| AWARD/CONTRACT | 1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350) | RATING | PAGE OF PAGES 1 \| 32 |
|---|---|---|---|
| 2. CONTRACT (Proc. Inst. Ident.) NO. HR0011-09-C-0028 | 3. EFFECTIVE DATE 02 Oct 2008 | 4. REQUISITION/PURCHASE REQUEST/PROJECT NO. X670/04 & X670/08 | |

5. ISSUED BY CODE HR0011
DARPA
CMO
ATTN: MICHAEL D. BLACKSTONE
3701 N. FAIRFAX DR.
ARLINGTON VA 22203-1714

6. ADMINISTERED BY (If other than Item 5) CODE S2404A
DCMA VIRGINIA
10500 BATTLEVIEW PARKWAY
SUITE 200
MANASSAS VA 20109-2342

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code)
FIBERTEK, INC.
510 HERNDON PKWY
HERNDON VA 20170-5225

CODE 8Y519 FACILITY CODE

8. DELIVERY
[ ] FOB ORIGIN [ X ] OTHER (See below)

9. DISCOUNT FOR PROMPT PAYMENT
net 30 days

10. SUBMIT INVOICES 1 (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN:

ITEM
Section G

11. SHIP TO/MARK FOR CODE N00039
SPAWAR SYSTEMS CENTER SAN DIEGO
DR. FRANK HANSON
SPAWARSYSCEN 55430
53490 DOW STREET
SAN DIEGO CA 92152-5743

12. PAYMENT WILL BE MADE BY CODE HQ0338
DFAS COLUMBUS CENTER
SOUTH ENTITLEMENT OPERATIONS
P.O. BOX 182264
COLUMBUS OH 43218-2264

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:
[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )

14. ACCOUNTING AND APPROPRIATION DATA
See Schedule

| 15A. ITEM NO. | 15B. SUPPLIES/ SERVICES | 15C. QUANTITY | 15D. UNIT | 15E. UNIT PRICE | 15F. AMOUNT |
|---|---|---|---|---|---|
| | SEE SCHEDULE | | | | |

15G. TOTAL AMOUNT OF CONTRACT $3,530,165.00

16. TABLE OF CONTENTS

| (X) | SEC. | DESCRIPTION | PAGE(S) | (X) | SEC. | DESCRIPTION | PAGE(S) |
|---|---|---|---|---|---|---|---|
| | | PART I - THE SCHEDULE | | | | PART II - CONTRACT CLAUSES | |
| X | A | SOLICITATION/ CONTRACT FORM | 1 | X | I | CONTRACT CLAUSES | 21 - 31 |
| X | B | SUPPLIES OR SERVICES AND PRICES/ COSTS | 2 - 3 | | | PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS | |
| X | C | DESCRIPTION/ SPECS./ WORK STATEMENT | 4 - 7 | X | J | LIST OF ATTACHMENTS | 32 |
| X | D | PACKAGING AND MARKING | 8 | | | PART IV - REPRESENTATIONS AND INSTRUCTIONS | |
| X | E | INSPECTION AND ACCEPTANCE | 9 | | K | REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS | |
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CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. [ X ] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 1 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

19A. NAME AND TITLE OF SIGNER (Type or print)

20A. NAME OF CONTRACTING OFFICER
MICHAEL D. BLACKSTONE / PCO
TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil

19B. NAME OF CONTRACTOR
BY _____
(Signature of person authorized to sign)

19C. DATE SIGNED

20B. UNITED STATES OF AMERICA
(b)(6)
BY _____
(Signature of Contracting Officer)

20C. DATE SIGNED
02-Oct-2008

Section B - Supplies or Services and Prices

| ITEM NO | SUPPLIES/SERVICES | ESTIMATED COST | FIXED FEE | TOTAL EST. COST PLUS FIXED FEE |
|---|---|---|---|---|
| 0001 | RIFL Phase I (Base)<br>AO No. X670/04 & X670/08 | (b)(4) | (b)(4) | $3,530,165.00 |
| | The contractor shall conduct the Phase 1 research entitled "Multi-kW Fiber MOPA for Coherent Applications," in accordance with the Attachment 1 Statement of Work, dated 15 September 2008 and in Section C herein. Data deliverables/reports shall be provided in accordance with Sections C and F herein. | | | $3,530,165.00 |

| ITEM NO | | AMOUNT |
|---|---|---|
| 000101 | Funding for CLIN 0001 only | $0.00 |
| | AO No. X670/04 & X670/08 | |
| | ACRN AA | $553,000.00 |

| ITEM NO | SUPPLIES/SERVICES | ESTIMATED COST | FIXED FEE | TOTAL EST. COST PLUS FIXED FEE |
|---|---|---|---|---|
| 0002 | RIFL Phase II (Option)<br>AO No. X670/04 & X670/08 | (b)(4) | (b)(4) | $2,431,306.00 |
| | The contractor shall conduct the Phase 1 research entitled "Multi-kW Fiber MOPA for Coherent Applications," in accordance with the Attachment 1 Statement of Work, dated 15 September 2008 and in Section C herein. Data deliverables/reports shall be provided in accordance with Sections C and F herein. | | | $2,431,306.00 |

Section C - Descriptions and Specifications

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C-1 Scope of Work

(a) The Contractor shall furnish the necessary personnel, materials, facilities and other services as may be required to perform Contract Line Item Number (CLIN) 0001, and to the extent the Option is exercised , CLIN 0002, in accordance with the Statement of Work, Attachment 1 hereto.

C-2 Reports and Other Deliverables

(a) The Contractor shall submit the following reports and other deliverables in accordance with the delivery schedule set forth in Section F. Reports and other deliverables shall be submitted in writing, as defined in FAR 2.101, or as specified below:

(1) R&D STATUS REPORT (MONTHLY)
This brief narrative, not to exceed five pages in length, shall contain the following:
- (i) Description of progress during the reporting period, supported by reasons for any change in approach reported previously.
- (ii) The contractor shall also discuss any technical and/or financial problems discovered during the reporting period in this narrative.

(2) DETAILED TECHNICAL/FINANCIAL REPORT (QUARTERLY)
This detailed narrative does not have page restrictions and shall contain the following:
- (i) For first report only; the date work actually started.
- (ii) Description of progress during the reporting period, supported by reasons for any change in approach reported previously
- (iii) Planned activities and milestones for the next reporting period.
- (iv) Description of any major items of experimental or special equipment purchased or constructed during the reporting period.
- (v) Notification of any changes in key personnel associated with the contract during the reporting period.
- (vi) Summary of substantive information derived from noteworthy trips, meetings, and special conferences held in connection with the contract during the reporting period.
- (vii) Summary of all problems or areas of concern.
- (viii) Related accomplishments since last report.
- (ix) Fiscal status, to include reporting of summary level financial data in the following format: (next page)

R&D STATUS REPORT
PROGRAM FINANCIAL STATUS

| Work Breakdown | | Cumulative to Date | | | At Completion | |
|---|---|---|---|---|---|---|
| Structure or Task Element | Planned Expend | Actual Expend | % Budget Compl | At Compl | Latest Revised Estimate | Remarks |
| Subtotal: | | | | | | |
| Management Reserve: | | | | | | |
| Or Unallocated Resources: | | | | | | |
| TOTAL: | | | | | | |

Note: Budget at completion changes only with the amount of any scope changes. (Not affected by underrun or overrun)

Based on currently authorized work:

Is current funding sufficient for the current fiscal year (FY)? (Explain in narrative if "NO")

YES NO

What is the next FY funding requirement at current anticipated levels?

$ _____

Have you included in the report narrative any explanation of the above data and are they cross-referenced?

YES NO

(2) FINAL REPORT
This report shall document the results of the complete effort and should be delivered at the completion of the contract. If the Government chooses to exercise the options under this contract, the due date for the final report is extended accordingly. Title pages shall include a disclaimer worded substantially as follows:

> "The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressly or implied, of the Defense Advanced Research Projects Agency or the U.S. Government."

The Final Technical Report summary shall include:

Task Objectives
Technical Problems
General Methodology (i.e., literature review, laboratory experiments, surveys, etc.)
Technical Results
Important Findings and Conclusions
Significant Hardware Development
Special Comments
Implications for Further Research
Standard Form 298, September 1988

(3) ALL REPORTS

(a) Reports delivered by the Contractor in the performance of the contract shall be considered "Technical Data" as defined in Section I contract clauses entitled "Rights in Technical Data – Noncommercial Items" and "Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation."

(b) Bulky Reports shall be mailed by other than first-class mail unless the urgency of submission requires use of first-class mail. In this situation, one copy shall be mailed first-class and the remaining copies forwarded by less than first-class.

(c) All papers and articles published as a result of DARPA sponsored research shall include a statement reflecting the sponsorship. In addition, a bibliography of the titles and authors of all such papers are to be included in the Final Technical Report

(i) The cover or title page of each of the above reports or publications prepared, will have the following citation:

Sponsored by
Defense Advanced Research Projects Agency
Microsystems Technology Office (MTO)
Program: Revolution in Fiber Lasers (RIFL)
Issued by DARPA/CMO under Contract No: HR0011-09-C-0028

(ii) The title page shall include a disclaimer worded substantially as follows:

> "The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressly or implied, of the Defense Advanced Research Projects Agency or the U.S. Government."

(d) All technical reports must (i) be prepared in accordance with American National Standards Institute (ANSI) Standard Z39.18; (ii) include a Standard Form 298, August 1998; and (iii) be marked with an appropriate Distribution Statement.

(e) Distribution Statement B applies.

"Distribution authorized to U.S. Government agencies only due to the inclusion of proprietary information and to prevent Premature Dissemination of potentially critical technological Information. Other requests for this document shall be referred to DARPA Technical Information Office via email at tio@darpa.mil."

**Note to contractor: In accordance with the applicable Data Rights clauses(s), all proprietary information within the data deliverables shall be clearly identified/marked as such for each such occurrence (use of footnotes, or similar forms of reference, for purposes of such identification is encouraged).**

(4) ADDITIONAL MISCELLANEOUS DATA DELIVERABLES

The Contractor shall also deliver those items listed in the Contract Attachment (1) - Statement of Work under the paragraph entitled "Deliverables", as applicable. The Contractor shall adhere to the schedule, as applicable, in the Statement of Work. Briefing materials (hard and softcopy) for all briefings given to the Government shall be provided in the Contractor's format.

(end of clause)

Section D - Packaging and Marking

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D-1 Packaging and Marking

(a) All items shall be preserved, packaged, packed and marked in accordance with best commercial practices to meet the packing requirements of the carrier, and to ensure safe delivery at destination.

(end of clause)

Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at destination by Contracting Officer's Representative identified in Section G herein.

Use of the DD 250 is required only for submission of the Program Final Report.
(end of clause).

CLAUSES INCORPORATED BY REFERENCE

| | | |
|---|---|---|
| 52.246-8 | Inspection Of Research And Development Cost Reimbursement | MAY 2001 |
| 252.246-7000 | Material Inspection And Receiving Report | MAR 2008 |

Section F - Deliveries or Performance

## DELIVERY INFORMATION

| CLIN | DELIVERY DATE | QUANTITY | SHIP TO ADDRESS | UIC |
|---|---|---|---|---|
| 0001 | 18 mths. ADC | | SPAWAR SYSTEMS CENTER SAN DIEGO<br>DR. FRANK HANSON<br>SPAWARSYSCEN 55430<br>53490 DOW STREET<br>SAN DIEGO CA 92152-5743<br>(619) 553-2094<br>FOB: Destination | N00039 |
| 000101 | 18 mths. ADC | | (SAME AS PREVIOUS LOCATION)<br>FOB: Destination | N00039 |
| 0002 | 15 mths. ADC | | (SAME AS PREVIOUS LOCATION)<br>FOB: Destination | N00039 |

CLAUSES INCORPORATED BY REFERENCE

| | | |
|---|---|---|
| 52.242-15 Alt I | Stop-Work Order (Aug 1989) - Alternate I | APR 1984 |
| 52.247-34 | F.O.B. Destination | NOV 1991 |

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F-1 Term of Contract

(a) The term of the contract commences 03 October 2008 and continues through 03 April 2009.

(b) The period of performance for Option 1, as set forth in CLIN 0002, shall be from the effective date of the option exercise to and including 15 months thereafter.
(end of clause)

F-2 Reports and Other Deliverables

(a) Delivery of all reports and other deliverables shall be made to the addressee specified in F-3 entitled "Report Distribution" in accordance with the following:

| Item No. | Description | Due Date (on or before) |
|---|---|---|
| 0001,0002 | R&D Status Reports | Monthly IAW Section C-2 |
| 0001,0002 | Interim R&D Technical Reports | Quarterly IAW Section C-2 |

| | | |
|---|---|---|
| 0001,0002 | RIFL Final Report | 18 months after date of contract award (03 April 2009)<br>If option is exercised, 33 months after date of contract award (03 July 2011) |
| 0001,0002 | Additional Misc. Deliverables | As required IAW Section C-2 |

(end of clause)

F-3 Report Distribution

(a) DARPA/MTO (RIFL Program Manager)
Attn: Joseph Mangano
3701 North Fairfax Drive
Arlington, VA 22203-1714
Email: (Joseph.Mangano@darpa.mil)
(one copy each report/data deliverable)

(b) DARPA
Attn: ADPM (R. Glaze)
3701 North Fairfax Drive
Arlington, VA 22203-1714
(one copy each monthly status report and final report)

(c) DARPA/Library
3701 North Fairfax Drive
Arlington, VA 22203-1714
Email: library@darpa.mil
(one copy of the Final Technical Report)

(d) Defense Technical Information Center

(1) Email: TR@dtic.mil
(one electronic copy of the Final Technical Report, if unclassified)

OR

(2) Attn: DTIC-BCS
8725 John J. Kingman Road, Suite 0944
Fort Belvoir, VA 22060-0944
(two hard copies of the Final Technical Report if unclassified)

(e) DARPA/CMO
Attn: Michael Blackstone
3701 North Fairfax Drive
Email: Michael.Blackstone@darpa.mil
Arlington, VA 22203-1714
(one copy each monthly status report and final report)

(f) COR
Attn: Dr. Frank Hanson
SPAWARSYSCEN 55430
53490 Dow Street
San Diego, CA 92152-5743

Email: hansonfe@spawar.navy.mil
(one copy each report/data deliverable)

(end of clause)

Note 1: (a) through (f) – submission of unclassified materials only. Submission of classified material shall be coordinated through DARPA SID and/or the DARPA Program Manager in accordance with the attached DD 254, as applicable.

Note 2: (a) through (f) – Interim Report submissions may be made electronically via e-mail. Final Report submissions shall be made in hardcopy and CD soft copy.

Note 3: For the Final Technical Report (s), the Contractor must also comply with the distribution requirements of DFARS 252.235-7011, as applicable.

F-4 Notice Regarding Late Delivery

(a) In the event the Contractor anticipates difficulty in complying with the contract delivery schedule, the Contractor shall immediately notify the Contracting Officer in writing, giving pertinent details, including the date by which it expects to make delivery; PROVIDED, however, that this date shall be informational only in character and the receipt thereof shall not be construed as a waiver by the Government of any contract delivery schedule, or any rights or remedies provided by law or under this contract.

(end of clause)

Section G - Contract Administration Data

## ACCOUNTING AND APPROPRIATION DATA

AA: 9780400 1320 X670 P8G10 2525 DPAC 8 5252 S12136 62702E
AMOUNT: $553,000.00
CIN 00000000000000000000000000000: $553,000.00

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252.204-7006 BILLING INSTRUCTIONS (OCT 2005)

When submitting a request for payment, the Contractor shall--

(a) Identify the contract line item(s) on the payment request that reasonably reflect contract work performance; and

(b) Separately identify a payment amount for each contract line item included in the payment request.

(End of clause)

G-1 Procuring Office Representative

(a) The Procuring Office Representative is Michael Blackstone, DARPA/CMO, 3701 North Fairfax Drive, Arlington, VA 22203-1714, telephone: 571-218-4804, e-mail: Michael.Blackstone@darpa.mil

(b) Notwithstanding any other provision of this contract, the Contracting Officer is the only individual authorized to redirect the effort or in any way amend or modify any of the terms of this contract. If, as a result of technical discussions, it is desirable to alter contract obligations or the statement of work, a modification must be issued in writing and signed by the Contracting Officer.

(end of clause)

G-2 Electronic Submission of Payment Requests

(a) Invoices for goods received or services rendered under this contract shall be submitted electronically through Wide Area Work Flow – Receipt and Acceptance (WAWF):

(1) Vendors that have never used WAWF shall follow the directions in the WAWF Vendor Getting Started Guide available at the following website: http://www.dfas.mil/contractorpay/electroniccommerce/wideareaworkflow.html. This website also contains links for Vendor training and practice. Additional support can be obtained by calling WAWF Customer Service at 866-618-5988.

(2) Back up documentation (such as timesheets, monthly status reports, etc.) can be included and attached to the invoice in WAWF. Attachments should be in PDF format, but Attachments created in any Microsoft Office product may be attached. Total limit for the size of files per invoice is 5 megabytes.

(b) The following information, regarding invoice routing DoDAAC's, must be entered for completion of the invoice in WAWF:

| | |
|---|---|
| WAWF Invoice Type: | Cost Voucher |
| Issuing Office DoDAAC | HR0011 |
| Admin Offfice DoDAAC | S2404A |
| Service Approver DoDAAC | S2404A |
| DCAA Office DoDAAC | HAA210 |
| Paying Office DoDAAC | HQ0338 |

(c) Cost Vouchers from Contractors approved by DCAA for direct billing will be directly routed to DFAS. Cost Vouchers from Contractors not approved for direct billing will be routed to DCAA for approval before the Cost Voucher is routed to DFAS. All Final Cost Voucher submissions will be routed to the Service Approver for approval. The DCAA office for this award is:

| *Baltimore Branch Office 06141* | |
|---|---|
| 8441 Belair Road<br>Suite 102<br>Baltimore, MD 21236-3024 | **DoDAAC**: HAA210<br>**Phone No**: (410) 962-3857<br>**Fax No**: (410) 962-9976<br>**E-mail**: *dcaa-fao6141@dcaa.mil* |

(d) For each invoice/cost voucher submitted for payment, the contractor shall also e-mail the WAWF automated invoice notice directly to the following points of contact:

| **Name** | **E-mail** | **Phone** | **Role** |
|---|---|---|---|
| Frank Hanson | hansonfe@spawar.navy.mil | 619-553-2094 | COR |
| | | | |
| | | | |

G-3 Delegation of Authority for Contract Administration

(a) DCMA Virginia (S2404A), is hereby designated as the Contracting Officer's authorized representative for administering this contract in accordance with current directives.
(end of clause)

G-4 Contracting Officer's Representative (COR)

(a) Performance of work under this contract shall be subject to the technical direction of Frank Hanson, SPAWARSYSCEN 55430, 53490 Dow Street San Diego, CA 92152-5743, telephone (619)553-2094, e-mail: hansonfe@spawar.navy.mil. Such technical direction includes those instructions to the Contractor necessary to accomplish the Statement of Work. The COR is not otherwise authorized to make any representations or commitments of any kind on behalf of the Contracting Officer or the Government. The COR does not have the authority to alter the Contractor's obligations or to change the specifications of the contract.

(b) Technical direction shall not include any direction which:

(1) Constitutes additional work outside the scope of work;

(2) Constitutes a change as defined in Section I contract clause entitled "Changes";

(3) In any manner causes an increase or decrease in the total estimated cost or the time required for contract performance; or

(4) Changes any of the stated terms, conditions, or specifications of the contract.

(5) See Attachment (2)

(end of clause)

G-5 Payment Instructions for Multiple Accounting Classification Citations

(a) Payments under contract line items funded by multiple accounting classification citations shall be made from the earliest available fiscal year funding sources. The earliest assigned ACRN must be fully disbursed before making disbursements from a succeeding ACRN.

(end of clause)

G-6 Incremental Funding

(a) This contract shall be subject to incremental funding, as indicated in the table below, which is presently made available for performance under this contract. It is estimated that the funds presently available are sufficient to permit the Contractor's performance through the performance end dates indicated in the table below. Except in accordance with the Section I clause FAR 52.232-22, "Limitation of Funds," no legal liability of the part of the Government for payment of any money in excess of the funds listed in the table below shall arise unless and until additional funds are made available by the Contracting Officer through a modification to this contract.

| **Phase** | **CLIN** | **Funding Provided to Date** | **Funding Period of Performance End Date** |
|---|---|---|---|
| 1 | 0001 | $553,000 | 30 November 2008 |
| 2 | 0002 | TBD | TBD |

(end of clause)

G-7 Payment of Cost and Fee

(a) As consideration for the proper performance of work required under this contract, the Contractor shall be paid as follows:

(1) Costs, as provided for under Section I contract clause titled "Allowable Cost and Payment" not to exceed the amount set forth as "Total Estimated Cost" in Section B, and subject further to those Section I clauses entitled "Limitation of Cost" or "Limitation of Funds".

(2) A fixed fee in the amount set forth as "Fixed Fee" in Section B, in accordance with the Section I contract clause entitled "Fixed Fee". The Contractor may bill on each invoice the amount of the fixed fee bearing the same percentage to the total fixed fee as the amount of cost billed bears to the total estimated cost.

(end of clause)

Section H - Special Contract Requirements

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H-1 Type of Contract

(a) This is a Cost-Plus-Fixed-Fee completion contract.
(end of clause)

H-2 Public Release or Dissemination of Information

(a) There shall be no dissemination or publication, except within and between the Contractor and any subcontractors, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written approval of the DARPA Technical Information Officer (DARPA/TIO). All technical reports will be given proper review by appropriate authority to determine which Distribution Statement is to be applied prior to the initial distribution of these reports by the Contractor. Papers resulting from unclassified contracted fundamental research are exempt from prepublication controls and this review requirement, pursuant to DoD Instruction 5230.27 dated October 6, 1987.

(b) When submitting material for written approval for open publication as described in subparagraph (a) above, the Contractor must submit a request for public release request to the DARPA TIO and include the following information: 1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx 30 words), number of pages (or minutes of video) and document type (briefing, report, abstract, article, or paper); 2) Event Information: event type (conference, principle investigator meeting, article or paper), event date, desired date for DARPA's approval; 3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and 4) Contractor's Information: POC name, e-mail and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests can be sent either via e-mail to tio@darpa.mil or via 3701 North Fairfax Drive, Arlington VA 22203-1714, telephone (571) 218-4235. Refer to www.darpa.mil/tio for information about DARPA's public release process.

(c) See also Section I, Clause 252.235-7010, "Acknowledgement of Support and Disclaimer."
(end of clause)

H-3 Key Personnel

(a) The Contractor shall notify the Contracting Officer prior to making any change in key personnel. Key personnel are defined as follows:

(b)(4)

(b) The Contractor must demonstrate that the qualifications of the prospective personnel are equal to or better than the qualifications of the personnel being replaced. Notwithstanding any of the foregoing provisions, key personnel shall be furnished unless the Contractor has demonstrated to the satisfaction of the COR that the qualifications of the proposed substitute personnel are equal to or better than the qualifications of the personnel being replaced.
(end of clause)

H-4 Restrictions on Printing

(a) Unless otherwise authorized in writing by the Contracting Officer, reports, data, or other written material produced using funds provided by this contract and submitted hereunder shall be reproduced only by duplicating processes and shall not exceed 5,000 single page reports or a total of 25,000 pages of a multiple-page report. These restrictions do not preclude the writing, editing, preparation of manuscript or reproducible copy of related illustrative materials if required as part of this contract, or incidental printing such as forms or materials necessary to be used by the Contractor to respond to the terms of the contract.
(end of clause)

H-5 Contractor Representations and Certifications

(a) The Contractor's Representations and Certifications dated 3 July 2008 (ORCA) and 11 July 2008 are incorporated herein by reference.
(end of clause)

H-6 Insurance Schedule

(a) The Contractor shall maintain the types of insurance listed in FAR 28.307-2 (a), (b) and (c), with the minimum amounts of liability indicated therein. The types of insurance coverage listed in paragraphs (d) and (e) shall also be maintained when applicable.
(end of clause)

H-7 Travel

(a) Reimbursement for travel-related expenses shall be in accordance with the Contractor's approved travel policy. The Federal Travel Regulations, Joint Travel Regulations (JTR), and Standardized Regulations as stated in FAR 31.205-46 will be used as a guide in determining reasonableness of per diem costs. Costs for travel shall be allowable subject to the provisions of FAR 31.205-46.

(b) In connection with direct charge to the contract of travel-related expenses, the Contractor shall hold travel to the minimum required to meet the objectives of the contract, and substantial deviations from the amount of travel agreed to during contract negotiation shall not be made without the authorization of the Contracting Officer.

When applicable, the Contractor shall notify the COR of proposed travel of an employee beyond that agreed to during negotiations.

(c) Approval of the Contracting Officer shall be obtained in advance for attendance by personnel at training courses, seminars, and other meetings not directly related to contract performance if the costs for the courses, seminars, and other meetings are charged to the contract.

(d) All foreign travel shall be authorized and approved in advance, in writing, by the Contracting Officer. Request for such travel must be submitted to the Contracting Officer at least 45 days in advance of traveler's anticipated departure date, and shall include traveler's itinerary of United States Flag Air Carriers.
(end of clause)

H-8 Metric System

(a) The Defense Advanced Research Projects Agency (DARPA) will consider the use of the metric system in all of its activities consistent with operational, economical, technical and safety requirements.

(b) The metric system will be considered for use in all new designs. When it is deemed not to be in the best interest of the DoD to provide metric design, justification shall be provided.

(c) Physical and operational interfaces between metric items and U.S. customary items will be designed to assure that interchangeability and interoperability will not be affected.

(d) Existing designs dimensioned in U.S. customary units will be converted to metric units only if determined to be necessary or advantageous. Unnecessary retrofit of existing systems with new metric components will be avoided where both the new metric and existing units are interchangeable and interoperable. Normally, the system of measurement in which an item is originally designed will be retained for the life of the item.

(e) During the metric transition phase hybrid metric and U.S. customary designs will be necessary and acceptable. Material components, parts, subassemblies, and semi-fabricated material, which are of adequate or when it is otherwise specifically determined to be in the best interest of the Department of Defense. Bulk materials will be specified and accepted in metric units when it is expedient or economical to do so.

(f) Technical reports, studies, and position papers, (except those pertaining to items dimensioned in U.S. customary units) will include metric units of measurement in addition to or in lieu of U.S. customary units. With respect to existing contracts, this requirement applies only if such documentation can be obtained without an increase in contract costs.

(g) Use of the dual dimensions (i.e., both metric and U.S. customary dimensions) on drawings will be avoided unless it is determined in specific instances that such usage will be beneficial. However, the use of tables on the document to translate dimensions from one system of measurement to the other is acceptable.
(end of clause)

H-9 Consent to Subcontract

(a) Pursuant to the clause of the General Provisions entitled "Subcontracts (JUN 2007)," FAR 52.244-2(j), the Contracting Officer hereby consents to the placement of subcontract(s) with the following firm(s)/consultant(s) at the ceiling amounts specified:

| NAME | TOTAL AMOUNT |
|---|---|
| (b)(4) | (b)(4) |
| | TOTAL AMOUNT |
| | (b)(4) |

(b) Approval must be obtained from the Administrative Contracting Officer (ACO) to increase/decrease the use of the above listed subcontractors by greater than 5% from the level established in subparagraph (a).
(end of clause)

H-10 Government Furnished Property/Facilities and Services

(a) In accordance with the Section I contract clause entitled "Government Property", the following property, facilities and/or services shall be provided for use in the performance of this contract.

| Need Date | QTY | PROPERTY NOMENCLATURE | DELIVERY TO |
|---|---|---|---|
| NONE IDENTIFIED AT TIME OF AWARD | | | |

(end of clause)

H-11 Invention Disclosure Reports (DFARS 252.227-7038)

All written communications required by this clause shall be submitted to the Administrative Contracting Officer (ACO). All required reporting (invention disclosures, patent disclosures, etc.) shall be accomplished using the i-Edison.gov reporting website (http://s-edison.info.nih.gov/iEdison/).

H-12 Contractor Acquired Property (IT)

(a) Performance of this contract will require use of the information technology (IT) resources listed below, acquisition of which (or equivalent) is hereby authorized:

| ITEM | TOTAL AMOUNT |
|---|---|
| NONE IDENTIFIED AT TIME OF AWARD | |

(b) The costs incurred by the Contractor in acquiring the IT listed in paragraph (1.) above shall be considered allowable costs under the contract provided that the total net amount of the IT does not exceed $_____. The Contractor shall have no obligation to acquire IT and the Government shall have no obligation to reimburse any amount for IT in excess of the amount set forth above unless the contract is modified to increase this amount.

(c) The IT resources listed above shall be considered Government Property and shall be subject to the provisions of FAR 52.245-1, incorporated in Section I.

(d) The Contractor shall not use Contractor acquired property listed above for work other than that performed pursuant to this contract unless so authorized in writing by the Contracting Officer.

(e) This authorization is subject to the Contractor's compliance with the approvals and screening requirements set forth in DFARS Subpart 239.73 and DoD 7950.1-M, "Defense Automation Resources Management Manual."

(1) Use of the DD Form 1851 for determining availability of excess information technology (IT) is only required for IT with a unit acquisition cost of $ _____ and above.
(2) On-line screening for excess IT, regardless of cost, via remote terminal dial-up, is available to contractors through their Administrative Contracting Officers.
(end of clause)

H-13 Proprietary Technical Data and Computer Software

(a) Any deliverable technical data or computer software developed or generated at private expense and considered to be proprietary by the Contractor or subcontractors shall be delivered in accordance with DFARS 252.227-7013 and 252.227-7014. No items have been identified at time of award.
(end of clause)

H-14 Consultants

(a) The contractor is authorized to use the following consultants to the extent indicated:

| Name | No. of Hours | Rate | Total Amount |
|---|---|---|---|

NO CONSULTANTS AUTHORIZED AS OF THE EFFECTIVE DATE OF THIS CONTRACT.

(b) Approval must be obtained from the Administrative Contracting Officer to increase the use of consultants from the level estimated in subparagraph (1.).
(end of clause)

H-15 Export Control Clause

Should this project develop beyond fundamental research (basic and applied research ordinarily published and shared broadly within the scientific community) with military or dual-use applications the following apply:

(a) The contractor shall comply with all U. S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of (including deemed exports) hardware, technical data, and software, or for the provision of technical assistance.

(b) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at any Government installation (whether in or outside the United States), where the foreign person will have access to export-controlled technical data or software.

(c) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

(d) The Contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

(end of clause)

Section I - Contract Clauses

CLAUSES INCORPORATED BY REFERENCE

| | | |
|---|---|---|
| 52.202-1 | Definitions | JUL 2004 |
| 52.203-3 | Gratuities | APR 1984 |
| 52.203-5 | Covenant Against Contingent Fees | APR 1984 |
| 52.203-6 | Restrictions On Subcontractor Sales To The Government | SEP 2006 |
| 52.203-7 | Anti-Kickback Procedures | JUL 1995 |
| 52.203-8 | Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity | JAN 1997 |
| 52.203-10 | Price Or Fee Adjustment For Illegal Or Improper Activity | JAN 1997 |
| 52.203-12 | Limitation On Payments To Influence Certain Federal Transactions | SEP 2007 |
| 52.204-4 | Printed or Copied Double-Sided on Recycled Paper | AUG 2000 |
| 52.204-7 | Central Contractor Registration | APR 2008 |
| 52.209-6 | Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment | SEP 2006 |
| 52.215-2 | Audit and Records--Negotiation | JUN 1999 |
| 52.215-8 | Order of Precedence--Uniform Contract Format | OCT 1997 |
| 52.215-10 | Price Reduction for Defective Cost or Pricing Data | OCT 1997 |
| 52.215-12 | Subcontractor Cost or Pricing Data | OCT 1997 |
| 52.215-14 Alt I | Integrity of Unit Prices (Oct 1997) - Alternate I | OCT 1997 |
| 52.215-15 | Pension Adjustments and Asset Reversions | OCT 2004 |
| 52.215-17 | Waiver of Facilities Capital Cost of Money | OCT 1997 |
| 52.215-18 | Reversion or Adjustment of Plans for Postretirement Benefits (PRB) Other than Pensions | JUL 2005 |
| 52.215-21 | Requirements for Cost or Pricing Data or Information Other Than Cost or Pricing Data--Modifications | OCT 1997 |
| 52.216-7 | Allowable Cost And Payment | DEC 2002 |
| 52.216-8 | Fixed Fee | MAR 1997 |
| 52.219-8 | Utilization of Small Business Concerns | MAY 2004 |
| 52.222-3 | Convict Labor | JUN 2003 |
| 52.222-21 | Prohibition Of Segregated Facilities | FEB 1999 |
| 52.222-26 | Equal Opportunity | MAR 2007 |
| 52.222-35 | Equal Opportunity For Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans | SEP 2006 |
| 52.222-36 | Affirmative Action For Workers With Disabilities | JUN 1998 |
| 52.222-37 | Employment Reports On Special Disabled Veterans, Veterans Of The Vietnam Era, and Other Eligible Veterans | SEP 2006 |
| 52.222-39 | Notification of Employee Rights Concerning Payment of Union Dues or Fees | DEC 2004 |
| 52.222-50 | Combating Trafficking in Persons | AUG 2007 |
| 52.223-14 | Toxic Chemical Release Reporting | AUG 2003 |
| 52.225-13 | Restrictions on Certain Foreign Purchases | JUN 2008 |
| 52.226-1 | Utilization Of Indian Organizations And Indian-Owned Economic Enterprises | JUN 2000 |
| 52.227-1 Alt I | Authorization And Consent (Dec 2007) - Alternate I | APR 1984 |
| 52.227-2 | Notice And Assistance Regarding Patent And Copyright Infringement | DEC 2007 |
| 52.228-7 | Insurance--Liability To Third Persons | MAR 1996 |

| | | |
|---|---|---|
| 52.230-2 | Cost Accounting Standards | APR 1998 |
| 52.230-6 | Administration of Cost Accounting Standards | MAR 2008 |
| 52.232-9 | Limitation On Withholding Of Payments | APR 1984 |
| 52.232-20 | Limitation Of Cost | APR 1984 |
| 52.232-22 | Limitation Of Funds | APR 1984 |
| 52.232-23 Alt I | Assignment of Claims (Jan 1986) - Alternate I | APR 1984 |
| 52.232-25 | Prompt Payment | OCT 2003 |
| 52.232-33 | Payment by Electronic Funds Transfer--Central Contractor Registration | OCT 2003 |
| 52.233-1 | Disputes | JUL 2002 |
| 52.233-3 Alt I | Protest After Award (Aug 1996) - Alternate I | JUN 1985 |
| 52.242-1 | Notice of Intent to Disallow Costs | APR 1984 |
| 52.242-3 | Penalties for Unallowable Costs | MAY 2001 |
| 52.242-4 | Certification of Final Indirect Costs | JAN 1997 |
| 52.242-13 | Bankruptcy | JUL 1995 |
| 52.243-2 Alt V | Changes--Cost-Reimbursement (Aug 1987) - Alternate V | APR 1984 |
| 52.244-2 | Subcontracts | JUN 2007 |
| 52.244-5 | Competition In Subcontracting | DEC 1996 |
| 52.244-6 | Subcontracts for Commercial Items | MAR 2007 |
| 52.245-1 (Dev) | Government Property (June 2007) | JUN 2007 |
| 52.245-9 | Use And Charges | JUN 2007 |
| 52.249-6 | Termination (Cost Reimbursement) | MAY 2004 |
| 52.249-14 | Excusable Delays | APR 1984 |
| 52.253-1 | Computer Generated Forms | JAN 1991 |
| 252.201-7000 | Contracting Officer's Representative | DEC 1991 |
| 252.203-7001 | Prohibition On Persons Convicted of Fraud or Other Defense-Contract-Related Felonies | DEC 2004 |
| 252.204-7003 | Control Of Government Personnel Work Product | APR 1992 |
| 252.204-7004 Alt A | Central Contractor Registration (52.204-7) Alternate A | SEP 2007 |
| 252.204-7008 | Requirements for Contracts Involving Export-Controlled Items | JUL 2008 |
| 252.205-7000 | Provision Of Information To Cooperative Agreement Holders | DEC 1991 |
| 252.209-7004 | Subcontracting With Firms That Are Owned or Controlled By The Government of a Terrorist Country | DEC 2006 |
| 252.211-7007 | Item Unique Identification of Government Property | SEP 2007 |
| 252.215-7000 | Pricing Adjustments | DEC 1991 |
| 252.215-7002 | Cost Estimating System Requirements | DEC 2006 |
| 252.215-7004 | Excessive Pass-Through Charges | MAY 2008 |
| 252.225-7006 | Quarterly Reporting of Actual Contract Performance Outside the United States | MAY 2007 |
| 252.225-7012 | Preference For Certain Domestic Commodities | MAR 2008 |
| 252.226-7001 | Utilization of Indian Organizations and Indian-Owned Economic Enterprises, and Native Hawaiian Small Business Concerns | SEP 2004 |
| 252.227-7013 | Rights in Technical Data--Noncommercial Items | NOV 1995 |
| 252.227-7014 | Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation | JUN 1995 |
| 252.227-7015 | Technical Data--Commercial Items | NOV 1995 |
| 252.227-7016 | Rights in Bid or Proposal Information | JUN 1995 |
| 252.227-7019 | Validation of Asserted Restrictions--Computer Software | JUN 1995 |
| 252.227-7027 | Deferred Ordering Of Technical Data Or Computer Software | APR 1988 |
| 252.227-7037 | Validation of Restrictive Markings on Technical Data | SEP 1999 |
| 252.231-7000 | Supplemental Cost Principles | DEC 1991 |

| | | |
|---|---|---|
| 252.232-7003 | Electronic Submission of Payment Requests and Receiving Reports | MAR 2008 |
| 252.232-7010 | Levies on Contract Payments | DEC 2006 |
| 252.235-7011 | Final Scientific or Technical Report | NOV 2004 |
| 252.242-7004 | Material Management And Accounting System | NOV 2005 |
| 252.243-7002 | Requests for Equitable Adjustment | MAR 1998 |
| 252.244-7000 | Subcontracts for Commercial Items and Commercial Components (DoD Contracts) | JAN 2007 |
| 252.247-7023 | Transportation of Supplies by Sea | MAY 2002 |
| 252.247-7024 | Notification Of Transportation Of Supplies By Sea | MAR 2000 |

CLAUSES INCORPORATED BY FULL TEXT

52.203-14 DISPLAY OF HOTLINE POSTER(S) (DEC 2007)

(a) Definition.

United States, as used in this clause, means the 50 States, the District of Columbia, and outlying areas.

(b) Display of fraud hotline poster(s). Except as provided in paragraph (c)--

(1) During contract performance in the United States, the Contractor shall prominently display in common work areas within business segments performing work under this contract and at contract work sites--

(i) Any agency fraud hotline poster or Department of Homeland Security (DHS) fraud hotline poster identified in paragraph (b)(3) of this clause; and

(ii) Any DHS fraud hotline poster subsequently identified by the Contracting Officer.

(2) Additionally, if the Contractor maintains a company website as a method of providing information to employees, the Contractor shall display an electronic version of the poster(s) at the website.

(3) Any required posters may be obtained as follows:

Poster(s) Obtain from

(3) Any required posters may be obtained as follows:

Poster(s) Obtain from

DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884

(c) If the Contractor has implemented a business ethics and conduct awareness program, including a reporting mechanism, such as a <http://farsite.hill.af.mil/otcgi/llscgi60.exe?ACTION=Highlight&QUERY=%68%6F%74%6C%69%6E%65%20%70%6F%73%74%65%72&OP=and&DB=2&SORTBY=%54%49%54%4C%45&SUBSET=SUBSET&FROM=1&SIZE=50&ITEM=3#test7#test7> hotline poster <http://farsite.hill.af.mil/otcgi/llscgi60.exe?ACTION=Highlight&QUERY=%68%6F%74%6C%69%6E%65%20%70%6F%73%74%65%72&OP=and&DB=2&SORTBY=%54%49%54%4C%45&SUBSET=SUBSET&FROM=1&SIZE=50&ITEM=3#test9#test9> , then the Contractor need not display any agency fraud hotline posters as required in paragraph (b) of this clause, other than any required DHS posters.

(d) Subcontracts. The Contractor shall include the substance of this clause, including this paragraph (d), in all subcontracts that exceed $5,000,000, except when the subcontract—

(1) Is for the acquisition of a commercial item; or

(2) Is performed entirely outside the United States.

(End of clause)

52.215-19 NOTIFICATION OF OWNERSHIP CHANGES (OCT 1997)

(a) The Contractor shall make the following notifications in writing:

(1) When the Contractor becomes aware that a change in its ownership has occurred, or is certain to occur, that could result in changes in the valuation of its capitalized assets in the accounting records, the Contractor shall notify the Administrative Contracting Officer (ACO) within 30 days.

(2) The Contractor shall also notify the ACO within 30 days whenever changes to asset valuations or any other cost changes have occurred or are certain to occur as a result of a change in ownership.

(b) The Contractor shall--

(1) Maintain current, accurate, and complete inventory records of assets and their costs;

(2) Provide the ACO or designated representative ready access to the records upon request;

(3) Ensure that all individual and grouped assets, their capitalized values, accumulated depreciation or amortization, and remaining useful lives are identified accurately before and after each of the Contractor's ownership changes; and

(4) Retain and continue to maintain depreciation and amortization schedules based on the asset records maintained before each Contractor ownership change.

The Contractor shall include the substance of this clause in all subcontracts under this contract that meet the applicability requirement of FAR 15.408(k).

(End of clause)

52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 2000)

(a) The Government may extend the term of this contract by written notice to the Contractor within 18 months from the effective date of CLIN 0001; provided that the Government gives the Contractor a preliminary written notice of its intent to extend at least 14 days (60 days unless a different number of days is inserted) before the contract expires. The preliminary notice does not commit the Government to an extension.

(b) If the Government exercises this option, the extended contract shall be considered to include this option clause.

(c) The total duration of this contract, including the exercise of any options under this clause, shall not exceed 33 months.
(End of clause)

52.219-28 POST-AWARD SMALL BUSINESS PROGRAM REREPRESENTATION (JUNE 2007)

(a) Definitions. As used in this clause--

Long-term contract means a contract of more than five years in duration, including options. However, the term does not include contracts that exceed five years in duration because the period of performance has been extended for a cumulative period not to exceed six months under the clause at 52.217-8, Option to Extend Services, or other appropriate authority.

Small business concern 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, and qualified as a small business under the criteria in 13 CFR part 121 and the size standard in paragraph (c) of this clause.

(b) If the Contractor represented that it was a small business concern prior to award of this contract, the Contractor shall rerepresent its size status according to paragraph (e) of this clause or, if applicable, paragraph (g) of this clause, upon the occurrence of any of the following:

(1) Within 30 days after execution of a novation agreement or within 30 days after modification of the contract to include this clause, if the novation agreement was executed prior to inclusion of this clause in the contract.

(2) Within 30 days after a merger or acquisition that does not require a novation or within 30 days after modification of the contract to include this clause, if the merger or acquisition occurred prior to inclusion of this clause in the contract.

(3) For long-term contracts--

(i) Within 60 to 120 days prior to the end of the fifth year of the contract; and

(ii) Within 60 to 120 days prior to the exercise date specified in the contract for any option thereafter.

(c) The Contractor shall rerepresent its size status in accordance with the size standard in effect at the time of this rerepresentation that corresponds to the North American Industry Classification System (NAICS) code assigned to this contract. The small business size standard corresponding to this NAICS code can be found at http://www.sba.gov/services/contractingopportunities/sizestandardstopics/.

(d) The small business size standard for a Contractor providing a product which it does not manufacture itself, for a contract other than a construction or service contract, is 500 employees.

(e) Except as provided in paragraph (g) of this clause, the Contractor shall make the rerepresentation required by paragraph (b) of this clause by validating or updating all its representations in the Online Representations and Certifications Application and its data in the Central Contractor Registration, as necessary, to ensure they reflect current status. The Contractor shall notify the contracting office by e-mail, or otherwise in writing, that the data have been validated or updated, and provide the date of the validation or update.

(f) If the Contractor represented that it was other than a small business concern prior to award of this contract, the Contractor may, but is not required to, take the actions required by paragraphs (e) or (g) of this clause.

(g) If the Contractor does not have representations and certifications in ORCA, or does not have a representation in ORCA for the NAICS code applicable to this contract, the Contractor is required to complete the following rerepresentation and submit it to the contracting office, along with the contract number and the date on which the rerepresentation was completed:

The Contractor represents that it ( ) is, ( ) is not a small business concern under NAICS Code 541712- assigned to contract number HR0011-09-C-0028.

(Contractor to sign and date and insert authorized signer's name and title).

(End of clause)

52.222-2 PAYMENT FOR OVERTIME PREMIUMS (JUL 1990)

(a) The use of overtime is authorized under this contract if the overtime premium cost does not exceed $0.00 or the overtime premium is paid for work --

(1) Necessary to cope with emergencies such as those resulting from accidents, natural disasters, breakdowns of production equipment, or occasional production bottlenecks of a sporadic nature;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting;

(3) To perform tests, industrial processes, laboratory procedures, loading or unloading of transportation conveyances, and operations in flight or afloat that are continuous in nature and cannot reasonably be interrupted or completed otherwise; or

(4) That will result in lower overall costs to the Government.

(b) Any request for estimated overtime premiums that exceeds the amount specified above shall include all estimated overtime for contract completion and shall--

(1) Identify the work unit; e.g., department or section in which the requested overtime will be used, together with present workload, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime;

(2) Demonstrate the effect that denial of the request will have on the contract delivery or performance schedule;

(3) Identify the extent to which approval of overtime would affect the performance or payments in connection with other Government contracts, together with identification of each affected contract; and

(4) Provide reasons why the required work cannot be performed by using multishift operations or by employing additional personnel.

* Insert either "zero" or the dollar amount agreed to during negotiations. The inserted figure does not apply to the exceptions in paragraph (a)(1) through (a)(4) of the clause.

(End of clause)

52.227-11 PATENT RIGHTS--OWNERSHIP BY THE CONTRACTOR (DEC 2007)

(a) As used in this clause--

Invention means any invention or discovery that is or may be patentable or otherwise protectable under title 35 of the U.S. Code, or any variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.)

Made means--

(1) When used in relation to any invention other than a plant variety, the conception or first actual reduction to practice of the invention; or

(2) When used in relation to a plant variety, that the Contractor has at least tentatively determined that the variety has been reproduced with recognized characteristics.

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 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)), or any nonprofit scientific or educational organization qualified under a State nonprofit organization statute.

Practical application means to manufacture, in the case of a composition of 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 being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

Subject invention means any invention of the Contractor made in the performance of work under this contract.

(b) Contractor's rights. (1) Ownership. The Contractor may retain ownership of each subject invention throughout the world in accordance with the provisions of this clause.

(2) License. (i) The Contractor shall retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, unless the Contractor fails to disclose the invention within the times specified in paragraph (c) of this clause. The Contractor's license extends to any domestic subsidiaries and affiliates within the corporate structure of which the Contractor is a part, and includes the right to grant sublicenses to the extent the Contractor was legally obligated to do so at contract award. The license is transferable only with the written approval of the agency, except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(ii) The Contractor's license may be revoked or modified by the agency to the extent necessary to achieve expeditious practical application of the subject invention in a particular country in accordance with the procedures in FAR 27.302(i)(2) and 27.304-1(f).

(c) Contractor's obligations. (1) The Contractor shall disclose in writing each subject invention to the Contracting Officer within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The disclosure shall identify the inventor(s) and this contract under which the subject invention was made. It shall be sufficiently complete in technical detail to convey a clear understanding of the subject invention. The disclosure shall also identify any publication, on sale (i.e., sale or offer for sale), or public use of the subject invention, or whether a manuscript describing the subject invention has been submitted for publication and, if so, whether it has been accepted for publication. In addition, after disclosure to the agency, the Contractor shall promptly notify the Contracting Officer of the acceptance of any manuscript describing the subject invention for publication and any on sale or public use.

(2) The Contractor shall elect in writing whether or not to retain ownership of any subject invention by notifying the Contracting Officer within 2 years of disclosure to the agency. However, in any case where publication, on sale, or public use has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period.

(3) The Contractor shall file either a provisional or a nonprovisional patent application or a Plant Variety Protection Application on an elected subject invention within 1 year after election. However, in any case where a publication, on sale, or public use has initiated the 1-year statutory period during which valid patent protection can be obtained in the United States, the Contractor shall file the application prior to the end of that statutory period. If the Contractor files a provisional application, it shall file a nonprovisional application within 10 months of the filing of the provisional application. The Contractor shall file patent applications in additional countries or international patent offices within either 10 months of the first filed patent application (whether provisional or nonprovisional) or 6 months from the date permission is granted by the Commissioner of Patents to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

(4) The Contractor may request extensions of time for disclosure, election, or filing under paragraphs (c)(1), (c)(2), and (c)(3) of this clause.

(d) Government's rights--(1) Ownership. The Contractor shall assign to the agency, on written request, title to any subject invention--

(i) If the Contractor fails to disclose or elect ownership to the subject invention within the times specified in paragraph (c) of this clause, or elects not to retain ownership; provided, that the agency may request title only within 60 days after learning of the Contractor's failure to disclose or elect within the specified times.

(ii) In those countries in which the Contractor fails to file patent applications within the times specified in paragraph (c) of this clause; provided, however, that if the Contractor has filed a patent application in a country after the times specified in paragraph (c) of this clause, but prior to its receipt of the written request of the agency, the Contractor shall continue to retain ownership in that country.

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

(2) License. If the Contractor retains ownership of any subject invention, the Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice, or have practiced for or on its behalf, the subject invention throughout the world.

(e) Contractor action to protect the Government's interest. (1) The Contractor shall execute or have executed and promptly deliver to the agency all instruments necessary to--

(i) Establish or confirm the rights the Government has throughout the world in those subject inventions in which the Contractor elects to retain ownership; and

(ii) Assign title to the agency when requested under paragraph (d) of this clause and to enable the Government to obtain patent protection and plant variety protection for that subject invention in any country.

(2) The Contractor shall 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 the Contractor's format, each subject invention in order that the Contractor can comply with the disclosure provisions of paragraph (c) of this clause, 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) of this clause. The Contractor shall instruct such employees, through employee agreements or other suitable educational programs, as to the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

(3) The Contractor shall notify the Contracting Officer of any decisions not to file a nonprovisional patent application, continue the 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 30 days before the expiration of the response or filing period required by the relevant patent office.

(4) The Contractor shall include, within the specification of any United States nonprovisional patent or plant variety protection application and any patent or plant variety protection certificate issuing thereon covering a subject invention, the following statement, "This invention was made with Government support under (identify the contract) awarded by (identify the agency). The Government has certain rights in the invention."

(f) Reporting on utilization of subject inventions. The Contractor shall submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining utilization of the subject invention that are being made by the Contractor or its licensees or assignees. The reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and other data and information as the agency may reasonably specify. The Contractor also shall provide additional reports as may be requested by the agency in connection with any march-in proceeding undertaken by the agency in accordance with paragraph (h) of this clause. The Contractor also shall mark any utilization report as confidential/proprietary to help prevent inadvertent release outside the Government. As required by 35 U.S.C. 202(c)(5), the agency will not disclose that information to persons outside the Government without the Contractor's permission.

(g) Preference for United States industry. Notwithstanding any other provision of this clause, neither the Contractor nor any assignee shall grant to any person the exclusive right to use or sell any subject invention in the United States unless the 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 an agreement may be waived by the agency upon a showing by the Contractor 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.

(h) March-in rights. The Contractor acknowledges that, with respect to any subject invention in which it has retained ownership, the agency has the right to require licensing pursuant to 35 U.S.C. 203 and 210(c), and in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency in effect on the date of contract award.

(i) Special provisions for contracts with nonprofit organizations. If the Contractor is a nonprofit organization, it shall--

(1) Not assign rights to a subject invention in the United States without the written approval of the agency, except where an assignment is made to an organization that has as one of its primary functions the management of inventions, provided, that the assignee shall be subject to the same provisions as the Contractor;

(2) Share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (but through their agency if the agency deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202(e) and 37 CFR 401.10;

(3) Use the balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions for the support of scientific research or education; and

(4) Make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business concerns, and give a preference to a small business concern when licensing a subject invention if the Contractor determines that the small business concern has a plan or proposal for marketing the invention which, 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 concerns; provided, that the Contractor is also satisfied that the small business concern 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 Contractor.

(5) Allow the Secretary of Commerce to review the Contractor's licensing program and decisions regarding small business applicants, and negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary's review discloses that the Contractor could take reasonable steps to more effectively implement the requirements of paragraph (i)(4) of this clause.

(j) Communications.
**All written notifications required by this clause shall be submitted to the Administrative Contracting Officer (ACO). All required reporting shall be accomplished using the i-Edison.gov reporting website (https://s-edison.info.nih.gov/iEdison/).**

**Final patent report will be submitted in hard copy to the Administrative Contracts Officer (ACO) and Procurement Contract Officer (PCO) designated herein until such time that iEdison allows for electronic submission.**

(k) Subcontracts. (1) The Contractor shall include the substance of this clause, including this paragraph (k), in all subcontracts for experimental, developmental, or research work to be performed by a small business concern or nonprofit organization.

(2) The Contractor shall include in all other subcontracts for experimental, developmental, or research work the substance of the patent rights clause required by FAR Subpart 27.3.

(3) At all tiers, the patent rights clause must be modified to identify the parties as follows: references to the Government are not changed, and the subcontractor has all rights and obligations of the Contractor in the clause. The Contractor shall not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(4) In subcontracts, at any tier, the agency, the subcontractor, and the Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and the agency with respect to the matters covered by the clause; provided, however, that nothing in this paragraph is ntended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (h) of this clause.

(End of clause)

52.233-4 APPLICABLE LAW FOR BREACH OF CONTRACT CLAIM (OCT 2004)

United States law will apply to resolve any claim of breach of this contract.

(End of clause)

52.247-1 COMMERCIAL BILL OF LADING NOTATIONS (FEB 2006)

When the Contracting Officer authorizes supplies to be shipped on a commercial bill of lading and the Contractor will be reimbursed these transportation costs as direct allowable costs, the Contractor shall ensure before shipment is made that the commercial shipping documents are annotated with either of the following notations, as appropriate:

(a) If the Government is shown as the consignor or the consignee, the annotation shall be:

"Transportation is for the Defense Advanced Research Projects Agency (DARPA) and the actual total transportation charges paid to the carrier(s) by the consignor or consignee are assignable to, and shall be reimbursed by, the Government."

(b) If the Government is not shown as the consignor or the consignee, the annotation shall be:

"Transportation is for the Defense Advanced Research Projects Agency (DARPA) and the actual total transportation charges paid to the carrier(s) by the consignor or consignee shall be reimbursed by the Government, pursuant to cost-reimbursement contract no. HR011-09-C-0028. This may be confirmed by contacting the Administrative Contracting Officer at DCMA Virginia"

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

http://farsite.hill.af.mil

(End of clause)

52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Defense Federal Acquisition Regulation Supplement (48 CFR chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

252.235-7010 Acknowledgment of Support and Disclaimer. (MAY 1995)

(a) The Contractor shall include an acknowledgment of the Government's support in the publication of any material based on or developed under this contract, stated in the following terms: This material is based upon work supported by the Defense Advanced Research Projects Agency (DARPA) under Contract No. HR0011-09-C-0028.

(b) All material, except scientific articles or papers published in scientific journals, must, in addition to any notices or disclaimers by the Contractor, also contain the following disclaimer: Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Defense Advanced Research Projects Agency (DARPA), U.S. Department of Defense (DoD) or U.S. Government.

Section J - List of Documents, Exhibits and Other Attachments

LIST OF ATTACHMENTS

| DOCUMENT TYPE | PAGES | DATE |
|---|---|---|
| **Attachment 1** – Statement of Work | 5 | 15 September 2008 |
| **Attachment 2** – COR Letter | 3 | 30 September 2008 |

# Statement of Work
# for
# Revolution in Fiber Lasers (RIFL)
# by
# FIBERTEK, Inc.

15 September 2008

## 1.0 Research Objectives & General Program Scope:

The objective of the RIFL program is to scale fiber laser amplifiers to > 1 kW in Phase 1, and then to explore scaling fiber laser amplifiers to > 3kW in Phase 2. In each case the high power output of the fiber laser amplifier shall be single-mode, polarization-maintaining, and narrow linewidth (consistent with coherent combination of multiple fiber laser amplifiers).

Fibertek, Inc. will utilize a systematic and integrated approach to the design, realization and test demonstration of multi-kW SF, SP, SM all-fiber-MOPA at 1μm, via innovations in:

- efficient high Yb-doped fibers, with large core/clad ratio for short length (< 3 m) operation
- scaling of mode area, while ensuring mode-discrimination *via* Yb-doping profile and refractive-index profile tailoring
- effective thermal management methods for added SBS mitigation
- advanced fiber fabrication method, pioneered by (b)(4) ideally suited for the precise fabrication of above such fibers (*partnered with* (b)(4)
- scaling of high-brightness fiber-coupled LD pumps to kW-levels, by combining advances in emitter power density and beam-combining methods (*partnered with* (b)(4)
- robust fiber-optic components (*e.g.* fused PM-combiners, isolators with integrated filters, improved fiber-ends, *etc.*) capable of high-power operation in MOPA-chains producing multi-kW output (*vendors: ITF Labs, EM4 Inc. and OFR Inc.*)
- advanced fiber fusion-splicing methods for such large dual-clad PM fibers, to produce low-loss and 'mode-matched' launch conditions in 'all-fiber' configuration (*vendor: Fujikura*)

To accomplish the above program objectives, Fibertek, Inc. will design, develop and implement a 'breadboard' laboratory demonstration of an 'all-fiber' MOPA system operating cw at $\lambda \sim 1064$ nm, producing $\geq 1$ kW cw power output in a single-frequency, diffraction limited, single-polarization beam. Drive and control/monitoring electronics will be housed in standard 19" rack equipment. This MOPA system will use a combination of passive (conduction) cooling and TE-cooling/fan-cooling. However, 'breadboard' water-cooling may be used to reject heat to ambient. A two-step approach will be used – a 'free-space' interconnected version, especially for final MOPA stage, to facilitate design engineering, evaluation and performance assessment. With increasing confidence, an 'all-fiber' version will be assembled and tested in parallel, to mitigate program schedule risks. This system will be set-up, tested and available for extended review by the program review panel team, in a 'clean environment' facility within Fibertek, Inc.

Fibertek, Inc. will develop a RIFL solution based on a multi-stage fiber-MOPA system, using suitably design-engineered high-Yb-doped LMA fibers, as developed by (b)(4) (nLight), in this program. Appropriate high-power high-brightness fiber-coupled pump source will developed by (b)(4) An 'all-fiber' version of the system will be implemented by design optimization and extension of current state-of-art in fused-fiber pump combiners and mode-field adapters, fiber-pigtailed optical isolators with integrated rejection filters, and precision fusion-slicing for large-diameter PM fibers, by working with various subcontractors/vendors; Avensys/ITF Labs, OFR Inc. & EM4 Inc., and AFL-Telecom/Fujikura, respectively. Fibertek, Inc. will achieve technical risk mitigation through multiple design points. Teaming/Supplier risk mitigation will be achieved by working in parallel, but in a much reduced scope, with differing technology/approaches and suppliers.

Fibertek, Inc. shall allow Government representatives to witness any tests deemed necessary in order to validate performance consistent with the metrics delineated in this SOW. The final disposition of the hardware developed by Fibertek, Inc. will be determined during the course of Phase II, if the Phase II option is exercised. The Government will, at that time, notify Fibertek, Inc. of its intent regarding the delivery of any such hardware, to include providing delivery location, if the Government chooses to exercise its right to have the resulting hardware items delivered.

## 2.0 Milestones & Technical Tasks

### 2.1 Milestones

| # | Phase 1 Milestones | Month |
|---|---|---|
| 1 | Demonstrate multi-stage fiber-MOPA producing P~10W, and retaining all coherence properties of the seed 1μm laser source (<100kHz linewidth, $M^2$ ~ 1.1, PER ≥ 20 dB) | 4 |
| 2 | Demonstrate P>100W power operation (<100kHz linewidth, $M^2 \leq 1.4$, PER ≥ 20 dB) using the baseline Yb1200-30/250 dual-clad PM fiber | 6 |
| 3 | Demonstration of high-efficiency Yb1200-50/250 DC-PM fibers | 9 |
| 4 | Demonstrate P≥5W, pathfinder unit of fiber-optic isolator, ASE-filter, polarizer | 9 |
| 5 | Demonstration of 600W (200μm/0.22NA) fiber coupled LD pump | 12 |
| 6 | Demonstrate ~400W power operation (<100kHz linewidth, $M^2 \leq 2$, PER≥20dB) using Yb1200-50/250 DC-PM fibers | 12 |
| 7 | Demonstrate 1x3 combined fiber-coupled Pump using multiple 600W units of (#3) for P ≥ 1.5kW, for coupling to 250um/0.46NA Yb-doped fibers | 15 |
| 8 | P≥1kW operation (<100kHz linewidth, $M^2 \leq 1.4$, PER≥20 dB), efficiency~15% runtime~200sec, lifetime>100hrs *(extrapolated from accum. runtime)* | 18 |
| | **Phase 2 Milestones** | **Month** |
| 9 | Demonstrate P≥20W capable fiber-optic isolators, ASE filters, polarizers | 21 |
| 10 | Develop & demonstrate multi-kW fiber-coupled pumps (P≥2 kW), either through 1xN combining, or from 400μm/0.22NA fiber | 24 |
| 11 | Development & demonstration of high-efficiency Yb1200 80/400 DC-PM fibers *(or similar fiber design)* | 27 |

| | | |
|---|---|---|
| 12 | P≥3kW operation (<100kHz linewidth, $M^2$≤1.4, PER≥20 dB), efficiency>20% runtime~200sec, lifetime>100hrs *(extrapolated from accum. runtime)* | 33 |

## 2.2 Phase 1 Tasks

***Fibertek, Inc.***

(1) Detailed design modeling and assessment of fiber-MOPA system and its key components (optical fiber, LD pumps, pump combiner, *etc.*) in support of Phase I milestone. Alternate design points will be specifically obtained. This task is an extension of the methodology described in this proposal. Interdependent parameters will be specifically included.
(2) Design, modeling and separate experimental verification of MOPA thermal management system in support of an optimized scheme for thermal-gradient induced SBS mitigation.
(3) Initial assessment and verification of individual components for cw operation to respective power levels estimated for the final power amplifier stage of the MOPA system, *e.g.* optical fiber ends, LD pumps, Pump combiners, Isolators, *etc.*
(4) Baseline fiber-MOPA system set-up using currently available optimized fiber based on same optical fiber fabrication (DND) process (*i.e.* based on using commercially available Liekki Yb1200-30/250μm 0.07NA-DC-PM). Improved & quantitative PM-fiber splicing method will be used, based on actively-controlled PM fusion splicing from AFL/Fujikura.
(5) Assemble and test a 'free-space' connected version of the final stage of MOPA design point, to assess performance against the predicted/estimated parameters, as well as Phase I milestone. Revise design points and optimize aspects of above steps (as needed) to optimize measured performance against Phase I milestone
(6) Assemble and test an "all-fiber" version of the final design point for kW class MOPA system, producing a highly coherent output per the Phase I milestone. Make it available for on-site test evaluation by an external review panel.
(7) Program management, interaction and supply of partners/subcontractors for key component development tasks. Communicate technical, program & financial status to DARPA.

(b)(4)

(8) Supply to Fibertek, non-PM polymer-clad version of Yb1200-50/250μm-0.07NA-DC fiber *(this is based on existing Liekki design for advanced (non-commercial) fibers)*
(9) Supply to Fibertek, non-PM polymer-clad version of Yb1200-80/400μm-0.07NA-DC fiber *(this is based on existing Liekki design for advanced (non-commercial) fibers)*
(10) Optimize process for all glass-clad fibers to reach ≥ 0.25NA for the inner-clad.
(11) Develop & fabricate non-PM all-glass-clad Yb1200-50/250/300μm-0.07NA-DC fiber
(12) Further enhancement of R.I. & doping-profile control tolerance, *via* process improvement
(13) Develop & fabricate modified RI-index & Yb-doping profile, for fiber from task 11
(14) Develop & fabricate PM version of fiber from task 13
(15) Software development & integration *(working in conjunction with Fibertek, Inc.)*

(b)(4)

(16) Assemble, test & supply to Fibertek, Qty = 2 of 200W, 200μm 0.22NA fiber-coupled 976nm high-power LD pumps. Extend to prototype a 400W, 400μm, 0.22NA, pump.

(17) Optimize laser-bar design & assembly and extend architecture of beam-combining to demonstrate prototype of 600W/200μm/0.22NA, fiber-coupled 976nm LD pumps
(18) Assemble, test and deliver to Fibertek, Qty=3 of 600W, 200μm 0.22NA, fiber-coupled 976 nm high-power LD pumps

***Others***

(19) OFR, Inc.: high-power isolators up to 30W and beyond, with fiber-pigtails
(20) EM4, Inc.: fiber-pigtail and innovative fiber-end preparation for high cw powers, and 'compensated' high-power isolator designs
(21) Work with nLight Corp. (sub-contracted) to develop and demonstrate alternate approach to (single-emitter LD chips based) compact high-brightness fiber-coupled pumps

## 2.3 Phase 2 Tasks

***Fibertek, Inc.***

(22) Review and re-assess design path to be selected for Phase II milestone demonstration.
(23) Optimize and implement fiber thermal management scheme for "80/400μm" fiber
(24) Assessment and verification of individual components for cw operation to respective power levels estimated for the final power amplifier stage of the MOPA system, *e.g.* optical fiber ends, LD pumps, Pump combiners, Isolators, *etc.*
(25) Revised multi-stage MOPA system (an additional YDFA-amplifer stage is needed so as to be capable of producing high-enough signal power input (≥30W), so as to limit gain to ≤20dB for the final power amplification stage to achieve ≥ 3 kW coherent power output
(26) Assemble & test free-space coupled version of final power amplifier stage
(27) Assemble and test an "all-fiber" version of the final design point for kW class MOPA system, producing a highly coherent output per the Phase II milestone. Make it available for on-site test evaluation by an external review panel.
(28) Program management, interaction and supply of partners/subcontractors for key component development tasks. Communicate technical & program status to DARPA.

(b)(4)

(29) Develop & fabricate non-PM all-glass-clad Yb1200-80/400/460μm-0.07NA-DC fiber
(30) Develop & fabricate modified RI-index & Yb-doping profile, for fiber from task 29
(31) Develop & fabricate PM version of fiber from task 30
(32) Process optimization for higher dopings (*i.e.* Yb2000), with low photo-darkening
(33) Other custom fiber per evolving program requirements (*e.g.* 100μm core, SBS mitigation *via* acoustic anti-guiding)

(b)(4)

(34) Assemble/Test/Deliver Qty=6 of previously developed 600W/200μm,0.22NA pumps
(35) Multi-kW (>2kW), 400μm,0.22NA fiber-coupled 976nm pumps – (i) design & process development, (ii) prototype build & test
(36) Assemble/Test and deliver 2 more above pump units from task 35

***Others***

(37) Avensys/ITF Labs: Improved prototypes (Qty=2) of their kW pump combiners for ≥ 2 kW, with 80/400/460μm,0.22NA output fiber
(38) EM4, Inc. OR OFR, Inc.: select preferred supplier to continue work on fiber-pigtailed (isolator + integrated filters) to > 50 W cw power handling capability
(39) nLight : continued work on alternate approach to compact high-brightness 976 nm fiber-coupled pump 'demonstrator' unit
(40) Program Closure – Fibertek, Inc.

## 3.0 Program Management

Fibertek, Inc. shall provide oversight of all development activities, including those to be performed by subcontractor and/or outside vendors, to ensure cost and schedule compliance in accordance with the basic contract. Fibertek, Inc. shall be prepared to support a kickoff meeting at the contractor's facility and support periodic reporting and offsite program reviews, including the final reports.

Fibertek, Inc. shall support/host up to two (2) weeks of on-site performance testing by a Government team at the end of both Phase I and Phase II.

Fibertek, Inc. shall allow Government representatives to witness any contractor-performed tests that will be carried out, as scheduled, in order to validate performance consistent with the metrics delineated in this SOW. Fibertek, Inc. shall coordinate such test activities with the Contracting Officer's Representative (COR) to allow the Government the opportunity to witness such tests on-site as they are being conducted.

## 4.0 Program (Phase I and II) Deliverables

| | ***Deliverables*** | **Year 1** | | | | **Year 2** | | | | **Year 3** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1** | Design + Test results on all prior stages | | X | | | | | | | | | | |
| **2** | Design + Test result on 30/250 *hp*-MOPA | | X | | | | | | | | | | |
| **3** | Design + Test result on 50/250 *hp*-MOPA | | | | | X | | | | | | | |
| **4** | Thermal management design & test (via FBG) | | | | X | | | | | | | | |
| **5** | 600W fiber-coupled(200u/0.22NA) LD pump | | | | | X | | | | | | | |
| **6** | Fiber-optic Isolator + ASE-filter (10,30,50W) | | | | X | | X | | X | | | | |
| **7** | **Milestone 1 : RIFL Phase-I demo** | | | | | | X | | | | | | |
| **8** | Design & Test demo of 80/400 f-MOPA | | | | | | | | X | | | | |
| **9** | Design & Test of glass-clad 80/400 f-MOPA | | | | | | | | | X | | | |
| **10** | Multi-kW fiber-coupled pump in 400u fiber | | | | | | | | | X | | | |
| **11** | **Milestone 2 : RIFL Phase-II demo** | | | | | | | | | | X | | |
| | ***Reports*** | | | | | | | | | | | | |
| **a** | Technical Summary Report | X | X | X | X | X | X | X | X | X | X | | |
| **b** | Cost Summary Report | X | X | X | X | X | X | X | X | X | X | | |
| **c** | Progress Report (**X**) & Program Report (**X**) | | | | X | | X | | X | | | X | |

*Note: (1)All deliverables in last week of indicated quarter from start of program (2)hp-MOPA=high-power MOPA*
*Note (2) Phase I and II Final Reports, interim technical reports, and interim cost reports shall be provided as required by Sections C and F of the contract.*

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

# MEMORANDUM FOR CONTRACTING OFFICER'S REPRESENTATIVE

FROM: DARPA, Contracts Management Office

TO: Frank Hanson, SPAWAR

SUBJECT: Appointment as Contracting Officer's Representative (COR)

1. You are hereby appointed as the Contracting Officer's Representative for the below Revolution in Fiber Lasers (RIFL) Contract:

| RIFL Awardee | Contract No. |
|---|---|
| Fibertek, Inc. | HR0011-09-C-0028 |

2. This appointment authorizes and designates you to perform the following duties and/or responsibilities as specified herein:

   a. Furnish plans, schedules, specifications, descriptions, and other documents to the contractor as required by the contract.

   b. Assist the contractor in interpreting technical aspects of the contract specifications/statement of work. Differences of opinion and interpretations which could affect the terms and conditions of the contract will be referred to the contracting officer for resolution.

   c. Provide Government recommendations/approvals to the contractor promptly in all cases where the contract calls for technical approval.

   d. Observe, monitor, and assess the contractor's performance under the terms of the contract. This includes reporting promptly to the contracting officer any failures, delays, or significant deviations of performance, quality, costs, or other actions which might jeopardize contract performance.

3. In the performance of the duties delegated to you in this letter, you are cautioned that you could be held personally liable for actions taken or directions given by you to the contractor that are beyond the authorities given to you in this letter. The duties or authorities in this letter are not delegable; therefore, you must advise the Contracting Officer or the Contract Administrator/Specialist immediately when you are unable to perform these duties.

4. In your dealings with the contractor you must not give technical direction as though the contractor's employees are Government employees. You must maintain a formal, arms-length relationship with the contractor in order to avoid even an appearance that the contract

is one for personal services. If the contractor's performance takes place in a Government facility, then to the maximum extent practicable, the contractor's work area should be physically separated from areas in which Government employees work, and communication with the contractor's employees on contractual matters should be only through that contractor employee(s) designated by the contractor to supervise them. You must not give any direction to the contractor that is not authorized by the statement of work because it is not the intent of the Government that a contractor be required to do anything that is not included in the contract.

5. You are responsible for providing prompt notification to the contracting officer any significant deficiencies with respect to contractor performance or other actions which might jeopardize contract performance.

6. You are not authorized by this letter to take any action, either directly or indirectly, that could result in a change in the pricing, quantity, quality, place of performance, delivery schedule or any other terms and conditions of the basic contract, or to direct the accomplishment of effort which would exceed the scope of the basic contract. You must be especially cautious in providing interpretation of the specifications/ statement of work. The agreement reached or technical direction given must be formalized in writing with copies to the contracting officer. You shall also inform the contractor that if he believes that the COR's interpretation is erroneous, the contractor must notify the contracting officer in writing concerning the details of his position.

7. Specific duties in addition to those above are as follows:

    a. Control all government technical interfaces with the contractor.

    b. Ensure that copies of government technical correspondence are forwarded to the contracting officer for placement in the contract file unless otherwise posted to TFIMS by the contractor in accordance with the contract.

    c. Promptly furnish documentation on any requests for change, deviation, or waiver (whether generated by the Government or the contractor) to the contracting officer for appropriate action.

    d. Review and, if required (i.e., Fixed Price Payments), accept invoices submitted through WAWF as stipulated in Section G of the Contract.

    e. Provide required review of Patent/Invention Disclosures made in I-Edison (http://www.iedison.gov).

    f. The COR must maintain a separate file for each contract for which he/she acts as COR. The file should serve as a repository and record of all documents and communications between the contractor and the COR. At a minimum, the file must

include a copy of the contract and all modifications as well as the COR appointment letter. Examples of other file documentation may include:

- Reports required per the contract, e.g. interim and final technical or patent reports
- Memoranda for Record documenting important contract discussions
- Records of formal meetings, e.g. post award conference, program reviews, etc.

g. Assist ACO and/or PCO, as requested, with closeout activities at completion of contract period of performance.

8. If this is your first appointment as a COR or if you have not performed COR duties within the last two years, and in order to comply with DFARS 201.6-2, you must complete COR training immediately so that you can properly execute your responsibilities under this contract. A good source of COR training is available via a web-based module, CLC 106, "Contracting Officer Representative with a Mission Focus" at www.dau.mil.

9. Your appointment as COR for this effort expires on final disposition of the contract.

10. Your good judgment in performing your duties under the contract will have an important effect on the value of the performance obtained by the Government.

(b)(6) [redacted]

DARPA PCO
Contracting Officer

9/30/08
Date

Appointee
Contracting Officer's Representative

9/30/08
Date

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 3 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO.(If applicable) |
|---|---|---|---|
| P00001 | 06-Nov-2008 | SEE SCHEDULE | |

6. ISSUED BY CODE HR0011

DARPA
CMO
ATTN: MICHAEL D. BLACKSTONE
3701 N. FAIRFAX DR.
ARLINGTON VA 22203-1714

7. ADMINISTERED BY (If other than item 6) CODE S2404A

DCMA VIRGINIA
10500 BATTLEVIEW PARKWAY
SUITE 200
MANASSAS VA 20109-2342

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

FIBERTEK, INC.
510 HERNDON PKWY
HERNDON VA 20170-5225

CODE 8Y519 FACILITY CODE

| | |
|---|---|
| | 9A. AMENDMENT OF SOLICITATION NO. |
| | 9B. DATED (SEE ITEM 11) |
| X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

**See Schedule**

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Unilateral IAW Limitation of Funds Clause 52.232-22 & Clause G-6.

E. IMPORTANT: Contractor [X] is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill0998

The purpose of this modification is to provide incremental funding, in the amount of $2,599,000 (AO: X670/14, ACRN: AB), for Phase I of the RIFL program. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) MICHAEL D. BLACKSTONE / PCO TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer) | 16C. DATE SIGNED 06-Nov-2008 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The purpose of modification P00001 to Contract No. HR0011-09-C-0028 is to provide incremental funding for Phase I of the RIFL effort. Said contract is hereby revised as follows:

1. SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000102 is added as follows:

| ITEM NO | SUPPLIES/SERVICES | ESTIMATED COST | FIXED FEE | TOTAL EST. COST PLUS FIXED FEE |
|---|---|---|---|---|
| 000102 | Funding for CLIN 0001 only<br>AO No. X670/14 | | | |
| | ACRN AB | | | $2,599,000.00 |

2. SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item has been added to SUBCLIN 000102:

| DELIVERY DATE | QUANTITY | SHIP TO ADDRESS | UIC |
|---|---|---|---|
| 02-APR-2010 | | SPAWAR SYSTEMS CENTER SAN DIEGO<br>DR. FRANK HANSON<br>SPAWARSYSCEN 55430<br>53490 DOW STREET<br>SAN DIEGO CA 92152-5743<br>(619) 553-2094<br>FOB: Destination | N00039 |

3. SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $2,599,000.00 from $553,000.00 to $3,152,000.00.

SUBCLIN 000102:
Funding on SUBCLIN 000102 is initiated as follows:

ACRN: AB

CIN: 00000000000000000000000000000

Acctng Data: 9790400 1320 X670 P9G10 2525 DPAC 9 5064 S12136 62702E

Increase: $2,599,000.00

Total: $2,599,000.00

4. G-6 Clause G-6, "Incremental Funding," is revised as indicated in bold below:

(a) This contract shall be subject to incremental funding, as indicated in the table below, which is presently made available for performance under this contract. It is estimated that the funds presently available are sufficient to permit the Contractor's performance through the performance end dates indicated in the table below. Except in accordance with the Section I clause FAR 52.232-22, "Limitation of Funds," no legal liability of the part of the Government for payment of any money in excess of the funds listed in the table below shall arise unless and until additional funds are made available by the Contracting Officer through a modification to this contract.

| **Phase** | **CLIN** | **Funding Provided to Date** | **Funding Period of Performance End Date** |
|---|---|---|---|
| **1** | **0001** | **$3,152,000** | **31 December 2009** |
| 2 | 0002 | TBD | TBD |

5. Except as modified herein, all terms and conditions of Contract No. HR0011-09-C-0028 shall remain in full force and effect.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 2 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO.(If applicable) |
|---|---|---|---|
| P00002 | 08-Dec-2008 | SEE SCHEDULE | |

6. ISSUED BY CODE HR0011

DARPA
CMO
ATTN: MICHAEL D. BLACKSTONE
3701 N. FAIRFAX DR.
ARLINGTON VA 22203-1714

7. ADMINISTERED BY (If other than item 6) CODE S2404A

DCMA VIRGINIA
10500 BATTLEVIEW PARKWAY
SUITE 200
MANASSAS VA 20109-2342

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

FIBERTEK, INC.
510 HERNDON PKWY
HERNDON VA 20170-5225

CODE 8Y519 FACILITY CODE

| | |
|---|---|
| | 9A. AMENDMENT OF SOLICITATION NO. |
| | 9B. DATED (SEE ITEM 11) |
| X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

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X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Mutual of the Parties

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill09173

The purpose of this modification is to revise the the SOW to address concerns raised during the kickoff meeting. The 15 September 2008 version is hereby replaced in its entirety with the 24 November 2008 Rev 1 SOW provided as Enclosure 1 to this modification. See attached documents.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) MICHAEL D. BLACKSTONE / PCO TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer) | 16C. DATE SIGNED 08-Dec-2008 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

HR0011-09-C-0028 is hereby revised as bolded below:

1. SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

LIST OF ATTACHMENTS

| DOCUMENT TYPE | PAGES | DATE |
|---|---|---|
| **Attachment 1 – Statement of Work – Rev 1** | 5 | **24 November 2008** |
| **Attachment 2** – COR Letter | 3 | 30 September 2008 |

2. Except as modified herein, all terms and conditions of Contract No. HR0011-09-C-0028 shall remain in full force and effect.

# Statement of Work
# for
# Revolution in Fiber Lasers (RIFL)
# by
# FIBERTEK, Inc.

Revision 1 - 24 November 2008

## 1.0 Research Objectives & General Program Scope:

The objective of the RIFL program is to scale fiber laser amplifiers to > 1 kW in Phase 1, and then to explore scaling fiber laser amplifiers to > 3kW in Phase 2. In each case the high power output of the fiber laser amplifier shall be single-mode, polarization-maintaining, and narrow linewidth (consistent with coherent combination of multiple fiber laser amplifiers).

Fibertek, Inc. will utilize a systematic and integrated approach to the design, realization and test demonstration of multi-kW SF, SP, SM all-fiber-MOPA at 1μm, via innovations in:

- efficient high Yb-doped fibers, with large core/clad ratio for short length (< 3 m) operation
- scaling of mode area, while ensuring mode-discrimination *via* Yb-doping profile and refractive-index profile tailoring
- effective thermal management methods for added SBS mitigation
- advanced fiber fabrication method, pioneered by (b)(4) ideally suited for the precise fabrication of above such fibers (*partnered with* (b)(4)
- scaling of high-brightness fiber-coupled LD pumps to kW-levels, by combining advances in emitter power density and beam-combining methods (*partnered with* (b)(4)
- robust fiber-optic components (*e.g.* fused PM-combiners, isolators with integrated filters, improved fiber-ends, *etc.*) capable of high-power operation in MOPA-chains producing multi-kW output (*vendors: ITF Labs, EM4 Inc. and OFR Inc.*)
- advanced fiber fusion-splicing methods for such large dual-clad PM fibers, to produce low-loss and 'mode-matched' launch conditions in 'all-fiber' configuration (*vendor: Fujikura*)

To accomplish the above program objectives, Fibertek, Inc. will design, develop and implement a 'breadboard' laboratory demonstration of an 'all-fiber' MOPA system operating cw at $\lambda \sim 1064$ nm, producing $\geq 1$ kW cw power output in a single-frequency, diffraction limited, single-polarization beam. Drive and control/monitoring electronics will be housed in standard 19" rack equipment. This MOPA system will use a combination of passive (conduction) cooling and TE-cooling/fan-cooling. However, 'breadboard' water-cooling may be used to reject heat to ambient. A two-step approach will be used – a 'free-space' interconnected version, especially for final MOPA stage, to facilitate design engineering, evaluation and performance assessment. With increasing confidence, an 'all-fiber' version will be assembled and tested in parallel, to mitigate program schedule risks. This system will be set-up, tested and available for extended review by the program review panel team, in a 'clean environment' facility within Fibertek, Inc.

Fibertek, Inc. will develop a RIFL solution based on a multi-stage fiber-MOPA system, using suitably design-engineered high-Yb-doped LMA fibers, as developed by (b)(4) (nLight), in this program. Appropriate high-power high-brightness fiber-coupled pump source will developed by (b)(4) An 'all-fiber' version of the system will be implemented by design optimization and extension of current state-of-art in fused-fiber pump combiners and mode-field adapters, fiber-pigtailed optical isolators with integrated rejection filters, and precision fusion-slicing for large-diameter PM fibers, by working with various subcontractors/vendors; Avensys/ITF Labs, OFR Inc. & EM4 Inc., and AFL-Telecom/Fujikura, respectively. Fibertek, Inc. will achieve technical risk mitigation through multiple design points. Teaming/Supplier risk mitigation will be achieved by working in parallel, but in a much reduced scope, with differing technology/approaches and suppliers.

Fibertek, Inc. shall allow Government representatives to witness any tests deemed necessary in order to validate performance consistent with the metrics delineated in this SOW. The final disposition of the hardware developed by Fibertek, Inc. will be determined during the course of Phase II, if the Phase II option is exercised. The Government will, at that time, notify Fibertek, Inc. of its intent regarding the delivery of any such hardware, to include providing delivery location, if the Government chooses to exercise its right to have the resulting hardware items delivered.

## 2.0 Milestones & Technical Tasks

### 2.1 Milestones

| # | Phase 1 Milestones | Month |
|---|---|---|
| 1 | Demonstrate multi-stage fiber-MOPA producing P~10W, and retaining all coherence properties of the seed 1μm laser source (<100kHz linewidth, $M^2$ ~ 1.1, PER ≥ 20 dB) | 4 |
| 2 | Demonstrate P>100W power operation (<100kHz linewidth, $M^2 \leq 1.4$, PER ≥ 20 dB) using the baseline Yb1200-30/250 dual-clad PM fiber | 6 |
| 3 | Demonstration of high-efficiency Yb1200-50/250 DC-PM fibers | 9 |
| 4 | Demonstrate P≥10W, pathfinder unit of fiber-optic isolator, ASE-filter, polarizer | 9 |
| 5 | Demonstration of 600W (200μm/0.22NA) fiber coupled LD pump | 12 |
| 6 | Demonstrate ~400W power operation (<100kHz linewidth, $M^2 \leq 2$, PER≥20dB) using Yb1200-50/250 DC-PM fibers | 12 |
| 7 | Demonstrate 1x3 combined fiber-coupled Pump using multiple 600W units of (#3) for P ≥ 1.5kW, for coupling to 250um/0.46NA Yb-doped fibers | 15 |
| 8 | P≥1kW operation (<100kHz linewidth, $M^2 \leq 1.4$, PER~17-20 dB), efficiency ~15% runtime~200sec, lifetime>100hrs *(extrapolated from accum. runtime)* | 18 |
| | **Phase 2 Milestones** | **Month** |
| 9 | Demonstrate P≥20W capable fiber-optic isolators, ASE filters, polarizers | 21 |
| 10 | Develop & demonstrate multi-kW fiber-coupled pumps (P≥2 kW), either through 1xN combining, or from 400μm/0.22NA fiber | 24 |
| 11 | Development & demonstration of high-efficiency Yb1200 80/400 DC-PM fibers *(or similar fiber design)* | 27 |

| | | |
|---|---|---|
| 12 | P≥3kW operation (<100kHz linewidth, $M^2$≤1.4, PER≥20 dB), efficiency≥30% runtime~200sec, lifetime>100hrs *(extrapolated from accum. runtime)* | 33 |

## 2.2 Phase 1 Tasks

***Fibertek, Inc.***

(1) Detailed design modeling and assessment of fiber-MOPA system and its key components (optical fiber, LD pumps, pump combiner, *etc.*) in support of Phase I milestone. Alternate design points will be specifically obtained. This task is an extension of the methodology described in this proposal. Interdependent parameters will be specifically included.
(2) Design, modeling and separate experimental verification of MOPA thermal management system in support of an optimized scheme for thermal-gradient induced SBS mitigation.
(3) Initial assessment and verification of individual components for cw operation to respective power levels estimated for the final power amplifier stage of the MOPA system, *e.g.* optical fiber ends, LD pumps, Pump combiners, Isolators, *etc.*
(4) Baseline fiber-MOPA system set-up using currently available optimized fiber based on same optical fiber fabrication (DND) process (*i.e.* based on using commercially available Liekki Yb1200-30/250μm 0.07NA-DC-PM). Improved & quantitative PM-fiber splicing method will be used, based on actively-controlled PM fusion splicing from AFL/Fujikura.
(5) Assemble and test a 'free-space' connected version of the final stage of MOPA design point, to assess performance against the predicted/estimated parameters, as well as Phase I milestone. Revise design points and optimize aspects of above steps (as needed) to optimize measured performance against Phase I milestone
(6) Assemble and test an "all-fiber" version of the final design point for kW class MOPA system, producing a highly coherent output per the Phase I milestone. Make it available for on-site test evaluation by an external review panel.
(7) Program management, interaction and supply of partners/subcontractors for key component development tasks. Communicate technical, program & financial status to DARPA.

(b)(4)

(8) Supply to Fibertek, non-PM polymer-clad version of Yb1200-(45/45)/375μm-0.07NA-DC fiber *(this is based on existing Liekki design for advanced (non-commercial) fibers)*
(9) Supply to Fibertek, non-PM polymer-clad version of Yb1200-(60/60)/500μm-0.07NA-DC fiber *(this is based on existing Liekki design for advanced (non-commercial) fibers)*
(10) Based on COTS design, deliver Yb1200-25/230/250 DC-PM 'glass-clad' fiber, to evaluate advantages of glass-clad fiber for pump-coupling and thermal management
(11) Develop & fabricate non-PM glass-clad gain-tailored LMA fibers with 60 & 80um core
(12) Develop & fabricate index-tailored fibers for improved beam-quality of LMA 80um fiber
(13) Develop & fabricate step-doped approach to acoustic-profile tailored LMA fiber, for added SBS mitigation.
*(14) this number is no longer used*
*(15) this number is no longer used*

(b)(4)

(16) Assemble, test & supply to Fibertek, Qty = 2 of 200W, 200μm 0.22NA fiber-coupled 976nm high-power LD pumps. Extend to prototype a 400W, 400μm, 0.22NA, pump.

(17) Optimize laser-bar design & assembly and extend architecture of beam-combining to demonstrate prototype of 600W/200μm/0.22NA, fiber-coupled 976nm LD pumps
(18) Assemble, test and deliver to Fibertek, Qty=3 of 600W, 200μm 0.22NA, fiber-coupled 976 nm high-power LD pumps

***Others***

(19) OFR, Inc.: high-power isolators up to 30W and beyond, with fiber-pigtails
(20) EM4, Inc.: fiber-pigtail and innovative fiber-end preparation for high cw powers, and 'compensated' high-power isolator designs
(21) Work with nLight Corp. (sub-contracted) to develop and demonstrate alternate approach to (single-emitter LD chips based) compact high-brightness fiber-coupled pumps

## 2.3 Phase 2 Tasks

***Fibertek, Inc.***

(22) Review and re-assess design path to be selected for Phase II milestone demonstration.
(23) Optimize and implement fiber thermal management scheme for "80/400μm" fiber
(24) Assessment and verification of individual components for cw operation to respective power levels estimated for the final power amplifier stage of the MOPA system, *e.g.* optical fiber ends, LD pumps, Pump combiners, Isolators, *etc.*
(25) Revised multi-stage MOPA system (an additional YDFA-amplifer stage is needed so as to be capable of producing high-enough signal power input (≥30W), so as to limit gain to ≤20dB for the final power amplification stage to achieve ≥ 3 kW coherent power output
(26) Assemble & test free-space coupled version of final power amplifier stage
(27) Assemble and test an "all-fiber" version of the final design point for kW class MOPA system, producing a highly coherent output per the Phase II milestone. Make it available for on-site test evaluation by an external review panel.
(28) Program management, interaction and supply of partners/subcontractors for key component development tasks. Communicate technical & program status to DARPA.

(b)(4)

(29) Develop & fabricate non-PM all-glass-clad Yb1200-80/400/460μm-0.07NA-DC fiber
(30) Develop & fabricate modified RI-index & Yb-doping profile, for fiber from task 29
(31) Develop & fabricate PM version of fiber from task 30
(32) Process optimization for higher dopings (*i.e.* Yb2000), with low photo-darkening
(33) Other custom fiber per evolving program requirements (*e.g.* 100μm core, SBS mitigation *via* acoustic anti-guiding)

(b)(4)

(34) Assemble/Test/Deliver Qty=6 of previously developed 600W/200μm,0.22NA pumps
(35) Multi-kW (>2kW), 400μm,0.22NA fiber-coupled 976nm pumps – (i) design & process development, (ii) prototype build & test
(36) Assemble/Test and deliver 2 more above pump units from task 35

***Others***

(37) Avensys/ITF Labs: Improved prototypes (Qty=2) of their kW pump combiners for ≥ 2 kW, with 80/400/460μm,0.22NA output fiber
(38) EM4, Inc. OR OFR, Inc.: select preferred supplier to continue work on fiber-pigtailed (isolator + integrated filters) to > 50 W cw power handling capability
(39) nLight : continued work on alternate approach to compact high-brightness 976 nm fiber-coupled pump 'demonstrator' unit
(40) Program Closure – Fibertek, Inc.

## 3.0 Program Management

Fibertek, Inc. shall provide oversight of all development activities, including those to be performed by subcontractor and/or outside vendors, to ensure cost and schedule compliance in accordance with the basic contract. Fibertek, Inc. shall be prepared to support a kickoff meeting at the contractor's facility and support periodic reporting and offsite program reviews, including the final reports.

Fibertek, Inc. shall support/host up to two (2) weeks of on-site performance testing by a Government team at the end of both Phase I and Phase II.

Fibertek, Inc. shall allow Government representatives to witness any contractor-performed tests that will be carried out, as scheduled, in order to validate performance consistent with the metrics delineated in this SOW. Fibertek, Inc. shall coordinate such test activities with the Contracting Officer's Representative (COR) to allow the Government the opportunity to witness such tests on-site as they are being conducted.

## 4.0 Program (Phase I and II) Deliverables

| | ***Deliverables*** | **Year 1** | | | | **Year 2** | | | | **Year 3** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1** | Design + Test results on all prior stages | | **X** | | | | | | | | | | |
| **2** | Design + Test result on 30/250 *hp*-MOPA | | **X** | | | | | | | | | | |
| **3** | Design + Test result on 50/250 *hp*-MOPA | | | | | **X** | | | | | | | |
| **4** | Thermal management design & test (via FBG) | | | | **X** | | | | | | | | |
| **5** | 600W fiber-coupled(200u/0.22NA) LD pump | | | | | **X** | | | | | | | |
| **6** | Fiber-optic Isolator + ASE-filter (10,30,50W) | | | | **X** | | **X** | | **X** | | | | |
| **7** | **Milestone 1 : RIFL Phase-I demo** | | | | | | **X** | | | | | | |
| **8** | Design & Test demo of 80/400 f-MOPA | | | | | | | | **X** | | | | |
| **9** | Design & Test of glass-clad 80/400 f-MOPA | | | | | | | | | **X** | | | |
| **10** | Multi-kW fiber-coupled pump in 400u fiber | | | | | | | | | **X** | | | |
| **11** | **Milestone 2 : RIFL Phase-II demo** | | | | | | | | | | **X** | | |
| | ***Reports*** | | | | | | | | | | | | |
| **a** | Technical Summary Report | X | X | X | X | X | X | X | X | X | X | | |
| **b** | Cost Summary Report | X | X | X | X | X | X | X | X | X | X | | |
| **c** | Progress Report (**X**) & Program Report (**X**) | | | | X | | **X** | | X | | | **X** | |

*Note: (1)All deliverables in last week of indicated quarter from start of program (2)hp-MOPA=high-power MOPA*
*Note (2) Phase I and II Final Reports, interim technical reports, and interim cost reports shall be provided as required by Sections C and F of the contract.*

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 3 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO.(If applicable) |
|---|---|---|---|
| P00003 | 17-Nov-2009 | SEE SCHEDULE | |

| 6. ISSUED BY | CODE | 7. ADMINISTERED BY (If other than item 6) | CODE |
|---|---|---|---|
| DARPA<br>CMO<br>ATTN: MICHAEL D. BLACKSTONE<br>3701 N. FAIRFAX DR.<br>ARLINGTON VA 22203-1714 | HR0011 | DCMA VIRGINIA<br>10500 BATTLEVIEW PARKWAY<br>SUITE 200<br>MANASSAS VA 20109-2342 | S2404A |

| 8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code) | | |
|---|---|---|
| FIBERTEK, INC.<br>510 HERNDON PKWY<br>HERNDON VA 20170-5225 | | 9A. AMENDMENT OF SOLICITATION NO. |
| | | 9B. DATED (SEE ITEM 11) |
| | X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| CODE 8Y519 FACILITY CODE | X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

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**See Schedule**

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☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Unilateral: IAW FAR 52.232-22 "Limitation of Funds"

E. IMPORTANT: Contractor [X] is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill10118

The purpose of this modification is to apply Phase I, incremental funds in the amount of $297,000 (AO # X670/19) to CLIN 0001 of Contract HR0011-09-C-0028. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)<br>MICHAEL D. BLACKSTONE / PCO<br>TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR<br>(Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA<br>BY (b)(6)<br>(Signature of Contracting Officer) | 16C. DATE SIGNED<br>17-Nov-2009 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The following has been modified as indicated below:

1. SECTION B - SUPPLIES OR SERVICES AND PRICES

SUBCLIN 000103 is added as follows:

| ITEM NO | | AMOUNT |
|---|---|---|
| 000103 | Funding for CLIN 0001 only | $0.00 |
| | AO No. X670/19 | |
| | ACRN AC | $297,000.00 |

2. SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $297,000.00 from $3,152,000.00 to $3,449,000.00.

SUBCLIN 000103:
Funding on SUBCLIN 000103 is initiated as follows:

ACRN: AC

CIN: 00000000000000000000000000000

Acctng Data: 9700400 1320 X670 P0G10 2525 DPAC 0 5009 S12136 62702E

Increase: $297,000.00

Total: $297,000.00

G-6 Incremental Funding

*The following has been modified as bolded below:*

(a) This contract shall be subject to incremental funding, as indicated in the table below, which is presently made available for performance under this contract. It is estimated that the funds presently available are sufficient to permit the Contractor's performance through the performance end dates indicated in the table below. Except in accordance with the Section I clause FAR 52.232-22, "Limitation of Funds," no legal liability of the part of the Government for payment of any money in excess of the funds listed in the table

below shall arise unless and until additional funds are made available by the Contracting Officer through a modification to this contract.

| **Phase** | **CLIN** | **Funding Provided to Date** | **Funding Period of Performance End Date** |
|---|---|---|---|
| 1 | 0001 | **$3,449,000** | **28 February 2010** |
| 2 | 0002 | TBD | TBD |

(end of clause)

3. Except as modified herein, all terms and conditions of Contract No. HR0011-09-C-0028 shall remain unchanged and in full force and effect.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 2 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO. (If applicable) |
|---|---|---|---|
| P00004 | 08-Feb-2010 | SEE SCHEDULE | |

6. ISSUED BY CODE HR0011

DARPA
CMO
ATTN: MICHAEL D. BLACKSTONE
3701 N. FAIRFAX DR.
ARLINGTON VA 22203-1714

7. ADMINISTERED BY (If other than item 6) CODE S2404A

DCMA VIRGINIA
10500 BATTLEVIEW PARKWAY
SUITE 200
MANASSAS VA 20109-2342

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

FIBERTEK, INC.
510 HERNDON PKWY
HERNDON VA 20170-5225

CODE 8Y519 FACILITY CODE

| | |
|---|---|
| | 9A. AMENDMENT OF SOLICITATION NO. |
| | 9B. DATED (SEE ITEM 11) |
| X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Mutual Agreement of the parties

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: mvessill10357

The purpose of this modification is to extend the Phase I period of performance, at no additional cost to the Government, from 2 April 2010 to 30 April 2010. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) MICHAEL D. BLACKSTONE / PCO TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer) | 16C. DATE SIGNED 08-Feb-2010 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The following has been modified as indicated below:

1. SECTION F - DELIVERIES OR PERFORMANCE

F-1 Term of Contract

*The following have been modified:*

(a) The term of the contract commences 03 October 2008 and continues through **30 April 2010**.

(b) The period of performance for Option 1, as set forth in CLIN 0002, shall be from the effective date of the option exercise to and including 15 months thereafter.
(end of clause)

F-2 Reports and Other Deliverables

(a) Delivery of all reports and other deliverables shall be made to the addressee specified in F-3 entitled "Report Distribution" in accordance with the following:

| Item No. | Description | Due Date (on or before) |
|---|---|---|
| 0001,0002 | R&D Status Reports | Monthly IAW Section C-2 |
| 0001,0002 | Interim R&D Technical Reports | Quarterly IAW Section C-2 |
| 0001,0002 | RIFL Final Report | **19** months after date of contract award (**30 April 2010**)<br>If option is exercised, **34** months after date of contract award (**30 July 2011**) |
| 0001,0002 | Additional Misc. Deliverables | As required IAW Section C-2 |

(end of clause)

2. Except as modified herein, all terms and conditions of contract HR0011-09-C-0028 shall remain unchanged and in full force and effect.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 2 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO.(If applicable) |
|---|---|---|---|
| P00004 | 2/8/2010 | SEE SCHEDULE | |

| 6. ISSUED BY | CODE | 7. ADMINISTERED BY (If other than item 6) | CODE |
|---|---|---|---|
| DARPA<br>CMO<br>ATTN: MICHAEL D. BLACKSTONE<br>3701 N. FAIRFAX DR.<br>ARLINGTON VA 22203-1714 | HR0011 | DCMA VIRGINIA<br>10500 BATTLEVIEW PARKWAY<br>SUITE 200<br>MANASSAS VA 20109-2342 | S2404A |

| 8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code) | | |
|---|---|---|
| FIBERTEK, INC.<br>510 HERNDON PKWY<br>HERNDON VA 20170-5225 | | 9A. AMENDMENT OF SOLICITATION NO. |
| | | 9B. DATED (SEE ITEM 11) |
| | X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| CODE 8Y519 / FACILITY CODE | X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Mutual Agreement of the parties

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, [X] is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill10357

The purpose of this modification is to extend the Phase I period of performance, at no additional cost to the Government, from 2 April 2010 to 30 April 2010. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) | |
|---|---|---|---|
| Tisca Dorsey Contracts Mgr. | | Michael D. Blackstone, Contracting Officer<br>TEL: 571-218-4804 EMAIL: Michael.Blackstone@darpa.mil | |
| 15B. CONTRACTOR/OFFEROR<br>(Signature of person authorized to sign) | 15C. DATE SIGNED<br>2/5/10 | 16B. UNITED STATES OF AMERICA<br>BY (b)(6) [redacted] | 16C. DATE SIGNED |

EXCEPTION TO SF 30
APPROVED BY OIRM 11-84

30-105-04

STANDARD FORM 30 (Rev. 10-83)
Prescribed by GSA
FAR (48 CFR) 53.243

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The following has been modified as indicated below:

1. SECTION F - DELIVERIES OR PERFORMANCE

F-1 Term of Contract

*The following have been modified:*

(a) The term of the contract commences 03 October 2008 and continues through **30 April 2010**.

(b) The period of performance for Option 1, as set forth in CLIN 0002, shall be from the effective date of the option exercise to and including 15 months thereafter.
(end of clause)

F-2 Reports and Other Deliverables

(a) Delivery of all reports and other deliverables shall be made to the addressee specified in F-3 entitled "Report Distribution" in accordance with the following:

| Item No. | Description | Due Date (on or before) |
|---|---|---|
| 0001,0002 | R&D Status Reports | Monthly IAW Section C-2 |
| 0001,0002 | Interim R&D Technical Reports | Quarterly IAW Section C-2 |
| 0001,0002 | RIFL Final Report | **19** months after date of contract award (**30 April 2010**)<br>If option is exercised, **34** months after date of contract award (**30 July 2011**) |
| 0001,0002 | Additional Misc. Deliverables | As required IAW Section C-2 |

(end of clause)

2. Except as modified herein, all terms and conditions of contract HR0011-09-C-0028 shall remain unchanged and in full force and effect.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 2 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO. (If applicable) |
|---|---|---|---|
| P00005 | 11-Mar-2010 | SEE SCHEDULE | |

6. ISSUED BY CODE HR0011

DARPA CMO
ATTN: MICHAEL D. BLACKSTONE
MICHAEL.BLACKSTONE@DARPA.MIL
3701 N. FAIRFAX DRIVE
ARLINGTON VA 22203-1714

7. ADMINISTERED BY (If other than item 6) CODE S2404A

DCMA VIRGINIA
10500 BATTLEVIEW PARKWAY
SUITE 200
MANASSAS VA 20109-2342

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

FIBERTEK, INC.
510 HERNDON PKWY
HERNDON VA 20170-5225

CODE 8Y519 FACILITY CODE

| | |
|---|---|
| | 9A. AMENDMENT OF SOLICITATION NO. |
| | 9B. DATED (SEE ITEM 11) |
| X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

**See Schedule**

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Unilateral IAW 52.232-22

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill10467

The purpose of this modification is to apply incremental funding in the amount of $81,165 (AO No. X670/22) for Phase I of the RIFL effort. This action fully funds Phase I. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) MICHAEL D. BLACKSTONE / PCO TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA BY (b)(6) (Signature of Contracting Officer) | 16C. DATE SIGNED 11-Mar-2010 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The following has been modified as indicated below:

1. SECTION G - CONTRACT ADMINISTRATION DATA

Accounting and Appropriation

Summary for the Payment Office

As a result of this modification, the total funded amount for this document was increased by $81,165.00 from $3,449,000.00 to $3,530,165.00.

SUBCLIN 000103:

AC: 9700400 1320 X670 P0G10 2525 DPAC 0 5009 S12136 62702E (CIN 0000000000000000000000000000) was increased by $81,165.00 from $297,000.00 to $378,165.00

G-6 Incremental Funding

*The following has been modified as bolded below:*

(a) This contract shall be subject to incremental funding, as indicated in the table below, which is presently made available for performance under this contract. It is estimated that the funds presently available are sufficient to permit the Contractor's performance through the performance end dates indicated in the table below. Except in accordance with the Section I clause FAR 52.232-22, "Limitation of Funds," no legal liability of the part of the Government for payment of any money in excess of the funds listed in the table below shall arise unless and until additional funds are made available by the Contracting Officer through a modification to this contract.

| **Phase** | **CLIN** | **Funding Provided to Date** | **Funding Period of Performance End Date** |
|---|---|---|---|
| **1** | **0001** | **$3,530,165** | **30 April 2010** |
| 2 | 0002 | TBD | TBD |

(end of clause)

2. Except as modified herein, all terms and conditions of HR0011-09-C-0028 shall remain unchanged and in full force and effect.

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

| 1. CONTRACT ID CODE | PAGE OF PAGES | |
|---|---|---|
| U | 1 | 3 |

| 2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO.(If applicable) |
|---|---|---|---|
| P00006 | 30-Apr-2010 | SEE SCHEDULE | |

| 6. ISSUED BY | CODE | 7. ADMINISTERED BY (If other than item 6) | CODE |
|---|---|---|---|
| DARPA<br>CMO<br>ATTN: MICHAEL D. BLACKSTONE<br>3701 N. FAIRFAX DR.<br>ARLINGTON VA 22203-1714 | HR0011 | DCMA VIRGINIA<br>10500 BATTLEVIEW PARKWAY<br>SUITE 200<br>MANASSAS VA 20109-2342 | S2404A |

| 8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code) | | |
|---|---|---|
| FIBERTEK, INC.<br>510 HERNDON PKWY<br>HERNDON VA 20170-5225 | | 9A. AMENDMENT OF SOLICITATION NO. |
| | | 9B. DATED (SEE ITEM 11) |
| | X | 10A. MOD. OF CONTRACT/ORDER NO. HR0011-09-C-0028 |
| CODE 8Y519 FACILITY CODE | X | 10B. DATED (SEE ITEM 13) 02-Oct-2008 |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
Mutual Agreement of the parties

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, [X] is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
Modification Control Number: mvessill10652

The purpose of this modification is to extend the Phase 1 period of performance for an additional month at no additional cost to the Government. See page two (2).

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)<br>MICHAEL D. BLACKSTONE / PCO<br>TEL: (571) 218-4804 EMAIL: michael.blackstone@darpa.mil | |
|---|---|---|---|
| 15B. CONTRACTOR/OFFEROR<br>(Signature of person authorized to sign) | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA<br>BY (b)(6)<br>(Signature of Contracting Officer) | 16C. DATE SIGNED<br>30-Apr-2010 |

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

**SUMMARY OF CHANGES**

The following has been modified as indicated below:

1. SECTION F - DELIVERIES OR PERFORMANCE

F-1 Term of Contract
*The following have been modified as bolded below:*

(a) The term of the contract commences 03 October 2008 and continues through **31 May 2010**.

(b) The period of performance for Option 1, as set forth in CLIN 0002, shall be from the effective date of the option exercise to and including 15 months thereafter.
(end of clause)

F-2 Reports and Other Deliverables

(a) Delivery of all reports and other deliverables shall be made to the addressee specified in F-3 entitled "Report Distribution" in accordance with the following:

| Item No. | Description | Due Date (on or before) |
|---|---|---|
| 0001,0002 | R&D Status Reports | Monthly IAW Section C-2 |
| 0001,0002 | Interim R&D Technical Reports | Quarterly IAW Section C-2 |
| 0001,0002 | RIFL Final Report | **20** months after date of contract award **(31 May 2010)**<br>If option is exercised, **35** months after date of contract award **(31 August 2011)** |
| 0001,0002 | Additional Misc. Deliverables | As required IAW Section C-2 |

(end of clause)

2. SECTION G - CONTRACT ADMINISTRATION DATA

G-6 Incremental Funding

*The following have been modified as bolded below:*

(a) This contract shall be subject to incremental funding, as indicated in the table below, which is presently made available for performance under this contract. It is estimated that the funds presently available are sufficient to permit the Contractor's performance through the performance end dates indicated in the table below. Except in accordance with the Section I clause FAR 52.232-22, "Limitation of Funds," no legal liability of the part of the Government for payment of any money in excess of the funds listed in the table below shall arise unless and until additional funds are made available by the Contracting Officer through a modification to this contract.

| **Phase** | **CLIN** | **Funding Provided to Date** | **Funding Period of Performance End Date** |
|---|---|---|---|
| **1** | **0001** | **$3,530,165** | **31 May 2010** |
| 2 | 0002 | TBD | TBD |

(end of clause)

3. Except as modified herein, all terms and conditions of HR0011-09-C-0028 shall remain unchanged and in full force and effect.