GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. ____

Project No. E-19-612 GTRI/~~GIT~~ DATE 7 / 12 / 83

Project Director: Dr. Stephen Antolovich School/~~Lab~~ ChE

Sponsor: Air Force Office of Scientific Research, Building 410,
Bolling AFB, D.C. 20332

Type Agreement: Grant No. AFOSR-83-0262

Award Period: From 7/15/83 To ~~7/14/84~~ 9/30/85 (Performance) ~~9/14/84~~ 9/30/85 (Reports)
9-29-85

Sponsor Amount:	This Change	Total to Date
Estimated: $		$ 200,000
Funded: $		$ 200,000

Cost Sharing Amount: $ 96,000 Cost Sharing No: E-19-313

Title: "Acquisition of a Vacuum/Inert Environment Test Facility for the Fracture and Fatigue Research Laboratory of the Georgia Institute of Technology"

ADMINISTRATIVE DATA OCA Contact Frank H. Huff X4820

1) Sponsor Technical Contact:

Alan H. Rosenstein
Air Force Office of Scientific Research
Bolling Air Force Base
Washington, D.C. 20332

(202) 767-4984

2) Sponsor Admin/Contractual Matters:

Valerie Spencer
Air Force Office of Scientific Research-PK
Bolling Air Force Base
Building 410
Washington, D.C. 20332

(202) 767-4945

Defense Priority Rating: ____ Military Security Classification: ____
(or) Company/Industrial Proprietary: ____

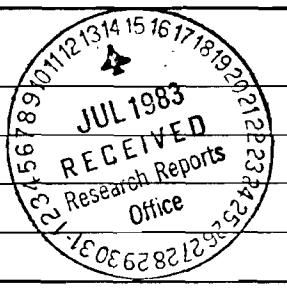
RESTRICTIONS

See Attached AFOSR Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with GIT; however, prior written approval of the contracting officer must be obtained for items over $1,000.00 if not specifically included in approved budget.

COMMENTS:



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FORM OCA 4 383

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 2/27/87

Project No. E-19-612 School/Lab ChE

Includes Subproject No.(s) N/A

Project Director(s) S. D. Antolovich GTRC / [illegible]

Sponsor Air Force Office of Scientific Research, Bolling AFB, DC 20332

Title "Acquisition of a Vacuum/Inert Environment Test Facility for the Fracture and Fatigue Research Laboratory of the Georgia Institute of Technology"

Effective Completion Date: 9/29/85 (Performance) 11/29/85 (Reports)

Grant/Contract Closeout Actions Remaining:

- [X] None
- [ ] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Continues Project No. _____ Continued by Project No. _____

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Other Ina Lashley
Angela Dubose
Russ Embry

FORM OCA 69.285

FRACTURE AND FATIGUE RESEARCH LABORATORY
Georgia Institute of Technology
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
ATLANTA, GEORGIA 30332 404/894-

March 19, 1986

file

Dr. Alan H. Rosenstein
Electronic and Material Sciences
Air Force Office of Scientific Research
Building 410
Bolling AFB
Washington, D.C. 20332

Dear Dr. Rosenstein:

For the final report on Air Force grant AFOSR-83-0262, enclosed please find ten (10) copies of the following: (a) original request for purchase from Georgia Tech; (b) original equipment quote on parts and performance from Material Test Systems Corporation (MTS); and (c) MTS original packing lists.

All of the above equipment was received in physically good condition from the vendor. Some equipment was unpacked upon its arrival at Georgia Tech, and no shipping damage was found. All items listed on the packing invoice were received.

At the request of MTS, physical location and house services were installed, as per instructions of the project engineer. An MTS technician is in house and has begun installation of this equipment at the present time. We expect the system to be up and running in 4-6 week time.

It is expected that these systems will check out as per the MTS quote and will provide a unique capability for university research.

Sincerelv.

Stephen D. Antolovich
Director
Fracture and Fatigue Research Lab

SDA/jf

Enclosures

PURCHASE REQUEST

MAKE ALL SPECIFICATIONS CLEAR, COMPLETE AND DETAILED

DATE January 16, 1984

REQUISITION NUMBER E-19-612-1-84-84320-$200,000
E-19-617-1-84-84320- 96,000

CLASSIFICATION: Equipment
(Supplies, Capital Outlay or Equipment)

TO: PROCUREMENT OFFICE

FROM: Chemical Engineering/Dr. Antolovich

Please make all arrangements for the purchase of the items listed below:

REQUESTED DELIVERY DATE: _____ DELIVER TO: _____

ITEM NO.	QUANTITY	UNIT		SPECIFICATIONS (If Model No. is shown, also give mfg's. Name)
1	1			MTS High Temperature, Ultra-High Vacuum Material Test System (Please see attached quotation with detailed list of equipment and associated components)

RECOMMENDED SOURCE OR SOURCES:

NAME	ADDRESS	TELEPHONE NUMB
MTS (Attn: Jack Noren)	1530 Dunwoody Village Pkwy., Suite 115, P.O. Box 88007 Atlanta, Georgia 30338	394-9618

ESTIMATED COST: NOT TO EXCEED $ 296,000

REMARKS: PLEASE SEE ATTACHED MEMO

APPROVED FOR DEPARTMENT HEAD: _____ 1/17/84

PAGE 1 OF 1 PAGES

SEND ORIGINAL ONLY TO PROCUREMENT OFFICE

REQUISITION NUMBER, DELIVERY POINT, SPECIFICATIONS AND DEPARTMENT HEAD APPROVAL SPACES MUST BE COMPLETED.

QUOTATION NO. 91726-2

QUOTATION DATE 21 November 1983

VALID UNTIL 21 December 1983

CUSTOMER INQUIRY NO. Verbal

Georgia Institute of Technology
Fracture and Fatigue Lab
Chemical Engineering
Atlanta, GA 30332

Attention: Dr. Steven Antolovich

FOR FURTHER COMMUNICATION ON THIS QUOTATION CONTACT: Mr. Jack Noren
404/394-~~6918~~ 9618

Shipment Schedule
12-14 Months After Receipt of Order

Shipment Terms
FOB - Minneapolis, Minnesota

Terms of Payment
(The attached Conditions of Sale also form a part of this quotation.)

30% Upon Receipt of Order
65% Upon Shipment
5% Upon Acceptance
Net 10 Days

Equipment Packed For
Padded Van

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
I.	MTS High Temperature, Ultra-High Vacuum Material Test System consisting of the following:			
IA.	MTS 880 New Generation Material Test System with the following major subassemblies:			
	1. Loading Unit, MTS 380.25 Load Frame with high lateral stiffness and tight concentricity designed to work with Item IB. Includes the following:	1		
	a. MTS 244.31 Actuator, rated at ±55 kip fatigue with:	1		
	- Extra rod length to fit inside internal bellows			
	- Integrally mounted LVDT			
	- 3 inch stroke			
	- MTS 252.23 Servovalve, rated at 5 GPM	1		
	- MTS 294.12 Service Manifold	1		
	- Upper Bearing integrated to baseplate			
	b. ±55 kip Load Cell integrally mounted with crosshead.	1		
NOTE:	*Please reference the above quotation number on any correspondence related to this quotation*			

Prepared by: _____
George F. Lucas
Manager
Hydromechanical/Environmental Systems Group
Materials Testing Division

MTS SYSTEMS CORPORATION
BOX 24012, MINNEAPOLIS, MINNESOTA 55424
TELEPHONE 612 937 4000 TELEX 29 052 MTS SYSTEM ENPE

100730-59

Address order to: Mr. Jack Noren
MTS Systems Corporation
1530 Dunwoody Village Pkwy.
Suite 115
P.O. Box 88007
Atlanta, GA 30338
394-9618

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
	c. Hydraulic lifts and locks.	1 Set		
	d. Specimen installation controls for operation of hydraulic lifts and locks and local actuator movement.	1		
	2. Control Console, MTS 490.21 with the following modules:	1		
	a. MTS 413.81 Master Control Panel with integrally mounted digital counter.	1		
	b. MTS 448.82 Test Controller Chassis with the following modules:	1		
	1. 448.13 Servo Controller.	1		
	2. 448.14 Valve Amplifier.	1		
	3. 448.21 DC Conditioner.	2		
	4. 448.22 AC Conditioner.	1		
	5. 448.32 Feedback Selector.	1		
	6. 448.41 Limit Detector.	1		
	c. MTS 410.80 Digital Function Generator.	1		
	d. Cabling as required - 20 feet.	1 Set		
IB.	MTS High Temperature, Ultra-High Vacuum System designed to be compatible with high temperature LCF, TMF and Fracture Mechanics materials testing. System includes the following:			
	1. 16 inch diameter, double walled vacuum chamber. Chamber capable of being water cooled between inner and outer walls. Chamber door, with 4 inch diameter window, set up to be sealed with either 16 inch Wheeler flange with 24 hole bolt patter or with Viton "O" ring with three (3) "C" clamps. Chamber contains symmetric internal load train bellows top and bottom with 3 inch stroke. Maximum leak rate of 1×10^{-9} std. cc He/second. Chamber contains twelve 2-3/4 conflat flanges for use with extensometer mounting, power feedthroughs, and instrumentation feedthroughs. All internal surfaces will be of austenitic stainless steel chemically cleaned and polished. Vacuum chamber and load train design to be such that an E46 RI radiant furnace or French equivalent could be added at a later date.	1		

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
	2. Vacuum pumping stack, horizontally mounted, containing the following elements:	1		
	a. Dry vane blower to reduce pressure to about 200 Torr.	1		
	b. Cryosorption pump (requires liquid nitrogen for cooling) to reduce pressure to the 10^{-3} Torr range.	1		
	c. 10 inch cryo pump (nude) capable of dropping pressure to the 10^{-9} Torr range. Comes with full controls.	1		
	d. Quantity three (3) 60 liter per second for a total of 180 liters/second of ion pump "kickers". These kickers will add a minimum of a decade of vacuum (to the 10^{-10} Torr range). Ion pumps to have special high hydrogen affinity elements. Comes with full Digital 500 controls.	Lot		
	e. 12 inch diameter manually operated "poppet" valve to isolate cryo and ion pumps from vacuum chamber.	1		
	3. Accessories to vacuum system include the following:			
	a. Nude Ion gage with P/E digital gage control III and cabling.	1		
	b. Over-pressure relief disk (set at approximately 3 psi gage pressure).	1		
	c. Induction power feedthroughs for 5 KW, 450 KHz induction system.	1		
	d. Thermocouple feedthrough (Type "K") including internal patch panel and external plug panel hardwired to feedthrough.	1		
	e. Instrumentation feedthrough for one extensometer at a time.	1		
	f. Water cooling feedthroughs as required.	A/R		
	g. Entire vacuum system capable of being baked out at 200°C.			
	h. A backfill valve with ultra-high vacuum needle valve for gas backfill of chamber.	1		
IC.	High Temperature Subsystem including the following:			
	1. Minimum of 5 KW high frequency induction power supply capable of heating:	1		
	a. 0.505 diameter dogbone specimen per E606 to 1200°C (minimum).			

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
	b. 1/2 T CT specimen to minimum of 800°C with susceptor. Induction power supply to be water cooled.			
	2. Moly or super alloy susceptor designed to surround the CT specimen. This will allow the CT specimen to be uniformly heated during the line of crack growth. Without the susceptor, a CT specimen tends to overheat at the crack tip.	1		
	3. Analog temperature control and readout system to control temperature to +2°C or better. A digital control system does not have a fast enough update rate to satisfactorily control a high gain induction heating system in a small, low thermal mass specimen. Control system to be capable of accepting a remote control signal (0-5 volts) from a D/A computer signal (not part of this quote).	1		
ID.	Load train system consisting of the following:	1		
	1. Extended actuator rod penetrating into lower internal bellows system on vacuum chamber. At the end of the actuator rod will be a water cooled adapter plate (outside vacuum) that directly ties into a piloted vacuum interface plate attached to the three inch stroke bellow. This keeps the internal grip attachment plate very near the bearings at the end of the actuator rod to keep the overall lateral stiffness and concentricity very high. The water cooling at the vacuum interface plate allows grips to be attached inside the vacuum chamber without additions (Note - grips not in main quotation).			
	2. Symmetric upper pullrod system to consisting of a large diameter high lateral stiffness rod preloaded directly to the 880 load head (combination crosshead and high precision load cell). This arrangement has the same symmetric water cooling adjacent to the piloted vacuum interface plate.			

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
IE.	High Temperature, Ultra-High Vacuum Axial Extensometer.	1		
	1. Maximum temperature of 1200°C using high purity Al_2O_3 extensometer rods, with U-chisel ends.			
	2. Water cooled mounting plate (nickel-plated copper).			
	3. Radiant shielding on main extensometer body.			
	4. 1 inch or 25 mm gage length. Strain ranges to be determined in design review.			
	5. Extensometer designed to be used in conjunction with an induction coil on an hourglass specimen.			
IF.	System Services.			
	1. System Integration and Factory Checkout at Plant by qualified MTS personnel.	Lot		
	2. Installation assistance at Georgia Tech by MTS Field Engineer.	Lot		
	3. System Manuals.	2 Sets		
	- Operation - Maintenance - Reference			
	4. One (1) Year System Warranty.			
	5. Full Design Review with customer in Minneapolis.			
	TOTAL SYSTEM PRICE.....			$ 296,000
II.	System Options.			
	A. Tension-Compression Grips, rated at +55 kip fatigue. MTS 643.66C with water cooling option. Designed for both button-head and threaded specimens.	1 Set		$ 9,500
	B. Fracture Mechanics Grips, sized for 1 TCT specimen with water-cooling.	1 Set		$ 7,500

ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL AMOUNT
	C. MTS 506.02 Hydraulic Power Supply rated 6 GPM at 3,000 psi.	1		$ 6,620
	D. High Temperature, Ultra-High Vacuum COD Gage	1		$ 16,500
	1. For use with 1/2 T CT specimen and susceptor. Similar in concept to COD gage shown in "Hot Fracture Mechanics" Application Note.			
	2. Water cooled mounting configuration.			
	3. Radiant cooling of main gage.			
	4. For use up to 800°C with quartz (low alpha) extension rods.			

GRANT AMENDMENT
UNITED STATES AIR FORCE
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH
BUILDING 410, BOLLING AFB, D. C. 20332

GRANT NO.	AMEND	EFFECTIVE DATE	PURCHASE REQUEST NO.	PROJECT-TASK	PAGE 1 OF 1
AFOSR-83-0262	A	83 DEC 15	N/A	2917/A3	

GRANTEE
Georgia Tech Research Institute
Atlanta, Georgia 30332

AUTHORITY
PUBLIC LAW 97-258

CHANGE IN GRANT AMOUNT
N/A

CHANGE IN DURATION
N/A

ADMINISTRATIVE OFFICE	SPONSORING SCIENTIFIC OFFICE	PAYING OFFICE
AFOSR/PKD Building 410 Bolling AFB, DC 20332	AFOSR/NA Building 410 Bolling AFB, DC 20332	Accounting and Finance Det 1, 76 ALD/ACFMCC Bolling AFB, DC 20332

NEGOTIATOR (Name, Organization, Telephone No.)	PROGRAM MANAGER (Name, Organization, Telephone No.)
DOUGLAS P. CONSTANT, 2Lt, USAF AFOSR/PKD (202-767-5008)/gw	DR. A. H. ROSENSTEIN AFOSR/NE (202-767-4984)

ACCOUNTING AND APPROPRIATION DATA
N/A

THE GRANT IDENTIFIED ABOVE IS MODIFIED AS FOLLOWS:

The provision entitled "Procurement Standards For Secondary Agreements" set forth in the August 1982 AFOSR Grants Brochure is hereby incorporated by reference and made a part of this agreement.

By deleting from the existing list of permanent equipment the following:

ITEM	ESTIMATED CHARGE TO GRANT FUNDS
Vacuum-Environmental Chamber System	$200,000

By substituting the following:

ITEM	ESTIMATED CHARGE TO GRANT FUNDS
MIS High Temperature Ultra High Vacuum Material Test System	$200,000

EXCEPT AS PROVIDED HEREIN, ALL TERMS AND CONDITIONS OF THE GRANT, AS HERETOFORE CHANGED, REMAIN UNCHANGED AND IN FULL FORCE AND EFFECT.

FOR THE GRANTEE		FOR THE UNITED STATES OF AMERICA	
SIGNATURE OF PERSON AUTHORIZED		SIGNATURE OF CONTRACTING OFFICER	
NAME AND TITLE OF SIGNER (Type or Print) Brian J. Lindberg/ J.W. Dees Contracting officer/Asst. Sec.	DATE SIGNED 1/4/84	NAME OF CONTRACTING OFFICER (Type or Print)	DATE SIGNED

AFSC FORM JUL 83 454 PREVIOUS EDITIONS ARE OBSOLETE. AFSC-Andrews AFB DC 1

MTS

REQUEST TO PACK

Job No. 932.36 Responsible Engineer Ray Sydeski Date 9/25/8

Customer Georgia Tech. Please pack for O/F, A/F, P/V, C/C

PACKED	REQUIRED	DESCRIPTION (with P/N where needed)
	1	BEO CONSOLE
	1	LOAD FRAME
	1	VACUUM CHAMBER
	1	VACUUM PUMP
	1	HPS
	1	WATER CHILLER
	1	INDUCTION HEATING Unit

MTS Part Number 114288-54

MTS

REQUEST TO PACK

Job No. 932.36 Responsible Engineer Ray Sydeski Date 9/25/18

Customer Georgia Tech. Please pack for O/F, A/F, P/V, C/C

PACKED	REQUIRED	DESCRIPTION (with P/N where needed)
	2	Pull Rods
	1	Bag Wash (2 SETS)
	1	Bag Burst Disk
	1	Bag 2 Water Feedthrough
	1	Bag 4 Fiber Tubing
	1	Pig Thermocouple Wire
	2	RF Coil
	1	RF Feedthrough
	2	Spectrum
	1	Coil Water Hose
	1	Small Bag Grip Parts
	1	Bag Lower Grip Parts
	1	Bag Upper Grip Parts
	1	Plastic Bracket
	1	RF Feedthrough Bracket
	1	Electronic Box
	6	Upper & Lower Grip Mounting Plates
	2	Upper & Lower Bellows (FRAGILE)
	1	Bag Black Parts
	1	Bag Misc.
	1	Bag Grip Bolts (STAINLESS)
	2	Column Rods
	2	Bellow Guide
	1	Ion Gage (FRAGILE)
	1	Udder CT Grip
	1	Lower CT Grip

MTS

REQUEST TO PACK

Job No. 932.36 Responsible Engineer Ray Sydeski Date 9/25/8

Customer Georgia Tech. Please pack for O/F, A/F, P/N, C/C

PACKED	REQUIRED	DESCRIPTION (with P/N where needed)
	1	HPS CABLE 377638-09
	1	DRAIN HOSE 01-8905-13
	2	PRESSURE HOSE 01-8906-12
		[illegible]
	2	WATER HOSE 1/2" YELLOW
	2	Poly-FIO 3/8"
	1	1/2" YELLOW WATER HOSE
	4	1/2" [illegible]
	2	1/2" [illegible]
	1	HYD PRE LODDER
	1	[illegible] PRE LOADER
	1	CABLE TEMP CONTROLER
	1	CABLE GND • 054023-04
	1	CABLE STRAIN GAGE 377630-05
	1	CABLE LVDT 377631-04
	1	CABLE LOAD CELL 377630 06
	1	CABLE LFC 377642-04
	1	CABLE HI LOW 377639.04
	1	CABLE SERVO 377663-04
	1	CABLE GND
	1	CABLE 377663-01
	1	CABLE LFC 377643-04
	1	CABLE DIGITEC 500 TO POWER DIST
	1	CABLE TC GAGE
	1	ION PUMP CABLE
	1	ION GAGE CABLE

MTS Part Number 114288-5

MTS

REQUEST TO PACK

Job No. 932.36 Responsible Engineer Ray Sydeski Date 9/25/85

Customer Georgia Tech. Please pack for O/F, A/F, P/V, C/C

PACKED	REQUIRED	DESCRIPTION (with P/N where needed)
	1	SORPTION Pump (2)
	1	EXTENSO[illegible] MOUNTING BRACKET
	1	CAL SPAN FLUID
	1	Tool Box
	2	SORPTION DUMP BUCKET.
	2	HARD LINE TUBEING
	1	MOUNTING BRICKET (Plastic)
	1	125/250 v 30A Plug
	1	BAG MISC. FITTINGS
	4	ISO PADS RUBBER
		VENDER MANUALS
	1	BAG SHORT CABLE (STRAIN)

MTS Part Number 114288-54

MTS Vacuum Components

REQUEST TO PACK

Job No. 932.36 Responsible Engineer Ray Sydeski Date 9/25/85

Customer Georgia Tech. Please pack for O/F, A/F, P/V, C/C

PACKED	REQUIRED	DESCRIPTION (with P/N where needed)
	1	Extensometer & Mtg Bracket Kit
		Ser # 601 Model 632.51B-77
	2	Filter Cartridges
	1 Box	Box of Misc VCO & JCR Fittings CAJON
	3	3 Spare wire Seal Door Gaskets
	2	2 Spare 6" Conflat Window Gaskets
	1	Radiant Chamber Shield
	2	2 Spare 10" Gaskets for CRYO-Pump Panels
	12	12 SPARE 8" Gaskets for Hand Ports
	1	Spare Chamber Burst Disc Assy
	1	Piezo-electric Valve Assy
	1	Spare Thyristors - Used on System
	1	1 Bag Spare Swagelok Fittings
	1	1 Bag CRYO-Pump Compressor Fittings
	1	1 Bag Spare Door O-Rings - Need Modified
	2	2 Plug - Compressor 220 volt
	2	2 Wrenches Compressor Fittings
	1	1 Wrench Water Filter (PLASTIC)
	3	Spare 1" Conflat Gaskets (Pressure Relief)
	4	Spare 2 3/4" Conflat Gaskets
	1	1 Box Spare Thermocouple Material
	1	1 Box Spare/MISC SST Bolts
	1	1 Box 7/16-14 SST Bolts x 3 3/4 Long
		(Original Bolts for Grips)
	2	Spare 2 3/4 FN Conflat Flanges
	1	1 Spare Piece of 1/4" yellow water Hose
	4	4 Spare 1/4" Push Lock Fittings for Hose
	1	1 Coil 3/8" Poly Flo tubing (SPARE) Compressor
		1 Bag FNSTEUNOUTATIOW Feed through PINS

MTS Part Number 114288-54