, isolate a failure to a single FRU. This diagnostic information may be accessible to operators through networked workstations.

4.1.5.6 Failure Isolation Mode (TR)
SMP (or FRU) failures may be able to be determined, isolated, and routed around without system shutdown. The operators may be able to reconfigure the system to allow for continued operation without use of the failed SMP (or FRU). The capability may be provided to perform this function from a remote network workstation.

4.1.5.7 Scalable System Diagnostics (TR)
There may be a scalable diagnostic code suite that checks processor, cache and RAM memory, network functionality, and I/O interfaces for the full system in less than 30 minutes.

4.1.5.8 System Graceful Degradation Failure Mode (TR)
The failure of a single component such as a single CPU, a single SMP, or a single communications channel may not cause the full system to become unavailable. It is acceptable for the application executing on a failed CPU or SMP to fail but not for applications executing on other parts of the system to fail.

4.1.5.9 SMP Processor Failure Tolerance (TR)
The SMP may be able to run with one or more computational processors disabled, and to do so with minimal performance degradation. That is, the SMP may be able to tolerate failures through graceful degradation of performance.

4.1.5.10 SMP Memory Failure Tolerance (TR)
The Subcontractor may propose SMPs that are able to run with one or more memory components disabled, and to do so with minimal performance degradation. That is, the SMPs may be able to tolerate failures through graceful degradation of performance.

4.1.5.11 Replacement Parts and Maintenance (MR)
The Subcontractor shall supply hardware and software maintenance for the proposed system for a four year utilization period. Hardware maintenance response time shall be less than four hours from incident report until Subcontractor personnel arrive for repair work. Software maintenance shall include a trouble reporting mechanism and periodic

software updates. In addition, the Subcontractor shall provide quick turnaround of software fixes to reported bugs. The proposed system will be installed in a classified area at the Laboratory and so maintenance personnel shall obtain DOE Q clearances.

4.2 SST Software High-Level Requirements

4.2.1 Operating System

4.2.1.1 SMP Base Operating System and License (MR)

The Subcontractor shall provide a standard multiuser POSIX (IEEE 1003.1-1990; FIPS 151-2; IEEE 1003.2 or later) compliant UNIX interactive operating system on each SMP, consisting of a basic kernel that supports system services and multiprocessing applications. Fully supported thread operations in shared address space, as defined by the POSIX.1003.1c-1995 (or later), implemented at the kernel level shall also be provided (within six months of standardization or at SST delivery). The operating system shall provide mechanisms to share memory between user processes and to run threads within a single user process on multiple CPUs simultaneously. This shall include provision of right-to-use license for an unlimited number of users, including unlimited concurrent usage, of the operating system, daemons, and associated utilities. The University will accept the Offeror's self-certification for POSIX compliance.

4.2.1.1.1 X/Open OS Compliance (TR)

The proposed operating system may have the X/Open XPG4 UNIX brand. Software with the functionality of the following X/Open components may be provided: XPG4 C Language ("ISO C"); XPG4 ISAM; FIPS 151-2; XPG4 Commands and Utilities V2; XPG4 Internationalized System Calls and Libraries (Extended); XPG4 X Window System Application Interface (FIPS 158-1). For the XPG4 UNIX brand, the Subcontractor may deliver a copy of the X/Open XPG4 UNIX Brand Certificate with the SST delivery.

4.2.1.1.2 Single System Image (TR)

The SST SMP scalable operating system may present a single system image to users. This may include: single cluster login address; cluster wide load leveling at login and at process creation time; cluster wide file lock management; cluster wide process and POSIX session ID space; virtual memory page sharing between SMPs; and extensions of standard UNIX utilities to the single system image.

4.2.1.1.3 Thread Packages (TR)

The Subcontractor may propose an alternative light-weight threads package tuned for efficiency rather than cross platform portability and provide an implementation of Pthreads as defined by the POSIX 1003.1 standard.

4.2.1.1.4 System Utilities (TR)

The Subcontractor may provide the GNU Utilities, which may at least include: bash, emacs, make; a scripting language such as perl; and lint-like tools for the baseline languages.

4.2.1.1.5 Job Checkpointing (TR)

The Subcontractor may provide an SMP base operating system that can perform process-level checkpointing, at the request of either the job or the job scheduler, and allow that job to continue execution.

4.2.1.2 Cluster Wide Fault Tolerance and Graceful Degradation of Service (TR)

The operating system may have the ability to detect, isolate and manage hardware or software faults in a way that minimizes the impact on overall SMP cluster availability. When SMP cluster (hardware or software) components fail, the SMP cluster software resources may provide degraded system availability. Under most circumstances, it may be possible to take hardware and software components off-line or bring them back on-line without operating system rebooting. The probability that a job will fail (due to hardware or software faults) should be proportional to the amount of resources consumed by the job, not SMP cluster size.

4.2.1.3 Networking Protocols (MR)

The operating system shall support the DoD standard networking protocol suite over the network interfaces described in section 4.1.4.7 of this document. TCP/IP, UDP, NIS, NFS (client and server), RIP, telnet, and ftp protocols shall be supported.

4.2.1.4 Third Party Transfer Support (TR)

The Subcontractor may provide the appropriate networking drivers and protocol support to enable third party transfer of files between the SST and network attached disks controlled by the High Performance Storage System (HPSS).

4.2.1.5 Group Routing (MR)

The Subcontractor shall provide an implementation of "Group Routing," which segregates network traffic based on (sub)network address and group id. A modified ROUTE table and command that allows (or explicitly disallows) packet routing to specific IP subnets based on group id would satisfy this need.

4.2.1.6 File Systems (TR)

The operating system file system may support a cluster wide file system and individual files of at least one (1.0) TeraByte in size. The file systems may support increased reliability and fast reboots (e.g., reduce the FSCK time via a journal implementation).

4.2.2 Distributed Computing Middleware

4.2.2.1 OSF DCE (MR)

The Subcontractor shall provide the Open Software Foundation (OSF) Distributed Computing Environment (DCE), version 1.1 or later, client software on the proposed

cluster of SMPs. This shall include Distributed File System (DFS) client-side distributed filesystem implementation which supports all standard features such as integration with CDS (Cell Directory Service) naming, integration with the DCE security, authentication, and authorization system. Additionally, this shall include fully supported implementation of DCE client-side security system including authentication, authorization controls, and access control lists. Fully supported remote system access programs such as rcp, rlogin, rsh, rexec, telnet, and ftp shall attempt to forward credentials to the remote system; and remote access services such as rcpd, rlogind, rshd, rexecd, telnetd, and ftpd shall accept forwarded credentials from a remote system. If credentials haven't been forwarded, the authentication mechanism of various system services such as login, rlogind, telnetd, and ftpd shall use the DCE security service to authenticate the password which the user presents and shall receive DCE and Kerberos V5 compatible tickets from the DCE security service.

4.2.2.1.1 Distributed File System Server (MR)

The Subcontractor shall provide Open Software Foundation (OSF) Distributed File System Servers, version 1.1 or later. A majority of the file space specified in section 4.1.1.2 shall be exportable with these DFS servers to clients over external networks. The DFS servers shall support file and directory Access Control Lists (ACLs).

4.2.2.1.2 Cluster Wide Service Security (MR)

All cluster wide services including debugging, performance monitoring, event tracing, resource management and control shall be performed in a secure manner using the authentication and authorization capabilities.

4.2.2.1.3 Transarc Encina (MR)

The Subcontractor shall provide a fully supported client-side implementation of the Transarc Encina (version 1.1 or later) distributed transaction system (which is needed to support the HPSS API).

4.2.2.2 Object Request Broker (TR)

The Subcontractor may provide a fully supported implementation of the OMG's (Object Management Group) CORBA (Common Object Request Broker Architecture) version 2.0 (or later) including development tools and libraries for developing object clients and object implementations. CORBA IDL (Interface Definition Language) compilers may build stubs for interfacing with C++.

4.2.3 Cluster Wide Resource Management and Accounting

4.2.3.1 Cluster Wide Resource Management (TR)

The Subcontractor may supply an X11-based graphical user interface for a single point of control resource manager to manage a minimal set of resources which includes number and type of CPUs, per-CPU and aggregate CPU time, wallclock time, memory (high-water allocation), and temporary disk space, as well as more detailed information such as CPU usage by user, network usage by hostname, and memory integral and swap memory integral.

4.2.3.1.1 Cluster Wide Resource Limits (TR)
The Subcontractor may provide a capability to assign and detect/report a soft limit for each supported resource and enforcement of a hard limit for each supported resource (at least the minimal resource set defined in 4.2.3.1).

4.2.3.1.2 Cluster Wide Resource Management API (TR)
The Subcontractor may provide a published API for getting the status for at least the minimal resource set as well as determine the status of overall system resources. The API may also provide interfaces to the following capabilities: selectively preempt or revoke critical resources from a job; set default provisions for abort, suspend, or do nothing for invocation at hard or soft limits boundaries; if the default provision is to suspend or abort, then a job priority ranking interface may be provided by the system so that the distributed resource manager can inform the system as to which job to affect in the default.

4.2.3.2 Cluster Wide Job Accounting (TR)
The Subcontractor may provide job accounting, with API interface, where data for all threads and processes of a job are combined to provide an aggregate job accounting record, and individual thread and process records are identified as being related to a job, for at least the minimal resource set. The accounting information may also contain UNIX UID information. The data returned may be an up-to-date snapshot of resource usage as of the time of the call to the API routine.

4.2.3.3 Accounting for System (Root) Usage (TR)

Resources used by root processes that are not otherwise considered to be part of another job and by the operating system itself may be accountable. In addition, resources not used may be accountable. Accounting for these resources may be accomplished through the same interfaces as are provided for all other jobs. Accounting for operating system resource usage may be done through a pseudo-job known as the "kernel" job. Accounting for root processes' resource usage may be done through one or more pseudo-jobs known as "system" jobs. Finally, accounting for unused resources may be done through a pseudo-job known as the "idle" job.

4.2.3.4 Cluster Wide Job Management (TR)

A job may be a cluster wide abstraction similar to a POSIX session, with certain characteristics and attributes. Commands may be available to manipulate a job as a single entity (including kill, modify, query characteristics, and query state). The characteristics and attributes required for each session type are as follows: 1) interactive session: an interactive session include all cluster wide processes executed as a child (whether direct or indirect through other processes) of a login shell and include the login shell process as well. Normally, the login shell process exists in a process chain as follows: init, inetd, [telnetd | rlogind | xterm | cron], then shell. 2) batch session: a batch session includes all cluster wide processes executed as a child (whether direct or indirect through other processes) of a shell process executed as a child process of a batch system shepherd process, and includes the batch system shepherd process as well. 3) ftp session: an ftp session includes an ftpd and all its child processes. 4) kernel session: all processes with a pid of 0. 5) idle session: this session does not necessarily actually consist of identifiable processes. It is a pseudo-session used to report the lack of use of resources. 6) system session: all processes owned by root that are not a part of any other session.

4.2.3.5 Cluster Wide Job Scheduling (MR)

The Subcontractor shall provide a capability so that a user can submit, either interactively or through the batch environment, a job that spans any subset of user accessible processors, and to schedule multi-thread, multi-process, message-passing jobs using configurable load levels. These configurable load levels shall be defined on CPU load, available memory, paging rate (if applicable), available swap and temporary disk space.

4.2.3.5.1 Cluster and SMP Gang Scheduling (TR)

The Subcontractor may provide a capability to gang schedule threads and processes from a single user job within an SMP and across SMPs. That is, when a user job is scheduled to run, the gang scheduler may contemporaneously allocate to CPUs all the threads and processes within that job (either within an SMP or within the cluster of SMPs). This scheduling capability may control all threads and processes within the SMP cluster environment.

4.2.3.5.2 Cluster Wide Job Scheduling Interface (TR)

The Subcontractor may provide an X11-based graphical user interface using an X window display which displays machine loads and systems information (including as a minimum the items described in 4.2.3.5) . This interface may also provide historical usage, job tracking from submission to deletion (note that deletion is not the same as end of execution), capability to control distribution of resources between interactive and batch requests, ability to tailor the scheduling policy to specific site requirements, and the ability to adjust cluster-wide load balance by checkpoint/migration/restart of single process jobs. In addition, job status shall be retained at least 24 hours after termination. All of the job scheduling functions underlying this X11-based user interface may also be provided in a published API.

4.2.4 Cluster System Administration Tools

4.2.4.1 Single Point for Cluster System Administration (MR)

The Subcontractor shall provide a set of facilities to administer the SST SMP cluster as a single entity. In particular, the Subcontractor shall provide fully supported implementation of a single-point system administration tool to handle: file system mounts; SMP booting, where appropriate; SMP status, where appropriate; SMP self-consistency checks of system configuration parameters; software installation; resource administration; SMP shutdown/restart; system patch installation; login control (provide capability to restrict login access to certain processors, and cluster-wide monitoring of failed login attempts by an individual); and system back-ups, including ability to dump multiple volumes of tapes without operator intervention. The Subcontractor shall provide a fully supported implementation of mechanisms for detecting and reporting failures of critical resources, including processors, network paths, and disks. The diagnostic routines shall be capable of isolating hardware problems down to the FRU level in both the system and its peripheral equipment.

4.2.4.2 Cluster System Debugging and Performance Analysis (TR)

The Subcontractor may provide a set of facilities to analyze SST system performance and make tuning modifications. In particular, the Subcontractor may provide fully supported implementation of a single-point system tuning tool to dynamically monitor and modify the following system attributes: processor status; key resources: system CPU usage, memory usage, page faults; run queues per SMP; scheduling priority of each process and each thread within a process; and current system configuration. The tuning parameter changes may take affect without requiring an operating system reboot.

4.2.4.3 Centralized Repository (TR)

The Subcontractor may provide a centralized resource data repository, keeping track of the state of all system resources, their current usage policies, and a system error log.

4.2.4.4 User Maintenance (TR)

The Subcontractor may provide a tool for managing user administration, including some means of integrating the namespace manager and the authentication server in

order to facilitate adding, removing, and modifying users. In addition, the Subcontractor may provide a tool for managing groups, including initial creation of groups, modification of groups, and user membership in groups.

4.2.5 Parallelizing Compilers/Translators

4.2.5.1 Baseline Languages (MR)

The Subcontractor shall provide fully supported implementations of Fortran90 (ISO 1539-1), C (ANSI/ISO 9899-1992;FIPS 160 or later), and C++. The Subcontractor shall provide a version of C++ that is standard compliant within one year after standardization. The Subcontractor is encouraged to adhere to the current proposed standard. Fortran90, C, and C++ shall be referred to as the baseline languages in this section. Also, an assembler shall be provided. The Subcontractor shall provide the fully supported capability to build programs from a mixture of the baseline languages (i.e., inter-language subprocedure invocation must be supported). The Fortran90 and C compilers shall support parallelism through directives or language constructs. As an optimization feature, the Fortran90 and C compilers shall perform automatic parallelization.

4.2.5.1.1 Common Preprocessor for Baseline Languages (TR)

The Subcontractor may provide the capability of preprocessing ANSI C preprocessor directives in programs written in any of the baseline languages.

4.2.5.1.2 Base Language Interprocedural Analysis (TR)

The Subcontractor may provide mechanisms to perform basic interprocedural analysis (e.g., variable cross-reference listing, COMMON block analysis, use/def analysis) for programs written in the baseline languages.

4.2.5.1.3 Baseline Language Compiler Generated Listings (TR)

The Subcontractor may provide baseline language compiler option(s) to produce source code listings that include information such as pseudo-assembly-language listings, optimizations and inhibitors, and variable types.

4.2.5.1.4 C++ Functionality (TR)

The Subcontractor may provide an implementation of the C++ standard template library and exception handling.

4.2.5.1.5 Cray Pointer Functionality (TR)

The Subcontractor may provide Cray style pointers implemented in an ANSI X3.9-1977 Fortran compliant compiler.

4.2.5.2 High Performance Fortran (TR)

The Subcontractor may propose a system with a fully supported implementation of HPF Version 1.1 or HPF Version 2.0. Additional extended HPF features to support indirect distribution, asynchronous I/O, C-interface, and distribution of arrays of

reported may include: accessing/freeing beyond allocated block; accessing/freeing unallocated blocks; memory leaks (accumulated memory chunks from malloc calls that can no longer be accessed or freed); and uninitialized memory read/write.

4.2.6.1.4 Debugging Optimized Applications (TR)
The parallel debugger may, in the presence of code optimization, provide a fully supported mechanism for reporting at least minimal information on program state (stack traceback, access to variables that have not been eliminated) and some degree of functionality such as breakpoints where possible (including at labeled basic blocks), single-stepping at some level, and stepping over subroutines.

4.2.6.1.5 Debugger Expression Evaluator (TR)
The parallel debugger may have an evaluator capable of calculating the results of simple expressions (in some scripting-like language) such as values of conditionals, indirect array references, etc. It is also desired that the evaluator handle the supported languages. This might be a language interpreter, but for the purposes of user code to be executed at breakpoints, or watchpoints, some form of compiled code is more desirable to make impact on execution smaller.

4.2.6.1.6 Parallel Debugger Barrier-Points (TR)
The parallel debugger may have an expanded breakpoint functionality for control of parallel processes by setting a "barrier-point." With a barrier point, the process may be held until all processes reach the same point, not responding to "start" commands until the barrier point is satisfied, or released.

4.2.6.1.7 Post-Mortem Debugging (TR)
The debugger may have a fully supported implementation of some mechanism for invoking the debugger for examining the final state of a program that failed ("postmortem debugging"). Facilities for modifying program state and/or continuing execution need not be available in this mode. If the code was not compiled for debugging, it is understood that access to source-level information may be limited.

4.2.6.1.8 Symbol Table (TR)
The time to initialize the debugger on an application with a 15 MB symbol table may be less than a minute longer than the time to initialize the debugger on the same number of processors, but with no symbol table.

4.2.6.1.9 Data Aggregation (TR)
The parallel debugger may have a capability of accumulating the local values of variables that are replicated across multiple threads/processes, and presenting a condensed summary within a single window. In addition, where distributed arrays are supported by the programming model, capability of gathering the elements of a distributed 2-D array and presenting them in a single tabular/visualization.

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4.2.6.2 Stack Traceback (TR)

The Subcontractor may provide runtime support for stack traceback error reporting. Critical information may be generated to stderr upon interruption of a process or thread involving any trap for which the user program has not defined a handler. The information may include a source-level stack traceback (indicating the approximate location of the process or thread in terms of source routine and line number) and an indication of the interrupt type.

4.2.6.3 Lightweight Corefile API (TR)

The Subcontractor may provide the standard lightweight corefile API, defined by the Parallel Tools Consortium, to trigger generation of aggregate traceback data like that described in 4.2.6.2 (may produce a platform-specific format). The specific format and command-line and graphical browsers for the lightweight corefile facility defined by the Parallel Tools Consortium are also of interest.

4.2.6.4 Profiling Tools for Cluster Applications (MR)

The Subcontractor shall provide tools for profiling CPU time distribution from all processes or threads in a parallel program, at the levels of subprocedures and coarse blocks (e.g., large loops). The tools shall include a capability for restricting the amount of profiling data collected to certain portions of the source code (e.g., a specific subset of procedures), through the use of compiler directives, API or command-line switches.

4.2.6.5 Event Tracing Tools for Cluster Applications (MR)

The Subcontractor shall provide event tracing tools for cluster wide applications. Distributed mechanisms for generating event records from all process and threads in the parallel program shall include timestamp and event type designator and shall be formatted in a self-defining data format. This functionality must be provided for all baseline languages. The event tracing tool API shall dynamically activate and deactivate event monitoring during execution from both within and outside a process.

4.2.6.5.1 Message-Passing Event Tracing (TR)

The Subcontractor may provide a fully supported implementation of some mechanism for tracing message sends, receives, and synchronizations, including non-blocking messages, for all message-passing libraries supported on the platform.

4.2.6.6 Performance Statistics Tools for Cluster Applications (MR)

The Subcontractor shall provide performance statistics tools, whereby performance measures obtained for individual threads or processes are reported and summarized for the cluster wide application. There shall be a mechanism for capturing the statistics and storing them for later analysis/viewing. Statistics of interest include: instruction issues by type; branch prediction accuracy; Translation Lookaside Buffer (TLB) and cache misses; lock or critical section usage; page faults; I/O and communications (in terms of bytes sent/received). The measures shall also include a summary of memory usage (actual allocations, not memory references) and a mechanism to relate that back to baseline language source code.

4.2.6.7 Cluster Wide Application Development Tool API (TR)

The Subcontractor may provide a published API (possibly platform-specific) for dynamically activating and deactivating profiling, event tracing, and performance statistics during execution.

4.2.6.8 Cluster Wide Application Development Tool GUI (MR)

The Subcontractor shall provide graphical as well as textual displays of profiling, event tracing and performance statistics tools output.

4.2.6.9 Timer API (TR)

The Subcontractor may provide an implementation of the API defined by the Parallel Tools Consortium for interval wallclock and for interval CPU timers local to a thread/process. These timer interfaces may access the best available wallclock timer on the platform, in terms of accuracy and non-intrusiveness.

4.2.7 Applications Building

4.2.7.1 Linker and Library Building Utility (MR)

The Subcontractor shall provide an application linker with the capability to link object and library modules into an executable binary. In addition the linker shall be capable of re-linking selected portions of an application (i.e., replace specific objects within the binary). The Subcontractor shall include a facility to build and incrementally update libraries of object modules.

4.2.7.2 Make Utility (MR)

The Subcontractor shall provide a make utility.

4.2.7.3 Parallel Make (TR)

The Subcontractor may provide a UNIX make facility that can utilize parallelism in performing the tasks in a makefile.

4.2.7.4 Source Code Management (TR)

The Subcontractor may provide a set of tools for the management of source code in a multiple programmer project environment (e.g., SCCS, USM, RCS, CVS).

4.2.7.5 Dynamic Processor Allocation (TR)

The Subcontractor may provide the capability of running an application on varying numbers of processors and/or threads without recompilation or relinking.

4.2.8 Application Programming Interfaces

4.2.8.1 Optimized Message-Passing Interface (MPI) Library (MR)

The Subcontractor shall provide a fully supported implementation of the current MPI standard, as defined by the most recent specification of the MPI forum. The MPI library shall operate transparently on all required interconnects, including shared memory.

4.2.8.2 MPI2 Library (TR)

The Subcontractor may make available an implementation of the evolving MPI2 standard (specifically dynamic spawning and single-sided communication capabilities) within one year of standard finalization.

4.2.8.3 Visual Display of Message Traffic (TR)

The Subcontractor may make available an implementation of a visual API to display message traffic and program state in a time-space diagram (like that generated by XPVM or AIMS).

4.2.8.4 Optimized Parallel Virtual Machine (PVM) Library (TR)

The Subcontractor may provide an implementation of PVM within six months of latest release from the Oak Ridge National Laboratory (ORNL).

4.2.8.5 Parallel I/O API (TR)

The Subcontractor may provide a fully supported implementation of a published API supporting four kinds of concurrent file I/O as described below. All threads and processes in a parallel program may be capable of performing the four operations described below although there may be variation in performance from one thread or process to another. It is the application's responsibility to ensure that all participating threads and processes open the logical file in the same mode.

1. Sequential read: all participating threads and processes read from a logically shared file using a shared file pointer. Each record may be read just once.

2. Parallel read: all participating threads and processes read from a logically shared file using independent file pointers. Thus, each process reads each record.

3. Sequentialized write: all participating threads and processes write to a logically shared file using a shared file pointer. Records are atomic and cannot be overwritten, but they may be merged into the shared output file in any order.

4. Direct access read/write: each participating thread or process can read or write any specified record location of a logically shared file. Updates are not guaranteed to take effect until the file is closed, but if the implementation makes use of shared buffers, records shall be atomic (i.e., not overwritten by other processes).

4.2.8.5.1 Parallel I/O Buffer Attributes (TR)

The supplied parallel I/O library may have user configurable butter lengths and all buffers associated with a job may be automatically flushed upon completion or failure of the job. It may also have an API for application invoked flushing of individual buffers.

4.2.8.5.2 Parallel I/O Sequential Write (TR)
Output from a cluster wide parallel job directed to stdout/stderr may be atomic on a line by line basis and be prefixed with a label indicating which thread or process performed the write.

4.2.8.5.3 Asynchronous Parallel I/O (TR)
The supplied parallel I/O library may also support asynchronous read/write operations in all the parallel I/O modes.

4.2.8.5.4 High-Level Parallel I/O API (TR)
The supplied parallel I/O library may also support an interface to a self-describing data-format, such as netCDF or HDF.

4.2.8.6 Graphical User Interface API (MR)
The Subcontractor shall provide the standard X11R6 and Motif 1.2, or current versions, applications, servers and API libraries.

4.2.8.7 Visualization API (TR)
The Subcontractor may provide OpenGL 1.0, or current version, and the Programmers Hierarchical Interactive Graphics System (PHIGS), ISO/IEC 9592-1:1988, including ISO/IEC 9592-4:1992 Plus Lumierre (lighting) and Surfaces (PHIGS PLUS), or current version.

4.2.8.8 Math Libraries (TR)
The Subcontractor may supply highly optimized mathematical libraries, callable from all baseline languages, for serial (single processor) SMP and cluster wide applications.

4.2.9 Operating System Security (TR)
The Subcontractor may provide security functionality where access to the system may be controlled by identifying and authorizing the user or by checking the validity of forwarded credentials. All users may be authenticated before access is permitted. Successive logon attempts may be controlled by denying access after multiple (maximum of 5) unsuccessful logon attempts with the same user ID.

4.2.9.1 Login Information (TR)
Users may be notified upon successful login of the following information: date and time of last successful login; and where the operating system provides the capability, number of unsuccessful attempts.

4.2.9.2 Audit Capability (MR)
A record of each user login and logoff shall be maintained. In addition, the following information shall be maintained as an audit record: use of authentication changing procedures; unsuccessful logon attempts; and blocking of a user ID and the reason for the blocking.

4.2.10 Compliance with DOE Security Mandates (MR)
DOE Security Orders have changed over time. From time to time these mandates cause LANL and LLNL to fix bugs or implement security features in vendor operating systems and utilities. We require, for computer security purposes only on this contract, that the Subcontractor either provide to the University the operating system and utilities source code on a demand basis or make needed enhancements or bug fixes as required.

4.2.11 Cluster Environment On-Line Document (TR)
The Subcontractor may supply hardcopy and on-line documentation for all major hardware and software subsystems. The on-line documentation may be readable by all users utilizing an X11-based graphical user interface and standard terminal interfaces.

4.2.12 SST Applications Development Support (MR)
The Subcontractor shall supply at least two on-site analysts to provide expertise to the University code development teams in the areas of software development tools, parallel applications libraries and applications performance. The proposed system will be installed in a classified area at the Laboratory and so analyst personnel shall obtain DOE Q clearances.

End of Section 4

5.1 Initial Delivery Hardware Requirements

5.1.1 Hierarchical Hardware Model

5.1.1.1 ID SMP Scalable Cluster (MR)

The Subcontractor shall provide an Initial Delivery (ID) system that implements all aspects of the hierarchical distributed shared memory programming model. The hierarchy consists of processor registers, cache, shared memory and communications. The hierarchy shall present the same performance aspects as the SST SMP scalable cluster. All cluster components need not present all of the memory hierarchy components. All cluster components shall be connected via a scalable network technology. The scalable cluster network shall support high bandwidth, low latency message passing. Within SMP cluster components the CPUs shall be connected via a high speed, extremely low latency mechanism to the set of hierarchical memory components. The cache may be hierarchical. If there are multiple SMP caches, they shall be kept coherent automatically by the hardware. The memory may be a Non-Uniform Memory Access (NUMA) architecture.

5.1.1.2 CPU Performance Model (TR)

The ID system may present similar general CPU performance characteristics to ASCI applications as the SST. The University is aware that the specifics (e.g., number of FP operations issued per clock, instruction pipeline depth, off chip bandwidth, branch prediction and dynamic execution) between the two systems may differ.

5.1.1.3 Hierarchical Memory Model (TR)

The ID system may present a similar general hardware hierarchical memory model to ASCI applications as the SST does. The University is aware that the specifics (e g., cache sizes, bandwidths and latencies, non-unit stride access performance and ratio of remote to local memory references) between the two systems may differ.

5.1.1.4 Message Passing Model (TR)

The ID system may present a similar general message passing and remote memory reference hardware interface to ASCI applications as the SST does. The University is aware that the specifics (e.g., bandwidths and latencies, remote reference granularity and software overhead) between the two systems may differ.

5.1.1.5 Parallel I/O Model (TR)

The ID system may present a similar general parallel I/O hardware model to ASCI applications as the SST does. The University is aware that the specifics (e.g., number of file servers, I/O channel bandwidths and latencies and software overhead) between the two systems may differ.

5.1.2 ID Performance Characteristics

5.1.2.1 ID Single CPU Performance (TR)

The minimum single CPU performance, as measured by peak floating point operations issued per second, may be at least two hundred fifty million 64-bit floating point operations per second (250 MFLOP/s).

5.1.2.2 ID SMP Cluster Performance (MR)

The ID SMP cluster performance, as measured by aggregate peak floating point performance, shall be at least one hundred billion 64-bit floating point operations per second (100 GFLOP/s).

5.1.2.3 ID System Component Scaling (TR)

In order to provide the maximum flexibility to the Subcontractor in meeting the goals of the ASCI project the exact configuration of the ID SMP scalable cluster is not specified. Rather the ID configuration is given in terms of lower bounds on component attributes. The ID SMP scalable cluster configuration may meet or exceed the following parameters:

- Memory Size ≥ 50 GB
- Disk Space ≥ 2.5 TB
- Cache Bandwidth ≥ 400 GB/s
- Memory Bandwidth ≥ 100 GB/s
- Intra-Cluster Network Bi-Section Bandwidth ≥ 50 Gb/s
- System Peak Disk I/O Bandwidth ≥ 3 GB/s

5.1.2.4 ID SMP Cluster Message Passing Performance (TR)

The ID SMP may be interconnected with at least one high speed, low latency network. Each SMP may have at least one connection link to this network capable of sustaining at least 0.1 Gb/s per peak GFLOP/s of processing power of that SMP. The cluster interconnect latency, as measured by sending a minimum length MPI message from user program memory on one processor in the SMP cluster to user program memory on any other processor in the cluster and receiving back an acknowledgment divided by two (standard MPI user space ping-pong test), may be less than 10 micro-seconds ($1x10^{-5}$ seconds).

Example: If the Subcontractor proposes 13 SMP's each with an aggregate of 8.0 GFLOP/s peak, then the cluster interconnect link bandwidth may be at least 0.1*8 Gb/s = 0.8 Gb/s.

5.1.2.5 Sustained ID Serial and Parallel I/O Performance (TR)

The minimum sustained transfer rate for reading or writing of a single 1.0 GB file to or from a single logical file system anywhere in the active I/O partition may be at least 10 MB/s. The minimum sustained parallel I/O transfer rate for reading or writing of a

parallel 10.0 GB file to a parallel file system in the active I/O partition may be at least 0.002 Byte/s per Peak FLOP/s.

Example: For a 100 GFLOP/s peak ID system, requirement 5.1.2.3 specifies that the system shall have at least 2.5 TB disk and 3.0 GB/s system peak I/O bandwidth. The sustained parallel I/O bandwidth to a single application running on the cluster may be at least 0.002*100 = 0.2 GB/s. This would allow an application write a 50 GB restart dump in a little under 4.2 minutes.

5.1.2.6 ID SMP Cluster External Networking (TR)

The ID system may include a minimum of four (4) FDDI interfaces (dual attached, 100 Mb/s). The ID system may include at least 8 HIPPI connections (800 Mb/s). These external networking connections may be split between the RED and BLACK partitions. Each of these connections may be capable of interoperating with existing LANL and LLNL systems and network gateways.

5.1.3 RED/BLACK Resource Usage Model

5.1.3.1 RED/BLACK Partitions (MR)

The ID system resources shall be available to ASCI code developers on both the RED and BLACK partitions at least part of the time. Code developers require constant access to the file systems on both partitions and the ability to compile, make libraries, link and load (but not run or debug) binaries. Two general approaches to this problem are specified. The system provided shall meet the requirements of one of these two approaches. An alternate solution that meets the requirements stated above may also be considered at the sole discretion of the University.

5.1.3.1.1 RED/BLACK Resource Split (MQ)

The scalable SMP cluster shall be divided in two (not necessarily equal) separate, stand-alone clusters. One cluster shall be placed in the RED network partition and one cluster shall be placed in the BLACK partition for ASCI code development. The CPU, memory, disk, scalable cluster interconnect and external network resources shall be divided between the two environments. Disks local to the SMPs are acceptable with this option.

5.1.3.1.2 RED/BLACK Partition Switching (MO)

The external network and aggregate disk resources of the scalable SMP cluster shall be divided in two (not necessarily equal) separate, I/O subsystems that can be attached and detached to the SMP cluster (one RED and one BLACK). The SMP cluster shall boot from either of these I/O subsystems. When the SMP cluster is attached to the RED (or BLACK) I/O subsystem and external network the files contained on the BLACK (or RED) subsystem shall be available to users over BLACK (or RED) external network connections. Users shall be able to edit, compile and load their programs utilizing this BLACK (or RED) resource. The system shall be able to switch between the RED and BLACK I/O partition and external network in less than thirty (30) minutes. There shall be no user-writeable non-volatile

memory (for any other than privileged users) in the proposed system except in the detachable, independent RED/BLACK I/O subsystems.

5.1.3.2 ID RAID Arrays (TR)

All disk space provided in the RED/BLACK partitions may be RAID 3 or RAID 5 arrays. The RAID units may have high availability characteristics. These include redundant failover power supplies and fans, hot swapable disks, ability to run in degraded mode (one disk/RAID string failure) and rebuild a replaced disk on the fly with minimal performance impact.

5.1.3.3 Cluster I/O Upgradeability (TR)

The disk capacity may be field upgradeable to twice the Subcontractor proposal amount.

5.1.4 Reliability, Availability, Serviceability and Maintenance (TR)

The Subcontractor may provide the same reliability, availability, serviceability and maintenance for the ID system as for the SST system as described for the Target Requirements in section 4.1.5.

5.1.4.1 Replacement Parts and Maintenance (MR)

The Subcontractor shall supply hardware and software maintenance for the proposed system. Hardware maintenance response time shall be less than four hours from incident report until Subcontractor personnel arrive for repair work. Software maintenance shall include a trouble reporting mechanism and periodic software updates. In addition, the Subcontractor shall provide quick turnaround of software fixes to reported bugs. The proposed system will be installed in a classified area at the Laboratory and so maintenance personnel shall obtain DOE Q clearances.

5.2 Initial Delivery Software Requirements

The general philosophy for the ID software requirements is to pose as few requirements as is feasible and reference all of the SST software target requirements (see section 5.2.9). This is done for the sake of brevity and does not indicate a lack of perceived value by the University in the software environment on the ID system.

5.2.1 Operating System

5.2.1.1 SMP Base Operating System and License (MR)

The Subcontractor shall provide a standard multiuser POSIX (IEEE 1003.1-1990; FIPS 151-2; IEEE 1003.2 or later) UNIX interactive operating system on each SMP, consisting of a basic kernel that supports system services and multiprocessing applications. A fully supported thread operations in shared address space, as defined by the POSIX 1003.1c-1995 (or later), implemented at the kernel level shall also be provided. The operating system shall provide mechanisms to share memory between user processes and to run threads within a single user process on multiple CPUs simultaneously. This shall include provision of right-to-use license for an unlimited number of users, including unlimited concurrent usage, of the operating system, daemons, and associated utilities. The University will accept the Offeror's self-certification for POSIX compliance.

5.2.1.2 Networking Protocols (MR)

The operating system shall support the DoD standard networking protocol suite operating over the network interfaces described elsewhere in this document. In particular, the TCP/IP, UDP, NIS, NFS (client and server), RIP, telnet, and ftp protocols shall be supported.

5.2.1.3 Third Party Transfers (TR)

The Subcontractor may provide a driver that supports third party transfers of files between the ID and HIPPI network attached disks controlled by NSL UniTree version 2.1, or later. This implies an operating system driver capable of IPI-3 over HIPPI with National Storage Laboratory third party extensions (see LLNL Report UCRL-ID-123184).

5.2.1.4 Group Routing (MR)

The Subcontractor shall provide an implementation of "Group Routing," which segregates network traffic based on (sub)network address and group ID. A modified ROUTE table and command that allows (or explicitly disallows) packet routing to specific IP subnets based on group ID would satisfy this need.

5.2.2 Distributed Computing Environment (MR)

The Subcontractor shall provide the Open Software Foundation (OSF) Distributed Computing Environment (DCE), version 1.1 or later, client software on the proposed cluster of SMPs. This shall include Distributed File System (DFS) client-side distributed filesystem implementation which supports all standard features such as integration with CDS naming, integration with the DCE security, authentication, and authorization system. Additionally, this shall include fully supported implementation of DCE client-side security system including authentication, authorization controls, and access control lists. Fully supported remote system access programs such as rcp, rlogin, rsh, rexec, telnet, and ftp shall attempt to forward credentials to the remote system; and remote access services such

as rcpd, rlogind, rshd, rexecd, telnetd, and ftpd shall accept forwarded credentials from a remote system. If credentials haven't been forwarded, the authentication mechanism of various system services such as login, rlogind, telnetd, and ftpd shall use the DCE security service to authentication the password which the user presents and shall receive DCE and Kerberos V5 compatible tickets from the DCE security service.

5.2.2.1 Distributed File System Server (MR)

The Subcontractor shall provide Open Software Foundation (OSF) Distributed File System Servers, version 1.1 or later. A majority of the file space specified in section 5.1.2.3 shall be exportable with these DFS servers to clients over external network. The DFS servers shall support file and directory Access Control Lists (ACLs).

5.2.2.2 Transarc Encina (MR)

The Subcontractor shall provide fully supported client-side implementation of the Transarc Encina (version 1.1 or later) distributed transaction system (which is needed to support the HPSS API).

5.2.3 Cluster Wide Resource Management and Accounting (TR)

The Subcontractor may provide a network batch queuing system (e.g., NQS, LSF) that allows for the execution of batch jobs within the cluster environment. The Subcontractor may provide a standard UNIX session based accounting mechanism that accurately accounts for all activity in the system on an end of process basis.

5.2.4 Cluster System Administration Tools (TR)

The Subcontractor may provide a set of facilities to administer the ID SMP cluster as a single entity. Such facilities may include, but are not limited to: file system mounts; SMP booting; SMP status, where appropriate; SMP consistency checks; software installation; resource administration; SMP shutdown/restart; system patch installation; login control; and system back-ups. In addition, the Subcontractor may provide a set of facilities to analyze ID system performance and make tuning modifications.

5.2.5 Parallelizing Compilers/Translators

5.2.5.1 Baseline Languages (MR)

The Subcontractor shall provide Fortran90 (ANSI X3.198-9 or later), C (ANSI/ISO 9899-1992; FIPS 160 or later), and C++ compilers. These languages shall be referred to as the baseline languages in this document. Also, an assembler shall be provided. The Subcontractor shall provide the fully supported capability to build programs from a mixture of the baseline languages (i.e., inter-language subprocedure invocation must be supported).

5.2.5.1.1 Cray Pointer Functionality (TR)

The Subcontractor may provide Cray style pointers implemented in an ANSI X3.9-1977 Fortran compliant compiler.

5.2.5.2 Hierarchical Programming Model (TR)

The ID programming environment may present a similar general hierarchical programming model to the programmer as that anticipated for the SST. This model may include the notion of hierarchical amalgamation of memories and latencies (e.g., registers, cache, SMP local memory and SMP remote memory) and code development techniques (e.g., local memory organization techniques, threads, processes, message passing) to utilize them efficiently. The University is aware that the specifics (e.g., compiler optimization features, support for multiple parallel programming paradigms in a single program, support for remote memory reference, hardware features) between the two programming environments may differ.

5.2.6 Debugging and Tuning Tools

5.2.6.1 Debugger for Parallel Applications (MR)

The Subcontractor shall provide an interactive debugger with an X11-based graphical user interface for debugging both sequential and parallel programs for all the baseline languages. The debugger shall report information at the level of program source code (before preprocessing) for all baseline languages, including support for mixed-language programs. Functionality shall include, but is not limited to: control of processes and threads (start/stop, breakpoints, and single-step into/over subprocedure invocations); examination of program state (stack tracebacks, contents of variables, aggregates, and blocks of memory, current states, registers, and source locations of processes); and modification of program state (changes to contents of variables, aggregates, and blocks of memory).

5.2.7 Applications Building

5.2.7.1 Linker and Library Building Utility (MR)

The Subcontractor shall provide an application linker with the capability to link object and library modules into a executable binary. The Subcontractor shall include a facility to build and incrementally update libraries of object modules.

5.2.7.2 Make Utility (MR)

The Subcontractor shall provide a make utility.

5.2.8 Application Programming Interfaces

5.2.8.1 Optimized Message-Passing Interface (MPI) Library (MR)

The Subcontractor shall provide a fully supported implementation of the current MPI standard, as defined by the most recent specification of the MPI forum. The MPI library shall operate transparently on all required interconnects, including shared memory.

5.2.8.2 Optimized Parallel Virtual Machine (PVM) Library (TR)

The Subcontractor may provide implementation of PVM within six months of latest release from Oak Ridge National Laboratory (ORNL).

5.2.8.3 Parallel I/O API (TR)

The Subcontractor shall provide a fully supported implementation of a published API supporting four kinds of concurrent file I/O as listed below. All threads and processes in a parallel program shall be capable of performing the four operations described below although there may be variation in performance from one thread or process to another. It is the programmer's responsibility to ensure that all participating threads and processes open the logical file in the same mode.

1. Sequential read: all participating threads and processes read from a logically shared file using a shared file pointer. Each record is read just once.

2. Parallel read: all participating threads and processes read from a logically shared file using independent file pointers. Thus, each process reads each record.

3. Sequentialized write: all participating threads and processes write to a logically shared file using a shared file pointer. Records are atomic and cannot be overwritten, but they may be merged into the shared output file in any order.

4. Direct access read/write: each participating thread or process can read or write any specified record location of a logically shared file. Updates are not guaranteed to take effect until the file is closed, but if the implementation makes use of shared buffers, records shall be atomic (i.e., not overwritten by other processes).

5.2.8.3.1 Parallel I/O Buffer Attributes (TR)

The supplied parallel I/O library may have user configurable buffer lengths and all buffers associated with a job may be automatically flushed upon completion or failure of the job. It may also have an API for manual flushing of individual buffers.

5.2.8.3.2 Parallel I/O Sequential Write (TR)

Output from a cluster wide parallel job directed to stdout/stderr may be atomic on a line by line basis and be prefixed with a label indicating which thread or process performed the write.

5.2.8.3.3 High-Level Parallel I/O API (TR)

The supplied parallel I/O library may include an interface to a self-describing data-format, such as netCDF, or HDF.

5.2.8.4 Graphical User Interface API (MR)

The Subcontractor shall provide the standard X11R5 and Motif 1.2, or current versions, applications, servers and API libraries.

5.2.8.5 Math Libraries (TR)

The Subcontractor may supply highly optimized mathematical libraries, callable from all baseline languages, for serial (single processor) SMP and cluster wide applications.

5.2.9 SST Software Environment Features for ID (TR)

The ID system may present a similar general software environment as the SST does. The University is aware that the specifics (e.g., clustering software, intra-SMP code development tools, software scalability) between the two systems may differ. Indicate which of the SST Software target requirements in section 4.2 may be delivered with the ID (or shortly thereafter as part of a software technology refresh program).

5.2.10 Compliance with DOE Security Mandates (MR)

DOE Security Orders have changed over time. From time to time these mandates cause LANL and LLNL to fix bugs or implement security features in vendor operating systems and utilities. We require, for computer security purposes only on this contract, that the Subcontractor either provide to the University the operating system and utilities source code on a demand basis or make needed enhancements or bug fixes as required.

5.2.11 Cluster Environment On-Line Documentation (TR)

The Subcontractor may supply hardcopy and on-line documentation for all major hardware and software subsystems. The on-line documentation may be readable by all users utilizing an X11-based graphical user interface and standard terminal interfaces.

5.2.12 ID Applications Development Support (MR)

The Subcontractor shall supply at least one on-site analyst to provide expertise to the University code development teams in the areas of software development tools, parallel applications libraries and applications performance. The proposed system will be installed in a classified area at the Laboratory and so analyst personnel shall obtain DOE Q clearances.

5.3 Performance of the ID System

The seven benchmark programs described below may be executed by the Subcontractor for the purpose of measuring the execution performance and compiler capabilities of the ID system. Each of the benchmark programs represents a particular subset and/or characteristic of the expected ASCI workload, which consists of solving complex scientific problems using a variety of state-of-the-art computational techniques. The general requirements and constraints outlined below shall apply to all of the benchmark codes. Additional requirements and/or constraints found in individual benchmark readme files shall apply to that individual benchmark.

5.3.1 Benchmark Suite (TR)

The test programs are available via the Web at http://www.llnl.gov/asci_benchmarks. There is a master readme file which provides further information regarding the benchmark suite as a whole. The individual benchmark codes can be downloaded as tar files. A readme file for each benchmark provides more detailed information about that benchmark including a more complete description of that benchmark, how to build and run it, and any specific constraints that apply to it. Access to some of the benchmarks is restricted and will require contacting the Contract Administrator to gain access.

The sPPM benchmark is an explicit three-dimensional hydrodynamics code designed to model problems involving high-speed hydrodynamic flow using the piece-wise parabolic method.

The SWEEP3D benchmark is a three-dimensional solver for the time-independent, neutral particle transport equation on a Cartesian mesh. The first-order form of the transport equation is solved by sweeping through the spatial mesh along discrete directions (ordinates).

The COMOPS benchmark is a communications program to test intra-cluster communications capability. Node-to-node, global reduction and mesh-oriented communication performance are measured.

The SMPT benchmark is a set of programs that tests the computational performance of a single SMP using various computational constructs. The set consists of three programs in three different languages (Fortran 77, Fortran 90 and C). Measurements of the time and MFLOP/s rate for each computational construct are recorded.

The DSBENCH benchmark solves Maxwell's curl equations in the time-domain and in three spatial dimensions. The code tests the use of unstructured non-orthogonal grids. Techniques in DSBENCH can be used with arbitrary unstructured grids composed of convex polyhedral cells.

The PCTH benchmark is an Eulerian hydrocode used to model time-dependent large-deformation material motion due to strong pressure impulses and/or large impact velocities. It is a large multi-language code written in C++, C, and Fortran 77.

The LFK benchmark is a suite of computational kernels that measures the computational performance of a single processor. The geometric mean of the rates of those kernels is reported.

5.3.2 System Configuration (MR)

If the Offeror chooses to submit benchmark results then those runs shall be made on a system with the following characteristics. The reference benchmark system shall be a scaled down version of the actual proposed ID system. The sPPM, SWEEP3D, and PCTH benchmarks shall be run on a 30 peak GFLOP/s configuration consisting of at least two

SMPs. The DSBENCH program requires only a 10 peak GFLOP/s system but again consisting of at least two SMPs. The COMOPS program shall be run on an 8 SMP cluster although each SMP need not be fully populated with processors; the specific requirement and alternatives are discussed in the COMOPS readme. The SMPT benchmark requires only a single SMP because it is scaled relative to the full proposed ID system. The LFK program runs on only a single processor.

Reference Benchmark Configurations	
sPPM	30 Peak GFLOP/s 2+ Node Cluster
SWEEP3D	30 Peak GFLOP/s 2+ Node Cluster
PCTH	30 Peak GFLOP/s 2+ Node Cluster
DSBENCH	10 Peak GFLOP/s 2+ Node Cluster
COMOPS	8-Node Cluster
SMPT	Single SMP
LFK	Single Processor

The benchmark system should contain the same processors, cache, memory, SMP size, interconnects, etc. that the ID system would have. If this condition is not possible, benchmark results from an alternative system may be reported but the Subcontractor shall also provide estimated scaled performance to the requested configurations consistent with the benchmark system configurations as identified in the previous paragraph. All scaling arguments shall be fully described by the Subcontractor and will be reviewed and evaluated by the University; supporting documentation may be provided. The University will be the sole judge of the validity of any scaled results.

5.3.3 Test Procedures (MR)

If the Offeror chooses to submit benchmark results then those runs shall be made according to the following test procedures. The ASCI systems will be primarily used in a high-level language environment. It is the intent of these benchmarks to measure performance of the ID system from this standpoint. Recoding of the benchmarks or portions of the benchmarks in assembly language is prohibited. The use of library routines that currently exist in a Offeror's supported set of general or scientific libraries, or will be in such a set when the ID system is delivered, is allowed at the University's discretion when they do not specialize or limit the applicability of the benchmark nor violate the measurement goals of the particular benchmark. Source preprocessors, execution profile feedback optimizers, etc. are allowed as long as they are, or will be, available and supported as part of the compilation system for the ID system. All benchmarks that use the message-passing programming paradigm shall use a supported communication library that implements the MPI standard. Some specific constraints about the use of library routines apply to individual benchmarks as stated in individual benchmark readme files.

Changes to accommodate unique hardware and software characteristics of a system that are consistent with the preceding paragraph will be allowed except where specifically prohibited in the constraints for each benchmark. Code modifications shall be documented

in the form of initial and final source files, preferably with accompanying text describing the changes. An audit trail shall be supplied to the University for any changes made to the benchmark codes. The audit trail shall be sufficient for the University to determine that changes made violate neither the spirit of the benchmark nor the specific restrictions on the various benchmark codes.

Output and measurements that shall be provided by the Offeror for each benchmark are:

1. the output of the results generated by each individual benchmark run,
2. any additional performance measurements as requested in the readme of each benchmark,
3. the CPU time, system time, and wall clock time for the entire execution of each individual benchmark run,
4. the maximum memory usage during the execution of each benchmark run, broken down by operating system usage and application usage,
5. all compilation options, the wall clock time required to compile all source code, and the wall clock time to load/link (i.e., create an executable image) for each benchmark.

Correct execution and measurements shall be certifiable by the University.

End of Section 5

6.0 Implementing a Sustained Stewardship TeraFLOP

Because of the complexity of this activity, a very strong project plan is of great importance. The Subcontractor's understanding of our requirements, approach to meeting those requirements, commitment of resources, and attention to cost are critical to the success of the project. In the same vein, the approach to managing this activity is critical. The need to have the support of corporate senior management and a major commitment to a quality assurance plan are also examples of areas critical to the success of the project.

The specific mandatory detailed planning and effort tracking and documentation requirements for the development and manufacturing efforts that shall be delivered as part of the contract are delineated in sections 6.1 and marked with (MR) designation.

The specific mandatory delivery milestones for the project that shall be met are delineated in section 6.2 with (MR) designation.

In addition to the mandatory delivery milestones, the Subcontractor may deliver any target delivery milestones, as delineated in section 6.2 with (TR) designation, and any Subcontractor-proposed features consistent with the objectives of this project and Subcontractor's Research and Development Plan which the Subcontractor believes will be of benefit to the project.

6.1 Detailed Project Plan

This project envisions a quantum advance in delivered performance capability for LANL and LLNL scientists and engineers. To successfully reach this level of delivered performance the Subcontractor shall submit, within thirty (30) days of contract award, a detailed, highly focused plan delineating the research and development activities to achieve the project goals. At a minimum, the detailed plan shall contain the following components: management; hardware; software.

6.1.1 Detailed Project Management Plan (MR)

The Subcontractor shall submit for University approval, within thirty (30) days of contract award, a detailed project management plan. The plan shall contain at least the following components:

- Actual management team and structure. List the actual members of the management team, provide their resumes and indicate their roles and responsibilities. Provide an actual organizational chart of the management team and lines of reporting to various parts of the company. Indicate the company interface mechanisms with the University.

- Actual organization for core team. List the contributing organizations within the company and how they will be coordinated. Provide an organizational chart of the company that depicts these groups and their lines of responsibility. Include hardware R&D, software R&D, productization, field team and applications support,

manufacturing, purchasing and quality assurance. Indicate how these areas will be coordinated by the management team.

- Detailed project plan and schedule. Provide a Work Breakdown Structure (including milestones) for the project giving at least five levels of detail, as appropriate, with projected start and finish dates and interdependencies of deliverables. This project plan shall elaborate on the tasks and milestones committed to in the scalable systems development section and clearly delineate the project critical path tasks (see below). Provide a Project Schedule that starts at contract award and ends with SST TeraFLOP/s sPPM Demonstration. The schedule shall be developed using the Critical Path Method (CPM) scheduling technique and shall utilize the same numbering scheme as the Work Breakdown Structure. The Project Schedule shall be placed under configuration control to ensure that all project schedule updates are accomplished in a manner that preserves an audit trail from the original Project Schedule to the current schedule status. The Schedule shall contain sufficient detail to ensure that the University and the Subcontractor can measure progress on an appropriate number of milestones and tasks on any path or on parallel paths to measure progress and to determine the true critical path to project completion.

- Risk reduction plan. In order to meet the project goals and objectives in a timely manner, indicate fall-back strategies that will become operative should accelerated delivery schedules not proceed as rapidly as predicted. Indicate additional resources that will be available to the effort in the event that problems develop. Delineate the problem escalation and resolution path. Designate and identify an individual within your company, whose line of reporting is outside that of the Project Management Team and Core Team, to provide independent quality assurance for this project. This individual shall report directly to the corporate executive ultimately responsible for this project and shall provide independent analysis of project schedule and potential problems.

6.1.2 Detailed Hardware Project Plan (MR)

The Hardware Project Plan shall contain at least the following components:

- CPU Technology. Identify the planned milestones for processor development that lead to those to be deployed in the SST. In particular, provide milestones for silicon process development, sampling, engineering quantities, production quantities for each processor generation(s) between the ID and SST.

- Shared Memory Subsystems. Provide the planned tasks and milestones for shared memory subsystem research and development. Include tasks and milestones for at least the following development areas: memory architecture; cache coherency protocols; interconnect technology; performance modeling efforts; applications anatysis.

- SMP Product Development. Provide the planned tasks and milestones for SMP product development between the ID and SST system generations. Include milestones for productization, beta-test and general availability areas. Indicate how and when this technology would be inserted at LANL or LLNL in the technology refresh program.

- Cluster Interconnect. Provide the planned tasks and milestones for cluster interconnect research and development between the ID and SST system generations. Include tasks and milestones for at least the following development areas: increasing bandwidth; low latency message passing; interconnect topology; virtual memory DMA between SMPs; extending cache coherent distributed shared memory between SMPs. Indicate how and when this technology would be inserted at LANL or LLNL in the technology refresh program.

- Cluster I/O and External Network Connections. Provide the planned tasks and milestones for development of cluster I/O and external networking. By external networking, we mean the standards-based networking (e.g., HIPPI, ATM, Fibre Channel) to connect the cluster to other networks at LANL and LLNL. Include tasks and milestones for at least the following development areas: parallel I/O development; remote file systems in support of the RED/BLACK I/O partitioning scheme; external networking. Indicate how and when this technology would be inserted at LANL or LLNL in the technology refresh program.

- Scalable Systems Capability. Provide the planned tasks and milestones for the development and testing of scalable system components. Include development of hardware for reliability, availability and serviceability (RAS).

- Other. Provide the planned tasks and milestones for research and development efforts related to this contract that are not covered by the preceding requirements.

6.1.3 Detailed Software Project Plan (MR)

The Software Project Plan shall contain at least the following components:

- Operating System Development. Provide the planned tasks and milestones for SMP operating system development. Include tasks and milestones for at least the following development areas: scalable SMP support; distributed shared memory locality of reference; support for hardware and system performance monitoring; low latency user callable thread mechanism; memory management; full 64-bit support, journaled file systems; reboot time minimization; SMP local gang scheduling; virtual memory support for batch processing (e.g., process swapping and checkpointing); support for RED/BLACK I/O partitions; DCE standard tracking; group routing.

- Single System Image Development. Provide the planned tasks and milestones for cluster wide single system image development. Include tasks and milestones for at least the following development areas: POSIX compliant cluster wide file system; cluster single IP network address; page leveled shared memory between SMPs; file

system failover; cluster wide lock management; cluster wide process and POSIX session ID space; virtual memory DMA between SMPs; load balancing and process migration between SMPs; system administration tools for managing the cluster as a single system;

- Parallel I/O Development. Provide the planned tasks and milestones for cluster wide parallel application I/O development. Include tasks and milestones for at least the following development areas: networked connected parallel I/O development; application programming interface; performance.

- Compiler Development. Provide the planned tasks and milestones for base language (Fortran 90, C, C++) and HPF development. Include tasks and milestones for at least the following development areas: mixed language support; automatic and directed parallelization (decomposition) of applications; latency reduction techniques; compiler optimization; migration support (from ID to SST).

- Message Passing Environment. Provide the planned tasks and milestones for message passing development. Include tasks and milestones for at least the following development areas: bandwidth and latency targets for MPI; MPI standard tracking; integration with debuggers, profilers and performance analysis tools; interoperability to cluster external resources.

- Code Development Tools. Provide the planned tasks and milestones for code development tools development. Include tasks and milestones for at least the following development areas: parallel make; profilers, debuggers, application performance monitoring tools, GUI development for code development tools.

- Cluster Resource Management Support. Provide the planned tasks and milestones for resource management development. Include tasks and milestones for at least the following development areas: hooks for external policy modules; system monitoring tools; cluster wide gang scheduling.

- Fault Tolerance and Containment. Provide the planned tasks and milestones for the development of fault tolerance and gradual degradation of service in the face of component failure features. Include tasks and milestones for at least the following development areas: failure tolerance of CPUs, memory components; SMPs, interconnect, I/O subsystems; error detection vs. retry.

- Other. Provide the planned tasks and milestones for research and development efforts related to this contract that are not covered by the preceding requirements.__

6.2 Project Milestones

Because of the need to meet Science-Based Stockpile Stewardship goals as quickly as possible, the project schedule and milestones are of critical importance. Meeting the following milestones is critical to the success of the project; earlier is much better.

The implementation will entail the installation of local clusters at Laboratory sites. Each cluster will be assembled from individual SMPs that are interconnected with a high-speed, low-latency interconnect supplied by the Subcontractor. These clusters will be connected to the site's local campus network and to the wide area network that interconnects the three Laboratories. Access to the resources will be provided locally via the site's existing campus networks and remotely through the ASCI-supplied WAN.

6.2.1 Detailed Project Plan (MR)

The Subcontractor shall provide a detailed Project Plan 30 days after contract award.

6.2.2 Initial Delivery (ID) System (MR)

The Subcontractor shall install and support an initial code development system containing 50 Gigabytes (GB) of memory, 2.5 TB of disk configured for RED/BLACK operations and capable of 100 GigaFLOP/s (GFLOP/s) of peak performance at LANL or LLNL, as directed, 90 days after contract.

6.2.3 Second Initial Delivery (ID) System (MO)

At the option of the University, the Subcontractor shall install and support a second initial code development system containing 50 Gigabytes (GB) of memory, 2.5 TB of disk configured for RED/BLACK operations and capable of 100 GigaFLOP/s (GFLOP/s) of peak performance at LANL or LLNL, as directed, 90 days after contract award.

6.2.4 ID Applications Development Support (MR)

The Subcontractor shall supply at least one on-site analyst to provide expertise to the University code development teams in the areas of software development tools, parallel applications libraries and applications performance at the time of ID system delivery. The proposed system will be installed in a classified area at the Laboratory and so analyst personnel shall obtain DOE Q clearances.

6.2.5 FY97 Plan and Review (MR)

The Subcontractor shall provide a detailed plan of activities and deliverables for fiscal year 1997 for University review and approval in the first quarter of FY97.

6.2.6 Technology Refresh (TR)

The Subcontractor may provide hardware and software technology updates between the installation of the ID system and the installation of the SST that would significantly

improve the hardware and software environment. Hardware technology updates may meet or exceed the following component scaling parameters:

- Memory Size/Peak FP (Byte/FLOP/s) ≥ 0.5
- Disk Space/Peak FP (Byte/FLOP/s) ≥ 25
- Cache Bandwidth/Peak FP (Byte/s/FLOP/s) ≥ 4
- Memory Bandwidth/Peak FP (Byte/s/FLOP/s) ≥ 1
- Intra-Cluster Network Bi-Section Bandwidth/Peak FP (Bits/s/FLOP/s) ≥ 0.167
- System Peak Disk I/O Bandwidth/Peak FP (Byte/s/FLOP/s) ≥ 0.03

6.2.7 FY98 Plan and Review (MR)

The Subcontractor shall provide a detailed plan of activities and deliverables for fiscal year 1998 for University review and approval in the first quarter of FY98.

6.2.8 SST Applications Development Support (MR)

The Subcontractor shall supply at least two on-site analysts to provide expertise to the University code development teams in the areas of software development tools, parallel applications libraries and applications performance at the three months prior to the SST system delivery. The proposed system will be installed in a classified area at the Laboratory and so analyst personnel shall obtain DOE Q clearances.

6.2.9 Scalable Development Environment Demonstration (TR)

The Subcontractor may demonstrate the scalability of essential software capabilities in the application development environment across the clustered SMP system in mid CY 1998. Specifically, the Subcontractor may use the sPPM demonstration code on the full cluster to demonstrate debugger, event tracing and performance statistics capabilities.

6.2.10 Sustained Stewardship TeraFLOP (SST) Demonstration (TR)

The Subcontractor may demonstrate the SST scalable cluster in mid CY 1998 containing 0.5 Terabytes (TB) of memory and at least 25 Terabytes of RAID disk. The sum of peak and sustained performance on the sPPM demonstration code of the SST scalable cluster shall be at least four (4.0) TeraFLOP/s.

6.2.11 Scalable Development Environment Demonstration (MR)

The Subcontractor shall demonstrate the scalability of essential software capabilities in the application development environment across the clustered SMP system no later than the end CY 1998. Specifically, the Subcontractor shall use the sPPM demonstration code on the full cluster to demonstrate debugger, event tracing and performance statistics capabilities.

6.2.12 Sustained Stewardship TeraFLOP (SST) Demonstration (MR)

The Subcontractor shall demonstrate the SST scalable cluster no later than the end CY 1998 containing 0.5 Terabytes (TB) of memory and at least 25 Terabytes of RAID disk. The sum of peak and sustained performance on the sPPM demonstration code of the SST scalable cluster shall be at least four (4.0) TeraFLOP/s.

6.2.13 SST Installation (MR)
The Subcontractor shall install and support this system at either LANL or LLNL, as directed, for at least two years following a successful demonstration.

6.2.14 FY99 Plan and Review (MR)
The Subcontractor shall provide a detailed plan of activities and deliverables for fiscal year 1999 for University review and approval in the first quarter of FY99.

6.2.15 Memory Installation (MO)
The Subcontractor shall, at the University's option, install SST system memory up to an additional 1.0 TB by the first quarter of CY 1999. If the University chooses to exercise this option, installation of the additional memory before or after SST installation shall be at the Subcontractor's discretion.

6.2.16 Disk Delivery (MR)
The Subcontractor shall deliver the remaining 50 Terabytes of disk within 12 months of SST delivery.

6.2.17 Faster Disk Delivery (TR)
The Subcontractor may deliver the remaining 50 Terabytes of disk within 6 months of SST delivery.

6.3 Performance Reviews (MR)

Quarterly performance reviews shall be conducted between the Subcontractor's corporate executives and the University. The Subcontractor shall submit a Quarterly Project Status Report at least five working days before each quarterly review. The report shall provide the status of all work breakdown structure tasks and milestones in the critical path. It shall also contain narrative descriptions of anticipated and actual problems, solutions, and the impact on the project schedule. Numbered action items shall be taken, assigned, logged, and tracked by the Subcontractor. The minutes of all project reviews shall be recorded in detail by the Subcontractor and provided to the University for approval within 5 working days after the review.

6.4 SST TeraFLOP/s sPPM Demonstration (MR)

The sPPM demonstration code is of special interest to ASCI because it solves important hydrodynamics problems using an aggressive and demonstrated highly-efficient SMP cluster implementation of numerical methods relevant to DOE's Stockpile Stewardship Program. The sPPM demonstration code represents the current state of an ongoing effort which has demonstrated good processor performance, excellent multitasking efficiency, and excellent message passing parallel speedups all at the same time. Its use as an SST demonstration is to validate the ASCI effort by demonstrating a sustained TeraFLOP/s computation across all processors of a cluster of SMPs for a single large application which is of direct interest to the DOE Stockpile Stewardship Program as well as to scientific simulation in general. It is expected to bring recognition to the ASCI Program, to the Subcontractor and the University, as well as to the larger scientific high performance computing community.

The Subcontractor shall provide a best effort to achieve a sustained one (1.0) TeraFLOP/s execution rate of the sPPM benchmark code across the entire SST. The University shall witness, verify and certify the demonstration. A sustained performance rate shall be computed only for the time step update portion of the sPPM code for a problem size of approximately 2000-cubed grid points for a number of time steps sufficient to run for at least one (1.0) hour of wall clock time. The exact problem size will necessarily be

determined by the actual SST cluster size, the available application memory, and the achieved sustained computation rate. The computation rate shall be determined based on the actual executed operations as shown below and the elapsed wall clock time required to complete the time steps on the SST system.

+, -, *	1 FLOP each
/, sqrt	4 FLOPs
min, max, abs, sign	1 FLOP each

The sPPM one (1.0) TeraFLOP/s SST demonstration code shall be derived from the sPPM code from the ID benchmark suite. It shall be programmed in Fortran with some C and shall contain no custom assembly language. It may use either single or double precision IEEE arithmetic (or even a mixture). It shall use POSIX threads and MPI message passing. It may use general or scientific library routines if they are, or will be, part of a supported library. It shall use the initial conditions built into the ID code without the image or texture maps. The time for initialization, visualization and restart dumps will not be included in the TeraFLOP/s rate determination - visualization and restart dumps could even be disabled. The timing prints per double time step can also be disabled but the one line "courant and energy" print is required on at least node 0 to either stdout or to the output file.

Optimizations will be allowed so long as they don't specialize the functionality represented by the reference sPPM benchmark implementation. In particular, the source code for the hydro kernel of the sPPM benchmark code (i.e. the file sppm.m4) shall be used as provided by the University (i.e. unmodified), except for the addition of compiler directives. The University will continue its efforts to improve the efficiency of the code. Even for the subroutines in sppm.m4, tuning can be achieved through selecting alternate pieces of provided code through preprocessor flags, through the parameter IQ, etc. The goal is to emphasize higher level optimizations as well as compiler optimization technology improvements while maintaining "readable" code and physics modules. One obvious permitted modification in the parallel part of the sPPM demonstration code may be the overlapping of computation and communication (i.e., asynchronous communication).

Ideas to demonstrate Tera-scale performance levels on additional ASCI relevant applications may be suggested, but only if such opportunities arise and prove feasible and do not interfere with the sPPM SST demonstration should such endeavors be considered.

End of Section 6

Appendix A Glossary

Hardware

b	bit. A single, indivisible binary unit of electronic information.
B	Byte. A collection of eight (8) bits.
Cluster	A set of SMP's connected via a scalable network technology. The network shall support high bandwidth, low latency message passing. It may also support remote memory referencing.
CPU	Central Processing Unit or processor. A VLSI chip constituting the computational core (integer, floating point, and branch units), registers and memory interface (virtual memory translation, TLB and bus controller).
FLOP	Floating Point OPeration.
FLOPS	Plural of FLOP.
FLOP/s	Floating Point OPeration per second.
GB	GigaByte. GigaByte is a billion bytes. When used in terms of Random Access Memory, billion is 2^{30} (or 1,073,741,824) bytes. When used in any other context is 10^9 (or 1,000,000,000) bytes.
GFLOP/s	GigaFLOP/s. Billion (10^9 = 1,000,000,000) 64-bit floating point operations per second.
MB	MegaByte. MegaByte is a million bytes. When used in terms of Random Access Memory, million is 2^{20} (or 1,048,576) bytes. When used in any other context is 10^6 (or 1,000,000) bytes.
MFLOP/s	MegaFLOP/s. Million (10^6 = 1,000,000) 64-bit floating point operations per second.
NUMA	Non-Uniform Memory Access architecture. The distance in processor clocks between processor registers depends on where in main memory the address points to. That is, a load/store operation latency for some memory locations is larger than that for others.

Peak Rate The maximum number of 64-bit floating point instructions (add, subtract, multiply or divide) per second that could conceivably be retired by the system. For RISC CPUs the peak rate is typically calculated as the maximum number of floating point instructions retired per clock times the clock rate.

Scalable A system attribute that increases in performance or size as some function of the peak rating of the system. The scaling regime of interest is at least within the range of 100 GFLOP/s to 3.0 (and possibly to 10.0) TFLOP/s peak rate.

SMP Shared memory Multi-Processor. A set of CPUs sharing random access memory within the same memory address space. The CPUs are connected via a high speed, low latency mechanism to the set of hierarchical memory components. The memory hierarchy consists of at least processor registers, cache and memory. The cache may also be hierarchical. If there are multiple caches, they shall be kept coherent automatically by the hardware. The main memory may be a Non-Uniform Memory Access (NUMA) architecture. The access mechanism to every memory element shall be the same from every processor. More specifically, all memory operations are done with load/store instructions issued by the CPU to move data to/from registers from/to the memory.

Tera-Scale The environment required to fully support production-level, realized TFLOP/s performance. This environment includes a robust and balanced processor, memory, mass storage, I/O, and communications subsystems; robust code development environment, tools and operating systems; and an integrated cluster wide systems management and full system reliability and availability.

TB TeraByte. TeraByte is a trillion bytes. When used in terms of Random Access Memory, trillion is (2^{40} = 1,099,511,627,776) bytes. When used in any other context is 10^{12} (or 1,000,000,000,000) bytes.

TFLOP/s TeraFLOP/s. Trillion (10^{12} = 1,000,000,000,000) 64-bit floating point operations per second.

UMA Uniform Memory Access architecture. The distance in processor clocks between processor registers and every element of main memory is the same. That is, a load/store operation has the same latency, no matter where the target location is in main memory.

Software

API (Application Programming Interface)
Syntax and semantics for invoking services from within an executing application. All APIs shall be available to both Fortran and C programs, although implementation issues (such as whether the Fortran routines are simply wrappers for calling C routines) are up to the supplier.

Current standard
Term applied when an API is not "frozen" on a particular version of a standard, but may be upgraded automatically by Subcontractors as new specifications are released (e.g., "MPI version 1.1" refers to the standard in effect at the time of writing this document, while "current version of MPI" refers to further versions that take effect during the lifetime of this contract.

Fully supported (as applied to system software and tools)
A product-quality implementation, documented and maintained by the HPC machine supplier or an affiliated software supplier.

Gang Scheduling
When a user job is scheduled to run, the gang scheduler must contemporaneously allocate to CPUs all the threads and processes within that job (either within an SMP or within the cluster of SMPs). This scheduling capability must control all threads and processes within the SMP cluster environment.

Job
A job is a cluster wide abstraction similar to a POSIX session, with certain characteristics and attributes. Commands shall be available to manipulate a job as a single entity (including kill, modify, query characteristics, and query state). The characteristics and attributes required for each session type are as follows: 1) interactive session: an interactive session would include all cluster wide processes executed as a child (whether direct or indirect through other processes) of a login shell and shall include the login shell process as well. Normally, the login shell process shall exist in a process chain as follows: init, inetd, [telnetd | rlogind | xterm | cron], then shell. 2) batch session: a batch session shall include all cluster wide processes executed as a child (whether direct or indirect through other processes) of a shell process executed as a child process of a batch system shepherd process, and shall include the batch system shepherd process as well. 3) ftp session: an ftp session would include an ftpd and all its child processes. 4) kernel session: all processes with a pid of 0. 5) idle session: this session does not necessarily actually consist of identifiable processes. It is a pseudo-session used to report the lack of use of resources. 6) system session: all processes owned by root that are not a part of any other session.

Published (as applied to APIs):	Where an API is not required to be consistent across platforms, the capability lists it as "published," referring to the fact that it shall be documented and supported, although it may be Subcontractor- or even platform-specific.
Single-point control (as applied to tool interfaces)	Refers to the ability to control or acquire information on all processes/PEs using a single command or operation.
Standard (as applied to APIs)	Where an API is required to be consistent across platforms, the reference standard is named as part of the capability. The implementation shall include all routines defined by that standard (even if some simply result in no-ops on a given platform).
XXX-compatible (as applied to system software and tool definitions)	Requires that a capability be compatible, at the interface level, with the referenced standard, although the lower-level implementation details may differ substantially (e.g., "DFS-compatible" means that the distributed file system shall be capable of handling standard DFS requests, but need not conform to DFS implementation specifics).

APPENDIX E

ASCI BLUE INTELLECTUAL PROPERTY

The following is the text of Department of Energy Memorandum regarding Intellectual Property Rights for the ASCI Blue procurement:

"If the respondent to the RFP does not agree to cost-share at least 20% excluding waived fee, that respondent if successful would get the standard patent and data causes in connection with such a procurement. On the other hand, if the respondent is willing to cost-share by an amount of at least 20% excluding waived fee, the DOE will agree to waive, in advance, patent rights to the respondent in its inventions and authorize the respondent to assert copyright in software produced under the contract subject to the following requirements:

1. With respect to Patent Rights, a standard DOE Patent Rights Clause including the waiver will contain the following provisions:

A. Any waived rights to inventions will be subject to a reserved government-use license as follows: "The government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world".

B. The government will have march-in rights to any subject inventions consistent with the march-in rights set out in 35 USC 203 and 48 C.F.R. 27,304-1(g).

C. That the recipient of such rights agree to submit, upon the request of DOE, a non-proprietary report no more frequently than annually on efforts to utilize any technology arising under the contract.

D. Any assignment of invention rights is subject to DOE approval.

E. That the recipient agree to the following United States Competitiveness provision:

U.S. Competitiveness Provision

"The waiver recipient agrees that any products embodying any waived invention or produced through the use of any waived invention will be manufactured substantially in the United States, unless the waiver recipient can show to the satisfaction of DOE that it is not commercially feasible to do so. Processes, services, and improvements thereof which are covered by any waived invention developed under this contract shall be incorporated into the contractor's manufacturing facilities in the United States either prior to or simultaneously with implementation outside the United States, shall not result in reduction of the use of the same processes, services, or improvements in the United States. The waiver recipient further agrees to make the above conditions binding on any assignee or licensee or any entity otherwise acquiring rights to any waived invention, including subsequent assignees or licensees."

F. U.S. Preference per 35 USC 204 will apply.

2. With respect to copyrights of computer software, the standard DOE rights in Technical Data Article as set out in Acquisition Letter 87-5 would be modified as follows: Paragraph (c) would be replaced with the following:

"(c) Copyright. (1) Data first produced in the performance of this contract, unless provided otherwise in paragraph (d) of this clause, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the Contracting Officer is required to established claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 USC 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U. S. Copyright Office. For data other than computer software the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

The Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in computer software first produced in the performance of this contract. For computer software, the Contractor grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government. Contractor will provide the DOE an abstract suitable for publication, describing the function of the software for which copyright is asserted.

This limited Government license will revert to a broad Government license (where the Government has the right to distribute the software to the public and permit others to do so) after five (5) years if the Contractor has not taken effective steps to commercialize the software; or where it is necessary to alleviate health, safety or energy needs that are not reasonably satisfied by the Contractor, or to meet requirements for public use specified by Federal Regulations and these requirements are not reasonably satisfied by the Contractor."

Paragraph (d)(3) would be modified by eliminating the first two sentences and retaining the last sentence as follows:

"The Contractor shall promptly deliver to the Contracting Officer or to the Patent Counsel designated by the Contracting Officer a duly executed and approved instrument fully confirmatory of all rights to which the Government is entitled and other terms pertaining to the computer software to which claim to copyright is made.

The justification for the above will be fully set out in the Statement of Considerations for the subject patent waiver."

APPENDIX F

Collaborative Research & Development Items

ithin the scope of the ASCI Blue/LLNL contract, IBM and the University, through the Lawrence Livermore National Laboratory, will engage in joint research and development activities of mutual interest and benefit. The primary objective of these activities is to perform the ASCI mission and exploit the capabilities of the IBM SP system(s) to be installed during the ASCI Blue/LLNL project. The collaborative activities will have direct manpower investments by IBM and LLNL. These activities will be reviewed quarterly with the rest of the ASCI Blue/LLNL project. Before the beginning of each fiscal year of the contract, specific objectives will be identified for the collaborative activities to accomplish that year. These objectives will be of mutual interest and benefit. Each party will make research and development activity suggestions for the collaboration and will be able to prioritize and prune the list.

This attachment describes seven basic areas of collaboration. Within each area of collaboration, high level deliverables for FY97 are enumerated and University and IBM responsibility with estimated minimum manpower commitments delineated. Within thirty days of contract signing, IBM and the University will have detailed technical discussions and will produce a detailed research and development plan as part of the overall ASCI-Blue Project Plan. This will include a detailed list of finalized manpower, deliverables and milestones for FY97. IBM will provide this plan to the University for approval. (The deliverables and milestones below are tentative, the final deliverables and milestones may be modified.)

1.

A.

Goal: Port the interface to the RS/6000 SP as a standard method for cess by application codes.

FY97 Manpower Commitment:

IBM Research has many efforts in the area of have developed prototypes of products

that is still evolving, but is important for those users who would like to a portable interface. IBM Research and NASA Ames have been working together to draft the proposal to address the portable) draws upon the widely accepted .

Furthermore, IBM and LLNL are currently collaborating on the HPSS project, and LLNL is developing an MPI-IO interface to HPSS. Certain additions to HPSS will allow this interface to work more efficiently.

In FY97, the) collaboration will achieve the following deliverables:

- By 4QCY96 IBM will train LLNL and HPSS developers in .
- By 4QCY96 LLNL will train IBM developers on the University's
- By 2QCY97 IBM and LLNL will interface the University's Meiko/Solaris implementation to the RS/6000 SP platform's at LLNL.
- By 1QCY97 LLNL will port the University's Meiko/Solaris) implementation onto the RS/6000 SP platform.
- By 1QCY97, the IBM Government Systems - Houston HPSS team will implement the following new features to support

1. Support for distributing access to open file handles among multiple processing nodes on an MPP.
2. Support for algorithmic descriptions of :
3. An option that allows a client to specify that HPSS will process entries in an the order in which they appear.

- By 3QCY97 LLNL will explore the adaptation of
- Throughout CY97, LLNL will track the emerging standard and ensure that it includes support for LLNL will also evaluate alternative parallel I/O interfaces to assess their effectiveness on ASCI applications.
- Throughout CY97, LLNL and IBM will jointly explore the possibility of implementing

Point of contacts:
LLNL -
IBM -

Point of contacts:
LLNL
IBM -

C. Parallel FTP (PFTP) Enhancements

Goal: Implementation of a

FY97 Manpower Commitment:

HPSS provides a parallel version of FTP (PFTP) which provides users with an interface capable of high performance parallel access to HPSS storage resources. The current PFTP interface on IBM SP platforms provides parallel data paths to the client by spawning multiple client processes resulting in faster transfers to a client.

In CY97, the PFTP Enhancements collaboration will achieve the following deliverables:

- In 2QCY97, The IBM Government Systems - Houston, will implement the enhanced
- In 3QCY97, LLNL will perform performance and reliability testing

Point of contacts:
LLNL
IBM -

D. Network Attached Peripheral Support

Goal: Provide the IBM SP/HPSS storage environment with the ability to accommodate tape Network Attached Peripherals.

FY97 Manpower Commitment:

Delivery of data between the large amount of local attached disks on the ASCI Blue SP machine and HPSS tape devices will require efficient and cost effective tape solutions in HPSS. A key element in the design of HPSS was to allow for the incorporation of Network Attached Peripherals (NAPs) to provide such a solution. A NAP is a device which is attached directly or very closely to a network in order to eliminate the cost and inefficiency of a general purpose processor front-ending the tape device. Currently HPSS only supports disk NAPs. This collaboration would integrate the accommodation of tape NAP support into the HPSS environment.

In CY97, the Network Attached Peripheral Support collaboration will achieve the following deliverables:

- In 4QCY97, IBM Government Systems - Houston, working with LLNL HPSS developers will provide a third-party data movement interface in HPSS that will accommodate various network protocols and media interconnecting the HPSS clients and tape NAPs.
- In 4QCY97, IBM Government Systems - Houston, working with LLNL HPSS developers will provide a third-party control interface in HPSS that is extensible to accommodate additional protocols, device types, control command, and new security models.

Point of contacts:
LLNL
IBM -

E. Persistence and HPSS

Goal: Provide a persistent parallel interface between IBM SP users and HPSS.

FY97 Manpower Commitment:

The majority of all LLNL user accesses to archival storage are today made using an interface which provides persistence and intelligent user scheduling. This capability frees a user from having to implement retry logic in their storage scripts, and also provides fair-share scheduling to storage users. HPSS and the ASCI Blue environment currently do not support such an interface. This collaboration would integrate a persistence engine capable of interfacing with HPSS' parallel interface.

In CY97, the Persistence and HPSS collaboration will achieve the following deliverables:

- In 3QCY97, LLNL will provide a mutually agreeable design for a parallel persistence engine.
- In 4QCY97, IBM Government Systems - Houston, will begin implementation of the parallel persistence engine design in HPSS.

Point of contacts:
LLNL
IBM -

F.

Goal: Provide

FY97 Manpower Commitment:

application codes accessing storage use two separate explicit parallel interfaces. The first interface, PIOFS, is used to access data stored in IBM's current parallel file system. Code needing direct access to HPSS files use a second interface, the HPSS Client API.

In CY97, the HPSS collaboration will achieve the following deliverables:

- By 1QCY97, IBM will deliver a LLNL
- By 2QCY97, IBM will deliver an early prototype and install it on the SMP partition of the ID system.

- By 3QCY97, The IBM Government Systems - Houston - will provide a design for for HPSS.
- By 4QCY97, The IBM Government Systems - Houston - will begin implementation HPSS.

Point of contacts:
LLNL -
IBM - i

G. Scientific Data Management

Goal: To define, design and prototype an end -to-end scientific data management solution that enable ASCI code developers and SBSS designer access to tera-scale data sets on the IBM RS/6000 SP platform.

FY97 Manpower Commitment:

Accessing huge amounts of data is synonymous with high performance computing. However, new paradigms are desperately needed to organize and catalogue data in meaningful ways for scientists and engineers. The ASCI program is funding a scientific data management (SDM) effort to investigate ways of presenting huge volumes at various levels of detail (meta-data) and integrate this with databases layered over HSM facilities. This collaboration will leverage the work done by Oak Park Research that integrated an object oriented database and HPSS. The collaboration will also leverage the CORBA standard as an interface between the graphicical user interface and the object oriented database.

In FY97, the SDM collaboration will achieve the following deliverables:

- By 1QCY97, LLNL and IBM will design an interface between ObjectStore and HPSS.
- By 2QCY97, LLNL and IBM will design a CORBA-based heterogeneous SDM architecture integrating the use of WWW tools, meta-data generation tools and analysis tools with the ObjectStore, Corba and Java technologies.
- By 2QCY97, LLNL and IBM will design an CORBA based interface between WEB browsers and meta-data generation and analysis tools and ObjectStore database.
- By 2QCY97, LLNL and IBM will deploy their SDM architecture for the generation of metadata for one of the ASCI codes as part of an overal end-to-end SDM solution for at least one SBSS designer or code developer use on the desktop to explore and manage tera-scale data sets generated on the SP platform.

Point of contacts:
LLNL -
IBM - TBD

2. Distributed Resource Management

Goal: Seamlessly integrate the IBM RS/6000 SP into the ASCI DRM environment.

FY97 Manpower Commitment:

IBM will work with the University in implementing a resource manager on the ASCI Blue system that not only scales with the system size, but also can provide a single resource manager that will work across all of the distributed, multi-vendor platforms.

IBM will bring to bear the knowledge we have gained in implementing our LoadLeveler resource management product in a parallel system, both in terms of scaling and efficiently supporting a large, parallel workload.

In FY97, the DRM collaboration will achieve the following deliverables:

- By 1QCY97, IBM will deliver and install a distributed batch system on the ID Machine.
- By 4QCY96, the University will give IBM the ASCI DRM requirements document.
- By 2QCY97, the University will provide to IBM a design for DRM over distributed batch system on the IBM SP platform.
- By 4QCY97, the University will provide to IBM an initial prototype DRM solution over the distributed batch system on the IBM SP platform for their review.

Point of contacts:

IBM - TBD

3.

Goal: Provide a flexable
of the computing resource for multiple symultenous tera-scale applications.

FY97 Manpower Commitment:

IBM is working towards providing SMP on the SP. An initial prototype has been developed at IBM's T. J. Watson Research Center. This prototype provide
SP and supports a wide variety . In particular, it supports

IBM will work with the University to implement a productized version of a
SP system.

In FY97, the will achieve the following deliverables:

- By 4QCY96, IBM will deliver the source code of an early prototype of the to LLNL and install it on the SMP partition of the ID system.
- By 4QCY96, the University will provide to IBM and Platform Computing a requirements document for the SP platform.
- By 2QCY97, IBM will deliver to LLNL the source code of an early prototype
- By 2QCY97, the University will provide to IBM a prototype implementation of
- By 2QCY97, the University will provide to IBM a prototype

Point of contacts:

4. Code Development Tools

Goal: Provide a stable, state-of-the art code development environment that radically increases the productivity of ASCI applications developers and the performance of ASCI applications on the IBM SP platform.

FY97 Manpower Commitment:

IBM will work with the University as a "beta test" site and as a model of High Performance Computing requirements for our software development tools including compilers, debuggers, API libraries, performance monitors and profilers. IBM will also work with BBN's TotalView debugger as part of this collaboration.

In FY97, the CDT collaboration will achieve the following deliverables:

- By 4QCY96, the University will provide to IBM a requirements document for the ASCI Common Basic Environment (CBE). IBM will respond within 30 days so that a joint research, development and deployment plan can be established.
- By 4QCY96, the University will provide to IBM a requirements document for FY97 TotalView debugger enhancements. IBM will respond within 30 days so that a joint research, development and deployment plan can be established.
- By 4QCY96, the University will provide to IBM a requirements document for FY97 baseline language compiler enhancements. IBM will respond within 30 days so that a joint research, development and deployment plan can be established.
- By 4QCY96, the University will provide to IBM a requirements document for FY97 performance analysis tools enhancements. IBM will respond within 30 days so that a joint research, development and deployment plan can be established.
- By 4QCY96, IBM will deliver to the University an early prototypes of software that will allow ASCI tools and applications developers to evaluate SMP code development tools on the SMP partition of the ID system. IBM and the University will jointly work to identify and resolves issues with the SMP code developent environment.

Point of contacts:
LLNL -
IBM -

5.

Goal: Provide a highly programming methodologies for the SP platform.

FY97 Manpower Commitment:

IBM expects to extend the SP node via solution. This will also be staged in over the life of the ASCI contract:

- Enhanced software/hardware based support collaboration with IBM Research and RS/6000 Divisions in FY97, FY98 and FY98.
-

IBM is proposing a collaboration between IBM and ASCI Blue/LLNL in the prototyping and testing of a solution for the SP. This solution will provide

We expect that the collaboration between IBM and ASCI will accelerate the development of this , allowing us to target providing a formal product . The University will be able to influence the design of the strategic solution for the SP by providing information on performance and software requirements, and collaborating in performance analysis, application enablement and software development.

In FY97, the will achieve the following deliverables:

- By 4QCY96, IBM will deliver to the University a plan on the SP platform.
- By 2QCY97, IBM will deliver to the University prototype software for evaluation of the ID system.
- By 4QCY97, the University will port the o the SP platform over the and demonstrate at least the EPIMETHEUS physics application utilizing the environment.

Point of contacts:
LLNL
IBM -

6. Applications Development

Goal: Enable rapid deployment and high efficiency of at least four key ASCI applications on the SP platform.

FY97 Manpower Commitment:

As stated in the ASCI-Blue RFP, the ID system's main focus is as a code development platform for the ASCI application efforts. As such, it is very difficult to enumerate specific deliverables that enable early ASCI applications developers' efforts. Therefore, the University and IBM have both agreed that the best way to represent this aspect of the ASCI program is to identify specific applications to enable on the IBM RS/6000 SPplatform. This enablement is describe with specific deliverables. However, achievement of these deliverables is not the ultimate goal, rather they are designed to be indicators that the code development is usable, stable, robust and that ASCI applications development is productively progressing.

The R&D collaborative effort for "Applications Development" will, on the one hand, focus on the research and development done by ASCI code developers on scalable applications algorithms. On the other hand, IBM's focus on and commitment to the necessary system and code development tools development and support to enable these applications. In particular, the compilers must produce efficient, optimized code. The system and associated user API libraries (e.g., libc.a, MPI) must be usable and highly efficient. The TotalView debugger must be able do work with these applications in a way that does not detract from code

developer productivity (e.g., TotalView start-up time on large applications must be short). Performance analysis tools (profiling tools, message passing performance analysis tools) should be able to shed insight into these applications to point out scaling and system bottlenecks or application/architecture mismatches. This will require early access to these IBM and third party code development tools [illegible] and quick fixes to problems that are discovered. There is a very tight [illegible] coupling between the "Applications Developent" and "Code Development Tools" collaborative areas. Specifically, these "Applications Development" requirements feed into the "Code Development Tools" collaborative effort and the latter feeds capability back.

Most of these codes are export controlled. The University will provide to IBM no-cost licensees to have access to these codes for the purposes of the applications R&D partnership. IBM will only have US Citizens work with the codes and will not export them. The on-site personnel will play a crucial role in working with the ASCI applications points-of-contact.

HED3D - Doug Miller

In FY97, the HED3D collaboration will achieve the following deliverables:

- By 4QCY96, LLNL and IBM will port a domain decomposed 2-d version of an SN radiation transport package to the RS/6000 SP. This code will demonstrate at least 600 MFLOP/s performance on 128 processors.
- By 2QCY97, LLNL and IBM will develop port hydro, diffusion and monte carlo to the RS/6000 SP platform.
- By 3QCY97, LLNL and IBM will demonstrate MPI-IO parallelization 128 way prallelization of I/O at least 384 MB/s performance.

Point of contacts:
LLNL -
IBM - TBD

DYNA3D/NIKE

DYNA3D is an explicit finite-element program for analyzing the transient dynamic response of three-dimensional solids and structures. ParaDyn is message-passing parallel version of DYNA3D. NIKE3D is an implicit, nonlinear finite element program for analyzing the static response of solids and structures in three dimensions. NIKE3D provides 14 nonlinear solution methods that use both direct and iterative linear solvers within Newton and Quasi Newton Raphson loops.

In FY97, the DYNA3D/NIKE collaboration will achieve the following deliverables:

- By 4QCY96, LLNL and IBM will collaborate on the porting of ParaDyn to the RS/6000 SP and demonstrate a performance of 1.2 microseconds per element time step on two production problems provided by the LLNL. This performance level corresponds to 800 MFlops. These benchmark production problems will be 1,000,000 and 200,000 elements, repectively. The production problems model the interaction of shocks in a solid medium. The model uses only hexahedral elements and no contact algorithms. LLNL will provide solutions to the problems. Answers will agree with the provided solutions to within .01%.
- LLNL and IBM will collaborate to develop efficient text and binary I/O for ParaDyn. The text file for the large production benchmark is 163 MBytes and binary plot states are 70 MBytes. I/O in ParaDyn will be optimized with the use of IBM PIOFS. The hardware reliability and software performance of the PIOF systems will be demonstrated for the million element benchmark calculation. I/O speeds of at least 10% of I/O subsystem peak hardware specifications will be achieved. IBM will provide appropriate software/hardware performance measurement tools. Deliverable will be due 3QCY97.
- IBM and LLNL will collaborate to develop and test threaded or microtasked linear solvers for both dense and sparse matrices. Emphasis in this project will be on sparse solvers. Threaded solvers incorporated into NIKE3D will be completed by 2QCY97. LLNL will provide production problems

for measuring performance of parallel solvers. Parallel efficiencies of 75% on four processors will be demonstrated 3QCY97.

Point of contacts:
LLNL
IBM - ,

ARES -

In FY97, the ARES collaboration will achieve the following deliverables:

- By 4QCY96, LLNL and IBM will port the serial version of ARES running on a single node of the RS/6000 SP.
- By 2QCY97, LLNL and IBM will demonstrate parallel domain decomposed hydrodynamics in ARES on the RS/6000 SP platform on at least 16 processors.
- By 3QCY97, LLNL and IBM will demonstrate domain decomposed hydrodynamics in ARES @ 15 MFLOP/s each over 128 processors. The aggregate performance of this code on this configuration will be at least 1.0 GFLOP/s.
- By 3QCY97, LLNL and IBM will demonstrate parallelized restart file I/O with SILO over MPI-IO scaled 128 way prallelization of I/O at least 384 MB/s performance.
- Want fast MPI between threads or processes on the SMP by 3QCY97.
- Investigating SMP parallelism with compiler directives (loop-level parallelism) on the RS/6000 SP machine in the in 2QCY97 to 3QCY97 timeframe. Performance goal is a factor of 2 over serial code in the lagrange package of the code.
- Parallel SILO over PIOFS 4QCY96.
- TotalView must be working on this system for code development. Will be in heavy code development mode immediatly.

Point of contacts:
LLNL -
IBM - TBD

ALE3D/ALEC - Richard Sharp

In FY97, the ALE3D/ALEC collaboration will achieve the following deliverables:

- By 4QCY96, LLNL and IBM will port ALE3D/ALEC to the RS/6000 SP. This code will demonstrate at least 1.0 GFLOP/s performance on 128 processors for a pure lagrange calculation and 0.5 GFLOP/s on 128 processors for a 128K element lagrange/advection problem.
- By 4QCY96, LLNL and IBM will demonstrate a scalable parallel SILO implementation over PIOFS and MPI-IO up and running on the IBM platform.
- By 2QCY97, LLNL and IBM will develop port ALEC running 3-d implicit hydrodynamcis, explicit hydrodynamics with advection and slide surfaces to the RS/6000 SP platform. This code will demonstrate at least 0.5 GFLOP/s performance on 128 processors.
- By 3QCY97, SMP prototype ALEC demo on 4 node (4-way SMP nodes).
- By 3QCY97, LLNL and IBM will demonstrate parallel I/O mimicker for ALE3D running over MPI-IO on the RS/6000 SP. The performance goal is 3.0 MB/s/node scaling 128 nodes for an aggregate of 384 MB/s.

Point of contacts:
LLNL -
IBM - TBD

Appendix G

IBM
SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN CALENDAR YEAR 1996

THIS SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN INCLUDES DATA THAT SHALL NOT BE DISCLOSED OUTSIDE THE GOVERNMENT AND SHALL NOT BE DUPLICATED, USED OR DISCLOSED (IN WHOLE OR IN PART) FOR ANY PURPOSE OTHER THAN TO EVALUATE THIS PLAN. THIS RESTRICTION DOES NOT LIMIT THE GOVERNMENT'S RIGHT TO USE INFORMATION CONTAINED IN THIS PLAN IF IT IS OBTAINED FROMANOTHER SOURCE WITHOUT RESTRICTION. THE PAGES THAT ARE SUBJECT TO THIS RESTRICTION ARE ANNOTATED WITH THE FOLLOWING LEGEND: "INFORMATION ON THIS PAGE CONSISTS OF IBM TRADE SECRETS AND CONFIDENTIAL AND/OR PROPRIETARY COMMERCIAL OR FINANCIAL INFORMATION EXEMPTED FROM PUBLIC DISCLOSURE UNDER THE PROVISIONS OF 5 USC 552(b)(4), THE FREEDOM OF INFORMATION ACT".

IBM SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS
SUBCONTRACTING PLAN FOR CALENDAR YEAR 1996

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1.0 IBM 1996 PLAN INTRODUCTION

This Small Business and Small Disadvantaged Business Subcontracting Plan (Plan) is submitted by International Business Machines Corporation (IBM) pursuant to Section 8(d) of the Small Business Act, FAR Sections 19.7 and 52.219-9, and other applicable statutes and regulations.

The Plan is a corporate-wide Plan which covers IBM's domestic purchases from suppliers during the period 1/1/96 through 12/31/96, IBM's fiscal year, for all commercial and non-commercial products and services. All subcontracts for production and non-production goods and services procured by IBM through its purchasing systems are included in this plan.

2.0 IBM 1996 GOALS

2.1 Total Subcontracting Dollars. In 1996, the total subcontracting dollars for U.S. operations are planned to be approximately $10.0 billion. This total consists of all domestic purchasing through our purchasing systems throughout IBM U.S.

2.2 Small Business Concern Percentage and Dollars. IBM plans to purchase 35% of its $10.0 billion base from small businesses, which represents $3.500 billion in estimated subcontracting dollars. The small disadvantaged business goal is included as a part of this small business goal.

2.3 Small Disadvantaged Business Concern Percentage and Dollars. IBM plans to purchase 3.75% of its $10.0 billion base from small disadvantaged businesses, which represents $375 million in estimated subcontracting dollars.

2.4 Factors Affecting Plan. Although IBM plans to aggressively pursue and achieve its 1996 goals, there are still a number of factors which could impact our plans and, therefore, affect the achievement of our goals. These factors include the growth of SBs or SDBs beyond the SBA's small business size standards, changes in ownership, the discontinuance of business, and significant changes in IBM's purchasing requirements.

The success of SBs and SDBs as they outgrow the small business classification continues to affect IBM's goal. However IBM continues to purchase from both small and large minority suppliers. IBM is committed to the continual search and development of new emerging SBs and SDBs.

Second, IBM's SB or SDB suppliers may undergo a change in ownership which affects their status. Any such change of status could adversely impact IBM's plan and, consequently, our subcontracting goals. Third, although IBM plans to work closely with small business and

small minority suppliers through our MBE development initiative to ensure IBM's requirements are understood and that necessary technical or management support is provided to increase their opportunity for success, there may be occasions where a supplier's product quality, serviceability or pricing may cause IBM to discontinue the business relationship or reduce the level of purchases with that supplier.

Finally, significant changes in IBM's overall purchasing requirements caused by product changes, customer demand shifts from one model to another, and/or major schedule shifts may adversely impact our Plan.

3.0 PRODUCT AND SERVICE SUBCONTRACTING PLAN

3.1 Categories of Products and Services. IBM's purchases include production related items, such as assemblies, mechanical and electrical parts, which includes plastics, sheet metal frames and covers, storage devices, logic components, transformers, power supplies, stampings, tools, dies, switching devices, circuit boards and cables. In support of our facilities, we also purchase non-production related items, such as capital equipment tooling, office supplies, furniture, packaging materials and chemicals; and service related items, such as construction, programming, maintenance, secretarial services, engineering, printing, travel agency and local transportation services.

3.2 Participation by Small and Small Disadvantaged Businesses. We expect that small and small disadvantaged businesses will participate in all of the listed categories of production and non-production items and services procured by IBM. IBM expects limited opportunity for SB and SDB subcontracting with respect to our acquisition of

IBM plans to spend approximately
1996 for these commodities. This represents of our total purchase base for which IBM believes that there are limited opportunities for small and small disadvantaged businesses to participate in providing competitive products. However, we will continue to look for such sources.

3.3 Factors Limiting Participation. The U.S. has been losing ground to foreign sources in high technology fields such as data processing and in the commodities and services that support the data processing industries. International sourcing for certain requirements in a number of specific commodity areas has caused a decline from a position of U.S. dominance during the '70s to one of growing international dependence as we continue in the decade of the '90s. Among these products are major elements of IBM's purchasing profile. For example, the market share of the highest single dollar segment of has shifted from almost a 100% U.S.

share in 1974 to close to an 80% Japanese share in 1988. None of the top five producers of is now U.S.-based. Japanese market share has increased to over 90% of the total worldwide market for these Similar trends exist for

With the cost of entry growing in most of these high technology areas, the opportunity for new participation by a small or small disadvantaged business is becoming extremely unlikely. In the area of for example, today's technology requires an investment approaching over in order to enter the market as well as a significant number of employees. For those SBs or SDBs that do gain entry, success may automatically catapult them to surpass the SBA's size criteria for small business classification. We will continue to seek out newly emerging SBs and SDBs to increase their participation in areas where procurement opportunities exist.

While IBM has and will work with the United States Government and our industry to meet these challenges, we must continue to make business decisions that will permit IBM's products to be competitive with other international sources of supply. To that end, it is essential that, among other things, we consider all potential sources of suppliers throughout the world and take advantage of the most competitive offerings available. We must, however, also take action in the U.S. to help improve the overall business environment so that domestic suppliers, including small and small disadvantaged businesses, can prosper.

4.0 METHODOLOGY FOR DETERMINING SUBCONTRACTING GOALS

Annually, for every IBM fiscal year, Worldwide Procurement requires IBM's U.S. purchasing managers, procurement councils and commodity teams to submit their minority purchasing goals for the year in both percentages and dollars. The setting of these goals begins with each area assessing the potential for IBM awards to small disadvantaged businesses. The level of penetration of each of the commodity areas is then assessed based upon the available small disadvantaged business base. The plans are aggregated upward through the management chain to the senior purchasing manager/executive for each IBM purchasing location, procurement council and commodity team and are then reported to Worldwide Procurement. The goals are reviewed to determine if they are attainable and represent a meaningful contribution to IBM's corporate-wide Minority Supplier Program. In making this determination, compounded growth rate, current performance and each site's subcontracting opportunities are considered.

If Worldwide Procurement is not satisfied with the goals, further justification and line management involvement is requested. Once agreement is reached, the objectives are combined to form the corporate-wide IBM goal.

For our small business goals, Worldwide Procurement does an annual analysis of our performance over the prior year, a review of our total purchasing plan, and an internal business assessment, in order to determine the appropriate goal to set for small business utilization. We also evaluate other factors such as total quality management, emerging small businesses, and our technology requirements in areas where small businesses have expertise and can participate.

IBM SDB goals are also reviewed with the senior vice-president to obtain his commitment before submitting as a part of this plan.

5.0 METHODOLOGY FOR IDENTIFICATION OF SUPPLIERS

5.1 Trade Fairs. IBM buyers actively participate in Minority Business Opportunity Trade Fairs across the country. This includes site participation in local fairs and Corporate participation in national fairs. We plan to continue to support and increase our participation in the following national fairs: National Minority Supplier Development Council (NMSDC), Minority Enterprise Development Week (MEDWEEK), Hispanic Chamber of Commerce, National Association of Women Business Owners (NAWBO), and the SBA 8(a) Procurement and Small Business fairs.

5.2 Associations. IBM will continue to participate in associations, primarily local affiliates of the NMSDC, NSIA, AIA, Hispanic Chamber of Commerce, SDB Development Panel and TRIAD to help us identify and develop small business and minority suppliers.

5.3 Minority Suppliers Listings

5.3.1 **IBM SDB Listing**. IBM U.S. purchasing locations will continue to use IBM's composite list of minority suppliers with whom we have done business. This list is provided annually to each purchasing location and identifies IBM's minority suppliers by commodity and purchasing location. Since our relationships with our suppliers have historically not been made public, this list is only distributed within IBM.

5.3.2 "Try US" Directory. IBM will continue to be a corporate user of the "Try Us" directory, published by the National Minority Business Directories. Minority businesses may list their services in this directory without charge to facilitate business between minority firms and corporate and government purchasing officials. IBM is a sponsor of this organization.

5.3.3 PASS. The SBA's Procurement Automated Source System ("PASS") will continue to be used as a source of potential small business suppliers.

5.3.4 Other Sources of Information. IBM buyers are instructed to use all available sources of information, such as state and local lists of minority suppliers, local Chambers of Commerce, the NMSDC data base, the Aerospace Industry Association's data base and the offices of the Small Business Administration to identify such suppliers.

5.4 Supplier Facility Survey. IBM's buyers and engineers will continue to visit the facilities of prospective small business and SDB suppliers to assess their capability, capacity and potential to provide goods and services to IBM.

5.5 Letters of Introduction. Supplier letters of introduction and capability statements are directed to the IBM locations where opportunities for business relationships may exist. Each package is reviewed locally to determine the supplier's potential to satisfy IBM's purchasing requirements.

6.0 INDIRECT COST ALLOCATION

Purchases made in support of IBM's U.S. manufacturing and development organizations through IBM procurement functions, including purchases of goods and services which generally are regarded as indirect costs, are included in establishing the subcontracting goals for IBM's commercial plan.

The formula used to determine the amount of IBM's indirect purchases to be purchased from SBs and SDBs is equivalent to the one used for direct purchases. A ratio of the realistic opportunities to purchase these products and services from SBs and SDBs is calculated as a percent of our total aggregate indirect purchases. The resulting ratio is tested by assessing the trend from past year's performance, changes in the indirect purchase base (non-production goods and services, examples of which are described in sections 3.1 and 3.2 of this plan) and the emergence of new contracting opportunities. Indirect purchases include all such purchases at manufacturing sites, development locations and headquarters operations.

7.0 PROGRAM MANAGEMENT PLAN

7.1 SB/SDB Plan Administration. The person at IBM in charge of overseeing IBM's small business and Minority Supplier Program is a member of the Worldwide Procurement staff and as corporate coordinator of the Program, reports semi-annually the results and outlook for the small business and Minority Supplier Program to division and corporate management. The current Program Manager is Phyllis McCarley, International Business Machines Corporation, Worldwide Procurement, Route 100, Somers, New York 10589. Her telephone number is (914) 766-2697. Her primary responsibilities include:

a) day-to-day administration of the small business and Minority Supplier Program and related minority purchasing activities;

b) establishing the strategy and objectives of IBM's program and recommending program policy changes as necessary;

c) developing and implementing program procedures;

d) working with line management to establish program goals;

e) consolidating, analyzing and distributing activity reports;

f) conducting internal audits of the program, as appropriate, and following up to ensure performance of commitments; and

g) with respect to outside organizations and suppliers, participating in organizations which promote the utilization of minority suppliers, overseeing Minority Opportunity Fair participation, referring minority firms to appropriate purchasing departments, and establishing liaison relationships with federal, state and local government agencies.

7.2 Line Management. IBM's purchasing activities are generally decentralized within the U.S. for manufacturing and centralized for non-manufacturing purchases, with over 25 separate purchasing organizations handling individual needs for materials and services. Line purchasing management and procurement executives have the following small business and Minority Supplier Program responsibilities:

a) implementing and managing all phases of the program at their individual location;

b) assisting in identifying and resolving problem areas and establishing local or unit goals and objectives;

c) periodically auditing the attainment of goals and objectives;

d) ensuring that small business and minority companies are afforded full opportunity to do business with IBM and are encouraged to seek IBM contract awards;

e) discussing regularly IBM's Small Business and Minority Supplier Program achievements and objectives with local managers and employees,

f) being actively involved with local minority business organizations and community action groups;

g) providing quarterly activity reports to the Program Manager; and

h) maintaining records on awards to small business and minority suppliers, such as dollar volume, products or services purchased, and other relevant information.

i) establishing development/mentoring relationships with minority businesses assisting them in becoming full service, competitive suppliers.

Purchasing Managers and buyers understand that a portion of their work performance evaluation is based on their SB and SDB development and utilization efforts and the results they are able to achieve from those efforts.

7.3 Purchasing Coordinators. Each of IBM's decentralized purchasing locations, procurement councils and commodity teams have a small business and Minority Supplier Coordinator. These coordinators are focal points for small and small disadvantaged businesses interested in providing goods and services to IBM. The coordinators' in-depth knowledge of the operation of their facility or commodity and its needs enables them to provide timely and knowledgeable responses to a small business or minority supplier's inquiries and to assist the supplier in presenting their capabilities to the appropriate personnel at the location.

7.4 Corporate Management Policy and Responsibility. IBM policies are guidelines which govern our actions both within and outside the Company. Their purpose is to foster Corporate objectives and ensure that we live up to our corporate principles. Corporate policy letters are only issued on subjects of significant importance to the company. (See Policy Letter 137-A) In 1993, IBM's Chairman of the Board re-issued a Corporate Policy letter to formalize a long-standing purchasing principle that states:

> "...in the United States, it is the policy of the IBM Corporation to provide minority and women-owned businesses the opportunity to participate in all areas of IBM's marketing, procurement, and contracting activities. This policy applies to all areas of expenditures, whether for products or services."

In addition, in a message from the General Manager, IBM North America, Bob Stephenson reaffirmed the Chairman's policy by stating...

> "...IBM continues to maintain a policy and commitment to providing opportunities for minority and women owned businesses in all areas of our business...It is important that we all continue to dedicate ourselves to developing business relationships with qualified minority and women entrepreneurs".

IBM implemented a M/WBE Development Council to manage its total M/WBE Program. Members of this council consist of program managers from the various business units whose primary responsibility is M/WBE development and utilization. This council has the authority to implement the direction and guidance of the IBM policy statement.

8.0 EFFORTS TO PROVIDE EQUITABLE OPPORTUNITIES

IBM actively promotes the development of SBs and SDBs through a variety of supportive practices. These practices include a number of financial and technical assistance programs, and various educational offerings.

8.1 Financial Assistance

8.1.1 Business Consortium Fund. The Business Consortium Fund (BCF), under the auspices of the NMSDC, uses funds made available from participating entities to provide capital to minority businesses. IBM invested $1 million in the BCF to assist minority businesses which have historically experienced difficulty in obtaining capital through traditional lending sources and have faced an inability to secure funds at a reasonable rate of interest.

8.1.2 Specialized Small Business Investment Companies. IBM also supports Specialized Small Business Investment Companies ("SSBICs") in both Dallas and New York, and is represented on the Board of Directors of each. These organizations, licensed and regulated by the SBA, provide equity and long-term financing, in addition to management assistance, to small business concerns owned by socially and economically disadvantaged individuals. IBM will continue its involvement with both SSBICs.

8.1.3 Payment Terms. Flexible payment terms are available to small and small disadvantaged business concerns experiencing short term cash flow limitations. These may include payment in advance or some other enhancement to our normal net 30 terms.

8.1.4 Equipment Loans. IBM has and will continue to loan equipment to small and small disadvantaged business concerns to increase their competitiveness for subcontracting opportunities.

8.2 Technical/Managerial Assistance

8.2.1 Requirements. Small disadvantaged business concerns are often inexperienced in dealing with large industrial organizations, and frequently need help with the technical and managerial aspects of producing a custom-made product. Consequently, it is the practice of IBM's purchasing and technical personnel, where appropriate, to spend additional time with these firms to explain in detail the manufacturing and quality requirements for materials that IBM intends to purchase.

8.2.2 Supplier Facility Surveys. In some instances, an IBM manufacturing engineer or quality control specialist may conduct an on-site survey of a minority supplier's plant, identifying areas where deficiencies are likely to occur and suggesting improvements in the manufacturing process. These technical experts also assist, when needed, IBM's minority suppliers during actual production runs.

8.2.3 Quality Feedback. If the goods delivered to IBM by a small disadvantaged business concern are defective, IBM specialists will frequently return to the supplier's plant to suggest corrective measures.

8.3 Education

IBM will utilize several education programs designed to enhance and improve the business skills of small disadvantaged proprietors. The programs will cover such subjects as quality, financial and management skills, strategic planning and the information super highway, and will be provided either free-of-charge or at a nominal fee.

8.3.1 Quality Seminar. Expanded quality classes will be offered to small disadvantaged proprietors either free of charge or at an nominal fee. These classes will be based upon IBM's corporate-wide focus on Quality.

8.3.2 Management Education. In 1996 IBM will sponsor several management education courses for SDB's that will be aimed at improving their financial skills and business success.

9.0 CONTRACT CLAUSE "UTILIZATION OF SB/SDB CONCERNS"

9.1 Contract Clause. IBM incorporates by reference the FAR clauses entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" and "Small Disadvantaged Business Subcontracting Plan" in all subcontracts, and requires all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a plan similar to the plan submitted by IBM, with respect to work performed under U.S. Government procurement contracts. IBM will monitor the performance of its first-tier subcontractors under these subcontracts.

9.2 Purchase Order Terms and Conditions. In addition, to further emphasize and expand the requirement to utilize small disadvantaged and women-owned business concerns, IBM has added the following requirement in its standard purchase order standard terms and conditions: "Seller represents to IBM that it has an active program to provide opportunities for participation in its procurement process to minority and women-owned businesses."

10.0 SB/SDB DATA MANAGEMENT PLAN

IBM assures the Government that IBM is prepared to (i) cooperate with the government in any studies or surveys as may be required, (ii) submit periodic reports as requested in order to allow the Government to determine the extent of compliance by IBM with the subcontracting plan, (iii) submit Standard Form 295, Summary Subcontract Report for this Commercial plan in accordance with the instructions on the form, and (iv) ensure that IBM's subcontractors (except small business concerns) agree to submit Standard Forms 294 and 295. IBM acknowledges that submittal of Standard Form 294 is not required for this Corporate-wide Commercial Plan.

11.0 RECORD KEEPING PLAN

The record-keeping for this SB/SDB subcontracting plan, as described below, is a corporate requirement and is maintained on a corporate-wide basis.

11.1 Performance to Goals. IBM's Program Manager tracks a location's actual payments to small business and SDBs against goals on a quarterly basis. This data is compiled and distributed semi-annually.

11.2 Awards of More than $100,000. Records are maintained on each subcontract solicitation resulting in an award of more than $100,000, indicating (a) whether small business concerns were solicited and if not, why not, (b) whether small disadvantaged business concerns were solicited and if not, why not, and (c) if applicable, a reason why an award was not made to a small business concern.

11.3 Source Lists, Organizations Contacted, Outreach Efforts. Line management maintains records of source lists, organizations contacted and outreach efforts, including trade associations, conferences and trade fairs.

11.4 Records of Internal Guidance. In addition, line management maintains records of internal guidance and encouragement provided to buyers through workshops, seminars, training, etc., and monitors performance to evaluate compliance with the program's requirements.

12.0 IBM SB/SDB OUTREACH PROGRAMS

IBM has historically been a major supporter of Small Business, buying a substantial percentage of our supplies and services from firms that meet the definition of small business. As an integral part of that commitment, IBM has implemented programs aimed specifically at the Minority and Women-owned business community. While any business can avail itself of the programs and services described below, the organizational structures and their primary focus is intended to broaden IBM's utilization and support of SBs and SDBs nationwide.

12.1 IBM M/WBE Development Council

The M/WBE Development Council provides a focal point and coordination function for IBM's outreach programs involving minority business relationships.

Representing the IBM U.S. business units and organizations, the Development Council carries out its primary functions through M/WBE Program Managers, M/WBE Area Outreach Managers and Purchasing Minority Coordinators.

The Development Council provides functional guidance and support to field business units and ensures their commonality of purpose and direction. The Development Council and individual outreach managers have responsibility for developing programs and activities which will yield increased utilization and broader participation of Minority and Women-owned businesses.

Externally, an important function of the Development Council is to provide a simplified, efficient and rapid-response mechanism to the M/WBEs who have an interest in developing business relationships with IBM. Key components in the achievement of this goal are the M/WBE Outreach Managers and Purchasing Minority Coordinators. These individuals are trained and qualified to identify and recruit minority businesses for participation in a wide variety of IBM business relationships. Established in every major business unit nationwide, this group ensures that the normal complexities of doing business with a major corporation will have minimal impact on M/WBEs seeking a relationship with the IBM Company. This process ensures that the small firm with little or no experience dealing with IBM will have an opportunity to interact with the right individual or division interested in his or her product or service, regardless of location. For firms already in a business relationship with IBM, those individuals provide an effective means for broadening that company's exposure to the other corporate functions that could utilize its product or service.

12.2 Associations, Conferences and Trade Fairs. As an integral part of its outreach activities, IBM provides support to a number of key M/WBE-oriented associations and organizations throughout the year. This support may take a variety of forms, including direct financial grants, equipment and technical support, participation in conventions and trade fairs, as well as time and effort of IBM executives and professionals. These contacts allow IBM to contribute effectively to the development and support of M/WBE firms across a broad spectrum of industries and services, and provides valuable information on new companies having the potential for developing business relationships with IBM. Some examples of these organizations include the NMSDC, NAWBO, MEDWEEK, and a number of local M/WBE advocacy and development groups.

In 1994, the National Minority Supplier Development Council honored IBM with a Leadership Award for significant, long-term contributions to minority business development. IBM has been a member of the Council since 1974, and IBM employees are actively involved board members and volunteers with many of the 44 regional councils in the United States. In addition, in 1995 IBM was recognized by NAWBO as corporation of the year as a major supporter of women-owned business development and by the American Association of Minority Business.

12.3 Historically Black Colleges & Universities / Minority Institutions (HBCU/MIs). IBM has a number of programs which provide support to Black colleges and universities nationwide. Many HBCUs/MIs have established small business development centers which work directly with the local minority business community on a wide variety of topics. IBM has provided grants of equipment, software, and personnel to a number of these centers over the years and will continue this activity in the future. As well as affording IBM the opportunity to contribute to minority business development in a significant way, these centers have frequently been valuable sources of information on potential business partners and suppliers for IBM.

Through the Faculty Loan Program, IBM offers its employees the opportunity to contribute time and expertise to HBCUs/MIs across a wide spectrum of disciplines. IBM grants interested employees up to 18 months paid leave of absence to teach or consult at selected HBCUs/MIs. Over the years, this program has contributed many thousands of hours of IBM professional and managerial time to the HBCU/MI community, and will continue as a mainstay of our support activities in 1996.

Expenditures to HBCUs/MIs are not included as a part of our SDB goals.

12.4 IBM M/WBE Business Partners Program. IBM has a variety of programs which offer qualified firms an opportunity to establish a marketing partnership with our company.

For Small Businesses, and Small Disadvantaged Businesses in particular, these programs provide the means to develop marketing relationships with IBM to secure an array of benefits. These include discounts on purchases of approved IBM products, access to electronic support systems and databases, a limited right to use the IBM logo in the marketing activities, and the opportunity to make joint sales calls with IBM.

Generally designated as "IBM Business Partner Program," these relationships were intended to broaden IBM's marketing coverage and product offerings. Several years of experience has clearly demonstrated the value of the Business Partner Programs as a means for SBs and SDBs to gain access to markets and expertise not ordinarily available to firms with limited resources. As a result, IBM has modified its management of the Business Partner Programs to ensure relevance to what is now a major segment of the Business Partner population. These changes are most evident in our extensive array of support offerings, many specifically designed to enhance the effectiveness and productivity of Small Businesses and Small Minority Businesses.

12.5 IBM M/WBE Dealer Program. To broaden our utilization of M/WBE's, IBM implemented an M/WBE Development Program for our M/WBE Business Partners. The objective is to grow the number of M/WBE PC dealers (PCDs) as resellers of the IBM PS/2 product line. The program, in essence, reduces the entry requirements for minorities and women when compared to normal entry criteria and it allows them to ramp up to the standard "minimum renewal criteria" over a longer period of time, three years.

12.6 External Communications. As an ongoing part of its communications activities, IBM intends to advertise its programs and opportunities through a variety of media. As in the past, IBM will place ads in national magazines targeting minority and women audiences, as well as in local minority business publications, M/WBE association publications, and other publications which could provide a unique opportunity for IBM to reach the M/WBE community.

IBM has also developed and distributed a M/WBE brochure, which provides a guide to the key marketing, purchasing and procurement locations and contacts within the company. Designed to invite interested M/WBE firms to explore opportunities with IBM, these brochures generated a large number of inquiries and new contacts.

13.0 IBM INTERNAL M/WBE COMMUNICATIONS

IBM uses various means to increase employee awareness of our M/WBE efforts and programs, and encourage individual involvement throughout the Company. A formal brochure "Making The Connection" (attached) is distributed to all employees in the U.S. to ensure their utilization of M/WBE's. Memos and directives from the highest levels of executive management have been issued and will continue to be one of the most important tools to give impetus and focus to the company's commitment. Articles in various divisional and local internal publications highlight specific programs and provide special recognition for organizations and employees with notable achievements in the M/WBE area. M/WBE articles are also available to all IBM employees via IBM's internal electronic mail system. IBM will continue its use of this process in 1996.

MESSAGE FROM THE CHAIRMAN AND CHIEF EXECUTIVE OFFICER

POLICY LETTER - Number 137A

SUBJECT: IBM'S COMMITMENT TO DIVERSE BUSINESS RELATIONSHIPS

Wherever IBM operates around the world, we strive to conduct our business in a fair and equitable manner. Consistent with this objective, we follow local laws and customs of the countries in which we operate, and we actively seek to establish close working relationships with businesses indigenous to those countries. For example, in the United States, it is the policy of the IBM Corporation to provide minority and women-owned businesses the opportunity to participate in all areas of IBM's marketing, procurement, and contracting activities. This policy applies to all areas of expenditures, whether for products or services.

Action should be taken by all IBM organizations to ensure that this policy is implemented and that there are programs which ensure IBM's performance against this long-standing commitment.

Louis V. Gerstner, Jr.
Chairman and Chief Executive Officer

MESSAGE FROM THE GENERAL MANAGER, IBM NORTH AMERICA

Dear IBMer:

IBM continues to maintain a policy and commitment to providing opportunities for minority and women owned businesses in all areas of our business.

In IBM North America, we have established the Minority and Women Owned Business Enterprise Program to build and nurture long term relationships in areas including: distribution channels, market surveys, consultant activity, business shows and related sales promotion activity, advertising, and external meetings.

The program is driven by three of IBM's eight basic principles:

- The marketplace is the driving force behind everything we do.
- Our primary measures of success are customer satisfaction and shareholder value.
- We are sensitive to the needs of all employees and to the communities in which we operate.

It is important that we all continue to dedicate ourselves to developing business relationships with qualified minority and women entrepreneurs.

R.M. Stephenson

MESSAGE FROM THE VICE PRESIDENT AND CHIEF PROCUREMENT OFFICER

Dear IBMer:

Making the connection is about meeting the challenge of minority and women supplier development within the IBM Corporation.

To ensure IBM's continued commitment to diverse business relationships, this document has been prepared as a guide for you to enhance your understanding of this program and encourage you to support minority and women entrepreneurs with your procurement dollars and your expert assistance.

The minority and women business enterprise program is not just a procurement program, it is a U.S. wide cross-functional program. We're depending on you to help make it an integral part of your daily process.

Sincerely,

Gene Richter

R.G. Richter
Vice President and
Chief Procurement Officer

SUBCONTRACTING PLAN NOTICE OF AWARD

CONTRACTOR

COMPANY NAME: IBM Corporation
ADDRESS: 6705 Rockledge Dr., Bethesda, MD 20817
PHONE: 301-564-3918

FAX/INTERNET: 301-564-2595
CONTACT PERSON: Kathy Sadler

CONTRACT NUMBER: GS-35F-0001D
SOLICITATION NUMBER: KESO-95-0002 (5-10)

DOLLAR AMOUNT
OF CONTRACT: $158,000,000
PERIOD OF CONTRACT
PERFORMANCE: 10/1/95 -9/30/96

DESCRIPTION OF
OF ITEMS/SERVICES
(INCLUDING FPDS
PRODUCT/SERVICE
CODE): ADP Supplies & Services

PLACE OF
PERFORMANCE: Same as above.

PLAN ADMINISTRATOR

NAME (CONTACT): Phyllis McCarley
ADDRESS: Rte. 100, Somers, NY 10589

TELEPHONE: 914-766-2697
FAX/INTERNET:

CONTRACTING OFFICER/ADMINISTRATIVE CONTRACTING OFFICER

NAME (CONTACT): Robert D. Bourne, Jr. K.B. 1-3-96 Plan covers period 1-1-96 thru 12-31-96. K.B.
ADDRESS: General Services Administration
Federal Supply Service - FCI
ADP Acquisition Center
Suite 1017
1941 Jefferson Davis Highway
Arlington, VA 22202
TELEPHONE/FAX: 703-305-5252

TYPE OF PLAN
(check appropriate blank)

INDIVIDUAL CONTRACT:

COMPANY-WIDE PLAN FOR COMMERCIAL PRODUCTS: X

APPROVED GOALS

TOTAL SUBCONTRACTING PLANNED	$10,000,000,000 = 100%
TO SMALL BUSINESS	$ 3,500,000,000 = 35%
TO SMALL DISADVANTAGED BUSINESS	$ 375,000,000 = 3.75%
TO WOMEN-OWNED SMALL BUSINESS *(APPLICABLE ONLY IF INDIVIDUAL CONTRACT PLAN)*	

ENERGY POLICY ACT OF 1992
(check appropriate blank)

"AWARDED UNDER THE ENERGY POLICY ACT OF 1992" yes_x__ no___

EXPIRATION OF PLAN

IBM Corporation's plan, awarded under Contract No.GS-35F-0001D expires on 9/30/96.

Actual Date of Contract Award is 8/25/95.

Revised 2/16/95

International Business Machines Corporation

6705 Rockledge Drive
Bethesda, Maryland 20817
301/564-2000

November 30, 1995

General Services Administration
Federal Supply Service-FCI
ADP Acquisition Center
Washington, DC 20406

Attention: Mr. Robin Bourne
Contracting Officer

Subject: IBM Small Business and Small Disadvantaged Business Corporate Subcontracting Plan for Calendar Year 1996

Dear Mr. Bourne:

IBM is pleased to submit its Small Business and Small Disadvantaged Business Corporate Subcontracting Plan for Calendar Year 1996.

IBM is fully committed to carrying out its responsibility to provide maximum practicable opportunities for the participation of small and small disadvantaged business concerns in our supplier and subcontracting programs.

This plan represents an improvement in our percentage goal for small disadvantaged businesses over our commitment in 1995, an increase from 3.5% to 3.75%. In addition, and more importantly, since our purchase base will be increasing, this represents an increase from a goal of $266 million to $375 million. We believe both our small and small disadvantaged goals are both aggressive, as well as realistically achievable.

This year IBM is also attaching a copy of our brochures describing IBM's commitment and implementation of our plan. Both entitled "Making the Connection", the smaller brochure is used within IBM for internal educational purposes; the larger brochure is our external publication on our commitment to the SB/SDB and Women Owned Business Programs.

Should you have any questions concerning this plan, please call me on (301)564-3918.

Very truly yours,

Kathy S Sadler

K. S. Sadler
Contract Relations Advisor
Government Systems
IBM North America

Appendix H

LICENSE AGREEMENT

The following terms and conditions will apply to any IBM Licensed Program (Program) delivered pursuant to any agreement which this License forms a part. This is a license agreement between International Business Machines Corporation (IBM) and the licensee ("you"). This is not an agreement for sale. IBM retains title to the copy of the Program and any copy made from it.

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1. Definitions

Program and/or Licensed Program is the following, including features and any whole or partial copies:

a) machine readable instructions;

b) a collection of machine readable data, such as a data base; and

c) related licensed materials, including documentation and listings, in any form.

The term "Program" and/or "Licensed Program" includes an IBM Program and any non-IBM Program delivered pursuant to this Agreement. The term does not include Licensed Internal Code or Materials.

Materials are literary works or other works of authorship (such as programs, program listings, programming tools, documentation, reports, drawings, and similar works) that may be delivered under a contract which this Agreement forms a part. The term "Materials" does not include Programs or Licensed Internal Code.

Specified Operating Environment is the Machines and Programs with which a Program is designed to operate, as described in the Program's Specifications. Software Release(s) updates existing software versions. Releases do not change the product name or number. Software releases may or may not be chargeable. Support for releases is normally discontinued after a period of time or when a new release or version becomes available.

Software Version(s) is a new product with its own name, product number, terms, and price. It is not just an update or revision of a prior version or release.

2. License

When an individual Program becomes subject to this Agreement, IBM will grant to the licensee a non-transferable and nonexclusive license within the United States, Puerto Rico and U.S. Government installations listed in the Contract. All Programs delivered to licensee become subject to this Agreement. The licensee may not transfer the Program without IBM's written consent IBM licensed programs are licensed under this Contract for the exclusive benefit of the Government. If the Government discontinues any such programs, Government will concurrently discontinue use of such programs in accordance with applicable program license terms. Under each license, IBM authorizes the Government to:

A. Use the Program's machine-readable portion on only the Designated Machine unless–

1. The Designated Machine is inoperable. The Government may then use the Program on a backup Machine until operable status is restored and processing on the back-up machine is completed.

2. The Designated Machine cannot assemble or compile the Program. The Government may then assemble or compile it on another Machine,

The Government must notify IBM of the Government's intention to change the designation of the machine on which licensed program materials are to be used. The change of designation will be effective upon the date set forth in the Government's written notification to IBM. Changes to the Designated Machine may be subject to a charge for Graduated Charge Programs.

B. Do the following to support the Government's authorized use as described above –

1. make copies of the Program, provided the Government reproduces the copyright notice and any other legend of ownership on each copy or partial copy.

2. merge into another program.

Related license materials provided by IBM in printed form, microfiche or other non-machine readable form may not be copied. Additional copies may be obtained under license from IBM outside the scope of this Agreement; and

D. Use any portion of the Program IBM 1) provides in source form, or 2) marks restricted (for example, "Restricted Materials of IBM") only to –

1. Resolve problems related to the use of the Program, and

2. Modify the Program so that it will work together with other Programs.

The Government agrees to comply with any additional terms (such as usage restriction) a Program's Specifications may contain. IBM provides the specifications to the Government with the Program. For an "AS IS" Program, any additional terms are contained in a document called "Notice of Availability."

Action the Government May Not Take. The Government agrees not to do any of the

following:

A. Sublicense, assign, or transfer the license for any Program between agencies or departments, including military departments;

B. Distribute any Program to any third party;

C. Reverse assemble, reverse compile, or otherwise translate the Program; or

D. Use, print, copy or display the licensed program, in whole or in part, except as expressly provided herein.

3. Usage License

IBM specifies a usage restriction for selected Programs. A separate license or an additional license charge is required for use of the Program which exceeds the usage restriction.

4. **Additional License Copies and DSLO Licenses**

For Programs for which you are licensed, in lieu of distribution from IBM, you may order an Additional License Copy of a Program for a charge. Such Copy will be deemed to be a copy of a Program under this Agreement. For each Additional License Copy ordered, IBM will authorize you to make a single copy of the Program's machine readable material. You agree to inform IBM in your order of the effective date of licensing such copy.

For certain Programs, you may obtain a Distributed System License Option (DSLO) license, in addition to the original license (Basic License), for a DSLO charge. A DSLO License will be deemed to be an Additional License Copy, except where otherwise specified. For each DSLO License, unless otherwise specified by IBM, you agree to;

a) copy the Program's machine readable portion and use such copy on the DSLO Designated Machine;

b) provide problem documentation to IBM from the Basic License's location;

c) distribute to, and install on, the DSLO Designated Machine any new release, correction or bypass which IBM provides to the Basic License Designated Machine; and

d) receive Program services and the warranty, if any, only through the Basic License location.

You agree to designate a new Basic License to replace a discontinued Basic License. You agree to pay IBM for each copy you make of any Program we refer to as a distributed feature.

5. Licensed Program Specifications

For each licensed program which is warranted, IBM will have published, at the time that the licensed program becomes available, a document entitled "Licensed Program Specifications." Such Licensed Program Specifications may be updated by IBM from time to time and such update may constitute a change in specifications.

6. Warranty for IBM Programs

Each Licensed program which is designated as warranted will conform to the Licensed Program Specifications in effect when shipped when it is used in a Specified

Operating Environment. The warranty period commences on its Date of Installation and expires when Program Services are no longer available. During the warranty period, IBM will provide warranty service, without charge, for a Program through Program Services. Program Services are available for at least one year following its general availability. Therefore, the duration of the warranty period depends on when the license was acquired.

IBM does not warrant that the functions contained in a licensed program will meet the Government's requirements or will operate in the combinations, which may be selected for use by the Government, or that the operation of the licensed program will be uninterrupted or error free or that all program defects will be corrected.

Non-warranted Programs are distributed on an "AS IS" basis without warranty of any kind either express or implied including but not limited to the implied warranty of fitness for a particular purpose.

Warranty service (defect support) for System/390 and Networking platforms is currently provided via telephonic (voice), electronic, fax or mail via Central Service at no additional charge.

For AIX, AS/400 and Personal Systems, customer warranty support (if applicable) is currently provided via Central Support by contacting IBM in writing or via electronic, fax or mail. The information required to provide warranty assistance includes documentation of the pertinent customer and problem data, and a reproducible test, if possible.

7. Program Services

IBM provides Program Services for warranted Programs and for selected other Programs. If IBM is able to reproduce the reported problem in the Specified Operating Environment, IBM will issue defect correction information, a restriction, or a bypass. IBM provides Program Services for only the unmodified portion of a current release of a Program. IBM provides Program Services 1) on an on-going basis (with at least six month's written notice before we terminate services for a Program), 2) until a specified date, or 3) for a specified period as may be announced generally to IBM customers.

Program Services for a licensed program used in other than a Specified Operating Environment are subject to limitations resulting from the differences between the Specified Operating Environment and the customer's operating environment. Such program services will only respond to defects which will occur when Central Service operates the licensed program in a Specified Operating Environment.

IBM Support Center Service described as Central Service is limited to defect support. When Central Service is specified, IBM will designate one or more service locations which will accept documentation, in a format prescribed by IBM, indicating that a problem is caused by a defect in the licensed program. The customer is responsible for the preparation and submission of documentation to the Central Service.

Other support services beyond Central Service described above (which are the scope of Warranty) are subject to prices, terms and conditions of the IBM Support Family Services offerings which are separate from this License

Agreement but which may be a part of the Contract which this Agreement forms a part.

8. Charges

The charges applicable to each Program are specified in the Price Tables. Such charges may be 1) one-time charges, 2) upgrade charges, 3) periodic charges and any initial charges, and/or 4) process charges.

For certain Programs IBM may designate a replacement Program for which upgrade charges may apply to the replacement Program. You may obtain the replacement Program before discontinuing the replaced Program as specified by IBM.

For Graduated Charge Programs, charges are based on the applicable group. When you change, upgrade, or downgrade the Designated Machine, applicable charges and/or periodic charges may apply. However, IBM will not adjust or refund any one-time, initial, process or upgrade charges due or previously paid for the variable charge Program. You agree to notify IBM of such changes and their date. Such date is the effective date of the change in charges. If you license a Graduated Charge Program for use on a Designated Machine not listed in the Price Tables, the charges for the group with the highest charges apply.

For Graduated Charge Programs, you agree to immediately notify IBM of any change in the Designated Machine. Such changes may result in a change in the applicable group. Any change in the charge associated with the new group will become effective upon the date IBM receives your notification of change in the Designated Machine.

The installation of an upgrade or downgrade to the Designated Machine may result in a change in the applicable group. In such event, you agree to notify IBM of such change. If such installation is not performed by IBM, you also agree to inform IBM of the date such machine upgrade or downgrade is installed. Any change in charges associated with the new group will become effective when such machine or upgrade is installed.

When you change or upgrade the Designated Machine to a Machine in a group with higher charges, the applicable group upgrade charge will be paid by you. When you change or downgrade a Designated Machine to a Machine in a group with lower charges, any charges due or previously paid will not be adjusted or refunded.

9. Program Testing

IBM provides a testing period for certain Programs. During the testing period, IBM will make the Program or Additional License Copy available for nonproductive use to determine if it meets your requirements. The testing period for a Program will begin on the day following 10 days after IBM ships the Program. The testing Period of the Additional License Copy, if any, begins on the Effective Date of the Additional License Copy. There will be no testing period for DSLO licenses, unless otherwise specified by IBM.

During the testing period, you may discontinue any license upon written notice effective immediately. In such event, charges other than process charges will not be due.

You agree to notify IBM if you use the Program or Additional License Copy for productive purposes during the testing period. The testing period will end as of the day you begin productive use.

10. Commencement and Invoicing of Charges

For a Program or Additional License Copy with a testing period, periodic charges will commence and one-time, initial and upgrade charges will be due on the day, Monday through Friday, following the end of the testing period. For a Program without a testing period, periodic charges will commence and one-time, initial and upgrade charges will be due on the day, Monday through Friday, 10 days after IBM ships the Program. For an Additional License Copy with no testing period, periodic charges will commence and other charges will be due upon the Effective Date for such Copy.

Process charges are due when invoiced and are not refundable.

IBM will prorate monthly charges based on a 30-day month. Other periodic charges will not be prorated and are not refundable. IBM will invoice periodic charges in arrears.

11. Program Protection

You may not distribute any Program to any other persons, including other licensees, without IBM's written consent. You agree to:

a) take appropriate action, by instruction, agreement or otherwise, with any persons permitted access to any Program, to satisfy your obligations under this Agreement.

b) reproduce and include the copyright notices and any other legend on any copies of the Program you make by following IBM's copyright instructions.

c) maintain records of the number and location of all copies of the Program. You will notify IBM in writing if the original or any copy of the Program will be kept at premises other than that of the Designated Machine.

For purposes specifically related to your use of the Program, you may make the Program available to 1) your employees or IBM's employees or 2) other persons a) when they are on your premises or b) whom you authorize to have remote access to the Program. You may not make the Program in any form available to any other persons without IBM's written consent.

Only you, your employees and IBM's employees may access any Program that is a data base. You may not make any data in the data base available to any other person.

12. License Termination

You may terminate the license for a Program on one month's written notice or at any time during the Program's testing period. IBM may terminate any license grant under this Agreement if you do not meet your obligations regarding Programs.

You agree to destroy all applicable copies of the Program. However you may retain a copy for archival purposes only. You must also remove the Program from any adaptation into which it is merged. You are not required, however, to destroy the individual pieces of data you obtained from a data base and which constitute a minor portion of such data base.

When you license a new version of a Program, which carries a different Program number than the previous version, and discontinue the previous version, you may retain the previous version of the Program without charge for up to three months following its date of discontinuance unless a

longer period of time is specified in this Contract. You may use the previous version only if a defect in the new version prevents its use.

13. Patents and Copyrights

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Appendix K

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April 21, 1998

John Greenwald Jr.
[redacted]

Re: 9803240009

Dear Mr. Greenwald:

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Sincerely,

Abel Lopez

Abel Lopez, Acting Director
FOIA/Privacy Act Division
Office of the Executive Secretariat

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

April 27, 1998

Mr. John Greenwald, Jr.
[redacted]

SUBJECT: Freedom of Information Act Request

Dear Mr. Greenwald:

This office is in receipt of your February 12, 1998 Freedom of Information Act (FOIA) request for all documents pertaining to the IBM contract with the Department of Energy to develop high-speed switching technology that will simulate the impact of fires, earthquakes, and other natural disasters on the U.S. nuclear stockpile. You also asked for all documents that reference, are about, or mention the super computer used in this project. It was referred to this office since Lawrence Livermore National Laboratory is one of our national laboratories, and it was received in this office on April 27, 1998.

Your request, as currently written, is deemed to be too broad in scope. It does not, for purposes of the FOIA, reasonably describe the documents sought. Absent greater specificity, your request would involve an unreasonable search of a large and indefinite number of records to ensure that all responsive documents had been identified. The Department's regulations which implement the FOIA provide, at 10 C.F.R. 1004(c)(1), that a request "must enable the DOE to identify and locate the records sought by a process that is not unreasonably burdensome or disruptive of DOE operations." Therefore, broad sweeping requests which lack specificity are not requests for reasonably described documents.

In order that this office can be fully responsive, you will need to restate your request to contain specific information as to what you are looking for by name, title, date, etc. Otherwise, this search can become a "fishing expedition", time consuming, and costly for you.

Lawrence Livermore National Laboratory

Human Resources
Staff Relations Division
Telephone: (925) 423-8774
FAX: (925) 423-5665
Mail Stop: L-708

August 19, 1998

John Greenewald, Jr.
[redacted]

RE: California Public Records Act Request #CP98-29

Dear Mr. Greenewald:

Enclosed are the documents you requested pertaining to the contract between Lawrence Livermore National Laboratory and IBM. Proprietary and confidential information has been redacted.

Please remit a check made payable to The Regents of the University of California in the amount of $24.00 (240 pages @ $.10/page) and return it to my attention.

If you have any questions about this material, please let me know.

Sincerely,

Susan B. Angstadt
Staff Relations Representative

SBA:sm

Enclosures

ASCI Problem-Solving Environment:

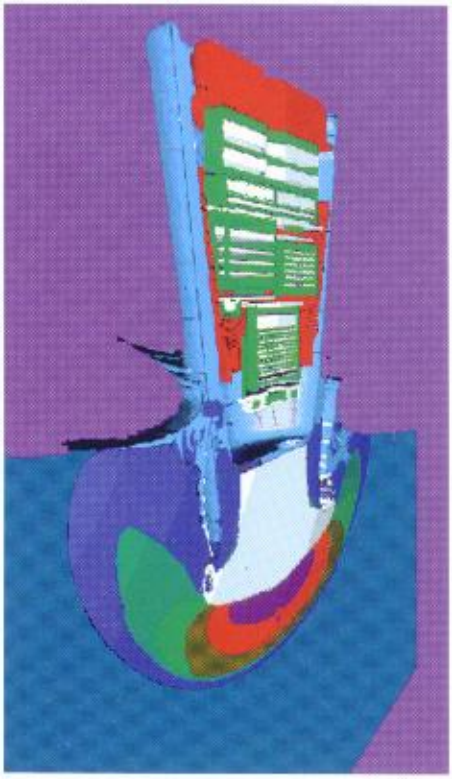
Visualization
Scientific Data Models
Problem Setup

Goal

Accelerate application development. Provide desktop access to high-performance-computing resources, applications, and information across the entire Defense Programs complex.

Objectives

Support rapid development of predictive weapon simulation codes that are adapted for the efficient use of very large scale parallel computers. Ensure that the power of the application/platform combination can be readily applied by our weapon scientists to the challenges of stockpile stewardship and management.



Shock physics code analysis of a reentry vehicle.

Because of the need to shift away from nuclear test-based designs, major decisions about stockpile stewardship will require analysts to possess unprecedented confidence in their computation simulations. They will need analyses of extremely high fidelity models (over 1 billion cells) and data sets orders of magnitude larger than current sets. Development and use of Accelerated Strategic Computing Initiative (ASCI) codes will generate terabytes of data, an overwhelming amount that analysts can comprehend only with advanced tools and visualization techniques. Furthermore, as the ASCI supercomputers grow from teraflops and terabytes today to 100 teraflops and petabytes in the next decade, simulations will increasingly rely on visualization for comprehension.

Success with ASCI codes depends on the ability to comprehend, debug, and analyze the data from the desktop, which in turn depends on robust tools, easy-to-use software, and visualization technologies provided by the three laboratories. Between the Problem-Solving Environment (PSE) and Applications programs, three important crosscutting thrusts have been identified:

- Visualization
- Scientific Data Models
- Problem Setup

Visualization

Visualization for ASCI-sized problems is no small task. A comprehensive solution based on state-of-the-art visualization hardware, leading-edge visualization research, and a synthesis of commercial tools along with in-house software and integration is required to handle the demands of ASCI.

A high-performance, scalable network comprised of graphics workstations, visualization servers, and storage systems—all interconnected to the ASCI supercomputers—forms the hardware backbone for the visualization effort. Through technologies such as video fiber modems, image compression and transmission, and hardware-parallel visualization systems, ASCI has the ability to transmit real-time, high-quality imagery from the visualization servers and supercomputers to scientists' offices and graphics labs. In the future, ASCI will provide this ability across long distances to support users residing at different sites.

Because of ASCI's extreme push on scientific computing, current visualization tools alone will not be sufficient for the long term. Visualization research, including multiresolution and hierarchical techniques, parallel and distributed algorithms, feature extraction, and alternative interfaces, is necessary to provide the techniques, algorithms, and tools needed to analyze tera-scale data sets.

An equally ambitious task is that of integration. To provide a robust, extensible solution that truly enables ASCI scientists, significant development is required to pull together the diversity of hardware, research, and end-user tools into a comprehensive framework. Of note, CEI's EnSight, IBM Data Explorer, and AVS Express have been identified as key visualization packages that will become part of the overall visualization solution

for ASCI. Partnerships, both with industry and academia, will also play a large role with ASCI Visualization as we look for ways to leverage the best technologies available and provide ways to disseminate the solutions back into the high-performance-computing community.

Scientific Data Models

The ability to manage the data associated with large-scale, complex simulations will ultimately constrain their usefulness. The three ASCI laboratories are developing a joint solution to simulation data management that will provide efficient data access, portability, and capability for sharing among applications. For data to flow smoothly among physics codes and between the phases of setup, simulation, and analysis, the data must be modeled in an application-neutral way. Tools for subselecting data and for remapping data from one mesh representation to another are also essential to this process. For ASCI applications, the data model must also accommodate partitioning, distribution, and assembly in parallel computations. Standardization of models and formats across the three laboratories is critical for data to be readily shareable. To meet this goal, the three ASCI laboratories are jointly developing a common data model for ASCI simulation data along with common APIs for programming and supporting data object libraries. The ASCI data model is based on fundamental topological principles that provide a comprehensive foundation for the meshes and fields common to nearly every scientific application, including those in ASCI.

Problem Setup

ASCI computational scientists are designing a framework for problem setup based on an open, distributed architecture. Domain analysis is used to develop appropriate requirements for the subsystems that will handle the three major phases of problem setup: (1) geometry specification, (2) mesh generation, and (3) instantiation of the initial state. The framework will be designed to allow the use of commercial as well as customized tools. In addition to framework development, there are ongoing research activities in the areas of grid optimization, automatic blocking and domain decomposition, volume fraction calculation, and feature suppression. These efforts are closely tied to the final ASCI physics codes.

The size of the potential problems to be set up can be staggering. Computational solution of problems consisting of hundreds of physical parts that are then decomposed into a billion grid cells are proposed. The setup phase of such problems will require a team of scientists and technicians working together to produce a result in a timely manner. Thus, a collaborative environment with standards for geometry, mesh, and material property data interchange is required. This environment is presently under development with joint participation between the Setup and Scientific Data Management ASCI efforts.

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This work was performed jointly under the auspices of the U.S. Department of Energy as part of the Accelerated Strategic Computing Initiative (ASCI) by LLNL Contract W-7405-ENG-48), LANL (Contract W-7405-ENG-36) and SNL (Contract DE-AC04-94AL85000).

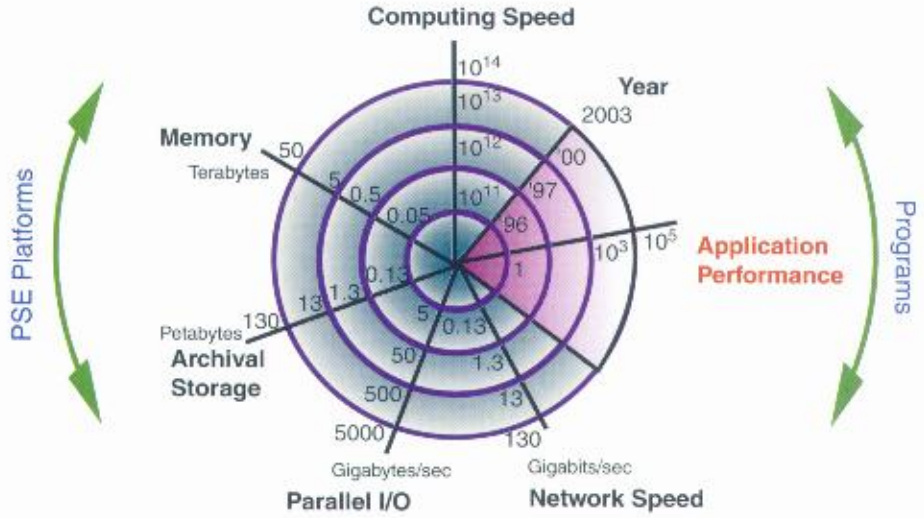
ASCI Problem-Solving Environment

Goal

Accelerate application development, desktop access to High-Performance Computing (HPC) resources, applications, and information across the entire Defense Programs (DP) complex.

Objectives

Support rapid development of predictive weapon simulation codes that are adapted for the efficient use of very large scale parallel computers, and ensure that the power of the application/platform combination can be readily applied by our weapon scientists to the challenges of stockpile stewardship and management.



ASCI success requires balanced growth of simulation components driven by the need for improved application performance.

Accelerated Strategic Computing Initiative (ASCI) is an application-driven program. Its success depends on the rapid development of a new generation of weapons simulation codes and their application to the challenges of stockpile stewardship and management. The fundamental goal of ASCI's Problem-Solving Environment (PSE) program element is to provide application developers and weapon designers with accelerated access to ASCI research platforms. In addition, PSE solutions have to be scalable to provide balanced computing systems for application users up to and beyond the teraflop scale. To accomplish these goals, the PSE program's main functions will be to

- support the rapid development of predictive weapon simulation codes that are adapted for the efficient use of very large scale parallel computers and
- ensure that the power of the application/platform combination can be readily applied by our weapon scientists to the challenges of stockpile stewardship and management.

Strategies

All PSE Products Shall Be Based on Industry Standards.

The PSE standards focus means that we will use standards whenever possible. When making architectural and implementation decisions, we will consistently choose to use existing software implementations of industry standards.

Think Globally, Act Locally.

ASCI as a whole is a Tri-Lab program. To support this programmatic goal, PSE management plans activities (e.g., High-Performance Storage System (HPSS), Common Basic Environment) across all three laboratories and coordinates the work accordingly. However, each laboratory is responsible for implementing its component locally. This includes gathering local site-specific and general requirements.

Each Laboratory Is Responsible for Providing Tri-Lab Access to ASCI Platform Resources at Its Site.

Each of the three Laboratories will have the major responsibility for integrating computer resources procured through the Platforms

component of the ASCI Program. Currently, Sandia is jointly developing a Teraflop capability with Intel (often referred to as "Option Red"). LLNL and LANL have announced collaborations with IBM and with the Cray division of SGI. Each of these sites must provide the necessary infrastructure (e.g., network connectivity, distributed computing environment (DCE), local disk, archive, user services, need-to-know access) to allow users from all three Laboratories to use the resource at their site.

PSE Development Efforts Will Be End-to-End Solutions that Directly Enable Applications Developers and SBSS Designers.

ASCI programmatic goals state that we will be making a measurable difference to the computational capability of Science-Based Stockpile Stewardship (SBSS) designers. To support this programmatic goal, PSE has chosen implementation strategies that use all the necessary PSE infrastructure components to deliver turnkey (end-to-end) solutions.

Development Efforts Focus on Building a Balanced Tera-Scale Problem-Solving Environment.

All PSE development efforts are focused on the high end. ASCI applications requirements and platforms are pushing into the tera-scale regime (teraflop/s, terabytes of RAM, tens of terabytes of disk, petabytes of archive, tens of gigabytes/s of networking bandwidth). Our activities are focused on solving this "big data" problem and providing a problem-solving environment that functions at these extremes.

Key Capabilities for 1997

ASCI to the Desktop: Bringing Tera-Scale Computing and Global Data to a Screen Near You.

The ASCI PSE integrated the Option Blue ID systems at LANL and LLNL in FY97, in addition to Option Red, which is being delivered to Sandia. The next-generation archival system, HPSS, came on-line in FY97 as did the first DCE capabilities. These tera-scale computing and data management central facilities will be fully integrated at each site. In addition, these capabilities will be made available to users directly at their workstations. The main feature of this will be the ability to log onto the workstation and have DCE authentication mechanisms allow access to all the other computing and data available at a site. In addition, a Laboratory-wide file system will be visible from the user desktop for home directories.

3-D Visualization to Your Desktop.

The task of visualization and analysis of the tera-scale data generated by the ASCI computational models overwhelms traditional methods of scientific visualization. ASCI PSE is working closely with ASCI applications to define, develop, and deploy tera-scale visualization so that scientists will have complete access to their simulation data. The Tri-Lab effort will involve deploying graphics servers at each of the three labs, which will be tightly integrated with the respective ASCI Red/Blue machines. The servers will provide the highest graphical performance to the designers' desktops, allowing them to visualize and analyze their simulation data at speeds and fidelity not currently possible. These servers will use the PSE environment for high-speed networking, access control, and scientific data management.

Parallel Tools Starter Kit for Red and Blue.

The ASCI Applications effort over the next several years will be directed at developing new codes to run on the ASCI platforms. This ASCI PSE effort will identify the tools and the functionality of those tools required to develop the new codes and take steps to ensure that they are available on ASCI platforms.

PSE Architecture: Blueprint for Enabling SBSS Applications on Tera-Scale Computing Resources.

To ensure a successful implementation of a Tri-Lab PSE system, a clear and well-defined architecture and system design must be established. This will be achieved by working with ASCI application programmers and designers to create a comprehensive system requirements document from which a PSE architecture and design can be developed. The architecture document will define the subsystems and components of the PSE along with the interfaces between them to meet the established functional requirements. It will be used as the blueprint for describing and documenting the subsystems and components so that a unified systematic approach is used throughout the PSE, which will help ensure a tightly integrated system. ■

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This work was performed jointly under the auspices of the U.S. Department of Energy as part of the Accelerated Strategic Computing Initiative (ASCI) by LLNL (Contract W-7405-ENG-48), LANL (Contract W-7405-ENG-36) and SNL (Contract DE-AC04-94AL85000).

ASCI Strategic Alliances and Investigations

Major Goals and Objectives of the Alliances Strategy

- **Establish and validate the practices of modeling and simulation as a viable scientific methodology.**
- **Enhance the overall ASCI goals by providing external experts in fields of interest.**
- **Tightly couple strategic alliances efforts with ongoing Laboratory projects.**
- **Leverage other high-performance computing research in the academic community.**
- **Strengthen training of Laboratory scientists and attract the best researchers in key disciplines for weapons applications.**
- **Collaborate with the best R&D programs of other DOE department offices, other agencies, and universities.**

The Accelerated Strategic Computing Initiative (ASCI) alliances strategy is an effort of the ASCI program to recruit and use the best resources available in the country. These efforts ensure that the ASCI goals in both applications development and Problem-Solving Environment (PSE) are met. The ASCI program has set aside funding for collaborations with US university personnel in science and computational science so that key applications can be initiated and undertaken. It is expected that these funds will be used primarily for research purposes related to strategic ASCI goals, possibly resulting in the development of a product. The alliances strategy team works strongly with the PSE, Applications, Platforms, and Code Acceleration teams to ensure a solid overall ASCI program.

The alliances strategy consists of three levels of funding and function.

Level 1 - Strategic Alliances
Level 2 - Strategic Investigations
Level 3 - Individual Collaborations

Strategic Alliances

The purpose of strategic alliances is to encourage the formation of sustained, multidisciplinary, critical mass, university programs to solve long-term theoretical and practical problems in the broad area of computational science. This work must be oriented toward the long-term goals of Science-Based Stockpile Stewardship (SBSS) and the ASCI program.

Three to five multidisciplinary university centers will be established. They will focus on (1) validating the concept of modeling and simulation as a scientific methodology and (2) meeting unclassified long-range mission goals. These centers will be selected through a nationwide competitive process. They will be managed technically by the laboratories.

Each alliance will form a Center of Excellence in science and computer and/or computational science in support of ASCI objectives. Close collaborative relationships with the ASCI laboratories are required. The intent is that the centers will be established with a five-year funding commitment subject to a contract continuation review in the third year. At the end of five years, the program plan allows for renewal or rebid for another five years.

Collaborative work under the Strategic Alliances program will be entirely unclassified. Examples of areas of interest to the ASCI program include, but are not limited to, the following:

Scientific Applications Modeling
- Materials
- Algorithms
- Computational fluid dynamics and turbulence
- Radiation transport
- Manufacturing processes and factors affecting system lifetimes
- Comparison with data that help validate and verify ASCI codes

Problem-Solving Environment
- Parallel input/output (I/O)
- Parallel programming environments
- Scientific data management
- Numerical methods
- Visualization
- Software tools

Platforms
- Scalability issues (e.g., scalable architectures and I/O, interconnection networks, shared memory)

Collaboration with ASCI Laboratories

The intent of the ASCI Strategic Alliances Centers program is to establish strong collaborative projects and working relationships between academic and laboratory researchers. Examples of collaborative mechanisms would include joint projects staffed by university and laboratory researchers, university researchers in residence at a partner laboratory or vice versa, and summer students or post docs at the laboratories.

Strategic Investigations

The second level of collaborations focuses on efforts in more discipline-specific areas. These efforts are aimed at individual university departments, directing a concerted effort to solve difficult problems in either science or PSEs; some may be multilaboratory. The duration of these collaborations is for a three-year period.

Individual Collaborations

Funds for individual collaborations (primarily one-on-one) are awarded for short-term projects out of laboratory ASCI programmatic funds.

Collaboration funds for Levels 2 and 3 will be awarded based on the following criteria:

- relevance of collaboration to the ASCI/SBSS goals,
- criticality and timeliness of proposed project,
- leverage/future benefits of forming a collaboration with the proposed institution/individuals, and
- probability of results in a timely manner.

Relationship to Other ASCI Projects

The alliances' strategy is strongly coordinated with all aspects of the ASCI program. As additional needs are projected within other ASCI strategies, either increased manpower or additional expertise, ASCI Alliances will seek out and augment the skills required to meet these needs from outside the Laboratories. If it is necessary to develop a team to investigate ASCI-related strategic issues, the strategic alliances (Level 1) provide such a vehicle. Levels 2 and 3 ensure that more focused, near-term technical issues can be addressed in a timely manner. ASCI problems create new challenges, which can only be resolved through university collaborations. ■

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This work was performed jointly under the auspices of the U.S. Department of Energy as part of the Accelerated Strategic Computing Initiative (ASCI) by LLNL (Contract W-7405-ENG-48), LANL (Contract W-7405-ENG-36) and SNL (Contract DE-AC04-94AL85000).

The ASCI Blue Pacific Supercomputer

The Accelerated Strategic Computing Initiative (ASCI) IBM Blue Pacific ultraperformance computer is the second step in the ASCI Platforms Strategy, which is aimed at giving researchers the one-hundred-order-of-magnitude increase in computing performance over current technology that is required to support high-fidelity, full-system simulation by early next century. This supercomputer, being installed at Lawrence Livermore National Laboratory (LLNL) will evolve to a terascale cluster of SMP systems by 1999. The performance goal of the full system is to demonstrate a physics application, sPPM, running at a sustained teraflop of performance.

Artist's rendition of the IBM Blue Pacific SST System.

Hardware

The Accelerated Strategic Computing Initiative (ASCI) IBM Blue Pacific installation will take place in three stages. The initial delivery (ID) system , installed in the fall of 1996, is a distributed memory, multiple-instruction, multiple-data (MIMD), message-passing SP2 supercomputer with 512 nodes, split equally between a classified and unclassified environment. At the beginning of 1998, the compute nodes of this system will be completely replaced with a technical refresh (TR) system made up of four shared-memory processor (SMP) nodes with four processors each.

The final stage of the upgrade of this system is scheduled for 1999. This system, called the Sustained Stockpile Teraflop (SST) system, will again have the compute nodes replaced with eight processor SMP nodes. At this time, the split systems will be united to provide the entire system resource for very large applications and will migrate between unclassified and classified usage.

The Blue Pacific is organized into three major pools: Login, Compute, and input/output (I/O). The Login pool provides nodes that support load-balanced interactive logins and supports users in their application development, testing, and job-execution management tasks. The Compute pool supports parallel application execution. The nodes in the I/O pool provide SSA RAID5 disks that are combined into several scalable parallel file systems and external network connectivity.

Software

System software on the Blue Pacific system is the IBM AIX operating system, with parallel system functionality provided by IBM's parallel environment POE. The access to the compute nodes for parallel applications is controlled through the Load Leveler system. To facilitate full access to the system that recognizes the need to support a mix of long-running, large applications, as well as more interactive, smaller applications, a gang scheduling system is being jointly developed by IBM and Lawrence Livermore National Laboratory (LLNL).

Fortran, high-performance Fortran (HPF), C, and C++ are supported. TotalView is the interactive parallel debugger support, and a variety of performance tools are available. Message passing interface (MPI), compiler/directive parallelism, and the Posix Pthreads package provide multiple parallel models for scalable application development. When the SMP nodes are available for use, applications using a mixture of parallel models are expected to evolve and will be fully supported.

Table 1. Aggregate system hardware parameters

BLUE PACIFIC System Attribute	ID System	TR System	SST System
Total nodes	512	344	512
Compute nodes	434	320	500
Processors per compute node	1	4	8
Total number of processors	512	1,328	4,096
Total number of compute processors	434	1,280	4,000
Disk I/O nodes	20	8	12
System control machines	2	2	2
Network nodes (FDDI, HIPPI-800)	16	16	TBD
Number of node cabinets	17	12	64
System RAM	98 Gbytes	180 Gbytes	2.5 Tbyte
Processor	66 MHz Power 2	PPC 604e	Power 3
Node-to-node bandwidth—bidirectional	100 Mbytes/s	150 Mbytes/s	N/A
Processor-to-memory bandwidth	1.0 Gbytes/s	1.2 Gbytes/s	12.8 Gbyte/s
Compute node peak performance	266 Mflops	2.6 Gflops	6.4 Gflop
System peak performance	136 Gflops	857 Gflops	3.2 Tflop
RAID I/O bandwidth	256 Mbyte/s	640 Mbytes/s	6.4 Gbyte/s
RAID storage	2.6 Tbytes	2.6 Tbytes	75.0 Tbyte

I/O System

The ID system has 2.6 terabytes of global disk and supports parallel I/O through IBM's Parallel I/O File System (PIOFS). The SST system will use IBM's General Parallel File System (GPFS) for parallel I/O and will be able to read and write files at more than 6 gigabytes/s from a single application. The aggregate I/O bandwidth for the system will be 90 gigabytes/s.

Conclusion

The ASCI platform effort will bridge the gap between gigascale and terascale computing to accommodate the required large increases in performance required by high-fidelity, full-system simulation. The Blue Pacific partnership between IBM and DOE at LLNL will play a foundational role in accomplishing the goals of the platform roadmap over the next several years.

For more information, contact:
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This work was performed jointly under the auspices of the U.S. Department of Energy as part of the Accelerated Strategic Computing Initiative (ASCI) by LLNL (Contract W-7405-ENG-48), LANL (Contract W-7405-ENG-36) and SNL (Contract DE-AC04-94AL85000).

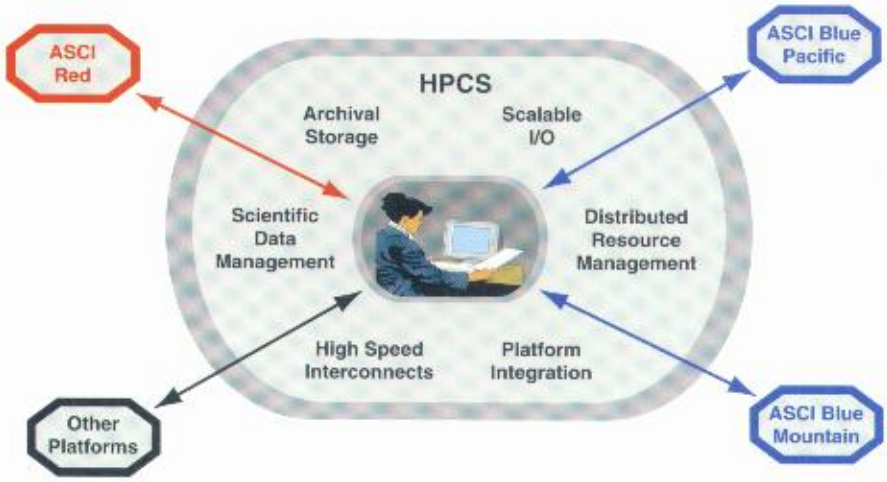
HPCS: Providing Tera-scale Infrastructures for ASCI Platforms and Applications

Mission

The ASCI Problem-Solving Environment's High-Performance Computing Support (PSE HPCS) provides a supporting infrastructure between platforms and applications for effective high-end application execution and tera-scale data management, through components that tie together platforms, applications, and other key PSE elements. HPCS concentrates on integrated high-performance archival storage and file systems, scientific data management, high-speed local interconnects, scalable I/O, distributed resource management, and platform integration. Close coordination among these diverse areas contributes to the overall goal of desktop access to tera-scale capabilities.

Impact

ASCI scientists using teraflop computers will generate, store, access, organize, and manipulate unprecedented amounts of data. Existing support technologies are inadequate, and without vast improvement, scientists will need to work around infrastructure shortcomings. This severely limits the enormous potential of new ASCI codes and platforms. Success requires a balanced environment where performance and functionality of applications scale with larger platforms and increased data capacity. Through HPCS facilities, tera-scale storage and computing capabilities can be harnessed and brought to the desktop, greatly enhancing ASCI scientific productivity and collaboration.



HPCS provides a supporting infrastructure between platforms and applications for effective high-end application execution and tera-scale data management.

High-Performance Computing Support (HPCS) development efforts aid the implementation of "end-to-end" infrastructure solutions to help achieve ASCI programmatic goals. HPCS is a far-reaching effort, encompassing expertise from all three Department of Energy Defense Programs laboratories. This requires effective communication of local requirements and deliverables between HPCS teams, HPCS and other areas of PSE (application development support, distributed computing environments, visualization), and ASCI applications. Development teams also work closely with ASCI alliance partners, leading computing vendors, and other members of the high-performance-computing and storage community.

Archival Storage

ASCI requirements for archival storage exceed the capabilities of commercially available hardware and software. Realizing the investment in ASCI applications and platforms requires data transfer performance and capacities much greater than exist today. Collaborations among ASCI scientists also necessitate seamless access to systems across multiple sites. Our approach to meeting these requirements focuses on continued development and deployment of the High-Performance Storage System (HPSS).

Innovative approaches to storage will be investigated, together with performance studies to understand data transfer, name space, metadata, and scheduling efficiency. ASCI sites, other R&D organizations, and our industrial partner (IBM) contribute to HPSS progress as both development and early deployment partners. ASCI sites have successfully deployed HPSS production systems in both unclassified and classified computing environments. Under development are methods for combining multiple HPSS sites to provide an ASCI-wide cooperative storage environment.

Scientific Data Management

Scientific Data Management (SDM) is a critical ASCI technology whose goal is to hide the complexity of underlying systems, freeing scientists to focus on data comprehension. SDM is developing an environment that allows scientists to store, retrieve, and search data within the natural context of their work. This framework integrates commercial databases, mass storage systems, and networking and computing infrastructure to provide assistance in managing the complexity and scale of the ASCI data.

Based on accurate characterization of application data requirements, an integrated set of tools will be developed that advances capabilities for

organizing, searching, selecting, extracting, and browsing data. SDM concentrates on the following areas: requirements extraction and user-driven prototyping, tools for metadata generation and exploitation, integration of application data with commercial databases and mass storage services, Tri-Lab specification of a common data model, and a data format that supports it. SDM works with specific ASCI code groups at all three sites to ensure that SDM tools meet application needs.

High-Speed Interconnects

The High-Speed Interconnect (HSI) project supports use of gigabit/s interconnection schemes on current ASCI systems and develops new interconnection technologies for future ASCI systems. ASCI success depends on deploying networking infrastructures that complement the interconnect technologies within new ASCI systems for improved system performance. This requires advances in speed, security, protocols, and functionality in both wide and local area networks.

Los Alamos National Laboratory (LANL) is working on American National Standards Institute–standard, multigigabit technology (HIPPI-6400) that addresses latency and host interface protocol performance. This standard will be used as a shared-memory processor (SMP) node interconnect and for an external network for storage and visualization. Also under development is a new standard called scheduled transfer (ST) to bypass inefficient kernel protocol processing. Sandia National Laboratories (SNL) is accelerating OC-48 capabilities and virtual interface architecture (VIA) potentials for distance computing, extending a synchronous transfer mode (ATM) to high-end visualization systems, and addressing single-image/multiple input/output (I/O) problems. HSI will evaluate ST and VIA bypass schemes over short- and long-distance ATM and HIPPI physical interconnects. Lawrence Livermore National Laboratory (LLNL) is investigating transmission of massive data sets over HIPPI-800 by exploiting new IPv6 protocol options.

Scalable I/O

The Scalable I/O (SIO) effort's goal is to ensure that efficient, reliable, and scalable I/O capabilities exist for the ASCI mission. Large-scale simulation-based analysis requires efficient transfer of data among simulation, visualization, and data mining applications. The SIO effort seeks to improve I/O performance of parallel codes by facilitating I/O operations multiple nodes in parallel through highly portable, user-level programming interfaces. The SIO effort will also help provide balanced I/O subsystems by developing scalable I/O techniques for other PSE teams to build upon. Solutions will be compatible with other related efforts of the high-performance-computing community and will leverage progress and advancements in the academic community.

ASCI codes will need a portable, parallel application programming interface (API) to ease development. An API layered over both HPSS and local parallel file systems allows applications to easily use HPSS and local storage. The HPCS-proposed API is based on the evolving Message-Passing Interface (MPI)-IO standard, based on the widely accepted MPI standard for message passing.

Distributed Resource Management

Distributed Resource Management (DRM) will be responsible for the management and distribution of ASCI computing resources to multiple jobs, users, and organizations. The Tri-Lab ASCI environment presents a complex, diverse, and geographically dispersed set of computing resources. With DRM, users will be able to access resources at any site in a uniform and seamless fashion. DRM will provide consistent access to and management of interactive and batch environments.

DRM will not independently set the policy for the assignment of resources but will provide tools for each site to fine-tune its resource management for individual job performance, overall job turnaround time, or programmatic priorities, according to its policies. Commercial technology will be leveraged or accelerated whenever possible. Advanced capabilities, such as gang-scheduling for high utilization of central processing units, are also under development.

Platform Integration

Platform Integration supports configuration and integration of ASCI systems into local computing environments. This effort will also develop and maintain an understanding of ASCI Red and ASCI Blue operations and administration. Each laboratory maintains overall responsibility for providing access to the platform located at its site and for the necessary infrastructure.

Platform Integration works closely with the Distributed Computing Environment and Application Development Support teams to ensure that appropriate distributed computing services and application development tools are provided to users. Within HPCS, Platform Integration must also coordinate related batch system and data support activities with DRM, Archival Storage, and Scalable I/O. ■

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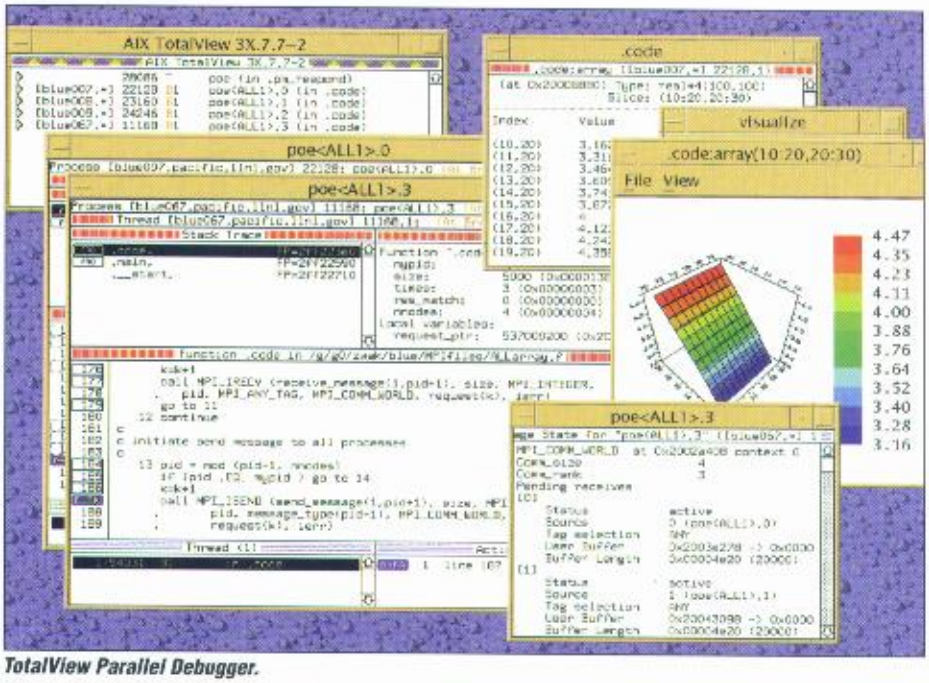
ASCI Application Development Support

A key to Accelerated Strategic Computing Initiative (ASCI) success is rapid development of applications that are high performance and high quality and that adapt quickly and reliably to new computational requirements and scalable platforms. The goal of the Problem-Solving Environment Application Development Support (ADS) effort is to provide a common and usable application development environment for ASCI code developers to enable rapid deployment of application codes that meet the computational needs of scientists.

The ASCI development environment will be driven directly by the needs of application developers to achieve this goal. ADS staff will partner with code developers to identify user requirements and to evaluate tool effectiveness, and the staff will develop direct ties with software suppliers to ensure an effective development environment.



TotalView Parallel Debugger.

Application Development Support (ADS) focuses on components that characterize ASCI application development needs: rapid code development, achievement of scalable performance, and reliability and correctness of the delivered code. There is a tension between each of these areas, which dictates that all three must be addressed. The complexity of ASCI applications and the leading-edge nature of platforms put further stress on each area.

An essential part of the ASCI program is the challenge to solve 3D computational problems that are far bigger than we have ever solved before. This translates to more data, more computational cycles, and a succession of more powerful computing platforms. From the computational viewpoint, this is not simply bigger and faster—it demands a fundamental shift in the way problems are solved. Codes, tools, algorithms, and systems that fail to scale properly as the data and the hardware resources grow are useless to ASCI developers. To some extent, this transition has already begun with the shift to parallel codes, but the rapid growth expected by the ASCI program will underscore and even exacerbate this need for change in a timely fashion.

To address these issues, ADS must have strong connections to the ASCI code development teams to support computing science and platform usage issues relevant to the new codes. In addition, ADS is evolving a common basic environment, promoting scalable tool development, developing frameworks and math software needed by the ASCI code teams, and starting work on tools to support code verification and validation.

Common Basic Environment

In order to meet the goals of the ASCI program, it is critical that applications be developed quickly and adapt easily to new platforms as the ASCI program scales up. ADS is defining a common basic environment that will ensure that critical tool capabilities and programming environments are available on all ASCI platforms. This includes current and emerging standards for languages and programming models, such as the message passing interface (MPI). It also includes common application program interfaces (APIs) for functions like parallel input/output (I/O), common parallel tools in addition to the GNU utilities, and even common ways of accessing documentation.

Scalable Tools

As the ASCI applications grow, both in code complexity and problem size, existing tools reach their limits. ADS is working on new small tools, as well as with external parallel debugging and performance tools, to add functionality needed in the ASCI environment. When hundreds and thousands of processors are involved, these tools must aggregate overall status of the progress of an application in a way that does not require individual examination of each process. Features for memory and status monitoring are of special interest. The functionality required to support clustered shared memory processor (SMP) systems and mixed parallel models is also important. Active participation with the parallel tools consortium, debugging forum, and platform vendors keeps the tool development tied to the larger high-performance-computing community.

Frameworks and Math Software Development

Frameworks and math software packages encapsulate common code packages to facilitate rapid code development through reuse. Software quality is enhanced through the leveraged quality assurance. ADS is contributing to two framework projects for ASCI applications. The Parallel Object Oriented Methods and Applications (POOMA) framework at LANL is continuing to evolve, with additional physics packages and performance improvements planned. The SAMRAI (Structured Adaptive Mesh Refinement Applications Infrastructure) parallel prototyping framework project at LLNL will facilitate numerical and algorithmic exploration in Adaptive Mesh Refinement (AMR) applications and will enable scientists to rapidly explore extensions of existing AMR technology for multiphysics and mixed-type applications. Linear solvers work is intended to bring state-of-the-art software for linear systems to applications in an easily integratable form. Because the ASCI applications are used with larger and larger data sets on an increasing number of processors, the need for linear solver algorithms and implementation techniques that address scalability is especially important. Multigrid and preconditioned Krylov methods are being made available.

Tools for Code Verification and Validation

Ensuring the correctness and reliability of ASCI codes must be an essential goal if simulation is to be useful. However, as simulation codes become more complex, it will become increasingly difficult to verify that the simulation results accurately reflect correct physical phenomenon. In addition, as the software projects increase in size, it will become critical to employ the latest techniques in software engineering to produce reliable and maintainable software. ADS will provide tools and direct support for code teams in the area of software quality assurance and code verification. Tools for code validation will emerge as we gain a better understanding of designer requirements in this area. ■

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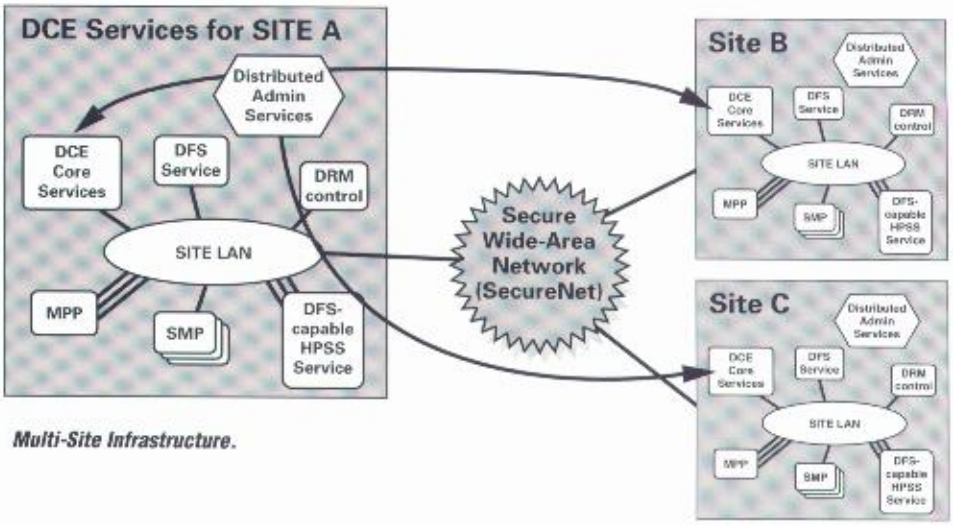
ASCI Distributed Computing Environment's Facilitating Tri-Lab Collaborative Computing



Multi-Site Infrastructure.

Mission

The Tri-Lab Distributed Computing team (a consortium of computer scientists from Lawrence Livermore, Los Alamos, and Sandia national laboratories) is collaborating on a project to provide a common set of distributed computing services at each of the three laboratories to facilitate the joint development and use of tera-scale applications. These distributed computing services are structured to give users a single view of the unique ASCI high-performance computing resources in a secure, user-authenticated environment with a common home directory.

Impact

The success of the ASCI Problem-Solving Environment (PSE) depends greatly on the use of a common set of distributed computing software across the ASCI complex to smoothly extend the computational reach of customers from their desktops to the unique resources installed at any of the Tri-Lab sites. The middleware component of the PSE is the Open Software Foundation's Distributed Computing Environment(OSF/DCE). We are planning to support all user services and PSE- layered products (e.g., Distributed Resource Management, High-Performance Storage System, Distributed Visualization, and Scientific Data Management) over the DCE components.

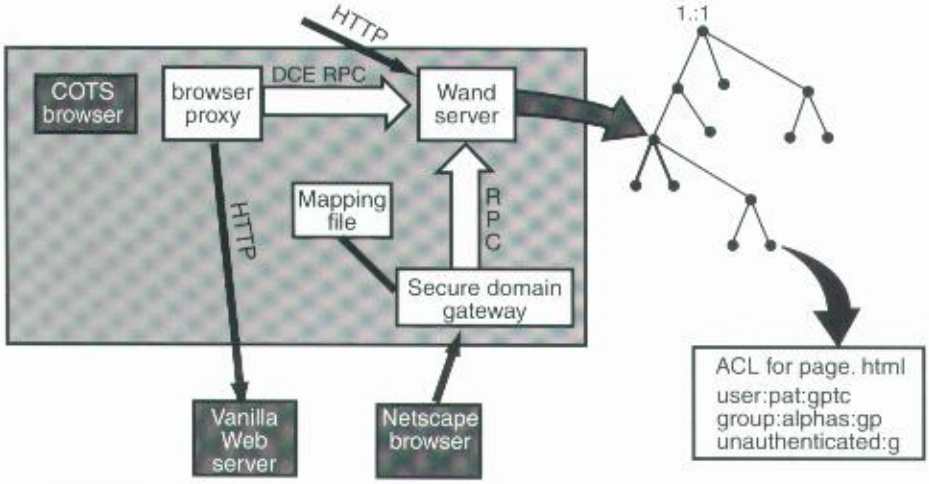
The Open Group's Distributed Computing Environment (DCE) provides services and tools that support the creation, use, and maintenance of distributed applications in a heterogeneous computing environment. Distributed computing involves the cooperation of two or more machines communicating over a network. DCE provides services that allow distributed applications to interact securely with a collection of possibly heterogeneous computers, operating systems, and networks as if they were a single system.

The most important DCE application is the Distributed File Service (DFS), which forms the foundation of the Problem-Solving Environment (PSE) global file system. Through the planning and cooperation of the Tri-Lab sites, an authorized customer will be able to access one common home directory from any of the three sites and, through the use of fine-grain access controls, securely share classified information through the Web.

DCE production cells are administrative domains of server machines that offer DCE core and distributed file services and client processes that make use of these services. The DCE core services include the Security Service, Cell Directory Service, Global Directory Agent, and Time Service. All use POSIX threads to process multiple requests concurrently and the DCE Remote Procedure Call (RPC) for secure communication with the client processes. The DCE Project team will leverage the availability of the DCE core services on multiple vendor operating systems and will configure the services to provide consistency across the three laboratories. Because much of the ASCI work is classified, the most important of the core services is the Security Service.

The Tri-Lab environment requires a common, network-based, secure authentication and authorization mechanism to support the common environment. Intercell trust relationships enable a user with a single authentication sign-on, with no transmission of clear text passwords over the network, to access those ASCI resources for which the user is authorized. Each need-to-know group will have the responsibility for creating and maintaining the access control lists, which limit the exposure of the group's shared information.

Efforts in FY98 will concentrate on extending secure and consistent access to the ASCI Red and Blue machines out to the desktop. This requires accreditation of DCE in the Tri-Lab (SecureNet) environment, interoperability with Kerberos clients, and the establishment of intercell trust relationships. A second important focus is to work with other segments of the ASCI PSE (Scientific Data Management, Distributed Resource Management, and Visualization) to make use of the DCE security infrastructure for authentication and authorization.



DCE-Web product plans.

Distributed File Service Production Servers

The DFS is the foremost DCE application because its tight integration with DCE provides a secure, location-independent, and efficient means of building a global file system. Any user in the ASCI Tri-Lab environment can share data by placing it in the global name space. The data is then accessible to a user-specified list of authorized clients.

DFS serves as an implicit part of the file-sharing infrastructure for the PSE. In order to make PSE effective, we will need to develop a global file structure that is shared between the laboratories.

We will build on the experience gained from establishing DFS production servers in the open environment at each site by deploying DCE/DFS clients with which users can access shared home directories from their desktops. Once security and test plans are approved, we will bring this same service to the closed environment. By deploying clients and establishing cooperative agreements between administrators of the DFS servers, we will construct a DFS backbone, or global file system.

DCE Web

Several commercial products based on the DCE Web technology are being evaluated for their usefulness in exchanging sensitive and classified information through the World Wide Web. This technology offers secure communication using the DCE RPC between any commercial Web browser and the Wand (Web and DCE) server. In addition, it provides fine-grain access protection down to the URL level for any information stored on the server.

DCE Desktop Deployment

The services offered by the DCE cells will be useful to the customers and their organizations only if we make a concerted effort to integrate the local computing environments and desktops at each site into the DCE. Our goal is to delegate the management of the DCE/DFS domains; therefore, a major effort will be undertaken to provide tools for managing user accounts, group membership, and access control lists to the user departments at each site.

Object-Based Distributed Computing Environments

DCE is a major part of the PSE and is the only complete distributed environment with integrated security and file systems. Object-based technologies are, however, of more interest to some developers of distributed applications for ASCI. The Legion Project, partially funded by ASCI, is one such object-based environment that needs to be integrated into the ASCI distributed environment. The Common Object Request Broker Architecture (CORBA) and use of CORBA by such systems as the Parallel Object Oriented Methods and Applications (POOMA) must also be integrated into the ASCI distributed environment. We don't expect to completely solve these issues in FY98, but progress in this area is essential to make these environments useful for ASCI. ■

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Accelerated Strategic Computing Initiative (ASCI) Applications Overview

Objective

Accelerated Strategic Computing Initiative (ASCI) application codes are key components in reaching the 2010 Stockpile Stewardship and Management Program objectives at an affordable cost and without nuclear testing.

Summary

ASCI will provide simulation capabilities needed to predict the performance, safety, reliability, and manufacturability of weapons systems. These simulations must achieve higher-resolution, three-dimensional calculations of full systems using high-fidelity physical models.

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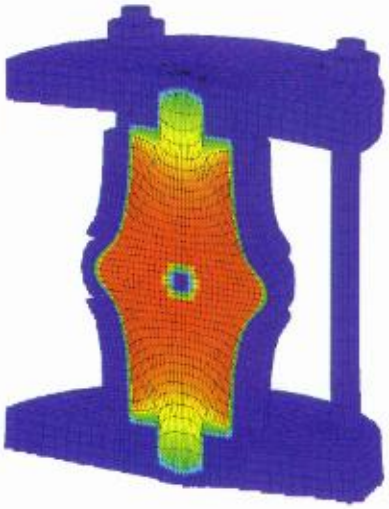

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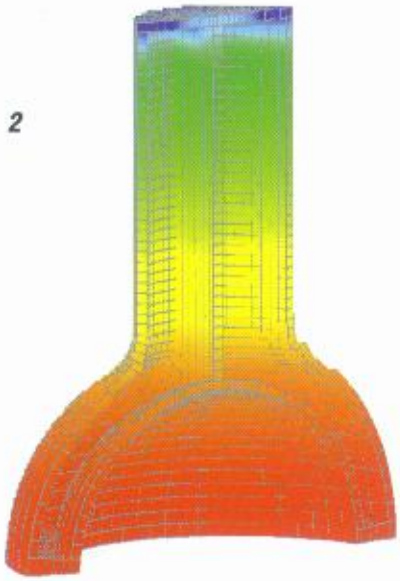

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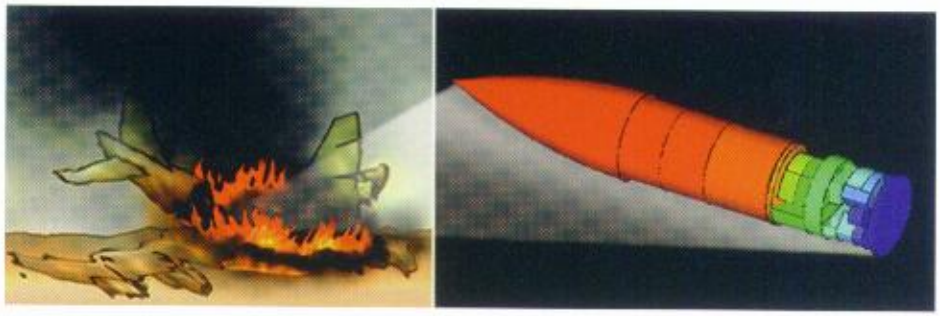

1 Mass fraction of an intermediate chemical constituent produced by chemical reactions in an energetic material in a thermal bath. The blue in the middle shows a complete reaction.

2 Simulated pressure distribution during molten copper fill of standard test part. Produced with code being developed for full-scale simulations of casting, solidification, and microstructural evolution on ASCI parallel computers.

3 Sandia's Safety Mission: Sandia must predict weapon behavior in accidents and abnormal environments and ensure weapon safety.

Accelerated Strategic Computing Initiative (ASCI) will develop the high-performance software applications needed as computing replaces underground nuclear testing. It is a formidable challenge to replace the empirical factors and adjustable parameters used in current calculations with predictive physical models. This challenge will produce large, complex applications that will drive the scale of computing machinery and the infrastructure.

The applications code development effort for ASCI will focus on applications in weapons physics, engineering, and manufacturing science. The combination of fundamental physics models, advanced 3-D numerical methods, and high-end scalable computer systems will require substantially more complex weapon simulation applications codes than any developed to date.

These applications will integrate 3-D capability, finer spatial resolution, and more refined physics. The nuclear/nonnuclear performance applications will be verified and validated, using data from laboratory test facilities, system verification tests, and experimental results from historical underground tests. These applications will be designed for maximum performance on the new scalable computer systems.

Technical Requirements

The requirements in simulation and modeling are driven by two fundamental changes in the nuclear weapons landscape: (1) The Comprehensive Test Ban Treaty and (2) The Stockpile Life Extension Program, which extends weapon lifetimes well beyond their anticipated field lifetimes.

The move from confidence based on nuclear testing to confidence based on predictive simulation forces a profound change in the questions we ask of codes. In the past, we have used computations to address the question, "What should we test down-hole in Nevada?" However,

because we no longer have recourse to underground nuclear testing today, we must use the codes to answer the question, "Will this device perform as expected?"

Changes to stockpiled weapons are expected to arise from the aging process and from changes in the manufacturing processes of replacement parts. When assessing the effect of these changes on weapons systems, analysts will use computational simulation in conjunction with data from new nonnuclear experiments and from historic nuclear tests. To meet this challenge, the codes require advances in the basic physical models on which they rest and in code technologies used in their implementation.

The Stockpile Life Extension Program requires that we extend the lifetime of existing systems into the indefinite future. This is complicated by three factors. First, the demise of key manufacturing technologies requires that we replicate existing functionality with newly designed components. Second, the reduction in size of the manufacturing complex requires that new and environmentally friendly manufacturing technologies be developed to produce necessary components. Finally, reductions in the overall budget for the weapons program constrain testing of both components and systems, even when this continues to be possible under current environmental regulations.

Traditional engineering approaches are not adequate for this challenge. Instead, we will rely on predictive modeling and simulation for product realization. Comprehensive life-cycle engineering driven by high-fidelity modeling and simulation must replace traditional trial-and-error engineering approaches.

Verification and Validation

Because it is necessary to place increased reliance on computational simulations when making stockpile judgments, the uncertainties associated with these calculations will be reduced. These uncertainties arise from many sources: errors in coding, inadequate approximations, physical processes not represented in the code, and user errors. Verification is the process of ensuring that we have solved a problem accurately. Validation is the process of ensuring that we have solved the right problems. The goal of both verification and validation is to reduce the total uncertainty associated with weapons calculations for a given stream of resources, both talent and money. Reducing any individual uncertainty to zero at the expense of leaving others large clearly fails to minimize the overall uncertainty; a balanced program must allocate resources across a range of strategies that address all sources of uncertainty in order to lower the total uncertainty.

Simulation and Modeling Technologies Development Plan: Extending Today's Base with Advances in Science and Computing for Future Codes

Codes require inputs, particularly inputs on the properties of the materials used in the problems. Properties such as the equation of state, strength characteristics, chemical reactions rates, neutron cross sections, and optical opacities are required for many types of calculations. Advances in theoretical and applied physics and chemistry coupled with enhanced computational capability are enabling calculation of many of these material properties in regimes that are inaccessible experimentally. The overall quality of the performance or safety calculations depends strongly on the quality of these inputs. Failure to devote adequate effort to these areas could render irrelevant much of the work on new codes. While providing necessary inputs to codes that contribute directly to our understanding of performance, reliability, and safety, these research programs are also voracious consumers of computer cycles—cycles that are required if they are to provide the inputs. ASCI is actively supporting research in modeling the properties of the actinides, other metals important in nuclear weapons and high explosives.

Even with the enhanced resolution that will be provided by the new codes and computing platforms, important physical phenomena must be modeled at scales that are smaller than the calculational grid, using so-called subgrid scale models. For example, subgrid scale models for 3-D turbulent flow may be needed for some aspects of weapon and weapons-system-performance simulations. Subgrid scale models of fracture may be important in applications involving reliability and manufacturing.

New codes being developed under ASCI are driven to realize enhancements in three complementary areas: representing three spatial dimensions, improving the quality of the physical models in the codes, and obtaining efficient performance on parallel computing platforms. The resulting application codes will provide the ability to predict performance of full nuclear weapons systems in future assessments and to analyze the consequences of aging processes or complex accident scenarios. Performance simulations will range from the "stockpile to target" sequence to full thermonuclear yield and output.

These applications will also make it possible to design efficient and environmentally acceptable manufacturing processes capable of producing systems that meet nuclear certification and performance requirements. ■

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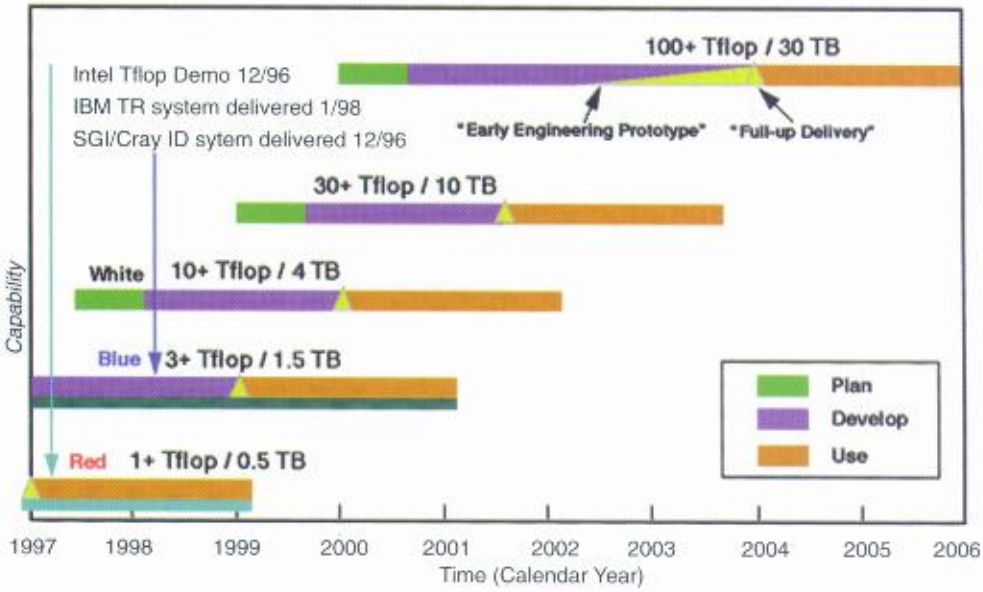
ASCI Platforms: Focusing on the High End of Computing

The Accelerated Strategic Computing Initiative (ASCI) platform effort will stimulate the U.S. computer-manufacturing industry to create high-end computers with speeds and memory capacities thousands of times greater than available at the beginning of the program.

Access to high-end supercomputing capability will give scientists the ability to develop high-performance, full-system, full-physics predictive codes and to consider classes of problems that are now intractable with current computing power.



ASCI computing systems roadmap—working with industry to reach unprecedented computer performance. (White, Blue, and Red refer to names for systems in the progression of ASCI platforms.)

Platform Strategies

Accelerated Strategic Computing Initiative (ASCI) applications will require a five-order-of-magnitude increase in computing performance above the sustained fifty megaflops currently provided by high-end commercial technology. In order to support full-physics, full-system simulation, hundreds of teraflops and beyond are required. The ASCI platform effort will bridge the gap between gigascale and terascale computing through four strategies:

- accelerate high-performance computing through multiple partnerships with computer companies,
- develop software to take full advantage of hardware capabilities,
- maintain affordability by accelerating existing technology trends,
- demonstrate scaleable balanced 100-teraflop/s computing platforms by the target date of 2003/2004.

Multiple Partnerships

This strategy pursues multiple research partnerships to develop alternative approaches to achieving the end goal of 100 teraflop/s.

Single computer company partnerships will provide a major increase in computing resources in one to three years in order to provide the computing resources necessary for further hardware and software development under ASCI.

Consortia will seed industry research and development with ASCI-relevant projects to provide improved computing resources on a five-year time scale.

University research will develop the long-term improvements necessary to achieve the final goal of 100 teraflop/s.

To reduce risk and to provide the breadth of computing capability required by the physics, ASCI will follow several promising technology approaches simultaneously. This will also allow competing technology and business aggregations room to develop and prosper.

Software Development

Of the 100,000-fold increase in computing performance in one decade that is expected by ASCI, a 100-fold increase will come from improving software to take full advantage of parallel processing capabilities. Collaborative efforts between the laboratories and computer companies will develop new software, data storage, and communications technologies to support high-end applications and ensure portability between platforms.

Accelerated Technology

The centerpiece of the ASCI platform strategy is to aggregate commercial, off-the-shelf (COTS) technology in scaleable architectures to develop high-performance computing platforms at affordable costs. The ASCI platform strategy will accelerate computer companies' business plans to create scaleable high-performance systems from high-volume computer platforms.

Balanced Platforms

The requirement for predictive simulations leading to platform performance objectives of 10 teraflop/s by the year 2000 and 100 teraflop/s by the target date of 2003/2004 requires a broad balance in both platform capabilities and the integrated problem-solving environment and imposes requirements for appropriate memory, memory bandwidth and latency, disk capacity, parallel input/output (I/O) bandwidth, and external networking.

Accomplishments

The first two years of the ASCI Platforms program have seen aggressive results.

- The ASCI RED Tflops system, a partnership between Sandia and Intel Corporation is in full operation and has achieved 1.3 teraflops.
- TheASCI BLUE Pacific system is a partnership between Lawrence Livermore National Laboratory and IBM with the initial delivery in 1996 of a 136 Gflops/98 Gbytes memory system and a technical refresh in January 1998 to an 857 Gflops/180 Gbytes memory system.
- The ASCI BLUE Mountain partnership between Los Alamos National Laboratory and Silicon Graphics, Inc., has made progress in the areas of computing platforms and associated hardware and system software, the software supporting the applications that run on these systems, and finally, the area of application development.
- The first platform PathForward initiative is accelerating interconnect technology for the 50 to 100 teraflops scale machines.

Conclusion

More powerful computers are needed for virtual testing and prototyping applications. ASCI will stimulate the U.S. computing industry to develop high-performance computers with speeds and memory capacities thousands of times greater than currently available models and tens to hundreds of times greater than future computers likely to result from current development trends. ASCI will partner with various U.S. computer manufacturers to accelerate the development of larger, faster computer systems and software that will run Defense Programs applications more efficiently.

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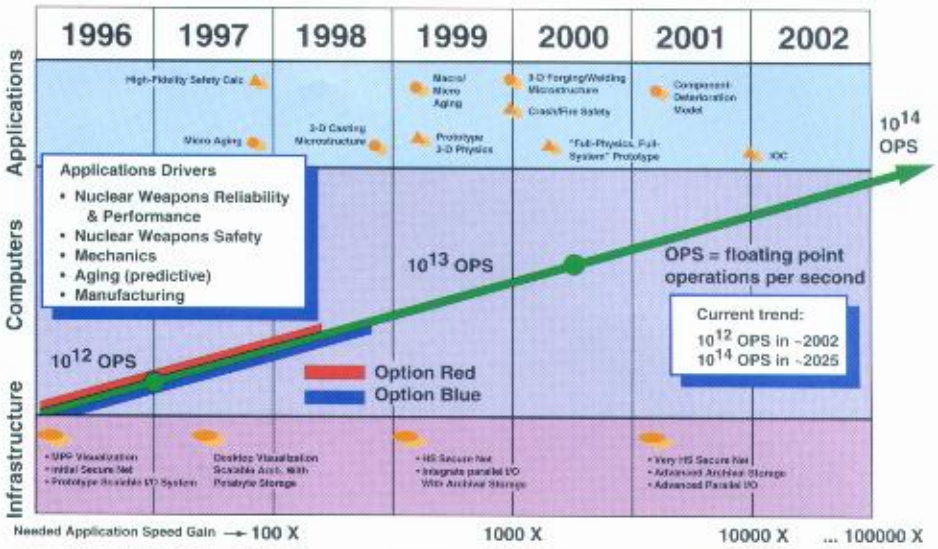
Accelerated Strategic Computing Initiative (ASCI)



Achieving Stockpile Stewardship objectives requires rapid advances in capability.

On September 24, 1996, President Bill Clinton became the first world leader to sign the Comprehensive Test Ban Treaty. This ushered in a new era in the way the United States ensures confidence in the safety, performance, and reliability of its nuclear stockpile. As President Clinton stated on August 11, 1995, " . . . we can meet the challenge of maintaining our nuclear deterrent under a [comprehensive test ban] through a science-based stockpile stewardship program without nuclear testing." Other key aspects of this new era include the U.S. decisions to halt new nuclear weapons designs and to drastically reduce its weapons manufacturing infrastructure. This means that the U.S. nuclear weapons stockpile will need to be maintained far beyond its design lifetime without either nuclear testing or its traditional manufacturing support system.

The ability to assess nuclear weapons, analyze their performance, predict their safety and reliability, and certify their functionality as they age is essential for conscientious management of the enduring stockpile. Accelerated Strategic Computing Initiative's (ASCI's) vision is to shift promptly from nuclear test-based methods to computational-based methods for ensuring the safety, reliability, and performance of our nuclear weapons stockpile. ASCI will create predictive simulation and virtual prototyping capabilities based on advanced weapon codes, and it will accelerate the development of high-performance computing far beyond what might be achieved in the absence of a focused initiative. ASCI will provide the ability to assess, evaluate, maintain, and prototype nuclear weapons and weapons components in the absence of nuclear testing and with a greatly reduced weapons manufacturing infrastructure.

ASCI will complement the Stockpile Stewardship and Management Program (SSMP) and the Core Computation Program by advancing the Department of Energy (DOE) Defense Program's computational capabilities to meet the future needs of stockpile stewardship. The problems that ASCI will solve for the SSMP span the activities and responsibilities of the three Defense Program laboratories: Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories. Cooperation is essential to the solution of these problems—the Defense Program laboratories will participate in the ASCI Program as partners.

ASCI is a focused and balanced program that will extend the DOE's computational resources to create predictive simulation and virtual prototyping capabilities for nuclear weapons. By 2010, the ASCI Program will

- develop high-performance, full-system, high-fidelity predictive codes to support weapons design, production analysis, accident analysis, and certification;
- stimulate the U.S. computer manufacturing industry to create more powerful, high-end supercomputing capability required by these applications; and
- create a computational infrastructure and operating environment that makes these capabilities accessible and usable.

Program Plan

The ASCI Program has four main objectives.

Performance: Create predictive simulations of nuclear weapon systems to analyze behavior and assess performance in an environment without nuclear testing.

Safety: Predict with high certainty the behavior of full weapons systems in complex accident scenarios.

Reliability: Achieve sufficient, validated predictive capabilities to extend the lifetime of the stockpile, predict failure mechanisms, and reduce routine maintenance.

Renewal: Use virtual prototyping to reduce production and testing facilities for stockpile requalification and replacement work.

Each of these objectives requires computational capabilities that do not currently exist. Five strategies have been identified for meeting program objectives. Together, these strategies compose a balanced program that will create predictive simulation and virtual prototyping capabilities.

ASCI Strategies

Create Seamless Management: One Program—Tri-Lab

- Operate ASCI as a three-lab, single-program activity with seamless management and execution across the laboratories.
- Collaborate on development and share hardware and software resources.
- Take maximum advantage of standard tools, common system structures, and code portability to enable interlaboratory collaboration.

Focus on Advanced Applications Development

- Focus on 3D, high-fidelity, full-systems weapons simulation applications.
- Accelerate code performance on ASCI platforms.
- Validate simulations by rigorous correlation with constrained experiments and archival data.

Focus on High-End Computing

- Accelerate the development of very high performance, scalable architectures.
- Develop partnerships with multiple vendors to ensure appropriate technology development and worldwide leadership.

Create Problem-Solving Environments

- Provide support for the rapid development of large, complex, scalable applications.
- Develop a computational infrastructure that supports efficient use of ASCI platforms and is accessible from users' desktops.
- Develop a Tri-Lab distributed computing environment.

Encourage Strategic Alliances and Collaborations

- Establish long-term strategic alliances with universities to develop critical mass efforts dedicated to long-term ASCI issues.
- Establish smaller-scale collaborations with individual investigators to work on more narrowly focused problems.
- Develop task-oriented collaborations closely linked with specific ASCI deliverables.

Initial Results

- Platform R&D partnerships include (1) Intel for a 1.8-Tflop peak system to be located at Sandia in FY97, (2) IBM for a 3.2-t teraflop system to be located at Lawrence Livermore National Laboratory in FY99, and (3) SGI/CRI to place a 3.1-tflops system at Los Alamos National Laboratory in FY99.
- Eleven next-generation weapons simulations codes in the areas of safety, performance, and manufacturing have been initiated.
- The first high-speed, secure network linking Sandia, Los Alamos, and Lawrence Livermore national laboratories is in daily use.

U.S. Technology Benefits

The United States has traditionally viewed its leadership in very high performance computers as a strategic economic advantage. ASCI's platform R&D partnerships will ensure that this leadership continues. The computer technology and products developed in ASCI will be applied to a broad spectrum of national needs.

The computer-based predictive capabilities developed in ASCI will bring economic and scientific benefits to the U.S. Solutions to numerous challenging computational problems await improvements in peak-performance computing hardware and applications. Many of these problems are in the fields of environmental studies, biology and biochemistry, consumer product safety, and information management and access. The computing environment and data analysis tools to be developed by ASCI will help attack these problems. ASCI also addresses environmental concerns. Predictive simulation for stockpile stewardship avoids the environmental damage of underground testing and uncontained aboveground experiments. Although some aboveground experiments are essential to provide data for ASCI applications development, the multiple experiments needed for parametric studies of design variations can be done through predictive simulation.

In addition to helping preserve the environment, predictive simulation and virtual prototyping will provide direct economic benefits. Virtual prototyping will drastically reduce the lead time for component design, development, testing, and fabrication. A faster lead time will reduce the cost of product development, which will enable unprecedented efficiencies and lead to lower manufacturing costs and greater economic competitiveness in U.S. manufacturing.

Relationship to Stockpile Stewardship Initiatives

ASCI is not a program unto itself but an integral part of the Stockpile Stewardship and Management Program. ASCI will take experimental data from the aboveground test facilities and link it into weapons-appropriate predictive capabilities. In addition, ASCI will provide virtual prototyping capability for the Advanced Design and Production Technologies initiative and will rely heavily on the ongoing efforts of the Defense Program's core research program for advances in physics, material sciences, and computational modeling. ASCI will also act in partnership with the National Ignition Facility and the tritium production programs to address issues of stockpile stewardship ■

For more information contact:
Don McCoy, LANL, 505-667-4236,
dmccoy@lanl.gov

David Nowak, LLNL, 510-423-6796,
dnowak@llnl.gov

William Camp,
SNL, 505-845-7655,
wjcamp@sandia.gov

This work was performed jointly under the auspices of the U.S. Department of Energy as part of the Accelerated Strategic Computing Initiative (ASCI) by LLNL (Contract W-7405-ENG-48), LANL (Contract W-7405-ENG-36) and SNL (Contract DE-AC04-94AL85000).

Derrol Hammer, Re: DOE FOIA Request

To: Derrol Hammer <hammer1@llnl.gov>
From: "John Greenewald, Jr." <greeney@primenet.com>
Subject: Re: DOE FOIA Request
Cc:
Bcc:
Attached:

Dear Mr. Hammer,

Thank you so much for your letter, and your kind words about my site :)

I talked to someone from your office, Im sorry I do not remember the name, about my request. I narrowed it down to just a copy of the contract itself, and she said that that would be okay, and not result in a search through volumes. She then said that I could send in other requests from ideas on the contract.

Let me know if this would be agreeable. I did check out those sites and found them interesting. Though, I didnt find a copy of the contract... maybe I missed it?

Thank you again, I appreciate your time and your help. I dont get many comments about my site from any of my FOIA officers, and I really appreciate it :)

Sincerely,

John Greenewald, Jr.
The Black Vault Site Operator
http://www.blackvault.com

P.S. Sorry for the delay, I have been offline for the past few days...

Lawrence Livermore National Laboratory

Human Resources
Staff Relations Division
Telephone: (925) 423-2663
FAX: (925) 423-5665
Mail Stop: L-708

July 1, 1998

John Greenewald, Jr.
[redacted]

RE: CALIFORNIA PUBLIC RECORDS ACT REQUEST #CP98-29

Dear Mr. Greenewald:

Please contact me at the above-number as soon as possible to discuss your request for information. Thank you.

Sincerely,

Beverly C. Thomas
Staff Relations Division

BCT:sm

Derrol Hammer, 10:00 AM 7/27/98 , DOE FOIA Request

X-Sender: e355388@popcorn.llnl.gov
Date: Mon, 27 Jul 1998 10:00:15 -0700
To: "John Greenewald, Jr." <greeney@primenet.com>
From: Derrol Hammer <hammer1@llnl.gov>
Subject: DOE FOIA Request

John,
My name is Derrol Hammer, I work at the Lawrence Livermore National Laboratory. The Freedom of Information Act request you submitted to the Department of Energy has filtered down to me. Your request caught my interest because it was not in the usual format I see from lawyers and other business people. The request was broad and, by its wording, will involve the review of many volumes of hardcopy and over 10 megabytes of electronic files before DOE can give you a response. Since you mentioned your interest was academic I decided to get in touch with you in order to find out what the nature of your interest is.

My search to find you resulted in a total surprise. I am quite impressed by your web pages and the prolific amount of information you have catalogued. It is encouraging to know that there are young people who have the interest and perserverence to take on the kind of effort you have. My hat is off to you.

Your material also gives me the impression that you are mostly interested in the technical side of things (and maybe some historical stuff). In this respect, I must tell you that what you are most likely to receive from your FOIA request is volumes of business documents and correspondence (very dry and legalistic kind of stuff), some of which is already available on the web. If I am right about your technical interest, I would suggest that you explore our technical program website which describes the IBM Blue machine and the programs it supports. There are also links to related efforts and sister machines at other DOE labs. I am sure it would be a simple task to link your pages to our site at - http://www.llnl.gov/asci

Once there, you will find information on the red, white and two versions of blue machines (Platforms); the Applications we use (APS); our research on problem-solving environments (PSE); our work with other Universities to develop new computing solutions (Alliances); and our work with the computer industry to improve computing performance (PathForward).

Please take a look and let me know whether this would suit your purpose better than what you requested via FOIA.

By the way, you can get a taste of what your FOIA request would produce by checking out the IBM Blue Request for Proposals and sample contract at - http://www.llnl.gov/asci_rfp/

I look forward to a response.

Derrol J. Hammer
hammer1@llnl.gov

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

June 5, 1998

Mr. John Greenewald, Jr.
[redacted]

SUBJECT: Freedom of Information Act Request

Dear Mr. Greenewald, Jr.

This office is in receipt of your Freedom of Information Act (FOIA) request for a copy of the contract the U.S. Department of Energy has with IBM to build a supercomputer for installation at Lawrence Livermore National Laboratory. It was forwarded to us by our Headquarters Office for a direct response to you.

However, under the California Public Records Act of November 10, 1994, all records related to any procurement action by Lawrence Livermore National Laboratory (LLNL) are University owned records and are no longer Government owned records. Therefore, it will be necessary for you to obtain these records directly from LLNL. I have faxed a copy of your request to: Bev Thomas, L-708, Information Coordinator, Lawrence Livermore National Laboratory, University of California, P.O. Box 808, Livermore, California 94550.

If you have any questions, please call Ms. Thomas at (510) 423-2663.

Sincerely,

RoseAnn Pelzner
FOIA Officer

Lawrence Livermore National Laboratory

Human Resources
Staff Relations Division
Telephone: (925) 423-2663
FAX: (925) 423-5665
Mail Stop: L-708

June 11, 1998

John Greenewald, Jr.
[redacted]

RE: CALIFORNIA PUBLIC RECORDS ACT REQUEST #CP98-29

Dear Mr. Greenewald:

This is to confirm receipt of your request for records regarding information pertaining to the contract with IBM.

The fees for information requested is assessed at the rate of $.10/page. Should your document fees exceed $50.00, we will contact you prior to duplication. Please do not hesitate to call if you require anything further.

Sincerely,

Beverly Thomas

Beverly C. Thomas
Staff Relations Division

BCT:sm

Department of Energy

Washington, DC 20585

9803240009

03/24/1998

JOHN GREENEWALD
[redacted]

Re: ALL DOCUMENTS PERTAINING TO A CONTRACT W

Dear JOHN GREENEWALD:

Thank you for your Freedom of Information Act (FOIA) request that was received at the Department of Energy on 03/24/1998. For tracking purposes, your FOIA request has been assigned the number printed above. Since the Department receives several hundred requests a year, please use this number in any future correspondence with the Department concerning your request.

If you have any questions regarding this transmittal, please contact this office on (202)586-6025. I appreciate the opportunity to assist you and thank you for your interest.

Sincerely,

Abel Lopez

Abel Lopez, Acting Director
FOIA/Privacy Act Division
Office of the Executive Secretariat

MAY 04 1998

John Greenewald, Jr.
[redacted]

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

Dear Ms. Pelzner;

This is in response to your letter dated April 27, 1998. In this letter, you state that my request was too broad in scope, and would need to be modified in order for it to be processed and fulfilled.

Since I do not know a lot about this contract, I can not be too specific. However, if I modified my request for a copy of JUST the contract, I think this may be a little easier. So therefore, I hereby modify my original request to include a copy of JUST the contract with IBM. Most of the contract specifications and the information I have has already been provided to you in my last letter.

Thank you very much for your response.

Sincerely,

John Greenewald, Jr.

Enclosures:
None

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

May 14, 1998

Mr. John Greenwald, Jr.
[redacted]

SUBJECT: Freedom of Information Act Request

Dear Mr. Greenwald:

I am afraid that you must be more specific with us regarding submitting a Freedom of Information Act (FOIA) request. Which contract with IBM are you requesting?

I was not able to place a quick, convenient telephone call to you since you did not list a telephone number.

If you have any questions, please call me at (510) 637-3195.

Sincerely,

RoseAnn Pelzner
FOIA Officer

MAY 2 2 1998

John Greenewald, Jr.
[redacted]

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, Ca. 94612-5208

Dear Ms. Pelzner,

Thank you very much for your letter dated May 14, 1998. I would reference a case number, but do not see a case number referenced on your letter.

You state that I have not provided enough information for the request. Unfortunately, I do not have much information on the request, more than I have already sent to you. I am attaching a copy of my original letter, which has the news article about the information I am requesting.

Again, this is all the information I have on this contract... I hope this will be enough to have some kind of search.

Thank you again for your time, and I look forward to your response.

Sincerely,

John Greenewald, Jr.

Enclosures:
a/s

MODIFICATION NO. 01

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 01 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to exercise an option for an additional on-site support person and revise the milestone payment schedule.

AGREEMENT

NOW, THEREFORE, the parties agree to modify the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F - SPECIAL PROVISIONS

1. Section F Paragraph 1a. is deleted in its entirety as written and substituted with the following:

" a. The firm fixed-price of this Subcontract is NINETY-FOUR MILLION, ONE HUNDRED SEVENTY-TWO THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($94,172,824.00).

Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract."

2. Section F Paragraph 1b. is deleted in its entirety as written and substituted with the following:

Milestones	Deliverables	Date	Payment	FY Total
FY96				
1	Initial Project Plan	Sep-96		
2	ID System Delivery (Partial)	Sep-96		
FY97				
3	ID System Delivery (Final)	Oct-96		
4	ID System memory upgrade (upgrade 256 nodes to 256 MB each, up from 128 MB each)	Oct-96		
5	Updated Project Plan	Nov-96		
6	ID App Dev Support	Nov-96		
7	SW Dev Tools	Nov-96		
8	FY97 Plan Review	Dec-96		
9	SW Drop One	Dec-96		
10	P2SC Upgrade	Jun-97		
11	On-Site Applications Support Person	Sep-97		
FY98				
12	Scaleable Shared Mem Prog Env	Oct-97		
13	PPC 604+ @ 225MHz	Dec-97		
14	SW Drop Two	Dec-97		
15	Demonstration of Tech Refresh System	Dec-97		
16	FY98 Plan Review	Dec-97		
17	Scaleable Dev Env	Jun-98		
18	On-Site Applications Support Person	Sep-98		
FY99				
19	FY99 Plan Review	Dec-98		
20	On-Site Applications Support Person	Dec-98		
21	SST Demo	Dec-98		
22	SST Install & 1.5 TB Mem & 75TB Disk	Jan-99		
23	Additional 1TB Mem	Jan-99		
Total			94,172,824.00	**94,172,824.00**

3. An option for one (1) Applications Support Person in accordance with Section F Paragraph 1c. is hereby exercised by this modification. The term for the additional on-site support person shall be from September 9, 1996 through December 31, 1998.

4. Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is TWELVE MILLION, SEVEN HUNDRED FIFTY THOUSAND AND NO/100 DOLLARS ($12,750,000.00). It is estimated that this amount is sufficient to cover performance by the Subcontractor through SEPTEMBER 30, 1996 (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

5. Section F Paragraph 14. is deleted in its entirety as written and substituted with the following:

"14. Documentation Requirements

Subcontractor shall furnish all documentation identified and described in the Statement of Work dated February 12, 1996."

6. Section F Paragraph 19. is deleted in its entirety as written and substituted with the following:

"19. Taxes

The fixed prices for Milestones 1 through 20 do not include, and the University shall not be charged for, any State Sales & Use Tax, as the University holds California Seller's State Resale Permit No. SR-CHA 21-135323.

The fixed prices for Milestones 21 through 23 are subject to California State Use Tax. Such taxes are not included in the fixed price stated above, and shall be separately identified in Subcontractor's invoice."

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 01, effective as of the date of the Subcontractor's signature.

IBM CORPORATION	THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
BY: Lynne C. Savage *	BY:
TITLE: LYNNE C. SAVAGE MANAGER, CONTRACTS & PROCUREMENT GOVERNMENT INDUSTRY	TITLE: DERROL J. HAMMER HPCC Group Leader Program Support Division LLNL Procurement & Materiel
DATE: 10/31/96	DATE: 9-18-96

Req # H23287 *(Form #PS-621;3/12/96)*

* SEE IBM LETTER DTD 11/1/96

MODIFICATION NO. 02

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 02 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to exercise options for hardware and software.

AGREEMENT

NOW, THEREFORE, the parties agree to modify the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F - SPECIAL PROVISIONS

1. Section F Paragraph 1a. is deleted in its entirety as written and substituted with the following:

   " a. The firm fixed-price of this Subcontract is NINETY-FOUR MILLION, FOUR HUNDRED TWELVE THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($94,412,824.00).

   Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract."

2. Section F Paragraph 1b. is deleted in its entirety as written and substituted with the following:

Milestones	Deliverables	Date	Payment	FY Total
FY96				
1	Initial Project Plan	Sep-96		
2	ID System Delivery (Partial)	Sep-96		
FY97				.00
3	ID System Delivery (Final)	Oct-96		
4	ID System memory upgrade (upgrade 256 nodes to 256 MB each, up from 128 MB each)	Oct-96		
5	Updated Project Plan	Nov-96		
6	ID App Dev Support	Nov-96		
7	SW Dev Tools	Nov-96		
8	FY97 Plan Review	Dec-96		
9	SW Drop One	Dec-96		
10	P2SC Upgrade	Jun-97		
11	On-Site Applications Support Person	Sep-97		
FY98				.00
12	Scaleable Shared Mem Prog Env	Oct-97		
13	PPC 604+ @ 225MHz	Dec-97		
14	SW Drop Two	Dec-97		
15	Demonstration of Tech Refresh System	Dec-97		
16	FY98 Plan Review	Dec-97		
17	Scaleable Dev Env	Jun-98		
18	On-Site Applications Support Person	Sep-98		
FY99				.00
19	FY99 Plan Review	Dec-98		
20	On-Site Applications Support Person	Dec-98		
21	SST Demo	Dec-98		
22	SST Install & 1.5 TB Mem & 75TB Disk	Jan-99		
23	Additional 1TB Mem	Jan-99		
Total				94,412,824.00

Note: Milestone 3 increased to include four ea HIPPI adaptors, PHIGS and PHIGS + software, and OPEN GL Software.

3. An option for four (4) each HIPPI adapters, in accordance with Section F Paragraph 1c, Option Item 6, is hereby exercised by this modification.

4. An option for one (1) lot PHIGS and PHIGS Plus Software, in accordance with Section F Paragraph 1c, Option Item 8, is hereby exercised by this modification.

5. An option for one (1) lot Open GL Software, in accordance with Section F Paragraph 1c, Option Item 9, is hereby exercised by this modification.

6. Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is TWELVE MILLION, NINE HUNDRED NINETY THOUSAND AND NO/100 DOLLARS ($12,990,000.00). It is estimated that this amount is sufficient to cover performance by the Subcontractor through SEPTEMBER 30, 1996 (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 02, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Lynne C. Savage

TITLE:

LYNNE C. SAVAGE
MANAGER, CONTRACTS & PROCUREMENT
GOVERNMENT INDUSTRY

DATE: 10/31/96

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: Lynn E Rippe

LYNN E. RIPPE

TITLE: Sr. Subcontract Administrator

HPCC Group
Program Support Division
LLNL Procurement & Materiel

DATE: 9/26/96

Req # F08700 *(Form #PS-621;3/12/96)*

MODIFICATION NO. 03

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 03 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is TWENTY-ONE MILLION, SEVENTY-NINE THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($21,079,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: This is an increase of $8,089,824.00 in Incremental Funding.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 03, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
JOHN S. HUNT

TITLE: Procurement and Materiel Manager
Lawrence Livermore National Laboratory

DATE: 11-18-96

(Form #PS-621,3/12/96)

MODIFICATION NO. 04

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 04 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is TWENTY-FIVE MILLION THREE HUNDRED FIFTY-SEVEN THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($25,357,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding limitation is increased by $4,278,000.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 04, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
JOHN S. HUNT

TITLE: Procurement and Materiel Manager
Lawrence Livermore National Laboratory

DATE: 12/23/96

(Form #PS-621;3/12/96)

MODIFICATION NO. 05

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 05 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is THIRTY-SIX MILLION THREE HUNDRED FIFTY-SEVEN THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($36,357,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding limitation is increased by $11,000,000.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 05, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
JOHN S. HUNT

TITLE: Procurement and Materiel Manager
Lawrence Livermore National Laboratory

DATE: 12/23/96

(Form 625-621) 3/12/96)

MODIFICATION NO. 06

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 06 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add the services of an administrator/programmer.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F - SPECIAL PROVISIONS

1. Section F Paragraph 1a. is deleted in its entirety as written and substituted with the following:

   " a. The firm fixed-price of this Subcontract is NINETY-FOUR MILLION, FOUR HUNDRED EIGHTY-SEVEN THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($94,487,824.00).

   Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract."

2. Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

   "3. Obligation Of Funds

   The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is THIRTY-SIX MILLION, THREE HUNDRED SEVENTY-SIX THOUSAND, FIVE HUNDRED SEVENTY-FOUR AND NO/100 DOLLARS ($36,376,574.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

3. Section F Paragraph 27 is added as follows:

"27. SP Systems Administrator/Systems Programmer

The Subcontractor shall provide a second SP systems administrator/systems programmer at LLNL for one year beginning July 1, 1997. The University will pay) per year for this administrator/programmer, which represents one-half the price for the administrator/programmer. Invoices for this administrator/programmer may be submitted either monthly or quarterly in arrears. Payments will be made upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract.

The administrator/programmer shall initially be on-site at LLNL for a period of three months, after which he/she shall execute his/her responsibilities from a remote location. The administrator/programmer shall return to LLNL for on-site support for a one to two week duration stay on a quarterly basis. The administrator/programmer shall apply for a DOE "Q" level security clearance.

The need for this additional capability shall be reviewed yearly and the Subcontractor agrees to extend this price sharing arrangement in one-year increments through the end of the current contract at any time a Milestone has been missed for which this on-site system administrator/programmer can have a direct application.

The credentials of the SP systems administrator/systems programmer shall be approved by the University Technical Representative. Such approval shall not unreasonably be withheld."

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 06, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Claudia N Herbert

CLAUDIA N. HERBERT

TITLE: CONTRACT RELATIONS ADVISOR

DATE: July 1, 1997

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: Lynn E. Rippe

LYNN E. RIPPE

TITLE: Sr. Contract Administrator

Program Support Division
LLNL Procurement & Materiel

DATE: July 1, 1997

MODIFICATION NO. 07
to
SUBCONTRACT B331593
between
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY
and
IBM CORPORATION

INTRODUCTION

This Modification No. 07 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to provide funding for a Fiscal Year 1997 (FY1997) collaborative effort for a Scaleable Shared Memory Prototype (Hardware).

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F - SPECIAL PROVISIONS

1. Section F Paragraph 1a. is deleted in its entirety as written and substituted with the following:

" a. The firm fixed-price of this Subcontract is NINETY-FIVE MILLION, FOUR HUNDRED EIGHTY-SEVEN THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($95,487,824.00).

Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract."

2. Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is THIRTY-SEVEN MILLION, THREE HUNDRED SEVENTY-SIX THOUSAND, FIVE HUNDRED SEVENTY-FOUR AND NO/100 DOLLARS ($37,376,574.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

3. Appendix F Item 5 Scaleable Shared Memory is deleted in its entirety as written and substituted with the following:

"5. Scaleable Shared Memory

Goal: Provide a highly effecient scalable shared memory system and programming methodologies for the SP platform.

IBM expects to extend the
. This will also be staged in over the life of the ASCI contract:

- Enhanced software/hardware based support for via research collaboration with IBM Research and RS/6000 Divisions in FY97, FY98 and FY98.
-

IBM is proposing a collaboration between IBM and ASCI Blue/LLNL in the prototyping and testing of a strategic solution for the SP. This solution will provide across nodes, in a Our current thinking is to pursue . architecture

We expect that the collaboration between IBM and ASCI will accelerate the development of this allowing us to target providing a formal product in
The University will be able to influence the design of the strategic
solution for the SP by providing information on performance and software requirements, and collaborating in performance analysis, application enablement and software development.

A. Development

FY97 Manpower Commitment:

In FY97, the collaboration will achieve the following deliverables:

- By 4QCY96, IBM will deliver to the University a plan for development on the SP platform.
- By 2QCY97, IBM will deliver to the University prototype software for evaluation of the on the SMP portion of the ID system.
- By 4QCY97, the University will port the programming environment to the SP platform over the infrastructure and demonstrate at least the EPIMETHEUS physics application utilizing the environment.

Point of contacts:
LLNL -
IBM -

B. Hardware Development

FY97 Commitment:

IBM will validate the protocol for correctness, and design the Application Specific Integrated Circuit (ASIC) chip (hardware). IBM will be paid a total of $1,000,000.00 for the FY1997 effort in lieu of 11 FTE equivalents from LLNL and will contribute 22.0 FTE equivalents. Payments will be made for the deliverables listed below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract.

In FY97, the SSM hardware collaboration will achieve the following deliverables:

(1) IBM will deliver to the University a written report of at least five pages describing the technical attributes and progress of the following activities to be performed prior to August 15, 1997:

a. IBM will develop a detailed specification of the scalable shared memory hardware architecture.
b. IBM will determine the register and pin counts, and the amount of various types memory required.
c. IBM will select the ASIC technology and validate the feasibility of the design.
d. IBM will setup CAD tools compatible with the above selected technology.

Commitment: IBM - LLNL -

(2) IBM will deliver to the University a written report of at least five pages describing the technical attributes and progress of the following activities to be performed prior to August 31, 1997:

a. IBM will develop a formal specification for the base part of the protocol using the specification language used by MurPHI and validate correctness using MurPHI.
b. IBM will start the first pass of the ASIC design.
c. IBM will start the overall logic design at RTL level.

Commitment: IBM - LLNL -

(3) IBM will deliver to the University a written report of at least five pages describing the technical attributes and progress of the following activities to be performed prior to September 30, 1997:

a. IBM will complete the overall logic design at the RTL level.
b. IBM will validate this logic by simulating

c. IBM will identify the critical paths, both within the ASIC and the board
d. IBM will ascertain the feasibility of fabricating the ASIC and the board in view of these critical paths.
e. IBM will synthesize the logic into physical layout.
f. IBM will start manual tuning when needed.

Commitment:

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 07, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Claudia N Herbert

TITLE: CLAUDIA N. HERBERT
CONTRACT RELATIONS ADVISOR

DATE: 8/8/97

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: _____

DERROL J. HAMMER
TITLE: HPCC Group Leader
Program Support Division
LLNL Procurement & Materiel

DATE: 7/25/97

MODIFICATION NO. 08

TO

SUBCONTRACT B331593

BETWEEN

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

AND

IBM CORPORATION

INTRODUCTION

This Modification No. 08 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to revise the milestone schedule. There is no change to the total amount of the subcontract.

AGREEMENT

NOW, THEREFORE, the parties agree to modify the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES
SECTION F - SPECIAL PROVISIONS

2. Section F Paragraph 1b. is deleted in its entirety as written and substituted with the following:

Milestones	Deliverables	Date	Payment	FY Total
FY96				
1	Initial Project Plan	Sep-96		
2	ID System Delivery (Partial)	Sep-96		
FY97				
3	ID System Delivery (Final)	Oct-96		
4	ID System memory upgrade (upgrade 256 nodes to 256 MB each, up from 128 MB each)	Oct-96		
5	Updated Project Plan	Nov-96		
6	ID App Dev Support	Nov-96		
7	SW Dev Tools	Nov-96		
8	FY97 Plan Review	Dec-96		
9	SW Drop One	Dec-96		
10	Early SMP Software	Sep-97		
11	On-Site Applications Support Person	Sep-97		

FY98			
12	Scaleable Shared Mem Prog Env	Oct-97	
13	Tech Refresh Hardware Upgrade Power PC 604e @ 225 MHz	Dec-97	
14	SW Drop Two	Dec-97	
15	Demonstration of Tech Refresh System	Dec-97	
16	FY98 Plan Review	Dec-97	
17	Scaleable Dev Env	Jun-98	
18	On-Site Applications Support Person	Sep-98	
FY99			
19	FY99 Plan Review	Dec-98	
20	On-Site Applications Support Person	Dec-98	
21	SST Demo	Dec-98	
22	SST Install & 1.5 TB Mem & 75TB Disk	Jan-99	
23	Additional 1TB Mem	Jan-99	
Total			**$94,412,824.00**

pp 5

Note: Milestone 10 contains an early ship of

All other terms, conditions, and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 08, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Claudia N Herbert

TITLE: CLAUDIA N. HERBERT CONTRACT NEGOTIATOR/ADVISOR

DATE: 8/12/97

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: Lynn E Rippe

TITLE: LYNN E. RIPPE
Sr. Contract Administrator
HPCC Group
LLNL Procurement & Materiel

DATE: 8/4/97

University Procurement Representative:
Lynn E. Rippe
Sr. Contract Administrator
Phone No.: (510) 423-2176
Fax No.: (510) 423-8019

MODIFICATION NO. 09

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 09 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is FORTY MILLION NINE HUNDRED SIXTY-FIVE THOUSAND FIVE HUNDRED SEVENTY-FOUR AND NO/100 DOLLARS ($40,965,574.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding Limitation is increased by $3,589,000.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 09, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
E. J. CUNNIFFE

TITLE: Procurement and Materiel Manager
Lawrence Livermore National Laboratory

DATE: 9-20-97

MODIFICATION NO. 010
to
SUBCONTRACT B331593
between
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY
and
IBM CORPORATION

INTRODUCTION

This Modification No. 010 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to provide funding for 1997 collaborative efforts under the ASCI Blue Pacific Large Scale Data Management Research and Development proposal and as listed in Appendix F. The Key Personnel Article is also modified to reflect a change in Program Managers.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F - SPECIAL PROVISIONS

1. Section F Paragraph 1a is deleted in its entirety as written and substituted with the following:

   "a. The firm fixed-price of this Subcontract is NINETY-SIX MILLION, EIGHTY-SEVEN THOUSAND, EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($96,087,824.00).

   Payments are subject to the availability of funds and will be made based on subparagraph b. below upon verification by the University that performance is satisfactory and in accordance with the requirements of this Subcontract."

2. Section F Paragraph 3 is deleted in its entirety as written and substituted with the following:

   "3. Obligation Of Funds
   The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is FORTY-ONE MILLION, FIVE HUNDRED SIXTY-FIVE THOUSAND, FIVE HUNDRED SEVENTY-FOUR AND NO/100 DOLLARS ($41,565,574.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

3. Section F Paragraph 9 is deleted in its entirety as written and substituted with the following:

"9. Key Personnel

It is agreed that the below listed key personnel or other personnel approved by the University Contract Administrator as persons of substantially equal abilities and qualifications, are necessary and key to the successful performance of this Subcontract, and Subcontractor agrees to assign such employees or persons to the performance of the work under this contract and shall not reassign or remove any of them without consent of the University Contract Administrator. Whenever, for any reason, one or more of these employees is unavailable for assignment for work under this Subcontract, or has been assigned less than full time to work under this Subcontract, Subcontractor shall, with the approval of the University Contract Administrator, replace such employee with an employee of substantially equal abilities and qualifications. Approval of the University Contract Administrator shall not unreasonably be withheld.

4. Section F Paragraph 26 is added as follows:

"26. 1997 Appendix F Collaboration and Funding for Large Scale Data Management

Subcontractor shall provide . including travel and related costs for the 1997 collaborative effort under Appendix F, Item 1 Large Scale Data Management and in accordance with the IBM HPSS proposal dated November 16, 1996 and the IBM letters dated July 21, 1997 and August 1, 1997.

Intellectual Property Rights for this Paragraph 26 shall be governed by IBM/Oak Ridge (Lockheed Martin) Subcontract #42X-SU333V.

Warranty provisions for this Paragraph 26 shall be as follows:

For Services provided by Subcontractor, Subcontractor warrants they will be performed:

1. in a workmanlike manner
2. according to its current description (including any Completion Criteria) contained in this Agreement, an Attachment, or a Transaction Document.

Extent of Warranty
These warranties replace all other warranties, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Items Not Covered by Warranty
Subcontractor does not warrant uninterrupted or error-free operation of any deliverable or service. Subcontractor provides materials and non-IBM services on an "as-is" basis.

This is a fixed price deliverables service agreement. Payment will be within 30 days of receipt of invoice, and upon verification by the University that the objectives of the milestones listed in (a), (b), and (c) have been met. Subcontractor shall invoice in the month the deliverable has been met and in the amounts specified in the payment table, sub-item (d) below.

(a) Parallel FTP (PFTP) SP Enhancements. This task will provide the University with a SP beta version of enhanced PFTP software by February 28, 1998.

Deliverables: (a.1.) AIX HPSS PFTP Interface Software Design Document
(a.2.) AIX HPSS PFTP Interface Software for IBM RS/6000 SP

(b) MPI-IO. This task will provide the University with an experimental version (alpha level) of HPSS with the following features required to efficiently support a MPI-IO interface by January 31, 1998.

(1) Support arbitrarily long srscinkdesc lists in IODs.
(2) Provide (within the Client API) a mechanism by which an open file handle can be used from multiple distributed memory processing nodes on a single MPP (SP) platform.
(3) Preallocation enhancements.
   a. The Bitfile Server shall support an option to preallocate storage segments as necessary when resetting the length of a file beyond its current length.
   b. The client API will provide a resize interface that will allow setting the BFS_PREALLOC flag for the bfs_BitfileSetAttrs call to set the length of the file.
(4) COS Interrogation.
   a. A function to determine the COS associated with a given file (it may already be possible to get this information). Input: open file handle. Output: COS identifier.
   b. A function to determine the characteristics of a given COS. Input: COS identifier. Output: structure containing parameters that define the COS (e.g., disk/tape, striping factor, stripe width).
   c. A function to report all of the available classes of service in the system. Input: none. Output: array of COS IDs or array of structures containing COS parameters (including the COS ID).
(5) MPI-IO Integration Test.
   a. Subcontractor personnel shall be allocated to Integration Test of the MPI-IO functions.

By December 31, 1997, IBM Global Government Industry will deliver the test article to the HPSS technical committee for inclusion in HPSS Release 4.1.

Deliverables: (b.1.) AIX HPSS MPI-IO Software Design Document and Prototype for MPI-IO Implementation
(b.2.) AIX HPSS MPI-IO Software for IBM RS/6000 SP

(c) Requirements Analysis for HPSS and GPFS Interface. This task will provide a completed analysis by December 31, 1997."

Deliverables: (c.1.) Draft Outline for Document
(c.2.) Document for above.

(d) Payment Table for Deliverables.

Item	Description	Delivery	Amount	Labor Years
(a.1.)	PFTP Design Document	09/15/97		
(a.2)	PFTP SP Enhancements	02/98		
(b.1.)	MPI-IO Design Document and Prototype for MPI-IO Implementation	09/15/97		
(b.2.)	MPI-IO	01/98		
(c.1)	Draft Outline of Requirements Analysis	09/15/97		
(c.2.)	Requirements Analysis Document	12/97		
		TOTAL		

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 010, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Claudia N Herbert

CLAUDIA N. HERBERT
TITLE: CONTRACT RELATIONS ADVISOR

DATE: 9/3/97

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: E. M. Moffet

ELOISE MOFFET
TITLE: Division Leader
Program Support Division
LLNL Procurement & Materiel

DATE: 8-22-97

MODIFICATION NO. 11

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 11 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds
The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is FORTY-ONE MILLION EIGHT HUNDRED SEVENTY-ONE THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($41,871,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding Limitation is increased by $306,250.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 11, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
LYNN E. RIPPE
Sr. Contract Administrator
HPCC Group

TITLE: Procurement and Materiel Manager
Lawrence Livermore National Laboratory

DATE: 10/28/97

MODIFICATION NO. 012

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 012 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

Section F Paragraph 3. is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is FORTY-THREE MILLION EIGHT HUNDRED SEVENTY-ONE THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($43,871,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding Limitation is increased by $2,000,000.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 012, effective as of the date of the University's signature.

THE REGENTS OF
THE UNIVERSITY OF CALIFORNIA

BY: _____
ELOISE MOFFET
Division Leader

TITLE: Program Support Division
Procurement and Materiel
Lawrence Livermore National Laboratory

DATE: 11-19-97

MODIFICATION NO. 013

to

SUBCONTRACT B331593

between

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA LAWRENCE LIVERMORE NATIONAL LABORATORY

and

IBM CORPORATION

INTRODUCTION

This Modification No. 013 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to add incremental funding.

AGREEMENT

NOW, THEREFORE, the University modifies the Subcontract in the following particular only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION F, PARAGRAPH 3 - OBLIGATION OF FUNDS

Section F, Paragraph 3 is deleted in its entirety as written and substituted with the following:

"3. Obligation Of Funds

The amount presently available for payment by the University and allotted to this Subcontract for all items of Section B is SIXTY-SIX MILLION NINE HUNDRED NINETY-THREE THOUSAND EIGHT HUNDRED TWENTY-FOUR AND NO/100 DOLLARS ($66,993,824.00) (see General Provisions, Clause C6 entitled Limitation of University's Obligation)."

Note: Incremental Funding Limitation is increased by $23,122,000.00.

All other terms, conditions and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the University has executed this Modification No. 013, effective as of the date of the University's signature.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: _____
John S. Hunt

TITLE: Laboratory Business Manager
Lawrence Livermore National Laboratory

DATE: Jan 15, 1998

MODIFICATION NO. 14
TO
SUBCONTRACT B331593
BETWEEN
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
AND
IBM CORPORATION

INTRODUCTION

This Modification No. 14 to Subcontract No. B331593 is entered into by and between The Regents of the University of California (hereinafter "University"), acting through the Lawrence Livermore National Laboratory ("LLNL"), and IBM Corporation (hereinafter "Subcontractor").

The purpose of this Modification is to exercise Option 3, revise the milestone schedule, modify associated special and general provisions and increase the total price.

AGREEMENT

NOW, THEREFORE, the parties agree to modify the Subcontract in the following particulars only:

MODIFICATIONS TO SCHEDULE OF ARTICLES

SECTION B - SUPPLIES AND SERVICES TO BE DELIVERED is revised by adding the following paragraphs:

"The system hardware and software delivered in accordance with the above Statement of Work and proposal documents shall be upgraded by the Subcontractor in accordance with the enclosed FIRST MODIFICATION TO APPENDIX D, ASCI White Statement of Work, dated February 10, 1998, which is hereby incorporated by this reference and made a part of this Subcontract.

The University and Subcontractor agree that this Subcontract involves the development of cutting-edge technology under aggressive schedules. The University and Subcontractor agree (i) that Subcontractor shall use reasonable efforts to deliver in accordance with the requirements and schedules set forth in this Subcontract; and (ii) to reasonably consider limitations which may occur in meeting obligations under this Subcontract."

SECTION C - PERIOD OF PERFORMANCE is revised in the following particulars:

Paragraph I. is deleted in its entirety and replaced by the following:

SECTION F - SPECIAL PROVISIONS is revised in the following particulars:

Paragraph 1. Payment is revised as follows:

The first paragraph of Subparagraph a. is deleted in its entirety and replaced by the following:

"The firm fixed-price of this Subcontract is ONE HUNDRED SEVENTY-EIGHT MILLION, SIX HUNDRED EIGHTEEN THOUSAND, EIGHT AND NO/100 DOLLARS ($178,618,008)."

Subparagraph b. is deleted in its entirety and replaced by the following:

"b. Milestone payments will be made in accordance with the following schedule:

Milestone	Associated Hardware Deliverable	Deliverable	Scheduled Completion Date	Payment
FY96 Subtotal				
1		Initial Project Plan	Sep-96	
2		ID System Delivery (Partial)	Sep-96	
FY97 Subtotal				
3		ID System Delivery (Final)	Oct-96	
4		ID System memory upgrade (128 nodes from 128MB to 256MB per node)	Oct-96	
5		Updated Project Plan	Mar-98	
6		ID Application Dev Support	Nov-96	
7		SW Development Tools	Nov-96	
8	14	FY97 Plan Review	Dec-96	
9		SW Drop One	Dec-96	
10	14	Early SMP Software	Sep-97	
11		On-Site Applications Support Person	Sep-97	

FY98 Subtotal			
12	14	Scalable Shared Memory Programming Environment	Oct-97
13	14	Technology Refresh Hardware Upgrade to PowerPC 604e @ 332Mhz, TR I	Mar-98
14		Technology Refresh Hardware Upgrade to PowerPC 604e @ 332Mhz, TR II	May-98
15	35	FY98 Plan Review	Mar-98
16	35	SST Chip Manufacturing Progress Payment	Apr-98
17			May-98
18			May-98
19		Software Drop Two (Troutbeck)	Jun-98
20			Jul-98
21	35	SST Build Progress Payment	Jul-98
22			Sep-98
23			Sep-98
24			Sep-98
25		On-Site Applications Support Person	Sep-98
26		On-Site Systems Programmer	Sep-98
FY99 Subtotal			
27	35	FY99 Plan Review	Dec-98
28		On-Site Applications Support Person	Dec-98
29	35	SST sPPM Demonstration	Dec-98
30			Jan-99
31			Feb-99
32	35	SST completion of Shipment Criteria under synthetic workload	Feb-99
33	35	SST Install with 2.5 TB Memory and 75 TB Global Disk	Apr-99
34	35	Software Drop Three (Mohonk)	Jun-99
35		SST Completion of Acceptance Under Synthetic Workload	Jun-99
36		16-way MUSPPA Design Review	Sep-99
37	35		Sep-99
38			Sep-99
39		On-Site Systems Programmer	Sep-99
FY00 Subtotal			
40	43	FY00 Plan Review	Dec-99
41	43	FY01-02 Two Year Plan Review (lease)	Jun-00
42			Jun-00
43		MuSST Acceptance (lease)	Jun-00
44	43	Software Drop Four (Lyndhurst) (lease)	Jun-00
45	43	MuSST Second Lease Payment	Jul-00
46	43	MuSST Third Lease Payment	Sep-00
47		On-Site Systems Programmer	Sep-00
TOTAL			**$176,943,008**

Technical Note:

Milestone 10 contains an early ship of

Payment Notes:

1. Release of payments for Milestones 22 and 23 will be apportioned based on level of completion.
2. Payment associated with milestone 37 shall be released to Subcontractor only upon successful installation on the SST.
3. Payment associated with milestone 47 is for on-site systems programmer services through 6/02.

Notwithstanding anything to the contrary in this Subcontract, for Plan Review Milestones, the University will make the noted Milestone payments on the earlier of the performance of the Milestone or the occurrence of the associated hardware deliverable as noted in the Milestone Schedule.

On acceptance of Tech Refresh, the University (i) will return 384 thin and 16 wide nodes ("400 nodes") of the Initial Delivery system ("ID system") to Subcontractor; (ii) will transfer title to Subcontractor in those 400 nodes; and (iii) represents that the 400 nodes are free and clear of all liens and encumbrances except those created by Subcontractor. On acceptance of Tech Refresh, the University may retain possession of 80 thin nodes ("80 nodes") of the ID system until SST installation (unless the parties otherwise agree) for so long as the University contracts with Subcontractor to provide appropriate maintenance service, software licensing, supportline services and software upgrade protection for these nodes. On the earlier of the University failing to contract with Subcontractor for the noted offerings, or at the time of SST installation (unless the parties otherwise agree), the University (i) will return the noted 80 nodes to Subcontractor; (ii) will transfer title to Subcontractor in those 80 nodes; and (iii) represents that the 80 nodes are free and clear of all liens and encumbrances except those created by Subcontractor.

The University will return all of the 320 silver thin nodes, 16 P2 thin nodes, and 16 P2 wide nodes associated with the Tech Refresh System ("352 Nodes") to Subcontractor no later than the end of the Subcontract, however, if the Subcontract ends under Section C for other than reason of timely Completion, the University will not return the 352 nodes until 120 days after Subcontract expiration. In addition, the University will return any of the 352 Nodes on the earlier of (i) when the University ceases to contract with Subcontractor to provide maintenance service, software licensing, supportline services and software upgrade protection as described in this paragraph for such nodes; or (ii) when the University ceases to use such nodes for the ASCI program. When the University returns any of the 352 Nodes to Subcontractor, it transfers title to Subcontractor in such nodes and represents that those nodes are free and clear of all liens and encumbrances except those created by Subcontractor. In addition, beginning on SST installation, and for so long as the University retains possession of any of the 352 Nodes, the University agrees to contract with Subcontractor to provide appropriate maintenance service, software licensing, supportline services and software upgrade protection for such nodes."

Paragraph 18. Software and Data Developed at Subcontractor Expense is revised by adding the following paragraph:

"Notwithstanding the Order of Precedence provision in Section F.2, if a conflict exists between Subcontract Appendix E and the Form 7500 General Provision Clauses B27 (Patent Rights) and Attachment A, Subcontract Appendix E shall control so long as Subcontractor has paid at least 20% of the cost of developing the inventions and software at issue."

Paragraph 19. Taxes is deleted in its entirety and replaced by the following:

"19. Taxes

The fixed prices for Milestones 1 through 40, 42 and 47 do not include, and the University shall not be charged for, any State Sales & Use Tax, as the University holds California Seller's State Resale Permit No. SR-CHA 21-135323.

The fixed prices for Milestones 41 and 43 through 46 are subject to California State Use Tax. Such taxes are not included in the fixed price stated above, and shall be separately identified in Subcontractor's invoice.

University shall reimburse Subcontractor for all property taxes lawfully imposed during the term hereof upon any equipment by any state, federal, or local government, based upon the ownership of the equipment. Subcontractor agrees to cooperate with University and do all acts reasonably necessary and appropriate to secure and maintain tax exemption of the property leased hereunder pursuant to Article XIII, Section 3 of the California Constitution."

Paragraph 21b. Acceptance/Ownership/Risk of Loss or Damage of Purchased Equipment is deleted in its entirety and replaced by the following:

"21b. Acceptance/Ownership/Risk of Loss or Damage of Purchased Equipment

Title to each machine will pass to the University upon payment of the purchase price. After the date of acceptance, the University will have responsibility for all risk of loss of, or damage to, a machine.

The University formally accepts the SST system when it successfully runs a synthetic workload test ("Workload") at LLNL to be developed by the University. Subcontractor may participate in the definition of the Workload content. The University and Subcontractor will mutually agree on the Workload test plan and the criteria for its successful completion. The test plan shall include the following requirements: (i) it shall be capable of execution in no more than 7 days; and (ii) it shall not impose technical requirements beyond those set out in the Statement of Work, as amended, for the SST system initial delivery. The University will deliver the mutually agreed Workload test plan to Subcontractor by June 30, 1998, and will deliver the Workload itself to Subcontractor by December 31, 1998.

Title to all external SSA disk delivered under the Subcontract will pass to the University. Furthermore, external SSA disk shall not be considered part of the MuSST system for purposes of the lease provisions under Article 24, Section F.

Notwithstanding the language in this section or anything to the contrary in this Subcontract, the leasing provisions in Section F, Article 24, control acceptance and ownership of equipment issues discussed therein."

Paragraph 22. Warranty of Equipment is deleted in its entirety and replaced by the following:

"22. Warranty of Equipment

The Subcontractor agrees that the materials, supplies and services furnished under this Subcontract shall be covered by the Subcontractor's standard commercial warranties in effect on the date the Subcontractor renders performance hereunder. Such warranties shall include performance, workmanship, labor, materials, Subcontractor's design or engineering contributions, and the Subcontractor also warrants that the materials, supplies or services furnished shall be of the most suitable grade and exactly as specified in this Subcontract. The rights and remedies provided by such warranties shall be in addition to and shall not limit any rights afforded to the University by any other provision of this Subcontract. EXCEPT AS EXPRESSLY SET FORTH HEREIN, THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

To the extent that Subcontractor provides maintenance service under this Subcontract, Subcontractor will provide such service in accordance with its standard commercial practice in effect on the date that it provides such service. However, to the extent any maintenance provisions in the Statement of Work ("SOW") are inconsistent with Subcontractor's standard commercial maintenance practice, those SOW maintenance provisions will control."

Paragraph 24. Leased Equipment is deleted in its entirety and replaced by the following:

"24. Leased Equipment

a. Lease Of Equipment

Subcontractor hereby leases to University and University hereby leases from Subcontractor the equipment upgrade described in the ASCI White Statement of Work, dated February 10, 1998, hereinafter referred to collectively as "Equipment." The University will evidence its acceptance of Equipment by executing and delivering to Subcontractor an acceptance certificate in a form acceptable to Subcontractor.

b. Term

The term of the lease shall begin when Subcontractor upgrades the SST system with 256 MuSST nodes, the additional frames for the I/O subsystem and 75 TB of disk. The lease shall continue for 24 months after the beginning of the lease. After Subcontractor upgrades the remaining 256 SST nodes to the MuSST system, the Equipment shall pass the following acceptance test criteria: the Equipment shall successfully run the SST synthetic workload test defined in article F21.b above as well as meet the performance criteria set forth in Sections 4.1.1.1, 4.1.4.5 and 4.1.4.6 of the MuSST Statement of Work. If the Equipment acceptance test is not successfully completed within seven days, the lease term shall be extended one day for each day thereafter until successful completion of the foregoing acceptance test criteria.

c. Payments

The University agrees to pay the lease payments in the amounts and on the dates as set out in the Milestone provisions of Section F, Paragraph 1b.

d. Default

Subcontractor shall provide the University's contract administrator with written notice of any defaults or non-performance and offer a cure period of at least thirty days to remedy the default or non-performance before Subcontractor's default rights are exercised.

University shall be in default upon the occurrence of any one of the following events: (1) failure to pay the lease payments or any additions thereto within ten days of the due date thereof except for cancellation in accordance with subparagraph f. below; or (2) failure to observe or perform any other term, condition, or covenant of the lease and such failure shall continue for a period of thirty days after notice; or (3) if the University ceases the conduct of active business; or (4) if a receiver or trustee shall be appointed for the University or any of University's assets or properties; or (5) if any of the equipment shall be attached, levied upon, encumbered, pledged, seized, or taken under any judicial process and such proceedings shall not be vacated, or fully stayed within twenty days thereof; or (6) if the University shall make an assignment for the benefit of creditors; institute or have instituted by, for or against it any bankruptcy, reorganization, arrangement or insolvency proceedings; or become unable or admit in writing its inability to pay its debts as they become due; or (7) if any warranty or representation made or furnished to the Subcontractor by or on behalf of the University which shall be, or which shall be proven to have been knowingly, false in any material respect when made or furnished.

Notwithstanding anything to the contrary in this Subcontract, in the event that the lease for the MuSST system fails to begin, or terminates before 24 months after lease initiation due to (i) University default; or (ii) contract termination under the provisions set out in Section C, the following remedies apply:

1. If the University terminates this lease early under the Nonavailabililty of Funds provision below, that provision will control the disposition of the Equipment.

2. If the MuSST System is not accepted by the University, the University will return all the leased Equipment to Subcontractor, and Subcontractor will restore the equivalent of the underlying SST equipment to function in accordance with the performance levels set out in the Subcontract's SST Statement of Work.

3. If the MuSST System is accepted by the University, but the University has not made the MuSST Acceptance Milestone Payment, the University will return the Equipment and Subcontractor shall return and reconvey to the University title to all cards and related parts removed from the SST System.

4. If the University makes the MuSST Acceptance Milestone Payment, but no others, the University may retain possession and use of the MuSST system for the earlier of 15 months after the beginning of the MuSST lease or expiration of the Subcontract.

5. If the University makes the MuSST Acceptance Milestone Payment and the MuSST Second Lease Payment, but no others, the University may retain possession and use of the MuSST system for the earlier of 19 months after the beginning of MuSST lease or expiration of the Subcontract.

6. If the University makes all the lease milestone payments, it may retain the MuSST system for the earlier of 24 months after the beginning of MuSST lease or expiration of the Subcontract.

The University's right to continue to possess and use the MuSST system for the periods described above after any early lease termination contemplated in this section is contingent on the University's taking no actions adverse to Subcontractor's ownership interest in MuSST, including, but not limited to, encumbering, subleasing or disassembling the MuSST system.

e. Title

Title to the Equipment delivered under the lease portion of this Subcontract remains in Subcontractor, and the University will not dispose of or encumber any of Subcontractor's interest in the Equipment. Subcontractor may label the Equipment to evidence ownership and University shall, at the request of Subcontractor, join Subcontractor in executing one or more Uniform Commercial Code financing statements or other documents reasonably required by Subcontractor to evidence or perfect Subcontractor's interest in the Equipment.

The Equipment will be a modification to the University-owned SST system ("SST"). The University agrees to transfer title to Subcontractor for any parts removed from the SST during the installation of the Equipment. Upon installation of the Equipment, the remaining hardware plus the upgrade, as already indicated above, will thereafter be a New Machine. The University represents that (i) the SST is free and clear of all liens and encumbrances except those created by the Subcontractor, and (ii) that entering into this lease by the University does not constitute a breach of any other agreements to which the University is a party. The University agrees to transfer title and renounces any and all rights and interest in and to the New Machine, except those specified in Section F24.d above, effective on the earlier of (i) the termination or cancellation of the lease after the first payment is made based on acceptance of the Equipment; (ii) the expiration of the Lease Term; or (iii) the date of the loss under subparagraph 24.i below. As of such date Subcontractor shall be the sole owner of the New Machine without any further action required on the part of the University.

f. Nonavailability Of Funds

Subcontractor understands that funding of this Lease is subject to the future availability of annually appropriated, apportioned, and allotted funds; and that this Lease must be made and administered consistent with 31 United States Code (U.S.C.) §1341 and 41 U.S.C. §11. Accordingly, funding of lease costs under this Lease shall be provided on a fiscal year basis, subject to a determination by the Department of Energy that sufficient appropriated and

apportioned funds are available to be allotted for such costs. The University agrees to give written notice not later than 30 days before the beginning of each successive fiscal year. This notice shall indicate that funds for the next fiscal year, which may be lawfully applied to this Lease are available. Such funds shall be applied to continue the Lease subject to the availability of funds. In the event that no funds are appropriated and/or apportioned, or a determination is not made by the Department that sufficient funds are available to continue this Lease and no written notice of availability of funds is made within the time prescribed, then this Lease shall end on the last day of the current fiscal year without penalty or expense of any kind to the University. If funding previously available for this Lease is withdrawn during the current fiscal year as a result of budgetary action by the Office of Management and Budget or by Congress, the University will notify the Subcontractor of this occurrence and may cancel this Lease upon (2) two weeks written notice to the Subcontractor. Upon cancellation of this Lease, and upon written direction from the Subcontractor, the University shall deliver the leased equipment to Subcontractor within the Continental United States consistent with the terms and conditions described in this Lease.

g. Assignment

This lease or any right, remedy or obligation hereunder is assignable in whole or in part by University to government or successor in interest. This lease, nor any interest in it, is not assignable by Subcontractor, in whole or in part, without prior written approval of University.

h. Possession Of Equipment

University shall not relinquish its possession of the Equipment nor shall the University assign (except a successor in interest as the government's operating contractor for the LLNL) or sublet the lease, any unit of Equipment, or any interest in either, unless (i) any such assignee is of equivalent credit rating as University or the remaining payments are revised accordingly to account for such change in credit rating, by amendment hereto, and assumes all of the obligations under this lease, and (ii) Subcontractor shall have given its prior written consent, which consent shall not be unreasonably withheld.

i. Risk Of Loss

In the event the New Machine is lost, destroyed or damaged beyond repair due to general perils (excluding loss or damage caused by University negligence, nuclear reaction, nuclear radiation, radioactive contamination, war, insurrection, rebellion or weapons of war for which the University shall be liable) the Subcontractor shall relieve the University of liability for the lease term subsequent to the month in which the loss occurred, and this lease shall be deemed ended for the affected machines.

j. Equipment To Remain Personal Property

The University will not permanently attach the equipment to any personal or real property and asserts it will keep the Equipment as personal property and not permit it to become a fixture.

k. Installation And Use Of Equipment

All equipment shall, at the University's expense, except as provided in purchase orders for the equipment, be installed, operated, and disconnected in accordance with any applicable installation operation manuals or instructions of the manufacturer of the equipment, by competent and duly qualified personnel in University's direct employment or under University's direct supervision with the assistance, as applicable, of the field service and systems engineering representatives of the manufacturer. University agrees to have any installation site prepared in accordance with the manufacturer's installation instructions.

University shall retain the equipment at the LLNL unless Subcontractor consents, in writing, to its removal. In the event that the University relocates the equipment from its LLNL, University agrees all details of the move shall be arranged and supervised in accordance with manufacturer

standards for movement of the equipment. University agrees said equipment will be used by University for the ordinary and sole purpose for which it is designed. It is further stipulated and agreed, during the term of this lease, University shall be responsible for and shall pay all charges for upkeep and/or storage of said equipment and shall make, at its own expense, any and all repairs and supply and pay for any and all materials needed to maintain said equipment in proper condition.

All repairs, alterations, and replacements, which shall include all engineering changes prescribed by the manufacturer, excluding any operating software, shall become the Subcontractor's property and shall be subject to this lease when incorporated into or attached to any unit of the equipment. University shall have the option, upon any return of the equipment to the Subcontractor, either to remove any and all attachments and additions, subject to the condition that each unit is restored to its original condition, less normal wear and tear; or to allow such additions and attachments to become the property of the Subcontractor unless the Subcontractor shall request that the attachments and additions be removed; in which case the unit as to which such request is made shall be restored to its original condition, less normal wear and tear, prior to redelivery to the Subcontractor.

All costs incurred in connection with the operation of each unit, including but not limited to labor, materials, energy, and supplies shall be borne by the University. All materials, supplies, and accessories used to operate the equipment are to meet the manufacturer's standard specifications.

University shall, at University's sole expense, install, use, operate, and maintain the equipment in full compliance with all applicable laws, ordinances, rules, and regulations or of any regulatory or other governmental bodies having jurisdiction thereover; and shall without limiting the foregoing, duly apply for, obtain and maintain in full force and effect all permits and licenses necessary for such installation, use, operation, and maintenance, and shall further prepare and timely file, or deliver to Subcontractor in time for such filing, if the same may only be filed by the owner of the equipment involved, any and all applications, certifications and reports required to be filed.

l. Manufacturer's Warranty

Subcontractor hereby assigns to University for and during the term of any equipment schedule, any and all of the manufacturer's warranties expressed or implied, issued on or applicable to each unit of equipment hereunder and hereby authorizes the University to obtain all warranties and services furnished in connection therewith by the manufacturer. During this lease, the Subcontractor shall execute such documents of assignment as the University may reasonably request and will otherwise use reasonable efforts to make available to the University all of its rights under any of the manufacturer's warranties on the equipment.

m. Notices

All notices shall be in writing and sent by prepaid, registered or certified mail addressed to the party to whom notice is intended to be given at such address as is specified herein or such other address as shall have been subsequently given in writing by such party for the purpose of notice. Any notice complying with the above provisions shall be deemed to have been received by such party on the fifth day after deposit in the mail.

Subcontractor: IBM Corp.
Government Industry
Attn: Linda Geier
6710 Rockledge Drive
Bethesda, MD 20817

University: University of California
Lawrence Livermore National Laboratory
Attn: Lynn Rippe, Mail Stop L-650
P. O. Box 5012
Livermore, CA 94551

n. Waiver By Subcontractor

Subcontractor's failure at any time to require strict performance by the University of any of the provisions hereof shall not waive or diminish Subcontractor's right thereafter to demand strict compliance therewith or with any other provisions. In the event the University fails to comply with any provision of this lease, the Subcontractor shall have the right, but shall not be obligated, to effect such compliance in whole or in part. All payments made by, and expenses of, the Subcontractor shall be paid forthwith, with any applicable late charges, by University as items of additional rent hereunder. No waiver by Subcontractor of any of its rights hereunder shall be effective unless express and in writing. No effective waiver by Subcontractor of any of its rights shall be effective to waive any other rights. No obligation of Subcontractor, except as otherwise specified herein, shall survive the lease.

o. Waiver By University

University's failure at any time to require strict performance by the Subcontractor of any of the provisions hereof shall not waive or diminish University's right thereafter to demand strict compliance therewith or with any other provisions. In the event the Subcontractor fails to comply with any provision of this lease, the University shall have the right, but shall not be obligated, to effect such compliance in whole or in part. No waiver by University of any of its rights hereunder shall be effective unless express and in writing. No effective waiver by University of any of its rights shall be effective to waive any other rights. No obligation of University, except as otherwise specified herein, shall survive the lease.

p. Modification

Subcontractor and University agree any modifications or changes to this lease hereto must be in writing and must be signed by both parties.

q. Quiet Enjoyment

Subcontractor covenants the University shall have quiet enjoyment of the Equipment during the term of this lease so long as the University is not in default thereunder.

r. Agreement Binding

This lease shall, in every respect, be binding on the parties hereto, and their respective successors and assigns.

s. Integration And Governing Law

These lease provisions shall be construed in accordance with the laws of the state of California.

t. End Of Lease Provisions

Upon any expiration, termination or cancellation of the lease, the leased machines shall be returned to the Subcontractor in the same condition as delivered, ordinary wear and tear excepted. The Subcontractor shall be responsible for deinstallation and transportation. Subcontractor may enter upon any premises where the Equipment may be located, only with the consent of the University's Security Officer (in conformance with all security regulations and requirements of the United States Department of Energy), which shall not be unreasonably

withheld, and take immediate possession of the Equipment without court order or other process of law, in which event Subcontractor shall not be liable for damages resulting from any such entry and repossession except for any willful or gross negligence of the Subcontractor.

If the University decides to purchase the equipment at the end of the lease term, the Subcontractor will prepare and submit a purchase price proposal. When the University and the Subcontractor have agreed upon the terms and conditions for the purchase and the Subcontractor receives payment of the purchase price, title will pass to the University."

SECTION G - GENERAL PROVISIONS is revised by adding Clause C11 to the list of incorporated clauses in subparagraph 3 and incorporating the enclosed Supportline Services and Software Upgrade Protection Plan provisions by this reference.

All other terms, conditions, and provisions of the Subcontract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have executed this Modification No. 14, effective as of the date of the Subcontractor's signature.

IBM CORPORATION

BY: Claudia N Herbert

CLAUDIA N. HERBERT
CONTRACT RELATIONS ADVISOR

TITLE: _____

DATE: 2/11/98

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

BY: _____
John S. Hunt

TITLE: Laboratory Business Manager
Lawrence Livermore National Laboratory

DATE: Feb 11, 1998

University Procurement Representative:
Lynn E. Rippe
Sr. Contract Administrator
Phone No.: (510) 423-2176
Fax No.: (510) 423-8019

SUPPORTLINE SERVICES

Support Line: Provides telephone assistance with routine, short duration, installation and usage ("how to") questions. An IBM technical specialist will return the Government's call within 2 hours during prime shift and within 4 hours during off shift.

In addition, IBM will provide electronic access upon request, provided certain prerequisites are met. Electronic access allows submission of questions electronically. IBM will respond to questions by the end of the next business day.

AIX STANDARD: Under this platform, the Government must designate one AIX knowledgeable person (called "System Administrator") and one designated backup to coordinate communications. These will be the only two individuals authorized to place calls to the Support Center.

UCLLNL agrees:

A. To ensure that any access codes provided are used only by those who are authorized to do so;

B. To pay any communciations charges associated with accessing these Services, unless IBM specifies otherwise;

C. To use the information obtained under Services only for the support of the information processing requirements within the Government's ordering department or agency;

For purpose of the Supportline service provided herein, following is the extent of coverage:

- 10 authorized callers
- Coverage Monday through Friday from 8:00 to 5:00 for no more than 516 nodes
- Base products list:
  AIX PSSP, Parallel Environment, PVMe, Parallel ESSL, Parallel Filesystem, Performance Toolbox, Performance Aide, AIX HIPPI, XL Fortran & C Set++.
- If service for one of the above listed License Program Products is withdrawn during the contract period, IBM will support the produce on a best effort basis only through the end of the fiscal year. Upon renewal of the contract each fiscal year, IBM can adjust the price accordingly for any product whose service has been withdrawn. This means no new PTFs and no backend lab to whom IBM can send complex questions requiring additional skill.

END

Software Upgrade Protection Plan.

The IBM Software Upgrade Protection Plan for AIX Operating System Based Software products is proposed for the life of the Subcontract. The LLNL will be entitled to receive all software product version and release upgrades that announce during the contract period and that have been enrolled under the Upgrade Protection Plan agreement.

Software Upgrade: An upgrade is either a new version (i.e., 2.x to 3.x), a new release (i.e., x.1 to x.2), or a maintenance release, if applicable (i.e., x.x.1 to x.x.2) of an IBM program announced as eligible for which the customer has enrolled under the Software Upgrade Protection Plan.

Upgrades do not include programs that are sold separately from the enrolled program, but enhance the performance of that program, or are considered add-ons or utilities to that enrolled program. Programs that perform the same functions as the enrolled program but are installed on a non-AIX platform are not considered upgrades.

IBM may announce a product that can be substituted for an enrolled product. This product is neither a new version, new release, nor maintenance release of that enrolled product. In most cases, this product will have a different architecture, more function, and a higher license charge than the enrolled product. IBM may provide those customers enrolled in Upgrade Protection Plan access to this product at a discounted rate. The terms of this transaction will be included in the new product announcement.

Eligibility of Upgrades. Only unannounced software product upgrades are eligible for coverage under the Upgrade Protection Plan. Once a software product upgrade is announced, it will no longer be eligible for enrollment in the Upgrade Protection Plan. If the upgrade for an eligible software product is announced prior to the effective contract date, the customer will not be entitled to enroll the software upgrade. If the upgrade for an enrolled software product is announced during the contract period, the customer will be entitled to the upgrade even if the product does not become generally available until after the end of the contract.

Notification of Upgrade Availability and Ordering. As software product upgrades become available, the customer will be notified that an upgrade for a software product that is included in their contract is now available for shipment. When the customer is ready to install the software product upgrade, they will contact IBM to request their record be updated and the upgrade to be shipped. All entitled upgrades for a specific software product must be obtained at the same time. Partial shipments are not allowed.

Upgrade Deliverables. The entitlement will include once copy of media and publications per country language per contract. The customer will be responsible for making and distributing the necessary copies to cover only the number of licenses that have been enrolled in the Upgrade Protection Plan.

Customer Responsibilities. The customer is responsible for ensuring that:

- they hold valid licenses for all software products that are being enrolled under the Upgrade Protection Plan
- the number of copies made of a software product upgrade delivered under this plan do not exceed the number of upgrades enrolled under this Plan
- Software products that are Processor Group Priced are installed on the appropriate systems
- Software products that have Usage restrictions comply with those Usage restrictions;
- they contact IBM when they are ready to be shipped upgrades.

END