GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Project Title: FY80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

Project No: A-2571

Project Director: Dr. C. T. Brown

Sponsor: Midwest Research Institute, Solar Energy Research Institute Division; Golden, CO 80401

Agreement Period: From October 1, 1979 Until September 30, 1980 (R&D Perf. Perio 3/31/82)

Type Agreement: Subcontract No. XP-0-9003-1 under Prime Contract No. EG-77-C-01-4042

Amount: $445,312 Operational
        154,988 Equipment
        $600,300 TOTAL


Sponsor Contact Person(s):

Technical Matters
Mr. Jim Lefferdo
Solar Energy Research Institute
Building No. 10
1617 Cole Boulevard
Golden, Colorado 80401
(303) 231-1388

Contractual Matters (thru OCA)
Mr. Clinton Harrell, Subcontract Administrator
Solar Energy Research Institute
1617 Cole Boulevard
Golden, Colorado 80401
(303) 231-1000

Defense Priority Rating: None

Assigned to: ERL/SRB

(Copies)

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Chair—EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other

Date: March 21, 1980
GEORGIA INSTITUTE OF TECHNOLOGY

OFFICE CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date February 2, 1984

Project No. A-2571

School/Lab EMSL

Includes Subproject No(s)

Project Director(s) Dr. C.T. Brown

GTRI / GIT

Sponsor Midwest Research Institute: Solar Energy Research Institute Division

Title FY80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

Effective Completion Date: 3/31/82 (Performance) 6/30/82 (Reports)

Grant/Contract Closeout Actions Remaining:

[ ] 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. ____________________________________________

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
Research Security Services

Library
GTRI
Research Communications (2)
Project File

Reports Coordinator (OCA) Other

Legal Services

Form OCA 60:1028
D.O.E. ADVANCED COMPONENTS TEST FACILITY

TECHNICAL STATUS REPORT

FOR OCTOBER, 1979

Date: 5/13/80
Period: 10/1/79 - 10/31/79
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as requested to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- No variances; see Open Items.

Task 201 Maintenance
- No variances; see Open Items.

Task 202 Technology Transfer
- No variances; see Open Items.

Task 210 Solar Turbines Test Program
- No variances; see Open Items.

Task 242 Improved Tracking
- No variances; see Open Items.

3.0 Technical Approach/Work Plan Changes
- None

4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Program is proceeding in caretaker mode in anticipation of receipt of signed contract from SERI.

4.4 Technical Variance
- None

5.0 Open Items
- Contractor has not received signed contract or other authority to proceed document from SERI; project is being managed in caretaker mode to protect Government's investment.
6.0 Summary Status Assessment/Forecast

- Lack of authority to proceed is becoming major problem.

ATTACHMENTS

- Contract Management Summary Report

______________________________
C. Thomas Brown
Director, ACTF

CTB/me

Enclosure
# Contract Management Summary Report

**Contract Identification:**
FY 80 Operations of U. S. DOE ACTF

**Reporting Period:**
10/01/79 through 10/31/79

**Contract Number:**
SERI #EP-R-9003-1

**Contractor (Name and Address):**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**Contract Start Date:**
October 1, 1979

**Contract Completion Date:**
September 30, 1980

## Cost Status

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## Milestone Status

- a. -200
- b. -201
- c. -202
- d. -210
- e. -242

## Remarks

*Cost status information includes expenditures plus encumbrances.*

13. Signature of Contractor's Project Manager and Date: [Signature]
14. Signature of Government Technical Representative and Date: [Signature]
D.O.E. ADVANCED COMPONENTS TEST FACILITY

TECHNICAL STATUS REPORT

FOR NOVEMBER, 1979

Date: 5/14/80
Period: 11/1/79 - 11/30/79
SERI Program Manager: J. Lefferdo

PROGRAM

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-Ø-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consulta-
tion to experimenters, designing and fabricating special hardware to
support specific experiments, operating the facility in support of such
experiments, and upgrading the facility as required to meet specific test
objectives.
2.0 Contract Tasks

Task 200 Administration
- No variances; see Open Items.

Task 201 Maintenance
- No variances; see Open Items.

Task 202 Technology Transfer
- No variances; see Open Items.

Task 210 Solar Turbines Test Program
- No variances; see Open Items.

Task 242 Improved Tracking
- No variances; see Open Items.

3.0 Technical Approach/Work Plan Changes

- SERI technical monitor has requested that three additional test programs (Dynatherm, Westinghouse, Princeton) be added to current proposed tasks. These will be picked up through modification of basic proposal. Budget preparation for this activity under way.

4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Program is proceeding in caretaker mode in anticipation of receipt of signed contract from SERI.

4.4 Technical Variance
- None

5.0 Open Items

- Contractor has not received signed contract or other authority-to-proceed document from SERI; project is being managed in caretaker
mode to protect Government's investment. The single exception is that Georgia Tech has started program coordination activities with Solar Turbines. This necessary to maintain March, 1980 test window.

6.0 Summary Status Assessment/Forecast

- Lack of authority to proceed is major problem. No planning possible; proposal budget/schedule now contains high degree of uncertainty.

ATTACHMENTS

- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/me

Enclosure
## Contract Management Summary Report

**1. Contract Identification**
FY 80 Operations of U.S. DOE ACTF

**2. Reporting Period**
11/1/79 through 11/30/79

**3. Contract Number**
SERI FSP-0-9003-1

**4. Contractor (Name and Address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**5. Contract Start Date**
October 1, 1979

**6. Contractor Completion Date**
September 30, 1980

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### Manpower Status (Direct Labor)

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### Manpower

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### Major Milestone Status

1. -200
2. -201
3. -202

### Remarks
Cost status information includes expenditures plus encumbrances.

### Signature
5/9/80
D.O.E. ADVANCED COMPONENTS TEST FACILITY

TECHNICAL STATUS REPORT

FOR DECEMBER, 1979

Date: 5/14/80
Period: 12/1/79 - 12/31/79
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-Ø-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consult-
ation to experimenters, designing and fabricating special hardware to
support specific experiments, operating the facility in support of such
experiments, and upgrading the facility as required to meet specific test
objectives.
2.0 Contract Tasks

Task 200 Administration
- No variances; see Open Items.

Task 201 Maintenance
- No variances; see Open Items.

Task 202 Technology Transfer
- No variances; see Open Items.

Task 210 Solar Turbines Test Program
- This task on schedule and receiving reasonable level of effort even though contract with SERI not yet received.

Task 242 Improved Tracking
- Tracking data collected and analyzed. Some improvement evident. Remaining error appears to be associated with mirror surface and support for mirror.

3.0 Technical Approach/Work Plan Changes

- Improved Tracking effort will be redirected to look at errors associated with mirror surface and its support structure.

4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Delay in completing implementation of mirror field Improved Tracking fix forces one month delay in current Improved Tracking characterization task. Redirected Improved Tracking activities necessitate revised milestone schedule for task -242. Revised schedule to appear in next month's report.
4.4 Technical Variance
- None

5.0 Open Items
- Contractor has not received signed contract or other authority-to-proceed document from SERI; project is being managed in caretaker mode to protect Government's investment. The exceptions to this are the several test programs (Solar Turbines, Dynatherm, Westinghouse, and Princeton) that have been verbally committed by SERI's technical monitor.

6.0 Summary Status Assessment/Forecast
- Lack of authority-to-proceed (signed contract) is major problem.

ATTACHMENTS
- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/me

Enclosure
**Form DOE 506**

**U.S. Department of Energy**

**Doe Contract #EG-77-C-01-49U2**

**Contract Management Summary Report**

1. **Contract Identification**
   - FY 80 Operations of U. S. DOE ACTF

2. **Reporting Period**
   - 12/1/79 through 12/31/79

3. **Contract Number**
   - SERI #XP-B-9003-1

4. **Contractor (Name and Address)**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Contract Start Date**
   - October 1, 1979

6. **Contract Completion Date**
   - September 30, 1980

7. **Months**
   - O
   - N
   - D
   - J
   - F
   - M
   - A
   - M
   - J
   - J
   - A
   - S
   - O
   - N
   - D
   - B
   - FY 80

8. **Cost Status**
   - a. Cost Plan Date: 5/80
   - b. Planned Costs Prior FYs: N/A
   - c. Actual Costs Prior FYs: N/A
   - d. Total Estimated Costs for Contract: $600,300
   - e. Total Contract Value: $600,300
   - f. Unfilled Orders Outstanding: 
   - g. Estimate for Subsequent Reporting Period: 

9. **Accrued Costs**
   - a. Planned: 14.2 13.9 17.9 31.232.9 68.1 86.0 90.0 67.6 62.6 71.8 44.2
   - b. Actual: 14.3 15.9 15.1
   - c. Variance: (1) (2) 2.8
   - d. Cumulative Variance: (1) (2) 2.7

10. **Manpower Status (Direct Labor)**
    - a. Manpower Plan Date: 4/8/80
    - b. Planned Manpower Prior FYs: N/A
    - c. Actual Manpower Prior FYs: N/A
    - d. Total Estimated Manpower for Contract: 127MM
    - e. Total Contract Manpower: 127 MM

11. **Major Milestone Status**
    a. 
    b. 
    c. 
    d. 
    e. 
    f. 
    g. 
    h. 
    i. 

12. **Remarks**
    - *Cost status information includes expenditures plus encumbrances.

13. **Signature of Contractor’s Project Manager and Date**
    - 5/22/80

14. **Signature of Government Technical Representative and Date**
D.O.E. ADVANCED COMPONENTS TEST FACILITY

TECHNICAL STATUS REPORT

FOR JANUARY, 1980

Date: 5/15/80
Period: 1/1/80 - 1/31/80
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
   - No variances; see Open Items.

Task 201 Maintenance
   - No variances; see Open Items.

Task 202 Technology Transfer
   - No variances; see Open Items.

Task 210 Solar Turbines Test Program
   - On schedule; no variances.

Task 242 Improved Tracking
   - None

3.0 Technical Approach/Work Plan Changes

- Plan is being formulated for redirected Improved Tracking task. Major effort will be devoted to characterizing contour of focused glass mirrors. Corrective action will be recommended.

4.0 Variances/Problems

4.1 Cost Variance
   - None

4.2 Manpower Variance
   - None

4.3 Schedule Variance
   - Improved Tracking activity has been rescheduled to encompass the remainder of the fiscal year.

4.4 Technical Variance
   - None
5.0 Open Items

- Contractor has not received signed contract or written authority to proceed for this program.

6.0 Summary Status Assessment/Forecast

- Lack of official authority to proceed is major obstacle to completing program on schedule. Experiment tasks are being maintained on schedule at Georgia Tech's expense due to critical timing for testing. Maintenance and operations of Facility are at a minimum.

ATTACHMENTS

- Contract Management Summary Report

______________________________
C. Thomas Brown
Director, ACTF

CTB/me

Attachment
**CONTRACT MANAGEMENT SUMMARY REPORT**

1. **Contract Identification**
   - FY 80 Operations of the U. S. DOE ACTF
   - 1/1/80 through 1/31/80

2. **Reporting Period**
   - 1/1/80 through 1/31/80

3. **Contract Number**
   - SERI #XP-B-9003-1

4. **Contractor (Name and Address)**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Contract Start Date**
   - October 1, 1979

6. **Contract Completion Date**
   - September 30, 1980

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10. **Manpower Status (Direct Labor)**

   a. Man
   - Months
   - 120
   - 100
   - 80
   - 60
   - 40
   - 20
   - 0
   - 0
   - 0
   - 0
   - 0
   - 0
   - 0
   - 0
   - 0
   - 0

   b. Planned
   - 2.8
   - 3.6
   - 3.9
   - 3.4
   - 10
   - 8.5
   - 14
   - 14
   - 14
   - 14
   - 14
   - 14
   - 14
   - 127 MM
   - e. Manpower Plan Date
   - 4/28/80
   - f. Planned Manpower Prior FYs
   - N/A
   - g. Actual Manpower Prior FYs
   - N/A
   - h. Total Estimated Manpower for Contract
   - 127 MM
   - i. Total Contract Manpower
   - 127 MM

11. **Major Milestone Status**

   a. -200
   b. -291
   c. -202
   d. -210
   e. -242
   f. 0
   g. 0
   h. 0
   i. 0

12. **Remarks**

   Cost status information includes expenditures plus encumbrances.

13. **Signature of Contractor's Project Manager and Date**

   5/26/80

14. **Signature of Government Technical Representative and Date**
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR FEBRUARY, 1980

Date: 5/15/80
Period: 2/1/80 - 2/29/80
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule; see Section 4.3.

Task 201 Maintenance
- Task behind schedule; see Sections 3.0 and 4.3.

Task 202 Technology Transfer
- Task behind schedule; see Section 4.3.

Task 210 Solar Turbines Test Program
- Shipment of Solar Turbines hardware delayed one week due to flooding in San Diego area; see Section 4.3.

Task 242 Improved Tracking
- None

3.0 Technical Approach/Work Plan Changes

- Based on verbal communications with SERI technical monitor, four additional test programs (Dynatherm, Westinghouse, Princeton, General Atomic) have been added to the current task schedule. These additional test programs are being supported at the expense of the facility maintenance program.

4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with support of four additional test programs yield a projected $22K overrun for the basic program. Pre-proposal to cover these tests has been forwarded to SERI for consideration.

4.2 Manpower Variance
- None
4.3 Schedule Variance
- All non-test tasks are behind schedule due to delay in program initiation. The single exception is the Improved Tracking Task which was redefined in January, 1980. Recovery will involve larger level of effort during last half of fiscal year.

4.4 Technical Variance
- None

5.0 Open Items
- Funding of MOD 1 for conduct of four additional tests; preliminary proposal at SERI for review.

6.0 Summary Status Assessment/Forecast
- All test programs involving outside contractors are on schedule. In house activities such as maintenance and operations are behind schedule. Expect to catch up through increased level of effort in coming months.

ATTACHMENTS
- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/me

Attachment
**Contract Management Summary Report**

**Contract Identification**
FY 80 Operations of U.S. DOE ACTE

**Contractor (Name and Address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**Reporting Period**
2/1/80 through 2/29/80

**Contract Number**
SERI #XP-0-9003-1

**Contract Start Date**
October 1, 1979

**Contract Completion Date**
September 30, 1980

### 7. Months

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<td>SO</td>
<td>NO</td>
<td>DN</td>
<td>ND</td>
<td>DJ</td>
<td>FM</td>
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</table>

### 9. Cost Status

- **Thousands**
  - Plan: 700
  - Actual: 600
  - Latest: 500
  - Est.: 400

- **B&R Numbers**
  - Planned: 350
  - Actual: 250
  - Variance: 100
  - Corp. Variance: 50

### 10. Manpower

- **Manpower**
  - Planned: 200
  - Actual: 150
  - Variance: 50

### 11. Major Milestone Status

- **-200**
- **-201**
- **-202**
- **-210**
- **-242**

### 12. Remarks

*Cost status information includes expenditures plus encumbrances.*

---

**Signature of Contractor's Project Manager and Date:**

May 23, 1980

**Signature of Government Technical Representative and Date:**

---
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR MARCH, 1980

Date: 5/20/80
Period: 3/1/80 - 3/31/80
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-Ø-9003-1
DOE Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U. S. Department of Energy in support of the U. S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule; see Section 4.3.

Task 201 Maintenance & Equipment Purchase
- Task behind schedule; see Section 4.3.

Task 202 Technology Transfer
- Task behind schedule; see Section 4.3.

Task 210 Solar Turbines Test Program
- Task behind schedule due to increased experiment installation time and to experimental difficulties with receiver.

Task 242 Improved Tracking
- No problems.

3.0 Technical Approach/Work Plan Changes

- Dynatherm has informed ACTF that it can not be ready for its April, 1980 test window. Test will be rescheduled for November, 1980.

- Solar Turbines steam generator failed during second day of solar testing. Boiler tube ruptured with system at elevated temperature and pressure. Analysis indicates failure occurred at damaged point on tube. Faulty section to be replaced by Georgia Tech machine shop. Testing to resume during April, 1980 period.

4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with support of four additional test programs yield a projected $44K overrun of the basic program. Pre-proposal to cover these tests has been forwarded to SERI for evaluation.

- Most non-test activities are experiencing underrun due to four month delay in initiation of contract and to shift in manpower to cover the five currently scheduled test programs.
4.2 Manpower Variance
- Increased staff is required to satisfy present Statement of Work plus the anticipated Statement of Work associated with the four additional test programs.

4.3 Schedule Variance
- Equipment difficulties with Solar Turbines hardware (ruptured boiler tube) have forced one month slip in completion of that test program.
- Delay in availability of Dynatherm hardware has resulted in moving their test window from April to November, 1980.

4.4 Technical Variance
- None

5.0 Open Items
- Action required on funding of Mod 1 for conduct of four additional tests; preliminary proposal at SERI for review.

6.0 Summary Status Assessment/Forecast
- Solar Turbines test to be completed in April, 1980. Dynatherm rescheduled for November, 1980. Operations and maintenance activities are behind schedule due to unanticipated influx of four plus test programs. Recovery will require increased staffing and most of the remainder of the current fiscal year.

ATTACHMENTS
- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/me
Enclosure
**Contract Management Summary Report**

**Contract ID:** DOE 536

**Fiscal Year and Period:** FY 80, Operations of U.S. DOE ACTF, 3/1/80 through 3/31/80

**Government Contractor:** Georgia Tech Research Institute

**Address:** Georgia Institute of Technology

**City, State, Zip:** Atlanta, Georgia 30332

**Contract Start Date:** October 1, 1980

**Contract Completion Date:** September 30, 1980

### Cost Status

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<th>ND</th>
<th>DJ</th>
<th>F</th>
<th>M</th>
<th>A</th>
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### Manpower Status (Direct Labor)

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### Remarks

Cost status information includes expenditures plus encumbrances.

---

**Date:** 5/30/80

**Signature of Contractor's Project Manager:**

**Signature of Government Technical Representative:**
1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U. S. Department of Energy in support of the U. S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
   - Task behind schedule due to late authority to proceed.

Task 201 Maintenance & Equipment Purchase
   - Task behind schedule due to late authority to proceed.

Task 202 Technology Transfer
   - Task behind schedule due to late authority to proceed.

Task 210 Solar Turbines Test Program
   - Schedule revised last month due to increased experiment installation time and to experimental difficulties with receiver. Experimental program completed April 22, 1980, three weeks behind schedule.

Task 242 Improved Tracking
   - No problems.

3.0 Technical Approach/Work Plan Changes

- Georgia Tech will have larger role in the Princeton test than initially visualized. Georgia Tech will provide engineering support, provide a water cooled support structure for the experiment, possibly provide terminal concentrator, and conduct proof test of a Princeton quartz/platinum cavity structure.

- Contact with Boeing Engineering and Construction, Electric Power Research Institute and Solar Energy Research Institute indicates likelihood of a late Fall 1980 solar test for EPRI/Boeing. Georgia Tech will provide proposal to SERI.
4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with support of four additional test programs yield a projected $63K overrun of the basic program. Pre-proposal to cover these tests has been forwarded to SERI for evaluation.
- Most non-test activities are experiencing underrun due to four month delay in initiation of contract and to shift in manpower to cover the five currently scheduled test programs.

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Non-test activities are behind schedule due to four month delay in program initiation. Effort is being made to overcome this difficulty with increased manpower.

4.4 Technical Variance
- None

5.0 Open Items
- Action required on funding of Mod 1 proposal for conduct of four additional tests and installation of elevator system; proposal is at SERI.

6.0 Summary Status Assessment and Forecast
- Westinghouse program is in good shape. General Atomic has indicated that they have stopped work pending receipt of SERI contract. Control Building/Perimeter Pad contractor should finish roadway and booster pump system early in summer.
Proposed Mod 1 to the contract includes installation of an elevator on the experiment tower. The September time window for installation required an April 15, 1980 turn on date. That date was missed. The next available installation window is in January - February, 1981. We are now less than six weeks away from missing that time window due to lack of authority to proceed with the task. Georgia Tech requires written authority to proceed before it can start subcontract negotiations for the elevator.

ATTACHMENTS
  o Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/me

Enclosure
1. Contract Identification
FY 80 Operations of U.S. DOE ACTF

2. Reporting Period
4/1/80 through 4/30/80

3. Contract Number
SERI #0-9003-1

4. Contractor (Name and Address):
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Contract Start Date
October 1, 1979

6. Contract Completion Date
September 30, 1980

7. Months
O N D J F M A M J J A S O N D

8. FY 80

9. Cost Status

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10. Manpower Status

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11. Major Milestones Status

12. Remarks
Cost status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date
5/30/80

14. Signature of Government Technical Representative and Date
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR MAY, 1980

Date: 7/8/80
Period: 5/1/80 - 5/31/80
SERI Program Manager: J. Lefferdo

PROJECT
Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT
SERI Subcontract No.: XP-0-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective
The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U. S. Department of Energy in support of the U. S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed.

Task 201 Maintenance & Equipment Purchase
- Task behind schedule due to late authority to proceed.

Task 202 Technology Transfer
- Task behind schedule due to late authority to proceed.

Task 210 Solar Turbines Test Program
- Test phase completed; no cost or schedule problems.

Task 242 Improved Tracking
- No problems.

3.0 Technical Approach/Work Plan Changes
- None

4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with support of four additional test programs yield a projected $83K overrun of the basic program. Proposal to cover these tests forwarded to SERI on April 17, 1980.

- Most non-test activities are experiencing underrun due to four month delay in initiation of contract and to shift in manpower to cover the five currently scheduled test programs.

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Non-test activities are behind schedule due to four month delay in program initiation.
4.4 **Technical Variance**
- None

5.0 **Open Items**
- Action required on funding of Mod 1 proposal for conduct of four additional tests and installation of elevator system; proposal is at SERI.

6.0 **Summary Status Assessment and Forecast**
- Consideration being given to swapping test windows for Dynatherm and General Atomic. Both contractors have been contacted.
- Solar testing of Westinghouse receiver initiated on May 21, 1980. No problems.
- Lack of Mod 1 to contract causing severe delay in installation of elevator to tower. D.O.E. Headquarters perceives this as a major safety related item. Georgia Tech requires written authority to proceed before it can start subcontract negotiations for the elevator.

**ATTACHMENTS**
- Contract Management Summary Report

---

C. Thomas Brown
Director, ACTF

CTB/mde
11. Major Milestone Status:

| a.  | -200 |
| b.  | -201 |
| c.  | -202 |
| d.  | -210 |
| e.  | -242 |
| f.  |   |
| g.  |   |
| h.  |   |
| i.  |   |

12. Remarks:

Cost status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date

14. Signature of Government Technical Representative and Date
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/80
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georga Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed.

Task 201 Maintenance & Equipment Purchase
- Task behind schedule due to late authority to proceed.

Task 202 Technology Transfer
- Task behind schedule due to late authority to proceed.

Task 210 Solar Turbines Test Program
- Test phase completed and draft report completed; no cost or schedule problems.

Task 242 Improved Tracking
- No problems.

3.0 Technical Approach/Work Plan Changes
- Dynatherm test period window moved to early October. Dynatherm to arrive 9/15/80 and begin testing 10/1/80.
- General Atomic test period window moved to the October 15 - November 15, 1980 time frame.

4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with the support of four additional test programs yield a projected $109K overrun of the basic program. Proposal to cover these tests forwarded to SERI on April 17, 1980.
- Most non-test activities are experiencing underrun due to four month delay in initiation of contract and to shift in manpower to cover the five currently scheduled test programs.

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Non-test activities are behind schedule due to four month delay in program initiation.

4.4 Technical Variance
- None
5.0 Open Items
- Action required on funding of Mod 1 proposal for conduct of four additional tests and installation of elevator system; proposal is at SERI.

6.0 Summary Status Assessment and Forecast
- Experimental portion of STI experiment completed. Draft report at SERI for review.
- All major test objectives for Westinghouse Fluidized Bed test program have been met. Receiver will be removed from tower early next report period.
- Technical support for Princeton test continues. No major difficulties expected.
- Preliminary technical support activities for General Atomic test have been initiated.
- Organization of September 16-17, 1980 ACTF Workshop got under way. Schedule is tight.
- Lack of Mod 1 to contract causing severe delay in installation of elevator to tower. D.O.E. Headquarters perceives this as a major safety related item. Georgia Tech requires written authority to proceed before it can start subcontract negotiations for the elevator.

ATTACHMENTS
- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/mde
1. Contract Identification
   FY 80 Operations of U.S. DOE ACTF

2. Reporting Period
   6/1/80 through 6/30/80

3. Contract Number
   SERI #XP-0-9003-1

4. Contractor (Name and Address):
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. Contract Start Date
   October 1, 1979

6. Contract Completion Date
   September 30, 1980

7. Months

8. FY 80

9. Cost Status
   a. Cost Plan Date
   b. Planned Costs Prior FYs
   c. Actual Costs Prior FYs
   d. Total Estimated Costs for Contract
   e. Total Contract Value
   f. Unfilled Orders Outstanding

10. Manpower Status (Direct Labor)
    a. Man Months
    b. Planned
    c. Actual
    d. Variance

11. Major Milestone Status:
    a. -200
    b. -201
    c. -202
    d. -210
    e. -242

12. Remarks
    Cost status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date: 9/9/80

14. Signature of Government Technical Representative and Date: 
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 201 Maintenance and Equipment Purchase
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 202 Technology Transfer
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 210 Solar Turbines Test Program
- Program essentially complete; no problems.

Task 242 Improved Tracking
- No problems.

3.0 Technical Approach/Work Plan Changes
- Major objectives of Westinghouse test program completed and Westinghouse researchers departed; Georgia Tech will conduct several more bed tests on a time available basis.

4.0 Variances/Problems

4.1 Cost Variance
- Expenses associated with support of four additional test programs yield a projected $138K overrun of the basic program. Modification of the contract to cover these test programs is being negotiated by SERI and Georgia Tech.
- Most non-test activities are experiencing underrun due to four month delay in initiation of contract and to shift in manpower to cover the five currently scheduled test programs. Strong effort being made to recover.

4.2 Manpower Variance
- None
4.3 Schedule Variance
- Non-test activities behind schedule due to four month delay in program initiation and to conflict with test programs. Strong effort to recover schedule is beginning to have some effect.

4.4 Technical Variance
- None

5.0 Open Items
- Action required on funding of Mod 1 proposal for conduct of four additional tests and installation of elevator system; proposal is being negotiated.

6.0 Summary Status Assessment and Forecast
- Program is gaining necessary momentum to simultaneously service outside experimenters and accomplish those tasks specified in the operations and maintenance Statement of Work.

ATTACHMENTS
- Contract Management Summary Report

C. Thomas Brown
Director, ACTF

CTB/mde
11. Major Milestone Status

a. -200
b. -201
c. -202
d. -210
e. -242
f. 
g. 
h. 
i. 

12. Remarks * Cost status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date

14. Signature of Government Technical Representative and Date
GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR AUGUST, 1980

Date: August 27, 1981
Period: 8/1/80 - 8/31/80
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate
the D.O.E. ACTF for the U. S. Department of Energy in support of the U. S.
Solar Thermal R & D effort. This includes providing technical support and
consultation to experimenters, designing and fabricating special hardware
to support specific experiments, operating the facility in support of such
experiments, and upgrading the facility as required to meet specific test
objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 201 Maintenance & Equipment Purchase
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 202 Technology Transfer
- The Summary of 1980 Activities was published. The booklet describes fifteen months of work at the ACTF.
- Announcements for the ACTF Users Workshop were mailed. The meeting will be held September 16 & 17, 1980.

Task 210 Solar Turbines Test Program
- Program essentially complete; no problems.

Task 211 Dynatherm Test Program
- Preparation underway for October 1980 test; no problems.

Task 212 Princeton Test Program
- Solar tests with the Princeton biomass reactor were conducted August 12 through 22. Georgia Tech began reaction product analysis and work on the test report.

Task 213 Westinghouse Test Program
- Program essentially complete; no problems.

Task 214 General Atomic Test Program
- Preparation underway for November test; no technical problems. See Schedule Variance.

Task 242 Improved Tracking
- Analytic model of mirror shape developed and experimental measurements begun; no problems.

3.0 Technical Approach/Work Plan Changes
- None
4.0 **Variance/Problems**

4.1 **Cost Variance**
- None

4.2 **Manpower Variance**
- None

4.3 **Schedule Variance**
- Non-test activities behind schedule due to four month delay in program initiation.
- General Atomic (GA) has fallen behind schedule for submitting ACTF/GA test documents. GA was informed that their test program may be delayed by lack of these documents. Support hardware design and preparation continued on schedule.

4.4 **Technical Variance**
- None

5.0 **Open Items**
- Supplemental Agreement No.1 has been executed and is in effect. It provides funds for installation of an elevator system and expires January 31, 1981. Funding for FY80 operation of the ACTF expires September 30, 1980. A preliminary proposal for FY81 operation of the ACTF has been submitted to SERI. SERI's timely response to this proposal is necessary for continuity of ACTF operations.

6.0 **Summary Status Assessment and Forecast**
- The Princeton experiment was conducted. Georgia Tech had a major role in engineering this test and analyzing reaction products. Princeton was satisfied with the test results.
- Planning for the Dynatherm experiment continues on schedule.
- Uncertainty of funding for the General Atomic experiment has resulted in delayed program documentation which may result in a test schedule change.
- No problems encountered or expected on other tasks.

**ATTACHMENTS**

- Contract Management Summary Report
- Technical Progress Report

---

C. Thomas Brown  
Director, ACTF
**Contract Management Summary Report**

1. **Contract Identification**
   - **FY80 Operations of the U.S. DOE ACTF**
2. **Reporting Period**
   - 8/1/80 through 8/31/80
3. **Contract Number**
   - MOD 1
4. **Contractor (Name and Address)**
   - **Georgia Tech Research Institute**
   - **Georgia Institute of Technology**
   - **Atlanta, Georgia 30332**
5. **Contract Start Date**
   - October 1, 1979
6. **Contract Completion Date**
   - January 31, 1981

### Cost Status

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### Manpower Status

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### Milestone Status

- **-200**
- **-201**
- **-202**
- **-210**
- **-211**
- **-212**
- **-213**
- **-214**
- **-242**

### Remarks

- Tasks added under Supplemental Agreement No. 1
- **Cost status information includes expenditures plus encumbrances**
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract no.: XP-Q-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 201 Maintenance and Equipment Purchase
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 202 Technology Transfer
- ACTF Users Workshop was held September 16 and 17, 1980. Thirty-two people attended. Proceedings will include papers and a summary of the workshop session.

Task 210 Solar Turbines Test Program
- Task completed; no problems.

Task 211 Dynatherm Test Program
- Preparations underway for October test; no problems.

Task 212 Princeton Test Program
- The solar test phase of the program was completed in August. Georgia Tech has forwarded its report of GC analysis to Princeton. Georgia Tech and Princeton are co-authoring the test report.

Task 213 Westinghouse Test Program
- Program essentially complete; no problems.

Task 214 General Atomic Test Program
- Georgia Tech experiment hardware fabrication nearly complete.
- General Atomic has submitted a draft Safety Document.
- See Technical Approach/Work Plan Changes.

Task 242 Improved Tracking
- No problems.

3.0 Technical Approach/Work Plan Changes
- At the request of Jim Lefferdo of SERI, the General Atomic Test Program was removed from the ACTF solar test schedule. Preparation for this test will be terminated in an orderly manner. Much planning and hardware fabrication has been completed. Hardware will be stored for possible use in a FY 81 test program.
4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- Non-test activities behind schedule due to four month delay in program initiation.

4.4 Technical Variance
- None

5.0 Open Items
- Funds for general operation of the ACTF expired September 30, 1980. Funds for tasks 211, 212, 213 and 214 expire January 31, 1981. SERI has not responded to Georgia Tech's proposal for FY 81 Operation of the ACTF.
- In order to ensure continuity of operating funds for the ACTF, it may be necessary to convert FY 80 funds for the General Atomic test and elevator monies to interim operating funds. Georgia Tech, DOE, and SERI are negotiating this.

6.0 Summary Status Assessment and Forecast
- Test programs are proceeding well.
- The ACTF Users Workshop was well attended and well received. Past experimenters were enthusiastic about their tests at the ACTF and potential future experimenters showed great interest in the facility.
- Uncertainty about FY 81 contract initiations for both ACTF operation and STTF Users Association research programs prevents development of an FY 81 ACTF schedule.

ATTACHMENTS
- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF

CTB/pm
**Contract Management Summary Report**

1. **Contract Identification**
   - FY00 Operations of the U.S. DOE ACTF
   - Reporting Period: 9/1/80 through 9/30/80
   - Contract Number: P-1
   - Project No.: 900-1
   - Project Title: GECA
   - Contract Start Date: October 1, 1979
   - Contract Completion Date: January 31, 1981

2. **Cost Status**
   - Planned Costs Prior Month: $14,272
   - Actual Costs Prior Month: $14,300
   - Total Estimated Costs: $882,437

3. **Manpower Status**
   - Planned Manpower: 6.1 (80)*
   - Actual Manpower: 2.8 MM

4. **Major Milestone Status**
   - a. -200
   - b. -201
   - c. -202
   - d. -210
   - e. -211*
   - f. -212*
   - g. -213*
   - h. -214*
   - i. -242

5. **Remarks**
   - *Tasks added under Supplemental Agreement No. 1
   - **Cost status information includes expenditures plus encumbrances

6. **Signature of Contractor's Project Manager and Date**
   - 9/4/81

7. **Signature of Government Technical Representative and Date**
   - [Signature]

---

**Legend**
- N: January
- D: February
- J: March
- F: April
- M: May
- A: June
- J: July
- S: August
- O: September
- N: October
- D: November
- J: December

**Cost Status Table**

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**Manpower Status Diagram**

- Planned Manpower: 6.1 (80)*
- Actual Manpower: 2.8 MM
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiment's, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 201 Maintenance & Equipment Purchase
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.
- A & E firm under contract for design of elevator system.

Task 202 Technology Transfer
- Submitted abstracts of six papers describing recent research at the ACTF to the American Section of ISES for the conference to be held in May.
- Draft begun for proceedings of September, 1980 ACTF Users Workshop.

Task 210 Solar Turbines Test Program
- Task completed in September.

Task 211 Dynaternel Test Program
- Solar testing of Dynaternel heat pipe receiver was conducted October 6 to 14, 1980. Data analysis underway. All objectives of the test program were achieved.

Task 212 Princeton Test Program
- Task essentially complete; no problems.

Task 213 Westinghouse Test Program
- Task essentially complete; no problems.

Task 214 General Atomic Program
- Equipment fabrication completed. Test program cancelled per Jim Lefferdo's request (September).

Task 242 Improved Tracking
- Fabricated prototype mechanical system which improves surface curvature of individual heliostat mirrors.

3.0 Technical Approach/Work Plan Changes
- None
4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- See Open Items. Elevator system procurement may be delayed by lack of FY 81 Operations contract.

4.4 Technical Variance
- None

5.0 Open Items

- The contract funding the operation of the ACTF expired September 30, 1980. SERI has not responded to Georgia Tech's proposal for the FY 81 Operations contract. Non-test activities are continuing in a caretaker mode pending receipt of the contract.

- Georgia Tech's plan for interim funding is attached. It calls for a change from fiscal-year funding to calendar-year funding. General Atomic test funds and elevator system installation monies are to be converted to interim ACTF Operations funds. This has been discussed with Jim Lefferdo at SERI.

- SERI's immediate response to these proposals is crucial for program continuity.

6.0 Summary Status and Forecast

- Test programs are proceeding well.

- Recent mirror shape studies have revealed that the curvature of our heliostat mirrors can be altered to significantly improve individual mirror focus.

- Uncertainty about FY 81 contract initiations for ACTF Operations and for STTF Users Association research programs is delaying development of future test programs for the ACTF.

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF

CTB/pm
## CONTRACT MANAGEMENT SUMMARY REPORT

**U.S. Department of Energy**

**Identification Information**
- **Contract Identification**: FY80 Operations of the U.S. DOE ACTF
- **Contract Period**: 10-1-80 through 10-31-80
- **Contract Number**: MOD I

**Contractor Information**
- **Name and Address**: Georgia Tech Research Institute, Georgia Institute of Technology, Atlanta, Georgia 30332

### 9. Cost Status

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### 10. Manpower Status (Direct Labor)

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### 11. Major Milestone Status

- **-200**: Solar Test
- **-211**: Solar Test
- **-213**: Solar Test
- **-214**: Solar Test Not Funded

### Remarks

*Cost status information includes expenditures plus encumbrances*

13. Signature of Contractor's Project Manager and Date: 11/2/79
14. Signature of Government Technical Representative and Date: 11/30/79
Mr. Jim Lefferdo  
Solar Energy Research Institute  
Building 10, 2nd Floor  
Branch 633  
1617 Cole Boulevard  
Golden, Colorado  80401  

Subject: Proposed modifications to FY 80 ACTF Operations contract to comply with Martin Gutstein's interim funding requirement for the ACTF and simultaneously to convert the contract to a calendar year cycle. SERI Subcontract No. XP-Ø-9003-1, EES Project A-2571.

Dear Jim:

Past experience and reason dictate that it is not possible to maintain continuity of funding for the ACTF program if it is to be funded on the Federal fiscal year cycle of October 1 to September 30. Our past two contracts, although backdated to October 1, became active around the middle of January or 3½ months into the fiscal year. These contracts were pushed through the system by SERI and JPL to minimize the delay in time. Furthermore, at the current rate of expenditure of funds of $55K to $75K per month, it is not possible for Georgia Tech to absorb $165K to $210K prior to the award of a follow-on contract.

As an indication of the seriousness of the problem, it is my understanding that this year's projected delay has prompted Martin Gutstein of DOE Headquarters to dictate that interim funds be made available to assure continuity of funding across the three-month-plus period between the beginning of the new fiscal year and the award of a follow-on contract.

The following is a proposed plan of action that will satisfy Martin Gutstein's dictate and simultaneously place the ACTF program on a calendar year cycle so as to eliminate the problem in future years.

The table below is a summary of the ACTF financial situation as of September 30, 1980. The FY 80 equipment budget is not included in this table. The $72K free balance taken from the table is due to (1) the delayed initiation of the FY 80 Operations contract for the ACTF, (2) the uncertainty of the costs associated with conducting test programs at the ACTF, and (3) the cancellation of the General Atomic test program.
TABLE I. ACTF Financial Summary

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<td>Dynatherm Receiver Test $22,921</td>
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<tr>
<td>Princeton Receiver Test 14,042</td>
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<tr>
<td>Tower Hoist Subcontract 61,000</td>
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<tr>
<td>Funds Available for a No Cost Extension</td>
<td>$72,038</td>
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*September 1980 costs are best estimates, not actuals.

The following is a list of the Operations tasks and their average costs for the past months of July, August, and September, 1980.

<table>
<thead>
<tr>
<th>Task</th>
<th>Average Cost</th>
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<td>-200 Administration</td>
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<tr>
<td>-201 Maintenance (less equipment)</td>
<td>23,707</td>
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<tr>
<td>-202 Technology Transfer</td>
<td>4,449</td>
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<tr>
<td>-242 Improved Tracking</td>
<td>8,157</td>
</tr>
<tr>
<td>Average Monthly Operational Cost:</td>
<td>$43,420</td>
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</table>

Thus, the Operational funds required for the interim three month period amount to 3 x $43.4K or approximately $130K.

$72K of the required monies is already available within the program budget as outlined in Table I. It is proposed that the remaining $58K be made available by deferring the man/material tower hoist subcontract ($61K) until FY 81 and reallocating these monies to the Operational task. The design of the hoist system will continue in the interim period and the deferring of the tower hoist subcontract to the FY 81 contract will not delay the installation of the hoist system provided the FY 81 contract is awarded by the end of January, 1981. A detailed Operations budget for the proposed reallocated $61K is attached.

It is also noted that the proposed plan requires that the Statement of Work for the support of the General Atomic test program should be removed from the contract since that program has been cancelled.
I have also revised the draft of our 1981 Operations proposal to reflect the above suggested plan of action. The budget is now based on a period of performance of January 1 - December 31, 1981 and the subcontract for the installation of the man/material tower hoist has been incorporated into the maintenance budget. A copy of the revised draft proposal is enclosed.

Yours truly,

C. Thomas Brown
Director, ACTF

CTB/mde

cc: R. A. Cassanova
    S. H. Bomar, Jr.
    Carol Cook, OCA

Enclosure
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing.

Task 201 Maintenance and Equipment Purchase
- Task behind schedule due to late authority to proceed, but degree of lateness is diminishing. A & E firm began design of elevator system.

Task 202 Technology Transfer
- The Proceedings of the ACTF Users Workshop have been assembled; publication awaits receipt of several missing papers.

Task 210 Solar Turbines Test Program
- Task completed in September.

Task 211 Dynatherm Test Program
- Analysis of data from October test continues. Georgia Tech's portion of test report has been draft typed.

Task 212 Princeton Test Program
- Task essentially complete; no problems.

Task 213 Westinghouse Test Program
- Task completed.

Task 214 General Atomic Test Program
- Task completed. Test program cancelled per Jim Lefferdo's request (September 1980).
Task 242  Improved Tracking
- Experiments with mirror curvature improvement have demonstrated a technique for doubling the peak flux from an individual mirror.

3.0 Technical Approach/Work Plan Changes
- None.

4.0 Variances/Problems

4.1 Cost Variance
- None.

4.2 Manpower Variance
- None.

4.3 Schedule Variance
- See Open Items. Elevator system procurement may be delayed by lack of FY 81 Operations Contract.

4.4 Technical Variance
- None.

5.0 Open Items
- The contract funding the operation of the ACTF expired September 30, 1980. SERI has not responded to Georgia Tech's proposal for the FY 81 Operations contract. Non-test activities are continuing in a caretaker mode pending receipt of the contract.
- Georgia Tech's plan for interim funding was attached to the October 1980 report. It calls for a change from fiscal-year funding to calendar-year funding. General Atomic test funds and elevator system installation monies would be converted to interim ACTF Operations funds. Jim Lefferdo at SERI has given verbal
approval to this plan, but Georgia Tech has not received written confirmation.

- SERI's immediate response to both proposals is crucial for ACTF program continuity.

6.0 Summary Status and Forecast

- All scheduled user experiments are now complete and test reports are nearly complete.

- Georgia Tech research into heliostat mirror optics and curvature measurement are producing data which will be useful at the ACTF and other central-receiver facilities.

- Development of FY 81 experiment programs is hindered by lack of an FY 81 ACTF Operations contract.

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF

CTB/pm
# Contract Management Summary Report

**Form Approved OMB No. 381-0540**

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<th>F</th>
<th>M</th>
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<tr>
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<td>2.8</td>
<td>6.1</td>
<td>9.2</td>
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<td>3.1</td>
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<td>1.3</td>
<td>8.9</td>
<td>35.7</td>
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<td>67.4</td>
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<td>5.8</td>
<td>28.5</td>
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</tbody>
</table>

**10. Manpower Status (Direct Labor)**

| Man Months |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|            | 3.6 | 3.9 | 10.1 | 8.6 | 14.1 | 14.1 | 14.1 | 14.1 | 15.2 | 15.1 | 15.1 | 15.1 | 15.1 | 15.1 | 15.1 | 15.1 | 15.1 | 15.1 |
| a. Manpower Plan Data | 8,180 |
| b. Planned Manpower |
| c. Manpower Plan Data | 8,180 |
| d. Manpower Plan Data | 2.8 |
| e. Total Estimated Manpower for Contract | 189 |

**11. Major Milestone Status**

-200
-201
-202
-210
-211
-212
-213
-214
-242

**12. Remarks**

*Cost status information includes expenditures plus encumbrances*

13. Signature of Contractor's Project Manager and Date: [Signature]

14. Signature of Government Technical Representative and Date: [Signature]
Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR DECEMBER, 1980

Date: 9/8/81
Period: 12/1/80 - 12/31/80
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- No problems.

Task 201 Maintenance and Equipment Purchase
- Preliminary design for elevator system has been completed and approved. A & E firm is authorized to proceed with detailed design and specification.
- SEPI granted authorization to transfer FY 80 elevator procurement funds to interim operating funds on December 1, 1980. FY 81 funds will be used to restore the elevator procurement monies. See Open Items.

Task 202 Technology Transfer
- No problems.

Task 210 Solar Turbines Test Program
- Task completed in September.

Task 211 Dynatherm Test Program
- Work continued on Georgia Tech portion of test report; no problems.

Task 212 Princeton Test Program
- Task essentially complete; no problems.

Task 213 Westinghouse Test Program
- Task completed in November.

Task 214 General Atomic Program
- Task completed in October. Test program cancelled per Jim Lefferdo's request (September).
Task 242  Improved Tracking
- Collection of single mirror flux data complete. Data show that mirror shape improvement could significantly increase total peak flux for a modest cost. Proposal preparation begun.

3.0 Technical Approach/Work Plan Changes
- None.

4.0 Variances/Problems

4.1 Cost Variance
- None.

4.2 Manpower Variance
- None.

4.3 Schedule Variance
- See Open Items. Elevator system procurement may be delayed by lack of FY 81 Operations contract.

4.4 Technical Variance
- None.

5.0 Open Items
- The contract funding the operation of the ACTF expired September 30, 1980. SERI has not responded to Georgia Tech's proposal for the FY 81 Operations contract.
- SERI granted Georgia Tech's request to convert elevator procurement monies to interim operating monies. Letter of authorization is attached.
- Test program funds (Supplemental Agreement No. 1) and interim operating funds will expire January 31, 1981.
- Georgia Tech must receive an executed FY 81 ACTF Operation contract by January 31, 1981, to ensure program continuity.

6.0 Summary Status and Forecast

- All scheduled user experiments are complete and test reports are nearly complete.

- Georgia Tech experiments with mechanical systems which focus flat circular mirrors have produced an inexpensive method of significantly increasing peak flux.

- The University of New Hampshire, Boeing Engineering and Construction Company, and United Stirling, Inc. are interested in conducting experiments at the ACTF in 1981.

- Development of FY 81 user programs and implementation of improved mirror shape are hindered by lack of the FY 81 ACTF Operations contract.

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report
- Letter of authorization for conversion of funds

C. Thomas Brown
Director, ACTF
December 1, 1980

Georgia Institute of Technology
Administration Building
Georgia Tech Research Institute
Atlanta, GA 30332

Attention: Ms. Carol A. Cook

Subject: Subcontract No. XP-0-9003-1

Dear Ms. Cook:

Authorization is hereby granted to transfer $61,000.00 previously allocated to purchase a tower hoist to FY 81 operating expenses. A subsequent modification to restore the funds for the hoist will be written as soon as FY 81 funds are available.

If you have any questions or comments concerning this transmittal, please feel free to contact me.

Sincerely,

Clinton Harrell
Group Manager
Subcontracts Branch

CH/pb
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR JANUARY, 1981

Date: 9/9/81
Period: 1/1/81 - 1/31/81
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
   - No variances; see Open Items.

Task 201 Maintenance and Equipment Purchase
   - No variances; see Open Items.

Task 202 Technology Transfer
   - ACTF Workshop Proceedings are complete and ready to go to press pending receipt of General Atomic's paper.
   - No variances; see Open Items.

Task 210 Solar Turbines Test Program
   - Task completed in September, 1980.

Task 211 Dynatherm Test Program
   - Task essentially complete; no problems.

Task 212 Princeton Test Program
   - Task essentially complete; no problems.

Task 213 Westinghouse Test Program
   - Task completed in November, 1980

Task 214 General Atomic Program
   - Task completed in October, 1980. Test program cancelled per Jim Lefferdo's request (September, 1980).

Task 242 Improved Tracking
   - Georgia Tech completed an experimental program which demonstrated that mirror surface curvature can be improved mechanically and thereby double the peak flux at the ACTF focus.
   - A proposal to implement mirror improvement is being prepared and will be submitted to SERI for consideration.
3.0 Technical Approach/Work Plan Changes
- None.

4.0 Variances/Problems

4.1 Cost Variance
- None.

4.2 Manpower Variance
- None.

4.3 Schedule Variance
- Georgia Tech must receive FY81 Operations Contract and authority to procure elevator by February 6, 1981 to maintain elevator procurement and installation task schedule. See Open Items.

4.4 Technical Variance
- None.

5.0 Open Items
- The contract funding the general operation of the ACTF expired September 30, 1981. SERI has not responded to Georgia Tech's proposal for the FY81 Operations contract. In December, SERI granted Georgia Tech's request to convert elevator procurement and installation monies to interim operating monies.

- As of January 31, 1981:
  - Supplemental Agreement No. 1 (test program funds) expired.
  - Interim operating funds (converted from elevator sub-contract task) were depleted.
  - Deadline for authority to procure elevator with FY91 funds is February 6, 1981.
  - Immediate execution of the FY81 ACTF Operations Contract is necessary to prevent disruption of the program.

6.0 Summary Status and Forecast
- All scheduled user experiments are complete and test reports are nearly completed.

- Research groups interested in scheduling 1981 tests at the ACTF include:
  a) United Stirling (a proposal for a privately funded test has been submitted)
b) Lawrence Berkeley Laboratories, Arlon Hunt (STTF UA funded)
c) Tile Council of America, Edward McNamera (STTF UA funded)
d) Dr. Ignatiev, University of Houston (STTF UA funded)

- Implementation of the mirror surface curvature devices is necessary to achieve the peak flux required by the United Stirling and Lawrence Berkeley Labs test programs.

- All funding for the ACTF expired January 31, 1981, jeopardizing all plans for 1981 solar tests and plans for installation of the elevator system.

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF
CONTRACT MANAGEMENT SUMMARY REPORT

1. Contract Identification:
   FY80 Operations of the U.S. DOE ACTF

2. Reporting Period:
   1-1-81 through 1-31-81

3. Contract Number:
   1000

4. Contractor (Name and Address):
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. Contract Start Date:
   October 1, 1979

6. Contract Closeout Date:
   January 31, 1981

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# Milestone Status

- 200
- 201
- 202
- 210
- 211
- 212
- 213
- 214
- 242

Solar Test Not Funded

*Cost status information includes expenditures plus encumbrances*

9/9/81
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR FEBRUARY, 1981

Date: 9/10/81
Period: 2/1/81 - 2/28/81
SERI Program Manager: J. Lefferdo

PROJECT
Title: FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81 (see 5.0 Open Items)
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the
D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar
Thermal R & D effort. This includes providing technical support and consul-
tation to experimenters, designing and fabricating special hardware to support
specific experiments, operating the facility in support of such experiments,
and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration

- No variances; see Open Items.

Task 201 Maintenance and Equipment Purchase

- Bids for the hoist assembly and its erection were opened February 27. In order to accept the low bid, FY81 funds must be available by March 27.

- No variances; see Open Items.

Task 202 Technology Transfer

- The Proceedings of the ACTF Users Workshop went to press.

- No variances; see Open Items.

Task 210 Solar Turbines Test Program

- Task completed in September.

Task 211 Dynatherm Test Program

- Task essentially complete; no problems.

Task 212 Princeton Test Program

- Task complete.

Task 213 Westinghouse Test Program

- Task completed in November

Task 214 General Atomic Program

- Task completed in October.

Task 242 Improved Tracking

- Prepared draft of technical document on improved tracking, aiming, and alignment of heliostats.

- Georgia Tech submitted a formal proposal to SERI for implementation of hardware to improve mirror surface curvature.

- Task complete.

3.0 Technical Approach/Work Plan Changes

- None
4.0 Variances/Problems

4.1 Cost Variance
   - None

4.2 Manpower Variance
   - None

4.3 Schedule Variance
   - Georgia Tech must receive authority to procure elevator by early March in order for the elevator task to remain on schedule. See Open Items.

4.4 Technical Variance
   - None

5.0 Open Items

   - Georgia Tech received the FY81 ACTF Operations contract, signed it on February 27, 1981 and returned it to SERI. It is urgent that SERI sign this contract immediately because:

   - All funding for the ACTF expired January 31, 1981.

   - Georgia Tech has received bids for elevator procurement and is receiving bids for elevator construction. Funds for this work must be available within 30 days of bid opening. Georgia Tech cannot execute construction contracts without first encumbering funds to cover them.

6.0 Summary Status Report

   - Georgia Tech is maintaining contact with several research groups interested in conducting tests at the ACTF in 1981.

   - Georgia Tech conducted a two-day experiment to test microwave transmissivity of a radome heated to flight temperature.
- A new method of detecting misaligned mirrors was demonstrated. A camera at the focal point photographed the concentrated image of the moon.

- Detailed planning of an FY81 test schedule and budget is impossible without an executed FY81 contract.

C. Thomas Brown
Director, ACTF

Attachments

- Contract Management Summary Report
- Monthly Technical Progress Report
1. Contract Identification
FY 80 Operations of the U.S. DOE ACTF

2. Reporting Period
2-1-81 through 2-28-81

3. Contract Number
MID 1

4. Contractor (Name and Address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Contract Start Date
October 1, 1979

6. Contract Completion Date
January 31, 1981

7. Months
J J F M A M J J A S O N D J F M

8. FY 80

9. Cost Status

<table>
<thead>
<tr>
<th>Thousands</th>
<th>Actual</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned</td>
<td>Actual</td>
<td>Variance</td>
</tr>
<tr>
<td>871,980</td>
<td>(546,088)</td>
<td>(445,212)</td>
</tr>
<tr>
<td>882,437</td>
<td>882,437</td>
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</table>

10. Manpower Status (Direct Labor)

<table>
<thead>
<tr>
<th>MAN MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

11. Major Milestone Status

- 200
- 201
- 202
- 210
- 211
- 212
- 213
- 214
- 242

12. Remarks
* Cost Status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date
9/1/81

14. Signature of Government Technical Representative and Date

[Diagram with charts and graphs illustrating cost status and manpower status]
PROJECT

Title: FY 80 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-8-9003-1 and Supplement 1
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 1/31/81 (see 5.0 Open Items)
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 Administration
- No variances; see Open Items.

Task 201 Maintenance and Equipment Purchase
- Bids for general contract work to install the elevator were opened March 6. The FY81 ACTF operations contract must be in force before April 6 or Georgia Tech cannot accept any bid. See Open Items.

Task 202 Technology Transfer
- Distributed two hundred copies of the Proceedings of the ACTF Users Workshop.
- ANSALDO of Italy requested and received permission to reprint the ACTF Summary of 1980 Activities.

Task 210 Solar Turbines Test Program
- Completed in September.

Task 211 Dynatherm Test Program
- Task essentially complete; no problems.

Task 212 Princeton Test Program
- Completed in February.

Task 213 Westinghouse Test Program
- Completed in November.

Task 214 General Atomic Program
- Completed in October.

Task 242 Improved Tracking
- Task essentially complete.
- Implementation of hardware to improve mirror surface curvature awaits SERI's response to Georgia Tech's proposal for this follow-on task.

3.0 Technical Approach/Work Plan Changes
- None.
4.0 Variances/Problems

4.1 Cost Variance
- The combined cost for the elevator procurement and general construction contract was $68.3K (low bid). This is $6.6K above budget due to 18 months of inflation since the budget was established.

4.2 Manpower Variance
- None.

4.3 Schedule Variance
- The FY81 ACTF Operations contract has not been signed by SERI. The bid for elevator procurement has expired but may be salvageable. The bid for the general contract will expire April 6 unless Georgia Tech receives funds and authority to proceed. Expiration of both bids will delay construction at least six weeks.

4.4 Technical Variance
- None.

5.0 Open Items
- Georgia Tech received and signed the FY81 ACTF Operations contract on February 27, 1981. The contract is at SERI for signature. This program is jeopardized because the FY81 contract is not in force.

- All funding for the ACTF expired January 31, 1981.

- If the contract is not in force prior to April 6, the elevator task will be set back a minimum of six weeks to the start of the bid process. See Schedule Variance.

6.0 Summary Status and Forecast
- Georgia Tech has completed all scheduled user tests.

- Georgia Tech has identified interested users and assisted them in developing programs and proposals for FY81.
- Georgia Tech has identified a moderate cost mirror field improvement which could double the ACTF peak flux and awaits SERI's decision on the proposal for implementation.

- Efforts to plan 1981 tests and improvements are blocked by lack of funds and authority to proceed.

C. Thomas Brown
Director, ACTF

Attachments
- Contract Management Summary Report
- Monthly Technical Progress Report
CONTRACT MANAGEMENT SUMMARY REPORT

1. Contract Identification
FY 80 Operations of the U.S. DOE ACTF

2. Reporting Period

3. Contract Number
MOD 1

4. Contractor (Name and Address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Contract Start Date
October 1, 1979

6. Contract Completion Date
January 31, 1981

7. Months
<table>
<thead>
<tr>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>b</th>
<th>Fy 80</th>
</tr>
</thead>
</table>

8. Cost Status

<table>
<thead>
<tr>
<th>a. Thousands</th>
<th>b. Planned</th>
<th>c. Actual</th>
<th>( % ) Variance</th>
</tr>
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<tbody>
<tr>
<td>1400</td>
<td>1200</td>
<td>1000</td>
<td>800</td>
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<table>
<thead>
<tr>
<th>g. Cost Plan</th>
<th>h. Planned</th>
<th>i. Actual Costs</th>
<th>j. Total Estimated Costs for Contract</th>
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</thead>
<tbody>
<tr>
<td>671/80</td>
<td>545.212</td>
<td>586.237</td>
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<table>
<thead>
<tr>
<th>k. Total Contract Value</th>
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<tbody>
<tr>
<td>586.237</td>
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<table>
<thead>
<tr>
<th>l. Unfilled Orders Outstanding</th>
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<tbody>
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<td>420</td>
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<table>
<thead>
<tr>
<th>m. Estimate for Subsequent Reporting Period</th>
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<tbody>
<tr>
<td>420</td>
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</table>

9. B&R Numbers

<table>
<thead>
<tr>
<th>b. Planned</th>
<th>c. Actual</th>
<th>( % ) Variance</th>
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<tbody>
<tr>
<td>1.2</td>
<td>2.6</td>
<td>1.4</td>
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</table>

10. Manpower Status (Direct Labor)

<table>
<thead>
<tr>
<th>MAN MONTHS</th>
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<tbody>
<tr>
<td>0</td>
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</table>

<table>
<thead>
<tr>
<th>a. Planned</th>
<th>b. Actual</th>
<th>( % ) Variance</th>
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<tbody>
<tr>
<td>10</td>
<td>8.5</td>
<td>1.5</td>
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11. Major Milestone Status

<table>
<thead>
<tr>
<th>a. 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. 201</td>
</tr>
<tr>
<td>c. 202</td>
</tr>
<tr>
<td>d. 210</td>
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<tr>
<td>e. 211</td>
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<tr>
<td>f. 212</td>
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<tr>
<td>g. 213</td>
</tr>
<tr>
<td>h. 214</td>
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<tr>
<td>i. 242</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Solar Test</th>
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</thead>
<tbody>
<tr>
<td>Solar Test</td>
</tr>
<tr>
<td>Solar Test</td>
</tr>
<tr>
<td>Solar Test</td>
</tr>
</tbody>
</table>

12. Remarks
* Cost Status information includes expenditures plus encumbrances.

13. Signature of Contractor's Project Manager and Date
9/10/81

14. Signature of Government Technical Representative and Date
PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 2
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 1980 Administration
- Completed

Task 201 1980 Maintenance and Equipment Purchase
- Completed

Task 202 1980 Technology Transfer
- Completed

Task 210 Solar Turbines Test Program
- Completed in September

Task 211 Dynatherm Test Program
- Completed in April

Task 212 Princeton Test Program
- Completed in February

Task 213 Westinghouse Test Program
- Completed in November

Task 214 General Atomic Program
- Completed in October

Task 242 Improved Tracking
- Completed in February

Task 300 1981 Administration
- No variances

Task 301 1981 Maintenance and Operations
- All bids for the elevator procurement and general construction contract expired on the April 6 deadline for acceptance because Georgia Tech had not received authority to commit these funds. Georgia Tech received the FY81 ACTF Operations contract on April 14 and procurement activities were reinitiated on April 15. Installation of the elevator is scheduled for August and September, 1981.

- Planning completed for the Tile Council of America Test Program and University of Houston test program. Initiation of programs await experiment funds from the STTF UA, and ACTF authority to proceed from SERI.
Task 302 1981 Technology Transfer

- At the Annual Meeting of the STTF UA, Tom Brown presented an overview of the ACTF and a discussion of calorimetry capabilities, problems, and possible solutions. The meeting was April 22 and 23, 1981, in Pasadena, California.

- ACTF activities will be presented to the International Solar Energy Society in:
  
  - Six papers accepted for the ISES American Section Conference in Philadelphia, May 26 through 30, 1981.
  
  - Three papers accepted for the ISES conference in Brighton, England, August, 1981.

3.0 Technical Approach/Work Plan Changes

- None

4.0 Variances/Problems

4.1 Cost Variance

- None

4.2 Manpower Variance

- None

4.3 Schedule Variance

- None

4.4 Technical Variance

- None

5.0 Open Items

- None

6.0 Summary Status and Forecast

- Supplemental Agreement No. 2 is in force, providing funding for the operation of the ACTF through September 30, 1981.

- Georgia Tech is maintaining close contact with the STTF UA and SERI so that FY81 tests may be scheduled as smoothly as possible. Coordination of funding is critical for scheduling of user tests.
United Stirling provided funding for April 24 and 27, 1981 Solar tests of cavity surface materials. A test of a stirling engine and cavity receiver is planned for August, 1981.

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF
CONTRACT MANAGEMENT SUMMARY REPORT

1. Contract Identification
   FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF

2. Reporting Period
   4/1/81 through 4/30/81

3. Contract Number
   SERT No. A-9052-1

4. Contractor Name and Address
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. Contract Start Date
   October 1, 1979

6. Contract Completion Date
   September 30, 1981

7. Months
   O N D J F M A M J J A S O N D

8. Cost Status
   THOUSANDS
   PLANNED
   ACTUAL

   a. Cost Plan
   b. Planned
   Costs Prior
   FYs
   $769,560
   c. Actual Costs
   Prior FYs
   $655,861
   d. Total Estimated
   Costs for Contract
   $2,253,040
   e. Total Contract
   Value
   $2,253,040
   f. Balanced
   Orders Outstanding
   A
   g. Estimate for
   Subsequent
   Reporting Period

9. B&R Numbers
   Acquired
   Costs
   Planned
   Actual
   Variance
   Completion

   a. Planned
   b. Actual
   c. Variance
   d. Completion

10. Manpower Status (Direct Labor)
    MONTHS
    MAN

    a. Manpower
    b. Planned
    c. Actual
    d. Variance

11. Major Milestone Status
    a. 200, 201, 202
    b. 210, 211, 212
    c. 213, 214
    d. 300
    e. 301
    f. 302
    g.
    h.
    i.
    j.
    k.
    l.
    m.
    n.
    o.

12. Remarks
   * Cost Status Information Includes Expenditures plus encumbrances

13. Signature of Contractor's Project Manager and Date
   9/14/81

14. Signature of Government Technical Representative and Date
PROJECT

Title: FY 80 and 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 2
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 9/30/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

<table>
<thead>
<tr>
<th>Task 200</th>
<th>1980 Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
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</table>

<table>
<thead>
<tr>
<th>Task 201</th>
<th>1980 Maintenance and Equipment Purchase</th>
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</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed</td>
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</table>

<table>
<thead>
<tr>
<th>Task 202</th>
<th>1980 Technology Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed</td>
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<table>
<thead>
<tr>
<th>Task 210</th>
<th>Solar Turbines Test Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in September, 1980.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Task 211</th>
<th>Dynatherm Test Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in April, 1981.</td>
</tr>
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<table>
<thead>
<tr>
<th>Task 212</th>
<th>Princeton Test Program</th>
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</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in February, 1980.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Task 213</th>
<th>Westinghouse Test Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in November, 1980.</td>
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</table>

<table>
<thead>
<tr>
<th>Task 214</th>
<th>General Atomic Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in October, 1980.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task 242</th>
<th>Improved Tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Completed in February, 1980.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task 300</th>
<th>1981 Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Planning has begun for a series of solar tests which can be conducted as substitutes for outside user tests which are delayed by lack of funding or authority to proceed. Substitute tests will be conducted with minimal material costs and within the facility maintenance task.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task 301</th>
<th>1981 Maintenance and Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Bids for the elevator construction contract were received and are within budget. Installation is scheduled for August/September, 1981.</td>
</tr>
<tr>
<td>-</td>
<td>Maintenance work included checking the calibration of the mirror field tracking device and conducting volume flux maps to characterize the focal zone.</td>
</tr>
<tr>
<td>-</td>
<td>Volume flux scans were made behind 3&quot; and 9.4&quot; diameter apertures placed at the system focus. The data collected is in support of the LBL small particle heat exchanger design effort.</td>
</tr>
</tbody>
</table>
- In tandem with the flux mapping work, two pyrometers were operated to determine the extent of their solar blindness and their potential for measurement of surface temperatures. Both instruments are on loan to the ACTF.

- A fixture to support small samples for materials tests was fabricated from foam silica block. The fixture will be used to evaluate the survivability of refractory castables.

- Boeing Engineering and Construction Company has offered to provide insulation samples, a fully instrumented test fixture, and an engineer experienced in high temperature insulation tests to assist the ACTF in a materials test program. The data resulting from such a test program would be useful to the Boeing/EPRI 1MW Bench Model effort. The test is tentatively scheduled for July, 1981.

**Task 302 1981 Technology Transfer**

- H.L. Teague represented the ACTF at the American Section of the International Solar Energy Society Conference in Philadelphia, May 26 through 29, 1981. Six papers on work at the ACTF were presented.

### 3.0 Technical Approach/Work Plan Changes

- None

### 4.0 Variances/Problems

#### 4.1 Cost Variance

- None

#### 4.2 Manpower Variance

- None

#### 4.3 Schedule Variance

- None

#### 4.4 Technical Variance

- None

### 5.0 Open Items

- None
6.0 Summary Status and Forecast

- Maintenance tasks are proceeding well.

- STTFUA experimenters planning tests at the ACTF in 1981 have not yet received funding. When a program is funded, the ACTF must have authorization from SERI to schedule and conduct the test. Georgia Tech is maintaining contact with the STTF UA and SERI to ensure that program funding and authorization are coordinated.

- During periods for which no sponsored tests are scheduled, routine maintenance tasks will be conducted in a manner which will yield maximum data about the characteristics and condition of the facility and its equipment. Tracking activity required for minor field maintenance will be combined with volume flux maps and small scale tests of high temperature materials donated to the ACTF.

Attachments

- Contract Management Summary Report
- Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF
1. Contract Identification
FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF
5/1/81 through 5/31/81

2. Reporting Period

3. Contract Number
SERT/XP-0-9003-1

4. Contractor (Name and Address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Contract Start Date
October 1, 1979

6. Contract Completion Date
September 30, 1981

7. Months
O N D J F M A M J J A S O N D a

8. FY 80-81

9. Cost Status

THOUSANDS

PLANNED

1400
1200
1000
800
600
400
200
0

ACTUAL

10. Manpower Status (Direct Labor)

MAN MONTHS

100
80
60
40
20
0

b. Planned
15 15 15 15 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6

c. Actual
12.2 12.2 12.2 12.2 11.9 12.6 10.3 10.3

d. Variance
0.88 0.88 0.88 0.88 0.88 0.88 0.88 0.88

e. Cumulative Variance
0.88 0.88 0.88 0.88 0.88 0.88 0.88 0.88

f. Manpower Plan Date
5/15/81

10. Manpower

129NM

142NM

288NM

11. Major Milestone Status
-200,201,202

-210,211,212,213,214

-242

-300

-301

-302

12. Remarks
* Cost Status Information Includes Expenditures plus encumbrances

13. Signature of Contractor's Project Manager and Date
14. Signature of Government Technical Representative and Date

9/25/81
Date: 9/14/81  
Period: 6/1/81 - 6/30/81  
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 2  
D.O.E. Prime Contract No.: EG-77-C-01-4042  
Start Date: 10/1/79  
Completion Date: 9/30/81  
Contractor: Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 1980 Administration
- Completed

Task 201 1980 Maintenance and Equipment Purchase
- Completed

Task 202 1980 Technology Transfer
- Completed

Task 210 Solar Turbines Test Program
- Completed in September, 1980

Task 211 Dynatherm Test Program
- Completed in April, 1981.

Task 212 Princeton Test Program
- Completed in February, 1981

Task 213 Westinghouse Test Program
- Completed in November, 1980

Task 214 General Atomic Program
- Completed in October, 1980

Task 242 Improved Tracking
- Completed in February, 1981

Task 300 1981 Administration
- No variances
- C.T. Brown and S.H. Bomar visited Sunny Cherian in Washington, D.C., to plan FY 82 operation of the ACTF.

Task 301 1981 Maintenance and Operations
- General contract for elevator constuction was awarded to low bidder. Contractor has been authorized to proceed. Installation is scheduled for August and September, 1981.
- United Stirling executed a contract to Georgia Tech to sponsor the test of a stirling engine receiver at the ACTF. The test will be conducted in August 1981.
Georgia Tech provided flux map data to Boeing Engineering and Construction Company. Data will be used in Boeing's design and fabrication of a materials test fixture. Boeing has agreed to provide the test fixture, instrumentation, materials, and an engineer to assist the ACTF in an insulation materials test in July, 1981.

Georgia Tech developed test procedures for solar tests of castable refractory materials at the ACTF.

The ACTF scanner bar was operated and inspected to verify calorimeter calibration.

Task 302 1981 Technology Transfers

No variances

3.0 Technical Approach/Work Plan Changes

None

4.0 Variances/Problems

4.1 Cost Variance

None

4.2 Manpower Variance

None

4.3 Schedule Variance

None

4.4 Technical Variance

None

5.0 Open Items

None

6.0 Summary Status and Forecast

STTF UA experimenters currently delayed by lack of sponsor funding and ACTF authority to proceed include the Tile Council of America,
previously scheduled for July, and the University of Houston, previously scheduled for June.

- Georgia Tech is preparing to substitute a study of high temperature insulations for the July Tile Council test. Boeing Engineering and Construction Company is providing materials and instrumentation.

ATTACHMENTS

o Contract Management Summary Report
o Monthly Technical Progress Report

C. Thomas Brown
Director, ACTF
1. Contract Identification
   FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF

2. Reporting Period
   5/1/81 through 6/30/81

3. Contract Number
   SERF#X-0-90033-J

4. Contractor (Name and Address)
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. Contract Start Date
   October 1, 1979

6. Contract Completion Date
   September 30, 1981

7. Months
   O N D J F M A M J J A S O N D
   B FY 80-81

8. Cost Status
   
   a. Cost Plan
   FY 15/81

   b. Planned Costs Prior FYs
   8769,960

   c. Actual Costs Prior FYs
   8655,861

   d. Total Estimated Costs for Contract
   $1,253,060

   e. Total Contract Value
   $1,253,060

   f. Unbilled Orders Outstanding

9. B&R Numbers

10. Manpower Status (Direct Labor)
    a. Manpower (June 15/81)
        b. Planned
        c. Actual
        d. Variance

11. Major Milestone Status
    a. 200,201,202
    b. 210,211,212
        213,214
    c. 242
    d. 300
    e. 301
    f. 302

12. Remarks
    * Cost Status Information Includes Expenditures plus encumbrances

13. Signature of Contractor's Project Manager and Date
    7/1/81

14. Signature of Government Technical Representative and Date

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR JULY, 1981

Date: 9/15/81
Period: 7/1/81 - 7/31/81
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 3
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 12/31/81
Contractor:
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project:
A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 1980 Administration
- Completed

Task 201 1980 Maintenance and Equipment Purchase
- Completed

Task 202 1980 Technology Transfer
- Completed

Task 210 Solar Turbines Test Program
- Completed in September, 1980

Task 211 Dynatherm Test Program
- Completed in April, 1981

Task 212 Princeton Test Program
- Completed in February, 1981

Task 213 Westinghouse Test Program
- Completed in November, 1980

Task 214 General Atomic Program
- Completed in October, 1980

Task 242 Improved Tracking
- Completed in February, 1981

Task 300 1981 Administration
- No variances
- Mr. Bill Kaspar of DOE/SAN visited the ACTF on July 9, 1981 for a tour and briefing.

Task 301 1981 Maintenance and Operation
- Elevator installation contractor on site and active; completion scheduled for late September, 1981.
- Boeing insulation test program successfully completed; 50 hours of exposure at sample temperatures to 2800°F realized.

- United Stirling hardware and personnel arrived July 30, 1981 for start of engine test program.

Task 302 1981 Technology Transfers
- No variances

3.0 Technical Approach/Work Plan Changes
- No variances

4.0 Variances/Problems

4.1 Cost Variance
- All currently scheduled test programs have been completed; No further changes are anticipated. Thus, cost breakdown sheets for tasks 210, 211, 212, 213, and 214 will be omitted from future submittals.

4.2 Manpower Variance
- None

4.3 Schedule Variance

4.4 Technical Variance
- None

5.0 Open Items
- None
6.0 Summary Status and Forecast

- United Stirling test program scheduled for August, 1981. Objective of test program includes use of standard stirling engine and electrical generator to produce 440V., 3 phase power for the utility grid.

C. Thomas Brown
Director, ACTF

ATTACHMENTS

0 Contract Management Summary Report
0 Monthly Technical Progress Report
CONTRACT MANAGEMENT SUMMARY REPORT

1. Contract Identification:
   FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF

2. Reporting Period:
   7/1/78 through 7/31/78

3. Contract Number:
   SER# EP-O-9005-1

4. Contractor (Name and Address):
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. Contract Start Date:
   October 1, 1979

6. Contract Completion Date:
   September 30, 1981

7. Months:
   O N D J F M A M J J A S O N D

8. Cost Status:
   THOUSANDS
   PLANNED
   1400
   1200
   1000
   800
   600
   400
   200
   0

   ACTUAL
   0
   0

9. B&R Numbers:
   e. Planned: 61.0 20.4 25.8 66.7 41.0 41.0 81.0 39.6 66.0 0.0 21.0 9.2
   f. Actual: 67.4 48.7 41.7 47.9 82.4 42.0 81.9 41.1 63.3 28.8
   g. Variance: 56.4 28.3 15.9 18.8 40.8 1.0 0.9 (1.5) 2.9 1.2

10. Manpower Status (Direct Labor):
    e. Manpower
        Planned: 96 96 96 96 96 96 96 96 96 96 96
        Total: 960
    f. Actual
        Planned: 120 120 120 120 120 120 120 120 120 120 120
        Total: 1200
    g. Variance:
        Planned: 96 96 96 96 96 96 96 96 96 96 96
        Actual: 120 120 120 120 120 120 120 120 120 120 120
        Variance: 24 24 24 24 24 24 24 24 24 24 24

11. Major Milestone Status:
    a. 200, 202
    b. 210, 211, 212
       213, 214
    c. 242
    d. 300
    e. 301
    f. 302
    g. 303

12. Remarks:
    * Cost Status Information Includes Expenditures plus encumbrances

13. Signature of Contractor's Project Manager and Date:

14. Signature of Government Technical Representative and Date:

(Handwritten Date: 7/13/81)
1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 1980 Administration
- Completed

Task 201 1980 Maintenance and Equipment Purchase
- Completed

Task 202 1980 Technology Transfer
- Completed

Task 210 Solar Turbines Test Program
- Completed in September, 1980

Task 211 Dynatherm Test Program
- Completed in April, 1981

Task 212 Princeton Test Program
- Completed in February, 1981

Task 213 Westinghouse Test Program
- Completed in November, 1980

Task 214 General Atomic Program
- Completed in October, 1980

Task 242 Improved Tracking
- Completed in February, 1981

Task 300 1981 Administration
- No variances
- Jim Lefferdo of SERI has verbally informed Georgia Tech that a contract modification is being prepared at SERI to provide the ACTF with an additional $80K for operations and testing for the period October through December, 1981.

Task 301 1981 Maintenance and Operations
- The first solar tests of the United Stirling 4-95 Engine and electrical generator are complete. A second series of tests is scheduled for October - November, 1981.
- Construction of the man-material hoist for the experiment tower is on schedule and should be completed in late September, 1981.

Task 302 1981 Technology Transfer
- No variances

3.0 Technical Approach/Work Plan Changes
- No variances

4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance

4.4 Technical Variance
- None

5.0 Open Items
- Execution of Contract Mod #4 for the addition of $80K by September 30, 1981 is necessary to maintain program continuity. Funds are necessary for conduct of STTFUA sponsored Tile Council test program, implementation of improved mirror shape hardware, and 4th quarter operations of the ACTF.

6.0 Summary Status and Forecast
- The Phase II tests of a United Stirling Sweden 4-95 Stirling engine system were completed. These tests represent the first use of a solar powered Stirling Engine to produce electric power and supply it to the utility grid.

-3-
- Preparations continue for a Phase III test involving an improved solar receiver for the Stirling Engine. The original receiver used the standard fossil fuel heater head assembly.

- Preparations are underway for an October, 1981 test of a single thermionic converter diode. Thermo Electron will supply the diode.

C. Thomas Brown
Director, ACTF

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report
**CONTRACT MANAGEMENT SUMMARY REPORT**

1. **Contract Identification**
   - FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF

2. **Reporting Period**
   - 08/15/81 through 09/30/81

3. **Contract Number**
   - SER# XP-0-9003-1 Mod 3

4. **Contractor (Name and Address)**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Contract Start Date**
   - October 1, 1979

6. **Contract Completion Date**
   - September 30, 1981

7. **Months**
   - O N D J F M A M J J A S O N D

8. **Cost Status**

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<th>ACTUAL</th>
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9. **B&R Numbers**

10. **Manpower Status (Direct Report)**

11. **Major Milestone Status**

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<th>Milestone</th>
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<td>302</td>
<td>Complete</td>
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12. **Remarks**
   - *Cost Status Information Includes Expenditures plus encumbrances*

13. **Signature of Contractor's Project Manager and Date**
   - 9/30/81

14. **Signature of Government Technical Representative and Date**
   - 9/30/81
PROJECT
Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT
SERI Subcontract No.: XP-0-9003-1 and Supplement 3
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 12/31/81
Contractor: Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective
The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 200 1980 Administration
  - Completed and will not be reported hereafter.

Task 201 1980 Maintenance and Equipment Purchase
  - Completed and will not be reported hereafter.

Task 202 1980 Technology Transfer
  - Completed and will not be reported hereafter.

Task 210 Solar Turbines Test Program
  - Completed in September, 1980 and will not be reported hereafter.

Task 211 Dynatherm Test Program
  - Completed in April, 1981 and will not be reported hereafter.

Task 212 Princeton Test Program
  - Completed in February, 1981 and will not be reported hereafter.

Task 213 Westinghouse Test Program
  - Completed in November, 1980 and will not be reported hereafter.

Task 214 General Atomic Program
  - Completed in October, 1980 and will not be reported hereafter.

Task 242 Improved Tracking
  - Completed in February, 1981 and will not be reported hereafter.

Task 300 1981 Administration
  - No variances.
  - SERI RFP for ACTF contract mod 4 received on September 14, 1981. Georgia Tech proposal response forwarded to SERI on same day.
  - Contract funding for the ACTF expired September 30, 1981. Mod 4 will provide $80k for ACTF operations October-December, 1981. Mod 4 awaits execution by SERI.

Task 301 1981 Maintenance and Operations
  - Planning continued for the United Stirling Phase III Test (Oct. - Nov. 1981), the Georgia Tech Ceramic Tile Program (Nov. 1981), the Lawrence Berkeley Laboratories Test (March, 1982), and the Thermo Electron Test (Oct. 1981)
- Construction of the man-material hoist for the experiment tower has been delayed slightly by the elevator installation contractor. Work has resumed and should be completed in early October, 1981.

Task 302 1981 Technology Transfer
- No variances.

3.0 Technical Approach/Work Plan Changes
- No variances

4.0 Variances/Problems
4.1 Cost Variance
- Funding for ACTF Operations expired September 30, 1981. See 5.0 Open Items below.

4.2 Manpower Variance
- None

4.3 Schedule Variance

4.4 Technical Variance
- None

5.0 Open Items
- Execution of Contract Mod #4 for the addition of $80K by September 30, 1981 is necessary to maintain program continuity. Funds are necessary for conduct of STTFUA sponsored Tile Council test program, implementation of improved mirror shape hardware, and the 4th quarter operations of the ACTF.

- Formal proposal response to SERI RFP for Mod 4 was forwarded to SERI on September 14, 1981.
6.0 Summary Status and Forecast

- Preparations continue for a Phase III test involving an improved solar receiver for the Stirling Engine. The original receiver used the standard fossil fuel heater head assembly.

- Preparations are underway for an October, 1981 test of a single thermionic converter diode. Thermo Electron will supply the diode.

- The general contractor for the construction of the tower hoist has completed the specified modification to the experiment support tower. Installation of the hoist machinery will be completed in early October.

C. Thomas Brown
Director, ACTF

ATTACHMENTS

- Contract Management Summary Report
- Monthly Technical Progress Report
Date: 11/25/81
Period: 10/1/81 - 10/31/81
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-Ø-9003-1 and Supplement 4
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 12/31/81
Contractor: Georgia Tech Research Institute
Georgiath Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U. S. Department of Energy in support of the U. S. Solar Thermal R&D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 300 1981 Administration

- Supplemental Agreement No. 4 to Contract XP-0-9003-1 was executed October 19, 1981. It provides Operational funds for October 1 to December 31, 1981.

Task 301 1981 Maintenance and Operations

- Georgia Tech and Thermo Electron conducted a brief solar test of a thermionics converter on October 20 and 21, 1981.

- The solar phase of the Georgia Tech Ceramic Tile Firing Program was begun October 30 and will continue through November 9, 1981. This program is sponsored by the STTF UA.

- Planning continued for the United Stirling Phase III Test (Nov. 1981), and the Lawrence Berkeley Laboratories Test Program (Mar. 1982).

- Final design of mirror shape moment arm is underway. Installation is scheduled to begin January 15, 1982.

- New man/material work hoist for experiment tower was placed in service October 12, 1981.

Task 302 1981 Technology Transfer

- No variances.

3.0 Technical Approach/Work Plan Changes

- No variances.
4.0 Variances/Problems

4.1 Cost Variance
   - None

4.2 Manpower Variance
   - None

4.3 Schedule Variance

4.4 Technical Variance
   - None

5.0 Open Items
   - None

6.0 Summary Status and Forecast

   - A strong effort is being made to complete the Georgia Tech Ceramic Tile Firing Program within its deadline, to counteract the effects of previous delays in funding.

   - The United Stirling Program Phase III solar test is scheduled for November 1981 and planning is nearly complete.

   - Implementation of the mirror shape moment arm devices is included in Supplemental Agreement No. 4, received October 19, 1981, and installation will begin in January 1982.

C. Thomas Brown
Director, ACTF

jw

ATTACHMENTS
- Contract Management Summary Report
- Monthly Technical Progress Report
D.O.E. ADVANCED COMPONENTS TEST FACILITY
TECHNICAL STATUS REPORT
FOR NOVEMBER 1981

Date: 1/4/82
Period: 11/1/81 - 11/30/81
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-Ø-9003-1 and Supplement 4
D.O.E. Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 12/31/81

Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R&D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 300 1981 Administration

- Request for no cost extension to present Contract XP-0-9003-1, Supplement 4 was sent to SERI for their approval on November 16, 1981. This extension will provide a contract through March 31, 1982 for completion of the Mirror Improvement Task.

Task 301 1981 Maintenance and Operations

- The first firing of the Georgia Tech Tile Firing Program occurred on November 1, 1981. Testing continued until November 9, 1981 and will be completed in early December, 1981.

- The experimental portion of the United Stirling Phase III Test Program was begun on November 9, 1981 and concluded on November 24, 1981. Peak power of 18.8 kW$_e$ was delivered to the utility grid on November 18, 1981.

- Planning continued for the STTF Users Association sponsored Lawrence Berkeley Laboratories Test Program (March, 1982).

- New man/material work hoist for the experiment tower malfunctioned on November 8, 1981, and was repaired by the manufacturer on November 10, 1981. Elevator is now completely operational.

- Request for bids for the moment arm hardware for the Mirror Shape Improvement Task were issued on November 16, 1981. Bid opening is scheduled for December 2, 1981. Installation is scheduled to begin January 15, 1982.

Task 302 1981 Technology Transfer

- Preparation for a December 1, 1981 ACTF Technical briefing for the Tennessee Valley Authority and Armstrong International was begun.
- Preparation was begun for a tour/display of the ACTF for the JPL Parabolic Dish Conference on December 10, 1981.

3.0 Technical Approach/Work Plan Changes

- No Variances.

4.0 Variances/Problems

4.1 Cost Variance

- None

4.2 Manpower Variance

- None

4.3 Schedule Variance

- A three month No Cost Extension was requested from SERI on November 16, 1981 to enable completion of the Mirror Improvement Task.

4.4 Technical Variance

- None

5.0 Open Items

- No Cost Extension for Contract XP-Ø-9003-1, Supplement 4 is awaiting approval by SERI.

6.0 Summary Status and Forecast

- The Georgia Tech Ceramic Tile Firing Experiment will be completed in early December, 1981.

- Installation of the mirror shape moment arm devices is included
in Supplemental Agreement No. 4, received October 18, 1981. Installation will begin in January, 1982.

C. Thomas Brown
Director, ACTF

ATTACHMENTS
  - Contract Management Summary Report
  - Monthly Technical Progress Report
U.S. DEPARTMENT OF ENERGY
CONTRACT MANAGEMENT SUMMARY REPORT

1. Contract Identification
FY 80 - 81 OPERATIONS OF THE U.S. DOE ACTF

2. Reporting Period
11-1-81 through 11-30-81

3. Contract Number
SER#XP-0-3003-1

4. Contractor (Name and Address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Contract Start Date
October 1, 1979

6. Contract Completion Date
December 31, 1981

7. Months
Q N O D J F M A M J J A S O N D

8. Cost Status
b. Planned
THOUSANDS

- Actual Costs Prior FYs
- Actual Costs Prior FYs
- Total Estimated Costs for Contract
- Total Contract Value
- Estimate for Subsequent Reporting Period

9. R&R Numbers
- Planned
- Actual
- Variance
- Percent Variance

10. Manpower Status
- Direct Labor

11. Major Milestone Status
- 200,201,202
- 210,211,212
- 213,214
- 242
- 300
- 301
- 302
- 303
- 310
- 

12. Remarks
* Cost Status Information Includes Expenditures Plus Encumbrances

13. Signature of Contractor's Project Manager and Date
11/17/82

14. Signature of Government Technical Representative and Date
1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 300 1981 Administration

- Request for No-Cost Extension to present Contract XP-Ø-9003-1, Supplement 4 was sent to SERI for their approval on November 16, 1981. This extension will provide a contract through March 31, 1982 for completion of the Mirror Improvement Task. As of the end of December, SERI approval has not been received.

Task 301 1981 Maintenance and Operations

- The last firings of the Georgia Tech Tile Firing Program occurred on December 7, 1981. This completes the experimental portion of the program. This program was sponsored by the STTF Users Association.

- Planning continued for the STTF Users Association sponsored Lawrence Berkeley Laboratories Test Program (March, 1982), and for a possible United Stirling Phase IV Test Program (Fall, 1982).

- Bid opening for the moment arm hardware for the Mirror Shape Improvement Task occurred on December 2, 1981 and a contract was awarded on December 3, 1981. Initial shipment is scheduled for the beginning of January and installation is scheduled to begin January 15, 1982.
Task 302 1981 Technology Transfer
- A technical briefing was held for the Tennessee Valley Authority and Armstrong International on December 1, 1981. The briefing included a tour of the ACTF and a slide presentation/discussion of the Engineering Experiment Station's research activities in solar energy. A follow up meeting is being planned for January, 1982.
- A tour/display of the ACTF was given to the participants of the JPL Parabolic Dish Conference on December 10, 1981.

3.0 Technical Approach/Work Plan Changes
- No Variances

4.0 Variances/Problems
4.1 Cost Variance
- None
4.2 Manpower Variance
- None
4.3 Schedule Variance
- A three month No-Cost Extension was requested from SERI on November 16, 1981 to enable completion of the Mirror Improvement Task. No response has been received from SERI.
4.4 Technical Variance
- None
5.0 Open Items
- No Cost Extension for Contract XP-Ø-9003-1, Supplement 4 is awaiting approval by SERI.

6.0 Summary Status and Forecast
- Installation of the mirror shape moment arm devices is included in Supplemental Agreement No. 4, received October 18, 1981. Installation will begin in January, 1982.

C. Thomas Brown
Director, ACTF

ATTACHMENTS
- Contract Management Summary Report
- Monthly Technical Progress Report
2. Reporting Period: 12-1-81 through 12-31-81
3. Contract Number: 4
4. Contractor (Name and Address): Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332
5. Contract Start Date: October 1, 1979
6. Contract Completion Date: December 31, 1981
7. Months: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
8. Cost Status: THOUSANDS
   | PLANNED | ACTUAL |
   | 411.0  | 404.0  |
   | 66.7   | 66.0   |
   | 81.0   | 80.0   |
   | 39.6   | 40.0   |
   | 66.0   | 66.0   |
   | 21.0   | 20.0   |
   | 9.2    | 10.0   |
   | 29.6   | 26.0   |
   | 20.0   | 21.0   |

9. B&R Numbers
   a. Planned Costs Prior FYs: 8769, 560
   b. Actual Costs Prior FYs: 5645, 861
   c. Total Estimated Costs for Contract: 81,333,089
   d. Total Contract Value: 81,333,089
   e. Unfunded Orders Outstanding: 8,234

10. Manpower Status (Direct Labor)
    | MAX MONTHS |
    | 15 | 15 | 15 | 15 | 12.4 | 12.4 | 12.4 | 12.4 | 12.2 | 12.5 | 12.3 | 12.2 | 6.0 | 6.0 | 6.0 |
    a. Manpower Plan Date: 5/15/81
    b. Planned Manpower Prior FYs: 12950
    c. Actual Manpower Prior FYs: 12426
    d. Total Estimated Manpower for Contract: 3081

11. Major Milestone Status
    a. 200, 201, 202
    b. 210, 211, 212, 211, 214
    c. 242
    d. 300
    e. 301
    f. 302
    g. 303
    h. 310

12. Remarks: * Cost Status Information Includes Expenditures Plus Encumbrances

13. Signature of Contractor's Project Manager and Date: 11/26/82
14. Signature of Government Technical Representative and Date: 
Date: 2/24/82
Period: 1/1/82-1/31/82
SERI Program Manager: J. Lefferdo

PROJECT

Title: FY 80 and FY 81 Operations of the United States Department of Energy Advanced Components Test Facility (ACTF)

CONTRACT

SERI Subcontract No.: XP-0-9003-1 and Supplement 5
DOE Prime Contract No.: EG-77-C-01-4042
Start Date: 10/1/79
Completion Date: 3/31/82
Contractor: Georgia Tech Research Institute
 Georgia Institute of Technology
 Atlanta, Georgia 30332

Georgia Tech Project: A-2571 (EES)

1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.

AN EQUAL EMPLOYMENT/EDUCATION OPPORTUNITY INSTITUTION
2.0 Contract Tasks

Task 300 1981 Administration

- Request for No-Cost Extension to present Contract XP-0-9003-1, Supplement 4 was sent to SERI for their approval on November 16, 1981. This extension will provide a contract through March 31, 1982 for completion of the mirror Improvement Task. SERI approval was received on January 8, 1982.

Task 301 1981 Maintenance and Operations

- The last firings of the Georgia Tech Tile Firing Program occurred on December 7, 1981. This completes the experimental portion of the program. This program was sponsored by the STTF Users Association.

- Planning continued for the STTF Users Association sponsored Lawrence Berkeley Laboratories Test Program (Spring, 1982), and for a possible United Stirling Phase IV Test Program (Fall, 1982).

- Initial and subsequent shipments of the moment arm hardware for the Mirror improvement Task were returned to the manufacturer due to imperfections in the hardware. Installation is now scheduled to begin on February 1, 1982.
Task 302 1981 Technology Transfer

3.0 Technical Approach/Work Plan Changes
- No Variances

4.0 Variances/Problems
4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule Variance
- A three month No-Cost Extension was requested from SERI and granted on January 8, 1982 to enable completion of the Mirror Improvement Task.

4.4 Technical Variance
- None

5.0 Open Items
- None
6.0 Summary Status and Forecast

Installation of the mirror shape moment arm devices is included in Supplemental Agreement No. 4 received October 18, 1981. Installation will begin in February, 1982.

C. Thomas Brown
Director, ACTF

Attachments
- Contract Management Summary Report
- Monthly Technical Progress Report
1.0 Contract Objective

The principal objective of this project is to maintain and operate the D.O.E. ACTF for the U.S. Department of Energy in support of the U.S. Solar Thermal R & D effort. This includes providing technical support and consultation to experimenters, designing and fabricating special hardware to support specific experiments, operating the facility in support of such experiments, and upgrading the facility as required to meet specific test objectives.
2.0 Contract Tasks

Task 300 1981 Administration
- No-Cost Extension to present Contract XP-Ø-9003-1, Supplement 4 received. This extension will provide a contract through February 28, 1982 for completion of the Mirror Improvement Task.

Task 301 1981 Maintenance and Operations
- Installation of mirror moment arm hardware initiated and completed in February.
- Addition of moment arm hardware increased ACTF peak flux from 125 to 235 w/m² at system focus.

Task 302 1981 Technology Transfer
- Nothing to report

3.0 Technical Approach/Work Plan Changes
- No Variances

4.0 Variances/Problems

4.1 Cost Variance
- None

4.2 Manpower Variance
- None

4.3 Schedule of Variance
- A two month No-Cost Extension was requested from SERI and granted on January 8, 1982 to enable completion of the Mirror Improvement Task.

4.4 Technical Variance
- None
5.0 Open Items
   - None

6.0 Summary Status and Forecast
   - Installation of the mirror shape moment arm devices initiated and completed in February. Improvement in beam quality was dramatic; peak flux increased from 125 to 235 w/m² at system focus.

C. Thomas Brown
Director, ACTF

Attachments
   - Contract Management Summary Report
   - Monthly Technical Progress Report
TECHNICAL PROGRESS REPORT
FOR PERIOD OCTOBER 1-31, 1979

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

APRIL, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
OCTOBER, 1979

The following is a summary of work performed at the Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Sub-contract No. XP-Ø-9003-1 for the month of October, 1979:

1. Improved Tracking Update.
   - Rework of 412 kinematic motions completed, 45 additional units in progress; 18 of the 45 have been aligned, but not aimed.
   - Task completion date holds at November 16, 1979, weather permitting.

2. Francia Receiver Update.
   - Receiver was removed from tower, the honeycomb support structure was repaired, and the unit was returned to the tower during the month. Operation required approximately five hours and was accomplished by site personnel with the help of a rental crane.
   - Glass tubes for spare honeycomb structures delivered to glass shop. Five spare units to be made during the next report period.
   - Operation of receiver scheduled for late November/December time frame.

3. Feedback Control Update.
   - Solar Photoelectric Guider assembly source located. Preferred unit is manufactured by Carson Astronomical, Inc. and is similar in design to unit used on LBL circumsolar telescope. We have been maintaining such a telescope on campus for two years and are very pleased with the performance of the guider assembly.
   - Received and accepted bid from Carson Astronomical for photoelectric guider assembly and readout. Unit will cost $5,400 and has a 50 day delivery schedule.
   - Preliminary design of mechanical mount for guider assembly to start next week. Request to Carson Astronomical for mechanical details of guider has been made; this required for mechanical design of GIT mount.
4. Control Building/Perimeter Pad Update.
   - Contractor has been active on site since Wednesday, October 10, 1979.
   - Excavation for building foundation completed. Concrete footing poured on October 16, 1979.
   - Installation of conduit in progress.
   - Grading for perimeter pad and site drainage still in progress.
   - Circulation lines between cooling tower and Francia condenser are too shallow where they will cross perimeter pad. Cost options are being explored.
   - Building supplier could deliver building around November 5, 1979 if general contractor can use it. I don't think foundation, slab and conduit will be ready in one week.
   - Authorization for contractor to install permanent water and sewer lines to tower will be given early next week. This will be Mod. 1 for the contract.

5. Solar Turbines Test Program
   - Contacted Pete Roberts of Solar Turbines on Friday, October 12, and discussed possibility of coordination meeting in Atlanta. Date for that meeting is November 7, 1979.

6. Dynatherm Test Program
   - Reviewed Dynatherm solar flux requirements as stated in their proposal; concluded that mirror field in its present condition could satisfy Dynatherm flux requirements on a good solar day. Present improvements to field should allow experiment to be performed on a "not-so-good" day.
   - Contacted Walter Bienert of Dynatherm to set up coordination meeting in Atlanta. Bienert favors such a meeting, the objective of which would be to determine if the Dynatherm test should be conducted at the ACTF. Date for meeting is November 6, 1979.

7. Westinghouse Test Program
   - Contacted Dave Archer of Westinghouse and discussed possibility of coordination meeting in Atlanta. Date for meeting is November 8, 1979.

8. Maintenance
   - Calorimeters have been removed from flux scanner and forwarded to Hy-Cal Engineering for re-calibration. Objective is to have flux scanner functional for volume flux maps at completion of Improved Tracking task.
- Delay exists in availability of re-calibrated Hy-Cal Calorimeters; new delivery date is November 14, two weeks later than originally scheduled.

- Old version of computer code HELIOS was successfully compiled on GIT computer.

TECHNICAL PROGRESS REPORT
FOR PERIOD NOVEMBER 1-30, 1979

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

APRIL, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI Subcontract No. XP-0-9003-1 for the month of November, 1979:

1. Improved Tracking Update.
   - Rework of all kinematic motions completed.
   - Synchronization of hour angles on the 550 kinematic motions has been completed.
   - Focusing of all mirrors completed. Sizable fraction of mirrors does not focus very well; this problem will be worked on later.
   - Mirror field declination synchronization has been completed.
   - Preparations are under way for flux mapping operation.

2. Francia Receiver Update.
   - Five spare glass tubes for the honeycomb structure have been fabricated by the Georgia Tech glass blowing shop.
   - Feedwater and steam lines reconnected; thermocouple leads reconnected. Receiver will be above the flux scanner during the flux mapping operation and therefore must be operational.

3. Feedback Control Update.
   - Purchase order has been issued to Carson Astronomical for guider head assembly and readout. Unit should be delivered on or about December 21, 1979.
   - Mechanical details of Carson's guider head have been requested and received. Preliminary design of mechanical mount has started. Guider head will be mounted on modified kinematic motion device.

4. Control Building/Perimeter Pad.
   - Installation of conduit system approximately 70 percent complete.
- Compacting of road bed has been completed. Load bearing tests conducted on road bed. Results satisfactory.

- Completion date for control building has been moved from December 15, 1979 to the first week in January 1980. December 28, 1979 delivery of access flooring forces this slip in schedule.

- Circulation lines between cooling tower and Francia condenser are too shallow where they will cross perimeter pad. Cost estimate by contractor for lowering lines was $1,300. Contractor will be given authority to exercise this modification.

- Detailed design and specification of building furnishings is under way.

5. Flux Mapping Preparations.

- Re-calibrated Hy-Cal calorimeters have been received.

- Low sensitivity calorimeters received from Hy-Cal.

- All 43 calorimeters installed on scanner bar and bar installed on tower. All electrical, water, and compressed air connections completed. Preliminary checkout of scanner completed.

- Real time computer data system ready for flux map operation.

- Modification of off line software necessary to process data has begun.

- Francia receiver has been hooked up; filling of system with DI water and system checkout remains.

- Mirror field is operational except for washing of mirrors and setting of daily declination.

- Flux mapping operations scheduled for next month.


- Need exists for computer optical model of mirror field. Part time work is continuing in an effort to get the Sandia code HELIOS up and running on the GIT computer. The basic code has been made to compile and execute without errors, a plotting package has been created and checked out, and trial runs have been made to model the heat flux associated with selected heliostats and the entire mirror field. Intent of the full field runs is to reproduce previous experimental results collected with the flux scanner. Resulting fits have not been very good; will require parameter adjustment work and possibly rewrite of mirror focusing routine.
7. Experiment Coordination Meetings.

- The following kickoff meetings occurred during the month:
  
  Tuesday, November 6, 1979 - Dynatherm  
  Wednesday, November 7, 1979 - Solar Turbines  
  Thursday, November 8, 1979 - Westinghouse

- The following solar test windows were established during these meetings:
  
  Solar Turbines: March 1 - March 31, 1980  
  Dynatherm: April 8 - April 30, 1980  
  Westinghouse: May 1 - June 30, 1980

- A subsequent phone conversation with Antal of Princeton has established an August 1980 test window for his experiment.

TECHNICAL PROGRESS REPORT

FOR PERIOD DECEMBER 1-31, 1979

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

APRIL, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI sub-contract No. XP-0-9003-1 for the month of December, 1979:

1. Improved Tracking Update.

- Conducted flux mapping operations on Thursday, November 29 and Friday, November 30, 1979. Data analysis is under way.

- First look at flux map data indicates that:
  (a) North/South drift of concentrated image has been eliminated.
  (b) Westward drift of concentrated image has been significantly reduced; possibly to no more than one inch per hour.
  (c) Predicted reduction of standard deviation of the concentrated beam by approximately 3.5 milliradians does not appear to have been realized. Reduction appears to be of the order of 1.0 milliradians. Precise statements must await reduction of data.

- Remaining source of image broadening appears to be associated with mirror focusing. Additional data has been collected on the focusing capability of individual mirrors. Preliminary results indicate that center ~ 50% area of mirror focuses properly and outer ~ 50% area of mirror has much longer focal length than desired. Thus, original sigma of 4.7 mr for image size is too small.

- Field examination of kinematic motion fixed point stiffeners indicates that retaining nut is backing off. This effect voids effectiveness of the stiffeners. Several tests under way to determine best fix for securing fixed point nuts. Rapid loosening of the nuts has tentatively been attributed to vibrations from road working machinery around periphery of mirror field.

- We will want to redo flux maps after correcting this problem. This "redo" does not void any previous field work except the removing and replacing of each mirror.
- Major effort after the first of the year will involve re-
tightening fixed point supports and re-doing flux maps.

2. Feedback Control Update.

- Fabrication of mechanical mount for guider head started

- Delivery of electrical/electronic package by Carson Astronomical

- Installation of mechanical mount and tracker head scheduled for

3. Control Building/Perimeter Pad Update.

- Installation of building is under way. Structural members have
  been installed. All wall and roof panels are in place. Contractor
  working on interior details of building and on instrument conduit
  system. Electrical work scheduled to be finished in approximately
  10 working days. Most below grade electrical and plumbing work
  which would interfere with road construction has been completed.
  Delivery date for access flooring has slipped from January 1 to
  February 1, 1980.

- Overall building schedule appears to be slipping badly due in
  part to weather related problems and in part to a less than 100
  percent effort on the contractor's part. Our Physical Plant De-
  partment is beginning to "push" contractor to complete as quickly
  as possible. Quality of contractor work is satisfactory.

- Road bed subgrade is ready for final compactness testing. Weather
  is becoming a major obstacle to road work.


- H. L. Teague and C. T. Brown visited Solar Turbines plant in
  San Diego on Friday, December 14, 1979. Purpose of visit was to
  review current receiver design and to go over draft versions of
  Document of Understanding, Test Plan and Safety Document. Meeting
  was most productive. Key points from meeting include:

  (a) Receiver is of cavity type and will use indirect heating on
      boiler tubes to minimize stresses and fatigue problems.

  (b) Samples of dome ceramic material will be supplied to Georgia
      Tech for solar beam exposure at earliest possible date.

  (c) Receiver will be supported from above by a tripod structure.
      Shadow shield will be incorporated to protect support struc-
      ture.
(d) Receiver and support equipment will incorporate generous supply of thermocouples.

(e) STI supplied Georgia Tech with latest version drawings of their design for detailed study by Georgia Tech. Georgia Tech will incorporate these drawings into Interface Document and will distribute.

(f) STI will provide next iteration of DOU, Test Plan and Safety Document to include comments and changes agreed upon during the meeting.

- Data package containing the following information will be forwarded to Solar Turbines early in January, 1980:
  
  (a) Revised Document of Understanding signed by Georgia Tech; requires STI approval.
  
  (b) Revised Safety Document signed by Georgia Tech; requires STI approval.
  
  (c) Marked up test plan for final typing and approval by both organizations.
  
  (d) Drawings of test fixture for insulation proof test.
  
  (e) Sketch pointing out mechanical interference problem.

5. Dynatherm Receiver Update.

- Contact with Dynatherm indicates that they are working on a draft of Test Plan, Document of Understanding, and Safety Document to be delivered to GIT early in January, 1980.

- Jim Tarter and Tom Brown will travel to Baltimore on January 10, 1980 for project review meeting with Dynatherm.


- Doug Neale and Tom Brown will travel to Pittsburgh on January 11, 1980 for project review meeting with Westinghouse.

7. Maintenance Update.

- Work with HELIOS code continues. Plots of single heliostat flux profiles as function of time of day, season and heliostat position
look satisfactory. Several full field runs have been made with HELIOS computer code. Objective is to model mirror field data taken before Improved Tracking fix implemented. Results look very encouraging for August 1978 data at focal plane and at two feet above focal plane. If code reproduces December 1978 experimental data, it will be assumed that code is operational. Next step would be to alter parameters to get good fit with January 1980 volume flux map.

TECHNICAL PROGRESS REPORT
FOR PERIOD JANUARY 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

APRIL, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
JANUARY, 1980

The following is a summary of work performed at the Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI sub-contract No. XP-0-9003-1 for the month of January, 1980:

1. Improved Tracking Update.
   - Lock nuts added to all 550 kinematic motion stiffening structures; fixed point now stable.

2. Feedback Control Update.
   - Optical guider head assembly and controls were delivered by vendor early in January, 1980. Guider head not weatherproof due to oversite in our specifications. This necessitated modification of our mechanical mount to render complete unit weatherproof.
   - Fabrication of guider head mount completed. Modified kinematic motion installed and linked to mirror field drive system. Guider head assembly installed on modified kinematic motion.
   - Guider head unit energized and in the process of being calibrated and checked out.

3. Control Building/Perimeter Pad.
   - Sheet rock installed and finished. Electrical entrance panel has been installed and wired. Interior electrical work continues. Air conditioning system presently being installed. Access flooring has been delivered to contractor; this no longer a pacing item. We are pushing contractor for a February 4, 1980 move in date.
   - No road work possible during the week due to rainy weather. Rains are often enough that road bed cannot dry out.
   - Testing of receiver has been rescheduled for June-September 1980 time frame. Schedule slip in control building forces this delay.

   - Monthly contractor meeting held in Atlanta on Thursday, January 24, 1980. Allen Campbell represented Solar Turbines. Design review accomplished. We suggested addition of water cooled aluminum ring at their aperture to protect and preserve their aperture diameter. Georgia Tech has signed DDU, Safety Document, and Test Plan. We await signatures by Solar Turbines.
   - Solar Turbines experimental hardware is scheduled to arrive at ACTF during last week of February 1980.

   - Jim Tarter and Tom Brown of Georgia Tech visited Dynatherm in Baltimore on January 10, 1980. Purpose of visit was to review program status and maintain strong communications. Reviewed Dynatherm drawings and Document of Understanding. Provided constructive criticism, especially in the area of the need for additional thermal shielding. Convective shield is still a problem at this time.
   - It has been agreed that Georgia Tech will provide support structure for Dynatherm experiment. Conceptual design completed and incorporated into draft of Interface Document.
   - Revised Document of Understanding ready for signatures by both parties.
   - Georgia Tech is using Dynatherm supplied drawings to prepare Interface Document.
   - Revised Test Plan and draft Safety Document is being prepared by Dynatherm for subsequent Georgia Tech review.
   - Major technical activity is centering around design concepts for their convective shield. We have reviewed situation and have recommended that they provide ceramic lined, water-cooled, metal shield, and water-cooled shield for upper portion of their experiment. This appears cost effective in that it eliminates need for a large water-cooled aperture plane shield. It also will provide heat pipes with surroundings operating at near heat pipe temperature.


- Document of Understanding signed by both organizations.

- Their Test Plan will be revised to include more information on receiver and support design, flow schematic and instrumentation needs. Revised document will also eliminate need for covering mirrors a large number of times.

- Georgia Tech looking into best way to supply experiment with 400 SCFM of clean compressed air at 15 psig. Most likely candidate is installation of 2-inch air line up the tower and location of rental compressor at south end of mirror field.

- Preliminary design of cylindrical flux mapper has been completed. Drive mechanism and controls for unit exist as surplused items from Sanders receiver test program. New rake, support structure, and calorimeters required. Lead time and cost of calorimeters may be a problem.


- Kickoff meeting scheduled in Atlanta for Friday, February 8, 1980.


- Kickoff meeting will be scheduled as soon as Atomic International is under contract.

10. HELIOS Code Update.

- Code has been refined to simulate August and December 1978 experimental data taken at the focal plane and at two feet above the focal plane.

- The HELIOS code is considered to be operational and will be used to support the design efforts of all scheduled test programs. Some flux maps should be available to experimenters within the week.

- Trial runs have produced flux maps for tilted planes. Work continues in attempt to plot maps for cylindrical surface.
TECHNICAL PROGRESS REPORT
FOR PERIOD FEBRUARY 1-29, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

MAY, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-0-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
FEBRUARY, 1980

The following is a summary of work performed at the Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI sub-contract No. XP-Ø-9003-1 for the month of February, 1980:

1. Improved Tracking Update.
   - FY 79 Improved Tracking activity completed; report to be generated.
   - FY 79 Improved Tracking activity has led to the conclusion that the major remaining tracking errors are associated with the type of glass being used at the ACTF and the particular mechanical arrangement being used to focus the mirrors. This area will be pursued to the point of recommending a "fix".

2. Feedback Control Update.
   - Tracker has been mounted, calibrated, checked out, and is operational. This task complete.

3. Control Building/Perimeter Pad.
   - Interior electrical work complete. Installation of access flooring complete. Painting of interior complete. Occupancy of control building has started. Computer data system moved to new building on February 25, 1980.
   - Data system installed and checked out.
   - Shakedown of heating and air conditioning system continues.
   - Miscellaneous cleanup operations remain.
   - No perimeter pad work accomplished by contractor this month. Significant drying out required before this work can be resumed.

   - Final test plan received and in review.
- Site preparations before solar testing estimated to require one week; solar testing should begin around March 10, 1980, weather permitting.

5. Dynatherm Receiver Update.
- Revised DOU, Interface Drawing and HELIOS flux maps of aperture plane forwarded to Dynatherm.
- Document of Understanding received; Safety Document received and in review.
- Dynatherm owes ACTF a revised Test Plan for review.
- ACTF has completed preliminary design of water-cooled support structure for Dynatherm experiment.

- Monthly program review meeting was held in Atlanta on February 19, 1980. Meeting yielded enough information to allow generation of draft Interface Document by Georgia Tech. Experiment design (fluidized bed receiver and cylindrical flux mapper) is beginning to "jell".
- Method for supplying 400 SCFM of 15 psi air to tower top has been established. ACTF will install 2-inch air line and operate electrically driven rental compressor at ground level.
- Preliminary design of cylindrical flux mapper has been completed and reviewed. Detailed design started late in month after February 19, 1980 review meeting.
- Draft Interface Document completed. Document will be forwarded to Westinghouse for comment.
- Monthly program coordination meeting in Pittsburgh planned for week of March 10, 1980.

- Program kickoff meeting occurred in Atlanta on February 8, 1980. Dr. Mike Antal represented Princeton. Detailed tour of facility given. General design questions discussed. Serious consideration is being given to the possibility of providing terminal concentrator for the experiment in an attempt to maximize peak flux. Dr. Antal would not discuss his receiver design; he preferred to wait until certain patent legalities have been taken care of.
   - Kickoff meeting will be scheduled when General Atomic is under contract.

9. HELIOS Code Update.
   - Code is operational and being used. Runs have been made in support of first four test programs and are being used as input to thermal design.

10. Miscellaneous
    - Georgia Tech has purchased a 12' x 60' office trailer for use by ACTF staff. The trailer has been delivered and is in the process of being installed.
    - The existing double wide trailer will be converted into office space now that the computer data system has been moved to the control building.
TECHNICAL PROGRESS REPORT
FOR PERIOD MARCH 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

MAY, 1980

Work performed under Contract EG-77-C-01-4042
Subcontract XP-0-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
MARCH, 1980

The following is a summary of work performed at the Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI sub-contract No. XP-Ø-9003-1 for the month of March, 1980:

1. Improved Tracking Update.
   - Report generation on hold; author is also task leader for STI test program.
   - Internal kick-off meeting occurred for heliostat mirror focusing program. Initial activity will be to gain capability to characterize shape of focused mirrors.

2. Control Building/Perimeter Pad.
   - Operations near normal in new building.
   - Specification of cabinets/racks/control console initiated.
   - Air conditioning system still having problems.
   - No perimeter work possible due to wet ground; rains have been heavier than usual for past six weeks.
   - Installation of water line and drain to experiment tower scheduled to resume next report period.

   - STI test hardware arrived on site March 4, 1980. Installation of STI hardware taking substantially longer than anticipated. Much of delay due to incomplete assembly of hardware before being shipped to ACTF and late delivery of critical hardware. Basic installation completed March 17, 1980, thirteen days after receipt of hardware.
   - Operated STI receiver under solar flux for first time on March 21, 1980. Receiver aperture approximately 21 inches above focal plane. Unit operated for one hour and 25 minutes. Maximum conditions achieved were: 450°F and 382 psi. Maximum tube wall metal temperature observed was 508°F. Insolation was 877 W/m².
- Operated STI Receiver under solar heating conditions on March 22, 1980. First run on this day was continuation of previous day's activity. Three hours and 25 minutes of run time accumulated. Maximum steam temperature achieved was 1132°F at 163 psi. Maximum steam pressure achieved was 1514 psi at 442°F. Maximum tube wall temperature of approximately 1815°F was recorded. Unit was not operated under steady state conditions during this run.

- STI receiver lowered six inches to approximately 15 inches above focal plane and solar heating resumed at 2:55 P.M. on March 22, 1980. Boiler tube in STI receiver failed 52 minutes into this second run. Outlet steam conditions one second before failure were: 554°F and 1077 psi. Tube wall temperatures of approximately 1925°F were recorded. Insolation at this time was 901 W/m².

- Subsequent metallurgical analysis of the ruptured tube indicates that rupture surface contained crack which pre-dated solar heating. A detailed metallurgical analysis is being undertaken at this time by Georgia Tech.

- Ruptured section of boiler tube replaced by new tube. Work done in Georgia Tech machine shop with specific STI permission. Receiver is presently being re-assembled for continued solar testing. Continuation of testing scheduled for early next report period.


- Monthly program review meeting held in Atlanta on March 18, 1980. Contractor maintains that his schedule has slipped and he cannot arrive before April 25, 1980. Our DOU Schedule calls for an April 1, 1980 arrival date. An April 25 arrival date is too late for conduct of test. Contractor was informed that if he misses his test window he can be rescheduled in the October - November, 1980 time frame. He was also informed that he can do some hot checkout type work in the July, 1980 time frame.

- Fabrication of water cooled support structure by Georgia Tech for experiment continues.

5. Westinghouse Receiver Update.

- Monthly program review meeting was held in Pittsburgh on March 11, 1980. Meeting attended by Doug Neale and Tom Brown of Georgia Tech. In-depth review of their design and the ACTF/Westinghouse Interface accomplished. Resolved several potentially serious interface problems and came to general agreement on Interface Document.
- HELIOS flux maps of their cylindrical geometry delivered and discussed at meeting.

- Reviewed and approved Westinghouse Test Plan.

- Forwarded draft Interface Document to Westinghouse for review.

- Cylindrical flux scanner drawings are in EES Machine Shop for fabrication of scanner mods. Machining of ACTF vertical flux scanner is 95% complete. Bench tests scheduled for next month. Suitable rental air compressor has been identified. General activity in support of installation of air line and rental of compressor continued. System scheduled to be in operation on April 14, 1980. Low pressure alarm will be incorporated into system.

- Westinghouse projects an April, 21, 1980 ACTF arrival date. On ground checkout is planned before installing unit on tower.

- Some preliminary orientation type work with IR pyrometer occurring.


- Dr. Steve Bomar has been given task leader responsibility for this test.

- Monthly program review meeting has been scheduled for Thursday, April 10, 1980 at Princeton. S. H. Bomar and C. T. Brown will represent ACTF.


- No activity.

8. Miscellaneous.

- New 12' x 60' office trailers has been occupied by ACTF staff. Older, double wide trailer is being renovated by Georgia Tech's Physical Plant Department.

- Full scale mockup of mirror field control console completed and evaluated. Some small changes indicated.

- Flux map data forwarded to Boeing Engineering and Construction Company for preliminary design of insulation evaluation experiment.

- Visitors this month included (1) two representatives of INSTITUTE DE INVESTIGACIONES ELECTRICAS, the Mexican equivalent of EPRI, and (2) Mr. David Master, photographer under DOE contract to produce 30-minute video tape about solar thermal.
TECHNICAL PROGRESS REPORT
FOR PERIOD APRIL 1-30, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

MAY, 1980

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
APRIL, 1980

The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI subcontract No. XP-0-9003-1 for the month of April, 1980:

1. Improved Tracking Update.
   - Major long term effort involves characterization of mirror contours using present mechanical pulldown arrangement and recommending a procedure for contouring mirrors into a spherical shape. Design of mirror contour measuring device in progress. Design of Foucault test range in process.
   - Sources of large diameter sagged glass being sought. Potential vendor not yet found.

2. Control Building/Perimeter Pad Update.
   - All underground plumbing to experiment tower completed. Concrete slab for booster pump for experiment tower water has been poured. Pump has been mounted.
   - Ground drying out after unusually wet winter/spring; road construction should resume shortly.

   - STI receiver repaired and returned to experiment tower on March 31 after March 22, 1980 boiler tube failure. Georgia Tech's metallurgical report on the failed STI boiler tube has been received. A copy of that report is attached.
   - Testing of the repaired receiver resumed on Wednesday, April 16, 1980 and was concluded on April 22, 1980. Maximum operating conditions during the test program were 1420°F at 1550 psia on April 22, 1980. A summary of run times follows:
<table>
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<th>Date</th>
<th>Exposure Time</th>
<th>No. of Starts</th>
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<td>2</td>
<td></td>
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<tr>
<td>March 22</td>
<td>4.3 hours</td>
<td>2</td>
<td>Tube Rupture</td>
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<td>April 16</td>
<td>4.7 hours</td>
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<td>4.7 hours</td>
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<tr>
<td>April 22</td>
<td>6.9 hours</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7 days</td>
<td>31.6 hours</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

- STI has been supplied with one minute readouts of all transducers involved in the experiment for all 31.6 hours of testing. They also have copies of the daily test procedures and the daily test log. They are expected to request one second data printouts for selected time periods of particular interest as indicated by the results of their preliminary analysis of one minute data.


- Conducted monthly program review meeting at Dynatherm plant in Cockeyville, Maryland on April 23, 1980.

- The schedule in the DOU was revised to reflect a "ready to ship" date of late June, 1980 for their experiment and a firm test window of November, 1980. A copy of the revised DOU will be forwarded when signed by both organizations. The possibility of hot checkout testing during the summer was discussed. Dynatherm appears neutral on the subject.

- Georgia Tech received samples of thermocouples and structural material from Dynatherm for survival testing in the ACTF solar beam. Testing of the material is likely to take place after the Westinghouse test.

- The water cooled support structure for the Dynatherm experiment has been fabricated and painted.

5. Westinghouse Receiver Update.

- Installation of 2-inch air line to tower platform completed.

- 600 SCFM rental compressor installed and checked out.

- Data collection algorithms have been supplied by Westinghouse. Programming of data system is under way.
- Westinghouse arrived on site 4/22/80. On ground setup and checkout started 4/23/80. Fluidized bed demonstrated on ground with quartz bed material on 4/24/80.

- Receiver scheduled to be placed on tower 5/1/80. Solar testing possible around 5/8/80.

- Hy-Cal calorimeters for cylindrical flux scanner delivered on schedule. Units to be installed in scanner early in May.

- Cylindrical flux scanner completed and checked out. Unit has been mounted on Westinghouse support structure and operated.


- S. H. Bomar and C. T. Brown participated in monthly review meeting at Princeton on Friday, April 11, 1980. Meeting very worthwhile. ACTF will have larger role in program than initially visualized. ACTF will: (1) help with engineering, (2) provide support structure for experiment, (3) provide calorimeter system, (4) possibly provide terminal concentrator, (5) conduct proof test of Princeton quartz/platinum cavity structure.


- Program kickoff meeting in Atlanta occurred Monday, April 28, 1980. Hamp Teague will be Project Director for that program. General Atomic gave a summary of their general program with specific interest devoted to their receiver configuration. Alternate receiver configurations were discussed. Their receiver is likely to undergo significant design changes due to the need to get a uniform heat flux over the majority of their heat exchanger surface.

- A draft version of the Document of Understanding (DOU) was discussed and red lined at the kickoff meeting. The schedule in the DOU calls for GA to be on site by September 15, 1980, with tower top installation complete by September 30, 1980. Solar testing is to occur during the month of October, 1980. A copy of the DOU will be forwarded when differences are resolved and the document is signed by both organizations.


- Mr. John Bigger of EPRI called early in April to inquire about the procedure for scheduling tests at the ACTF. They are interested in having Boeing develop an insulation package for their Brayton cycle receiver and test it at the ACTF. He is in contact with Frank Smith of the Users Association.
- Tom Brown discussed the proposed program with John Gintz of Boeing during the April STTF UA meeting. A statement of work and budget will be supplied to SERI in the near future.

- A data package containing samples of our Document of Understanding, Test Plan, etc. was forwarded to John Bigger on 4/14/80.


- On site Mag Tape capability using new Hewlett Packard 1000 computer system has been demonstrated. Solar Turbines International data is being routinely copied to tape using the new system. Transfer is six times faster and infinitely more reliable.
April 17, 1980
John G. Rinker
Metallurgy Program
Georgia Tech

C. Thomas Brown
EES Solar Research
Georgia Tech

Dr. Brown:

I have examined a tube, from a solar heat exchanger, which burst during testing at the GT/DOE ACTF. The tube was Hastelloy X, ½ inch O.D. with a wall thickness of 0.035 inch, and the burst was 1½ inches long, with a maximum offset of 5/8 inch. The cause of this failure was determined to be a pre-existing longitudinal crack, which extended under stress resulting in the aforementioned burst. Visual examination of the fracture surface revealed that the central area of the crack was markedly different from the two ends. This central region was darkened by a heavy oxide layer and was "thumbnail" shaped, being 7/8 inch long at the outside surface and 5/8 inch long at the inside surface. Examination under a low powered binocular microscope indicated that this region was of a brittle nature, whereas the crack extensions on both ends showed evidence of ductility. Further study using scanning electron microscopy could be done to confirm these findings.

The data from the experiment indicated that the skin temperature was 1900 - 1950°F and the outlet steam conditions were 1077 psi and 554°F. Thus, the mean wall temperature would have been about 1250°F. The hoop stress in this section was about 7700 psi. Although the ASME Boiler and Pressure Vessel Code does not give any allowable stress data for Hastelloy X, its 1000 hour creep rupture stress is about 30,000 psi, so it is hardly plausible that the operating conditions could have resulted in such a burst in such a short time test, had the tube been initially sound.

Sincerely,

John G. Rinker

JGR/me
TECHNICAL PROGRESS REPORT
FOR PERIOD MAY 1-30, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

JULY, 1980

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
MAY, 1980

The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE contract No. EG-77-C-01-4042, SERI subcontract No. XP-0-9003-1 for the month of May, 1980:

1. Improved Tracking Update
   - Design of mirror contour measuring device under way. Designing device with sufficient accuracy is major concern.
   - "First cut" Foucault test range has been installed on site and demonstrated. Range will be used to get qualitative feel for mirror focusing problem. Range will also be used to test methods for solving focusing problem.

2. Control Building/Perimeter Pad Update
   - Contractor working on roadbed; spreading of gravel started.
   - Plumbing for booster pump system for tower top water supply completed. System has been used to supply experiment with cooling water (without boost from pump). Electrical work for pump motor should be completed in near future.
   - Conceptual design specifications package for Control Building furnishings complete. Package mailed to twenty potential suppliers.

3. Solar Turbines Receiver Update
   - Experiment completed April 22, 1980; equipment removed from tower by May 2, 1980. Receiver operated under solar conditions for 31.6 hours; maximum steam conditions achieved were 1420°F at 1550 psia on April 22, 1980; preliminary look at data indicates Q out of 11 kW and receiver efficiency of approximately 80 percent was achieved. STI has been supplied with one minute listings of all transducer data and will provide detailed receiver performance evaluation.
- ACTF data reduction essentially complete; draft of test report under way.

4. Dynatherm Receiver Update

- Maintaining communications with contractor. Some consideration is being given to the possibility of swapping General Atomic and Dynatherm test windows due to delays in General Atomic program. This has been mentioned to Dynatherm.

- Solar testing of several structural and insulation materials will occur at conclusion of Westinghouse test program. Dynatherm has supplied specimens of Inconel sheet, Kaowool insulation, and high temperature thermocouple wire.

5. Westinghouse Receiver Update

- Safety Document reviewed and approved.

- Operating procedures reviewed and approved.

- Experiment placed on tower on Friday, May 2, 1980. Hookup and checkout of experiment required approximately two weeks. Final cold checkout occurred during week of May 15, 1980.

- Solar testing initiated on Wednesday, May 21, 1980. Initial runs on three bed materials accomplished by end of May, 1980. Test summary follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Hours of Test</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/21/80</td>
<td>4.5</td>
<td>#2 Sand</td>
</tr>
<tr>
<td>5/24/80</td>
<td>3.0</td>
<td>#2 Sand</td>
</tr>
<tr>
<td>5/25/80</td>
<td>1.5</td>
<td>Silicon Carbide</td>
</tr>
<tr>
<td>5/26/80</td>
<td>3.8</td>
<td>Silicon Carbide</td>
</tr>
<tr>
<td>5/31/80</td>
<td>2.7</td>
<td>Copper Shot</td>
</tr>
</tbody>
</table>

15.5 hours

- Early runs with silicon carbide and with copper shot indicate window deterioration for these materials.
6. Princeton Receiver Update

- Monthly review meeting held in Atlanta on Thursday, May 22, 1980. Topics discussed included preliminary test plan, Document of Understanding, and detailed drawings of his apparatus. Minutes of that meeting were transmitted to SERI under separate cover.

- Conceptual design for support structure and water cooled shielding complete. Georgia Tech will make use of 9' x 9' experiment deck built for Sanders experiment. Deck has hole in center for passage of beam. Underside of deck will require water cooled shielding. Plan calls for design and construction of general purpose water cooled shield. Shield will be approximately five feet in diameter and have 18 inch diameter hole in center for passage of solar beam. Ring inserts will be supplied to interface with specific experiments. Shield fabrication techniques are being developed at this time.

7. General Atomic Receiver Update

- Received call from Gottfried Besenbruch informing us that they have stopped work pending receipt of contract.

- Communications maintained; consideration is being given to the possibility of swapping General Atomic and Dynatherm test windows due to delay in startup of General Atomic program. This has been mentioned to General Atomic.

8. Potential Boeing Insulation Test

- Proposal for this test will go to SERI early in June, 1980.

- It is possible that STI support structure can be used to support Boeing cavity. Drawings of the STI support structure have been forwarded to Boeing for review.

9. ACTF Workshop

- Mr. Joe Harris of Georgia Tech will help plan and coordinate the workshop. First planning meeting has already occurred. Tentative date for workshop is September 23 and 24, 1980. Mr. Harris will check for major Atlanta convention conflicts before formalizing this date.
10. Technology Transfer

- S. H. Bomar and C. T. Brown traveled to Georgia Southern College in South Georgia and gave presentations on ACTF and its test programs.

- Site visitors:
  1. Roberto Covino of ANSALDO - filming for Italian movie on Solar Thermal technology.
  2. Dr. Ling Y. Wei of University of Waterloo, Canada - Solar Thermal Test Facility for Taiwan.
  3. Mr. Rodrigues of Emory University, Atlanta - Made educational film strip for teachers.
  4. Mr. John Pearson at Popular Mechanics magazine - collecting input for article about Facility.
TECHNICAL PROGRESS REPORT
FOR PERIOD JUNE 1-30, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

AUGUST, 1980

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-9-9003-1 for the month of June, 1980:

1. Improved Tracking Update
   - Design of mirror profile measuring gauge completed. Fabrication of device under way.
   - Technique development for use of Foucault test range continues; some trial data runs being made.
   - Mr. Teague is in contact with representatives of SERI, Battelle and several glass manufacturing companies concerning replacement glass for the ACTF.

2. Control Building/Perimeter Pad Update
   - Paving of Perimeter Pad completed. Final grading for site drainage under way.
   - Project nearing completion. Punch list for miscellaneous items high priority item.

3. Solar Turbines Receiver Update
   - Initial draft of ACTF report completed and reviewed. Draft of report mailed to STI for their review.

4. Dynatherm Receiver Update
   - Test window has been moved to early October. Dynatherm to arrive 9/15/80 and begin testing 10/1/80.
   - Georgia Tech understands that Dynatherm has been put on hold by SERI.

5. Westinghouse Receiver Update
   - All major test objectives have been met and the Westinghouse staff has departed. Georgia Tech will run three additional bed materials on a time-available basis.
6. Princeton Receiver Test

- Monthly program review meeting held at Princeton University on 
  Wednesday, June 25, 1980. Bomar, Steenblik, and Brown represented 
  Georgia Tech. Lefferdo represented SERI. Minutes of that meeting 
  were forwarded under separate cover.

- Fabrication of 5' diameter water cooled shield complete except for 
  mechanical support attachments.

- Inner shield being fabricated. Inner shield will contain three 
  calorimeters.

- Refurbishing of 9' x 9' steel deck continues.

- Georgia Tech is preparing drawings of the Princeton test apparatus 
  based on data received at the June 25 meeting. An Interface Document 
  is also being prepared.

7. General Atomic Receiver Update

- Test window for GA has been moved to the October 15 - November 15, 
  1980 time frame. Anticipate GA hardware on site around October 1, 
  1980.

- Informed that GA now under contract. Monthly program review meeting 
  held in San Diego, California on Friday, June 13, 1980. Mr. Hamp 
  Teague represented the ACTF.

- GA will probably make use of the recently completed 5' circular 
  shield. An inner shield and associated calorimeter array is being 
  designed.

8. ACTF Workshop

- Meeting date of September 16-17, 1980 has been selected for the two 
  day workshop. The Hyatt Riviera Hotel has been selected. Singles 
  rate is $34.00. The hotel is approximately 1½ miles from campus and 
  in a relatively safe area.

- Our Office of Contract Administration advises us that our contract 
  cannot supply coffee, doughnuts, etc. for breaks, or buses for 
  transportation to and from the site. Alternate solutions being 
  explored.
<table>
<thead>
<tr>
<th>Test Date</th>
<th>Bed Material</th>
<th>Run Time (Hours)</th>
<th>Insolation Range (Watts/m²)</th>
<th>Bed Temp. Range (°F)</th>
<th>Steady State Flux Scans</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/21/80</td>
<td>#2 Sand</td>
<td>4.5</td>
<td>580 - 780</td>
<td>350 - 900</td>
<td>8</td>
</tr>
<tr>
<td>5/24/80</td>
<td>#2 Sand</td>
<td>3.0</td>
<td>440 - 470</td>
<td>225 - 235</td>
<td>1</td>
</tr>
<tr>
<td>5/25/80</td>
<td>Silicon Carbide</td>
<td>1.5</td>
<td>415 - 430</td>
<td>320 - 325</td>
<td>1</td>
</tr>
<tr>
<td>5/26/80</td>
<td>Silicon Carbide</td>
<td>3.8</td>
<td>480 - 550</td>
<td>375 - 610</td>
<td>5</td>
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<tr>
<td>5/31/80</td>
<td>Copper Shot</td>
<td>2.7</td>
<td>600 - 630</td>
<td>360 - 375</td>
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<tr>
<td>6/2/80</td>
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<td>600 - 725</td>
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<td>6/4/80</td>
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<td>5.3</td>
<td>750 - 830</td>
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<td>405 - 1000</td>
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<td>6/7/80</td>
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<td>495 - 525</td>
<td>2</td>
</tr>
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<td>0 - 815</td>
<td>200 - 300</td>
<td>0 (Intermittent)</td>
</tr>
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<td>620 - 890</td>
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<td>6/11/80</td>
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<td>3.3</td>
<td>695 - 790</td>
<td>475 - 735</td>
<td>6</td>
</tr>
<tr>
<td>6/12/80</td>
<td>Alumina</td>
<td>4.3</td>
<td>740 - 805</td>
<td>430 - 590</td>
<td>6</td>
</tr>
<tr>
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<td>3.5</td>
<td>535 - 565</td>
<td>270 - 350</td>
<td>3</td>
</tr>
<tr>
<td>6/14/80</td>
<td>#3 Sand</td>
<td>2.8</td>
<td>590 - 615</td>
<td>325 - 355</td>
<td>2</td>
</tr>
<tr>
<td>6/16/80</td>
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<td>655 - 675</td>
<td>335 - 345</td>
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<td>455 - 640</td>
<td>515 - 725</td>
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<td>6/26/80</td>
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<td>760 - 860</td>
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<td>3.5</td>
<td>650 - 715</td>
<td>520 - 545</td>
<td>2</td>
</tr>
</tbody>
</table>

TOTAL 68.9 hours 76 data points

NOTE: All data are preliminary and are subject to change based on more extensive analysis by Westinghouse and Georgia Tech.
9. Miscellaneous

- Jim Lefferdo and Bim Gupta of SERI were given ACTF program briefing at SERI on June 18, 1980 by Georgia Tech's Bob Cassanova, Steve Bomar and Tom Brown. Potential ACTF FY 81 activities were also discussed.

- Received phone request for ACTF flux density information from BFR Engineering in California; they hope to respond to the latest Users Association solicitation. Their area of interest is re-powering.

- Site visitors during the month included:
  - Group of nine technical people from Malaysia.
  - Mr. Habauki of National Council for Research, Sudan.
  - Individuals attending the 15th Symposium on Electromagnetic Windows (approximately 35 people).

- Georgia Tech provided meeting accommodations for the June 18 meeting of EPRI's Solar Program Committee. The group was given a detailed tour of the ACTF.

- Local T.V. coverage of the Westinghouse experiment occurred on June 20, 1980 by ABC affiliate WXIA.
TECHNICAL PROGRESS REPORT
FOR PERIOD JULY 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

AUGUST, 1980

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy Research Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of July, 1980:

1. Improved Tracking Update
   - Fabrication of mirror profile measuring device completed.
   - First cut calibration of mirror profile measuring device accomplished; device has been used to profile one trial mirror. Results look "believable". Analytical model has been generated to predict mirror shape. Comparison will be made with experimental results.

2. Control Building/Perimeter Pad Update
   - Final grading for site drainage completed.
   - Contractor essentially complete; single remaining item is to get fire alarm system functioning properly.

3. Solar Turbines Receiver Update
   - ACTF contribution to STI test report completed.
   - STI cavity and steam loop will be returned to STI.

4. Dynatherm Receiver Update
   - Samples of their thermocouple wire and inconel shield material were exposed to the solar beam during the month. Objective was to test survivability of the materials and to determine the best way to attach thermocouples to structural materials exposed to the solar flux. The following results have been communicated to Dynatherm: (1) the thermocouple wire and its insulation material survived the direct beam without apparent damage; (2) several schemes were tried for attaching thermocouples to structural members and shielding them from the direct solar beam; accurate temperature readings were obtained by unshielded thermocouples provided the two thermocouple wires were seperately spot welded to the structural member; (3) the inconel shield material sagged and melted during direct exposure to the beam. It is recommended that the cone shield be lined with ceramic insulation as previously recommended.
- Written report of the test forwarded to Dynatherm.

5. Westinghouse Receiver Update

- Experimental portion of test completed; hardware removed from tower and stored. Bulk portion of experiment being stored out-of-doors at site. A summary of the test results appears as Table 1 of this report.

- Westinghouse has a complete set of data and samples of all bed materials. Mag tapes of the raw data have been prepared and forwarded to Westinghouse.

- Data reduction at ACTF site continues in support of Westinghouse experiment analysis.

6. Princeton Receiver Update

- Princeton arrived Wednesday, July 30, 1980. Wednesday spent unpacking hardware, going over program status and generally getting organized.

- DOU signed by Princeton.

- Rewrite of Princeton Safety Document completed; presently being reviewed by Princeton.

- Draft of operating procedures completed. Final version to be generated after dry runs later in the week.

- Interface Document completed and ready for Princeton review.

- Initial ACTF water cooled shield irreparable due to method of fabrication. Remake of shield started 7/25/80 with projected completion date of 8/1/80. No program delay anticipated.

- Preparation of lab apparatus for GC analysis well under way.

- Fabrication of water cooled shield to protect char bucket 90% complete.

- We reviewed design of Princeton's water cooled cavity and recommended changes to improve heat transfer; original design probably would have failed under solar heating due to lack of flow over portions of heated surface and existence of void space at top of water-filled cavity.

7. General Atomic Receiver Update

- Hamp Teague participated in monthly Design Review Meeting at GA on Friday, August 1, 1980. Minutes of that meeting will follow.
<table>
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<tr>
<td>6/27/80</td>
<td>50% Fused Silica, 50% Silicon Carbide</td>
<td>3.5</td>
<td>650 - 715</td>
<td>520 - 545</td>
<td>2</td>
</tr>
<tr>
<td>7/1/80</td>
<td>Crushed Lava</td>
<td>2.2</td>
<td>815 - 875</td>
<td>600 - 665</td>
<td>4</td>
</tr>
<tr>
<td>7/1/80</td>
<td>Steel Slag</td>
<td>1.8</td>
<td>775 - 825</td>
<td>385 - 430</td>
<td>3</td>
</tr>
<tr>
<td>7/2/80</td>
<td>Silica Sand (Fine)</td>
<td>2.8</td>
<td>580 - 625</td>
<td>890 - 1000</td>
<td>4</td>
</tr>
<tr>
<td>7/3/80</td>
<td>Silica Sand (Fine)</td>
<td>2.3</td>
<td>*</td>
<td>*</td>
<td>2</td>
</tr>
</tbody>
</table>

*Not yet available.

**NOTE:** All data are preliminary and are subject to change based on more extensive analysis by Westinghouse and Georgia Tech.
Design of water cooled aperture shield completed. Shield will have eight calorimeters spaced uniformly around QA receiver aperture.

8. ACTF Workshop

- Draft of program announcement and agenda completed and approved by SERI (Lefferdo).

- Mailing list essentially complete; envelopes typed.

- All speakers on program have been contacted. Most have accepted invitation to speak.

- A block of 40 hotel rooms has been reserved at the Riviera Hyatt Hotel.

- Bus transportation has been scheduled for the ACTF tour.

- Georgia Tech and SERI contracts have determined that ACTF program can pay for coffee breaks and for bus transportation.

- Marty Gutstein has been invited to be banquet speaker. He may have travel funds problem.
TECHNICAL PROGRESS REPORT
FOR PERIOD AUGUST 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

AUGUST, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of August, 1980:

1. Improved Tracking Update
   - Calibration of the mirror profile measuring device was completed and was confirmed by profiling sample mirrors from the field.
   - The analytical model for prediction of mirror shape was compared to experimental data; the correlation was good. The shape of existing mirrors was analyzed and found to be similar to a truncated cone.
   - The analytical model and ray trace code were used to evaluate various pull-down geometries. This produced several conceptual designs for focusing flat, circular mirrors.

2. Control Building/Perimeter Pad Update
   - Construction complete; the contractor's final invoice was approved for payment. This task will not be listed hereafter.

3. Solar Turbines
   - The ACTF reviewed Solar Turbine's contribution to the final report. Report ready for publication by SERI.

4. Dynatherm Receiver Update
   - Next monthly design review meeting tentatively scheduled for week of September 19, 1980 at Dynatherm.

5. Westinghouse Receiver Update
   - First draft of ACTF portion of test report completed.
6. Princeton Receiver Update
   - ACTF fabrication of water cooled shield finished August 2, 1980.
   - Safety Document and Operating Procedures were completed.
   - Receiver package lifted onto tower August 5, 1980.
   - Experimental program begun August 12 and completed August 22, 1980.
   - Summary of solar test runs attached.
   - Receiver package removed from tower August 26, 1980.

7. General Atomic Receiver Update
   - Minutes of August 1, 1980 monthly Design Review Meeting at General Atomic (GA) are attached. Hamp Teague represented the ACTF.
   - Designs for the shield insert and flux control paddle completed; EES Machine Shop began fabrication.
   - GA has not submitted the required Test Plan, Safety Document or signed DOU and has been informed that their test program will be delayed if these documents are not received promptly.
   - Mr. Henderson Ward of Georgia Tech's School of Chemical Engineering has been engaged to perform technical and safety reviews of GA's sulfuric system design.

8. ACTF Workshop
   - 150 copies of the program announcement and agenda were printed and mailed August 8, 1980.
   - Banquet speaker not yet selected. Tom Stelson of Georgia Tech and Frank Smith of the STTF Users Association are candidates.

9. Miscellaneous
   - Received signed version of Mod 1 to contract. Cost plan will be forwarded as soon as possible.
## PRINCETON-ACTF FLASH PYROLYSIS OF BIOMASS TEST PROGRAM DATA SUMMARY

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Biomass Material</th>
<th>Carrier Gas</th>
<th>No. of Gas Samples</th>
<th>Beam on Run Time (min)</th>
<th>Insolation Range (W/m²)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/12/80</td>
<td>None</td>
<td>CO₂</td>
<td>0</td>
<td>11</td>
<td>487 - 521</td>
<td>Operating temperature test. Tygon carrier gas inlet tube and neoprene thermocouple septum melted.</td>
</tr>
<tr>
<td>8/13/80</td>
<td>Cellulose</td>
<td>CO₂</td>
<td>2</td>
<td>84</td>
<td>0 - 572</td>
<td>Large amount of cellulose entrained and carried into condenser system. Condenser system inadequate. Reactor blackened by pyrolytic carbon.</td>
</tr>
<tr>
<td>8/14/80</td>
<td>None</td>
<td>Steam</td>
<td>0</td>
<td>28</td>
<td>651 - 669</td>
<td>Steam run to test steam system and clean pyrolytic carbon from walls of reactor.</td>
</tr>
<tr>
<td>8/19/80</td>
<td>Cellulose</td>
<td>Steam</td>
<td>1</td>
<td>32</td>
<td>0 - 571</td>
<td>Test terminated when screw feeder tube plugged with cellulose and auger bent.</td>
</tr>
<tr>
<td>8/20/80</td>
<td>Corn cob</td>
<td>Steam</td>
<td>2</td>
<td>12</td>
<td>713 - 739</td>
<td>First run - melted silicone thermocouple inlet tube. Second run - auger bent. Third run - malfunctioning screw feeder control caused excess biomass flow.</td>
</tr>
<tr>
<td>8/21/80</td>
<td>Wood</td>
<td>Steam</td>
<td>3</td>
<td>71</td>
<td>0 - 578</td>
<td>Some entrainment of sawdust.</td>
</tr>
</tbody>
</table>

**NOTE:** All data is preliminary and is subject to change based on more extensive analysis by Princeton and Georgia Tech.
MINUTES OF GENERAL ATOMIC (GA)/ACTF COORDINATION MEETING

AUGUST 1, 1980

SAN DIEGO, CALIFORNIA

ATTENDEES:

GENERAL ATOMIC
Gottfried Besenbruch
Walte Egli
Rudi Klasen
Howard Chiger

ACTF
Hamp Teague

Opened with meeting between Egli, Klasen and Teague in which hardware arrangement was reviewed with particular emphasis on:

1. Experiment support frame featuring drip pan below hazardous fluid area.
2. Aperture paddle mechanism mounting
3. Vertical frame for eqpt. support
4. Interface between water cooled shield and paddle disc.

The current receiver design was discussed with emphasis on:

1. Insulation of upper horizontal surface
2. Interface with ACTF water-cooled shield
3. Material - mild steel
4. No glass tubes in system

The aperture shield was then discussed with particular attention given to:

1. Set-point controller input
2. Method of moving paddle for total flux measurements.
3. Decision as to GA/ACTF interface on parts mfgr.
4. Calibration and need for position indicator

Lunch and tour of fuel manufacturing facility. Chiger joined group for lunch and system details were discussed.
Afternoon devoted to review of system schematic regarding:

1. Modification of relief value system
2. ACTF to provide furnace control contactors
3. ACTF will send samples of high temp. fabric and yarn.
4. ACTF will provide paddle position potentiometer and drive gear.

Finally, the schedule was discussed with the following decisions as outcome:

1. G.A. will assemble receiver in San Diego with flat plate as bottom closure
2. ACTF will modify water-cooled shield so that mating, upper surface is free of supply and exhaust tubes.
3. Units will be mated at ACTF prior to installation on the tower.

A. Safety document, Test Plan and Document of Understanding will be mailed to ACTF on August 18, 1980. G.A. section of test procedure will be hand carried by G.A. in October, 1980.
TECHNICAL PROGRESS REPORT
FOR PERIOD SEPTEMBER 1-30, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of September, 1980:

1. Improved Tracking Update
   - The analytical model for prediction of mirror shape was refined to include the effect of gravity.
   - Experimental work with mirror profile measuring device continued. Agreement between analytical and experimental work was good.
   - A briefing on the analytical and experimental work was given to Jim Lefferdo of SERI during the ACTF Users Workshop.

2. Solar Turbines Receiver Update
   - Mr. Teague reviewed the Solar Turbines (STI) portion of the final report and returned it to STI.
   - Program complete. STI will submit report to SERI for distribution. This task will not be listed hereafter.

3. Dynatherm Receiver Update
   - Program support activity increased in preparation for September 30, 1980 arrival of Dynatherm personnel and receiver hardware.
   - Received signed Document of Understanding.
   - Program review meeting held on Friday, September 19, 1980, at Dynatherm. Jim Tarter and Tom Brown represented Georgia Tech. Minutes of meeting attached.
Meeting did result in discovery of one significant, but solvable, problem. Dynatherm design for gas flow through their calorimeters is not adequate to insure gas flow through all seven calorimeters. Several possible fixes were discussed. Decision on fix left to Dynatherm.

4. Westinghouse Receiver Update
   - Draft of ACTF portion of test report complete.

5. Princeton Receiver Update
   - Written report of GC analysis forwarded to Antal.
   - First draft of Georgia Tech portion of report completed.
   - Press release prepared by Georgia Tech in consultation with Princeton.

6. General Atomic Receiver Update
   - Fabrication of flux control paddle and cavity aperture ring was under way in preparation for late October test.
   - ACTF received first draft of General Atomic (GA) Safety Document. Topics not covered in this draft include: acid and base handling procedures, spill clean-up procedures, remote operation from tower building, emergency procedures (fire, vapor leak, etc), and corrosive liquid storage and disposal procedures.
   - ACTF was informed verbally by Jim Lefferdo of SERI that the GA program is to be terminated prior to test at ACTF. Orderly termination of task begun.
7. ACTF Workshop
   - Workshop took place on September 16 and 17, 1980. Thirty-two people attended the meeting. Proceedings will include papers and a summary of the workshop session.

8. Man/Material Hoist Update
   - Initial contact made with A & E firm. Several sketches detailing possible elevator locations provided to A & E firm by ACTF.
   - Contract paperwork for A & E firm is being processed.

9. Miscellaneous
   - Mrs. Susan Saunders of Western Australia's Solar Energy Research Institute visited the facility on September 4, 1980. She commented that the facility was well known to her group in Australia.
   - A group of 25 French military engineers toured the facility on September 8, 1980.
   - Design for remodeling compressed air system completed; implementation will occur in FY 81.
   - The attached article appeared in the October, 1980 issue of Popular Mechanics and was based on interviews with Steve Bomar and Mike Antal.
MEMORANDUM

TO: Bob Cassanova

FROM: Jim Tarter and Tom Brown


Tom Brown and Jim Tarter arrived at Dynatherm's plant on September 19, 1980 at 11:30 AM. The meeting was attended by Dave Wolf, Walter Bienert, and Jim Blake of Dynatherm. Tom Brown and Jim Tarter examined the heat pipe solar receiver built by Dynatherm to see if any faults could be found that might be corrected before the receiver leaves Dynatherm. The only problem found was a possible problem with gas flow to the seven gas gap calorimeters to be used on the receiver. Dynatherm will correct the problem.

A discussion was initiated to determine what last minute preparations need to be made by Georgia Tech and Dynatherm. These issues were quickly resolved. Georgia Tech agreed to: 1) run two ¼" gas lines from the tower top to the edge of the mirror field, 2) furnish gas for the calorimeters, 3) install regulated water supply, and 4) provide water hoses between the manifold and the experiment. Dynatherm will handle all other supplies and equipment. These agreements are in addition to those specified in the D.O.U.

The capabilities of the computer data acquisition system were readdressed. Dynatherm was not fully aware of what information they need to properly operate their receiver, nor what is available from the ACTF system. Brown and Tarter clarified to Dave Wolf what is available at the ACTF. Dave will send a complete description of what he wants to do with the data system. Brown and Tarter also requested that Dynatherm quickly send Georgia Tech a Final Test Plan and a preliminary procedure. Dave assured us that these requests would be complied with. The meeting ended with a final look at the receiver and Brown took photographs.

James O. Tarter

C. Thomas Brown
Director, ACTF

JOT/mde

cc: Steve Bomar
Milton Bennett, OCA
Fuel from sawdust

The steel tower looms 85 feet over the Atlanta campus, a strange sentinel commanding the gaze of hundreds of mirrors lined up in rows like mechanical spectators at a theater for robots.

It isn't the kind of thing you see on a conventional campus, but this is Georgia Tech, where the tools of science are as much a part of the scene as faded jeans. Though the tower may have a sci-fi look, it's as functional as a gas stove.

In the future, similar units may routinely use the power of the sun to "cook" waste materials into valuable gas and oil fuels.

The tower and the array of mirrors harness and concentrate the radiant energy of the sun. Together they make a solar furnace, one of only a handful now available to scientists in a young field of research.

Supported by a metal framework, the field of 550 mirrors, called helioslats, stands some six feet off the ground. Each mirror is held by a mount that is mechanically driven by a 1-hp motor to track the sun and beam its rays to a common focus 70 feet up on the tower. There, temperatures surge to about 1500°F in a fraction of a second, and can be raised as high as 3500°F.

One upcoming experiment, by Princeton University's Dr. Michael J. Antal, is aimed at pulling useful products from wood and waste materials.

The heart of his experiment is a transparent quartz tube a couple of inches in diameter and a few feet long.

In a set of upcoming tests, Dr. Antal will inject sawdust from wood and ground corn cobs into the quartz reactor, placed at the focal zone. In a flash, the finely ground particles will vaporize.

Temperatures higher than 1300°F are critical to the process, Antal explained. Slow pyrolysis—a chemical change brought about by heat—produces mainly carbon monoxide and hydrogen. But fast pyrolysis results in significant quantities of hydrocarbons called olefins, valuable as feedstocks in the chemical industry and as precursors to gasoline.

"Our work is not, as some people seem to think, something that lies between a Rubik's cube and a cute trick," Antal told us. "It's not a cute trick that anyone can do. The answers we seek are not simple. We're studying chemistry that's very complex and sophisticated, using knowledge that wasn't even available just a few years ago. And the level of sophistication reflects the growth and promise of science."

PM visits

A field of 550 mirrors can raise temperatures at a focal zone to 3500°F. Reactor "cooks" fuel from sawdust.

116 POPULAR MECHANICS
TECHNICAL PROGRESS REPORT
FOR PERIOD OCTOBER 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
OCTOBER, 1980

The following is a summary of work performed at the DOE Advanced
Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI
Subcontract No. XP-Ø-9003-1 for the month of October, 1980:

1. Improved Tracking Update
   - Work continued on development of a technique for properly focusing
     flat circular mirrors, specifically, the use of moment producing
     clips around the periphery of the mirror. A prototype system
     was fabricated and installed. Qualitative results are encouraging.
     Quantitative data on the improvement will be obtained from flux
     scans of a single mirror image. The Westinghouse scanning bar
     was modified for use with the facility flux scanner to produce
     an instrument with the calorimeter sensitivity required for
     single mirror scans.
   - Began draft of Improved Tracking report which documents previous
     mechanical improvements.

2. Dynatherm Receiver Update
   - Minutes of September 25, 1980 Program Review meeting are attached.
   - Dynatherm personnel and hardware arrived at ACTF on September 30,
     1980. Dynatherm heat pipe receiver and ACTF flux scanner were
     placed on tower October 1, 1980.
   - Cold check-out of system on October 6, 1980, validated operating
     procedures. Successful hot check-out also occurred on October 6.
Testing was completed October 14, 1980. All objectives of the test program were met; specifically:
  a. The receiver was operated at and above design temperature.
  b. Receiver start-up to 8 kW in under 5 minutes was achieved, meeting and exceeding requirement of 5 kW in 5 minutes.
  c. The heat pipes were operated at rated output power.
  d. A failure mode test was conducted with a single heat pipe.

A summary of test activities is attached.
The Dynatherm receiver was removed from the tower October 15, 1980. All Dynatherm materials have been removed from the ACTF.
Data analysis was begun.
An abstract was prepared for submission to the American Section ISES conference scheduled for May of 1981.

3. Westinghouse Receiver Update
   - Second draft of ACTF portion of test report was prepared.
   - An abstract was prepared for submission to the American Section ISES conference.

4. Princeton Receiver Update
   - Work continued on draft of ACTF portion of report.
   - An abstract was prepared for submission to the American Section ISES conference.

5. General Atomic Receiver Update
   - The shutter paddle for the GA receiver was completed. No further work is planned for this program.
6. ACTF User's Workshop
   - Minutes of the workshop portion of the conference were draft typed for internal review.

7. Man/Material Work Hoist
   - A & E firm has been contracted to design elevator system support structure.

8. Technology Transfer
   - Abstracts of six papers were prepared for the American Section ISES conference to be held in May of 1981. Four of these papers involved experimenter test activities. A fifth paper was a joint effort between Georgia Tech and SERI, which presents the role of the ACTF within DOE's solar thermal program. The sixth paper summarized Improved Tracking activities, with specific emphasis placed on recent mirror shape studies.
MEMORANDUM

TO: Bob Cassanova

FROM: Jim Tarter and Tom Brown


Tom Brown and Jim Tarter arrived at Dynatherm's plant on September 19, 1980 at 11:30 AM. The meeting was attended by Dave Wolf, Walter Bienert, and Jim Blake of Dynatherm. Tom Brown and Jim Tarter examined the heat pipe solar receiver built by Dynatherm to see if any faults could be found that might be corrected before the receiver leaves Dynatherm. The only problem found was a possible problem with gas flow to the seven gas gap calorimeters to be used on the receiver. Dynatherm will correct the problem.

A discussion was initiated to determine what last minute preparations need to be made by Georgia Tech and Dynatherm. These issues were quickly resolved. Georgia Tech agreed to: 1) run two ¾" gas lines from the tower top to the edge of the mirror field, 2) furnish gas for the calorimeters, 3) install regulated water supply, and 4) provide water hoses between the manifold and the experiment. Dynatherm will handle all other supplies and equipment. These agreements are in addition to those specified in the D.O.U.

The capabilities of the computer data acquisition system were readdressed. Dynatherm was not fully aware of what information they need to properly operate their receiver, nor what is available from the ACTF system. Brown and Tarter clarified to Dave Wolf what is available at the ACTF. Dave will send a complete description of what he wants to do with the data system. Brown and Tarter also requested that Dynatherm quickly send Georgia Tech a Final Test Plan and a preliminary procedure. Dave assured us that these requests would be complied with. The meeting ended with a final look at the receiver and Brown took photographs.

James O. Tarter

C. Thomas Brown
Director, ACTF

JOT/mde

cc: Steve Bomar
Milton Bennett, OCA
# DYNATHERM HEAT PIPE RECEIVER OPERATION AT ACTF

<table>
<thead>
<tr>
<th>Date</th>
<th>Hours of Operation</th>
<th>Insolation Range</th>
<th>Heat Pipe Temperature Range</th>
<th>Heat Pipe Power Range</th>
<th># Steady State Data Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/6/80</td>
<td>0.33</td>
<td>783 - 652</td>
<td>440 - 610 °C</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>10/7/80</td>
<td>2.0</td>
<td>780 - 927</td>
<td>430 - 795</td>
<td>4.0 - 11.5kW</td>
<td>1</td>
</tr>
<tr>
<td>10/8/80</td>
<td>1.4</td>
<td>750 - 820</td>
<td>470 - 730</td>
<td>4.7 - 9.3</td>
<td>4</td>
</tr>
<tr>
<td>10/9/80</td>
<td>3.3</td>
<td>650 - 790</td>
<td>450 - 850</td>
<td>3.0 - 8.3</td>
<td>7</td>
</tr>
<tr>
<td>10/10/80</td>
<td>3.5</td>
<td>680 - 790</td>
<td>450 - 920</td>
<td>3.7 - 8.3</td>
<td>7</td>
</tr>
<tr>
<td>10/12/80</td>
<td>5.0</td>
<td>860 - 960</td>
<td>450 - 970</td>
<td>3.5 - 11.0</td>
<td>12</td>
</tr>
<tr>
<td>10/13/80</td>
<td>5.0</td>
<td>850 - 940</td>
<td>450 - 840</td>
<td>4.0 - 10.0</td>
<td>10</td>
</tr>
<tr>
<td>10/14/80</td>
<td>4.0</td>
<td>850 - 920</td>
<td>440 - 1200</td>
<td>4.0 - 10.0</td>
<td>4</td>
</tr>
</tbody>
</table>

**TOTAL: 24.53**

**TOTAL: 45**

**NOTE:** This data is preliminary and subject to further analysis by Georgia Tech and Dynatherm.
TECHNICAL PROGRESS REPORT
FOR PERIOD NOVEMBER 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-0-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
NOVEMBER, 1980

The following is a summary of work performed at the DOE Advanced
Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI
Subcontract No. XP-Ø-9003-1 for the month of November, 1980:

1. Improved Tracking Update
   - Characterization of image from improved mirror continued. Flux
     maps were plotted for mirrors equipped with the moment
     clips and for unimproved mirrors typical of the present field.
     Preliminary data reduction indicates that the peak flux from an
     improved mirror is twice that from an unimproved mirror.

2. Dynatherm Receiver Update
   - Data analysis continues. Flux maps and integrated power
     distributions have been generated. At Dynatherm's request,
     test day weather data have been obtained through Georgia Tech's
     Aerospace Department.

   - Draft of Georgia Tech portion of test report was begun.

3. Westinghouse Receiver Update
   - Drafts of Georgia Tech and Westinghouse portions of test report
     have been prepared and exchanged for mutual review. Westinghouse
     received current draft for delivery to SERI. A debriefing
     meeting between Georgia Tech and Westinghouse at SERI is
     tentatively planned for January 1981.

4. Princeton Receiver Update
   - Draft of Georgia Tech portion of test report was prepared for
     internal review.
5. General Atomic Reveiver Update
   - Georgia Tech hardware complete.

6. ACTF Users Workshop
   - Internal review of minutes of workshop sessions completed.
   - Requests for submission of camera ready papers mailed to all authors. Most responses received. Second requests mailed for papers not received.

7. Man/Material Work Hoist Update
   - A & E firm design effort under way.

8. Technology Transfer
   - Six abstracts submitted to American Section ISES for consideration for May 1981 conference.

9. Miscellaneous
   - Manual drive for mirror field designed, fabricated, and installed. This permits manual movement of mirror field hour angle in the event of power failure combined with air-motor failure.
   - Discussions have begun between ACTF and United Stirling concerning test of a P-40 stirling engine at the ACTF. Implementation of the improved mirror profile system would be necessary to provide the required 70 kW input flux.
TECHNICAL PROGRESS REPORT

FOR PERIOD DECEMBER 1-31, 1980

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of December, 1980:

1. Improved Tracking Update
   - Collection of single-mirror flux map data complete. Twelve mirror configurations have been studied. Parameters of study included improved vs. unimproved mirror profiles, drawn glass vs. float glass, and field location of mirror. Analysis has begun to determine mirror surface slope error, total power at focal plane, and total power into a 12" diameter circle at the focus.
   - Preliminary results show significant improvement possible for modest implementation cost. Implementation proposal preparation under way.

2. Dynatherm Receiver Update
   - Nothing to report.

3. Westinghouse Receiver Update
   - Westinghouse has indicated to Georgia Tech that the combined draft test report is under Westinghouse internal review prior to delivery to SERI.

4. Princeton Receiver Update
   - Georgia Tech has reviewed Princeton's draft of the test report. Draft of Tech portion of report under internal review.
5. General Atomic Receiver Update
   - This program is assumed to be cancelled and will not be reported hereafter.

6. ACTF Users Workshop
   - Communications continue with authors whose papers are to be included in the proceedings but have not been received.

7. Man/Material Work Hoist Update
   - A & E firm has completed preliminary design drawings for tower modification. Georgia Tech has approved drawings and authorized A & E firm to proceed with detailed design and specification.
   - The HELIOS computer code has been used to predict maximum incident flux on elevator rails from an improved mirror field. No problems found.

8. Miscellaneous
   - C.T. Brown Visited V.K. Mathur at the University of New Hampshire on December 2, 1980, to discuss the possibility of a DOE funded ACTF solar test of a coal gasification device in late 1981. The ACTF agreed to prepare and submit a proposal.
   - D. Bartlett of Boeing Engineering and Construction in Seattle called to discuss testing of advanced insulation materials at the ACTF in February 1981. Mr. Bartlett agreed to contact EPRI to request authorization.
   - United Stirling forwarded a copy of their STTF Users Association proposal for a test of their P-40 engine at the ACTF. Implementation of the improved mirror profile system would be required to meet test goals.
- Planning under way for tours of ACTF by attendees of IEEE conference on power engineering in January of 1981.

- Mr. Fitzgerald of the Tile Council of America will visit the ACTF in early 1981 to discuss conducting their Users Association funded program at the ACTF.
TECHNICAL PROGRESS REPORT

FOR PERIOD JANUARY 1-31, 1981

FY 80 OPERATIONS AT THE

UNITED STATES DEPARTMENT OF ENERGY

ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042

SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-0-9003-1 for the month of January, 1981:

1. Improved Tracking Update
   - Present program complete. Experimental data indicate that implementation of mirror profile improvement could double ACTF peak flux and increase overall power. Data submitted to SERI for presentation at January, 1981 DOE Quarterly Review Meeting.
   - Implementation not authorized or funded in present program. Preparation of a formal proposal to SERI begun at Sunny Cherian's request.

2. Dynatherm Receiver Update
   - Generation of Georgia Tech input to test report under way.

3. Westinghouse Receiver Update
   - Task complete and will not be listed hereafter.

4. Princeton Receiver Update
   - Integration of Princeton and Georgia Tech portions of test report completed. Princeton will submit combined draft for SERI approval.

5. ACTF Users Workshop
   - Received camera ready copy of Westinghouse paper.
   - General Atomic paper is only paper not received; it will be omitted unless received by press time.
6. Man/Material Work Hoist Update
   - A & E firm has completed and delivered final design and specification package.
   - Georgia Tech has issued bid package for purchase of elevator. Georgia Tech Physical Plant preparing bid package for installation of elevator by general contractor.

7. United Stirling Test Program
   - Doug Neale and Tom Brown met with United Stirling, Inc. in Washington, D.C., January 20, 1981. United Stirling expressed strong interest in financing and conducting a solar test of its P-40 stirling engine with standard heater head. Georgia Tech will provide cavity receiver design. ACTF test tentatively scheduled for early April, 1981.

8. Tile Council of America Test Program
   - Mr. Vince Fitzgerald and Dr. Ed McNamara of the Tile Council visited the ACTF January 21 to discuss the possibility of using the ACTF to conduct its Users Association funded program to fire ceramic tile with solar energy.
   - Georgia Tech agreed to produce experiment design concepts for Tile Council review.
   - Preparation of a Statement of Work and Budget for ACTF program support has begun.

9. University of Houston Solar Test Program
   - Dr. Alex Ignatiev of the University of Houston called Georgia Tech to discuss the use of the ACTF as the site for the STTF Users Association experimental study of black chrome degradation in an intense solar beam. A meeting has been scheduled for February 7, 1981 in Atlanta.
10. Lawrence Berkeley Laboratories Test Program
   - Dr. Arlon Hunt of LBL called Georgia Tech to discuss the possibility
     of using the ACTF to conduct the STTF Users Association test of his
     small particle heat exchanger. Further discussion planned.

11. Boeing Insulation Test Program
   - Current changes in Boeing/EPRI program eliminated the need for
     Boeing to conduct insulation tests at this time.

12. Miscellaneous
   - C.T. Brown and D.H. Neale attended the STTF Users Association
     Workshop in Albuquerque, January 7 - 9, 1981.
   - Major malfunction of archaic PDP-8 computer system occurred for the
     second time in two months.
TECHNICAL PROGRESS REPORT

FOR PERIOD FEBRUARY 1-28, 1981

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

September, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-0-9003-1 for the month of February, 1981:

1. Improved Tracking Update
   - First draft of the Improved Tracking/Heliostat Aiming and Alignment report was prepared.
   - Georgia Tech submitted to SERI a formal proposal for implementation of the improved mirror shape hardware.

2. Dynatherm Receiver Update
   - First draft of Georgia Tech portion of test report is 50% complete.

3. Princeton Receiver Update
   - Final drafts of Princeton and Georgia Tech portions of test report integrated and delivered to Princeton for final review.

4. ACTF Users Workshop
   - Proceedings of workshop were delivered to Georgia Tech Photo Lab for pressing of two hundred copies. All papers were received except General Atomic Report.

5. Man/Material Work Hoist Update
   - Bids for the hoist assembly and its erection were opened February 27. Low bid was $47.5K. Bids for general contract will be opened March 6.
- All work is on schedule but may be delayed by expiration of Operations and Maintenance contract.

6. United Stirling Test Program

- Representatives of Georgia Tech and United Stirling met at the ACTF on February 25 and discussed testing of a United Stirling heater assembly. It was agreed that the test would occur at the ACTF during May, 1981. The ACTF schedule for 1981 was revised accordingly and a copy is attached.

- Georgia Tech agreed to design and specify a cavity to surround United Stirling's heater head. Solar tests of samples of cavity materials are planned for March, 1981.

7. Tile Council of America

- Georgia Tech submitted a proposed experiment set up to the Tile Council. A draft DOU and test schedule were also included.

- C.T. Brown presented the preliminary Statement of Work and Budget for ACTF work on this STTF Users Association program during his visit with Lefferdo at SERI February 13, 1981.

- A formal proposal for the ACTF work was submitted to SERI. The test was scheduled for June, 1981.

8. University of Houston Solar Test Program

- Dr. Ignatiev of the University of Houston met C.T. Brown at the ACTF February 7, 1981 to discuss this STTF Users Association funded program. Based on this meeting, Georgia Tech began the draft of a DOU and concept drawings for the experiment set up.
9. Lawrence Berkeley Laboratories Test Program
   - Planning for test program continued pending SERI's response to
     the proposal. The test is scheduled for October, 1981.

10. Georgia Tech Radome Test Program
    - Georgia Tech engineers conducted a two day test of a silicon
      nitride radome in February, 1981, using the ACTF to heat the
      radome to flight temperature. The microwave transmissivity of
      the radome as a function of temperature was measured, using micro-
      wave equipment inside and beyond the radome. The radome functioned
      satisfactorily.

11. Technology Transfer
    - Thermo Electron Corporation was contacted to discuss a possible
      ACTF test of a thermionics converter. A meeting is scheduled for
      March in Boston. Thermo Electron will be encouraged to submit a
      test proposal to the STTF Users Association.

12. Focal Point Camera Studies
    - The mirror field was set up and used to track the moon at night.
      Photographs were taken from the focal point while the mirrors were
      operating. These photographs will be used to identify misaligned
      mirrors.
    - This is a continuation of the effort to develop techniques for
      maintaining the ACTF mirror field. The technique will be useful
      at other facilities with reflector systems.
1981 ACTF TEST SCHEDULE (PRELIMINARY)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STIRLING INC.</td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
</tr>
<tr>
<td>Setup and Checkout</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
</tr>
<tr>
<td>UNIVERSITY OF HOUSTON*</td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
</tr>
<tr>
<td>Setup and Checkout</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
</tr>
<tr>
<td>TILE COUNCIL OF AMERICA*</td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
</tr>
<tr>
<td>Setup and Checkout</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
</tr>
<tr>
<td>ELEVATOR INSTALLATION</td>
<td></td>
</tr>
<tr>
<td>MIRROR FIELD UPGRADE</td>
<td></td>
</tr>
<tr>
<td>LAWRENCE BERKELEY LABS*</td>
<td></td>
</tr>
<tr>
<td>Coordination</td>
<td></td>
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<tr>
<td>Setup and Checkout</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
</tr>
</tbody>
</table>

*STTF Users Association Supported Programs.
TECHNICAL PROGRESS REPORT
FOR PERIOD MARCH 1-31, 1981

FY 80 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-0-9003-1 for the month of March, 1981:

1. Improved Tracking Update
   - First draft of the Improved Tracking/Heliostat Aiming and Alignment report has been reviewed at ACTF.
   - Implementation of improved mirror shape hardware awaits SERI response to Georgia Tech's proposal.

2. Dynatherm Receiver Update
   - Draft of Georgia Tech portion of test report is 80% complete.

3. Princeton Receiver Update
   - Final draft of Princeton/Georgia Tech report was submitted to SERI for review.
   - This program is complete and will not be reported hereafter.

4. ACTF Users Workshop
   - Two hundred copies of workshop proceedings were printed and assembled for mail distribution.
   - This task is completed and will not be reported hereafter.

5. Man/Material Work Hoist Update
   - Bids for tower modification and electrical work were opened March 6. Low bid was $24.7K. Combined cost for elevator contract
and general contract is $68.3K. This is $6.6K above our FY 81 budget due to 18 months of inflation since the budget was established.

- The deadline for acceptance of this bid is April 6.
- The operations and maintenance contract must be in force prior to execution of this subcontract.

6. United Stirling Test Program
- The cavity receiver design effort is under way. Plans have been made for United Stirling to fabricate the cavity receiver for testing at the ACTF in the spring of 1981.

7. Tile Council of America
- Preliminary planning meetings completed; further action awaits STTF Users Association funds and authority to proceed.

8. University of Houston Test Program
- Preliminary planning meetings completed; further action awaits STTF Users Association funds and authority to proceed.

9. Lawrence Berkeley Laboratories Test Program
- Planning continued in telephone discussions; further action awaits SERI's response to the proposal.

10. Technology Transfer
- D.H. Neale and C.T. Brown met representatives of Thermo Electron on March 3, 1981 to develop a proposal to the STTF Users Association for the testing of a thermionic device at the ACTF.
- Rasor Associates of Sunnyvale, California was contacted concerning their interest in a solar driven thermionics device. An ACTF representative will visit Rasor during the RAD semi-annual review meeting in California.


- ANSALDO of Italy requested and received permission to reprint the ACTF Summary of 1980 Activities as part of a large publication describing the current status of solar thermal development. The necessary materials were provided to ANSALDO.

- Meridian Corporation of Falls Church, Virginia requested and received detailed program objectives and management plans for the ACTF to be included in a facilities document for Jim Rannels of DOE.

11. Focal Point Camera Studies

- The ACTF mirror field was used to track the full moon on the night of March 20, 1981. The mirror field was photographed with a conventional wide angle camera located at the system focus. An "improved mirror" was included in the mirror field and comparative focusing data was collected.
TECHNICAL PROGRESS REPORT
FOR PERIOD APRIL 1-30, 1981

FY 80 AND 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-0-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of April 1981:

1. Improved Tracking Update
   - The first draft of the Improved Tracking/Heliostat Aiming and Alignment report was reviewed and the second draft was begun.
   - SERI responded to Georgia Tech's proposal for implementation of the improved mirror hardware, indicating that there were no funds currently available for this effort.

2. Dynatherm Receiver Update
   - A first draft of the Georgia Tech portion of the test report was completed and reviewed; revisions are being made.

3. Man/Material Work Hoist Update
   - Georgia Tech's entire procurement effort was terminated and voided on April 6 due to lack of a signed contract for FY 81 operation of the ACTF.
   - The signed operations contract was received on April 14 and procurement activities were reinitiated on April 15. The purchase order for the hoist was issued. A new bid cycle was begun for the general contract. Installation of the hoist is scheduled for August, 1981.
4. United Stirling Test Program
   - Georgia Tech completed its design of the cavity for the Stirling engine heater head assembly. United Stirling plans to fabricate the cavity for an August, 1981 test at the ACTF.
   - Georgia Tech fabricated a materials test fixture and exposed various cavity surface coatings to the ACTF beam on April 24 and April 27. Data analysis was begun for forwarding to United Stirling.
   - This program is being sponsored by United Stirling; no DOE funds are involved.

5. Tile Council of America Test Program
   - Planning completed in March, 1981. Program initiation awaits STTF Users Association funds and authority to proceed.

6. University of Houston Test Program
   - Planning completed in March, 1981. Program initiation awaits STTF Users Association funds and authority to proceed.

7. Lawrence Berkeley Laboratories Test Program
   - Planning awaits STTF UA funds and LBL's decision on whether the test should be conducted at the ACTF or at White Sands Solar Furnace. Dr. Hunt of LBL has undertaken a technical evaluation and found no problem with conducting the program at the ACTF but had not publicly announced a decision.
8. Technology Transfer

- Ling Qing, China's Ambassador to the U.N., toured the ACTF on April 10, 1981, and was briefed on Georgia Tech's DOE sponsored solar energy activities.

- C.T. Brown attended the Annual Meeting of the STTFUA April 22 and 23 in Pasadena, California. He gave two presentations -- one describing the ACTF and its capabilities in general and the other a discussion of calorimetry capabilities, problems and possible solutions.

- ACTF activities of the past fifteen months will be presented in six technical papers accepted by the American Section of the International Solar Energy Society for its meeting in Philadelphia, May 26 through 30, 1981.

- The International Solar Energy Society has accepted three papers describing ACTF activities of the past fifteen months. These papers will be presented at the Brighton, England conference in August, 1981.
TECHNICAL PROGRESS REPORT
FOR PERIOD MAY 1-31, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
MAY, 1981

The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of May, 1981:

1. Improved Tracking Update
   - A second draft of the Improved Tracking/Heliostat Aiming and Alignment report is under internal review.
   - Remainder of mirror shape analysis was planned. It will include a study of the relationship between peak flux and mirror fixture temperature.

2. Dynatherm Receiver Update
   - Work continued on the second draft of Georgia Tech's portion of the experiment report.

3. Man/Material Work Hoist Update
   - The second bid opening for the general contract was held May 26. The low bid was $24,400, bringing the combined cost for elevator installation and tower modification to approximately $67,500. This is $2,500 below budget.
   - Construction work is scheduled to begin in five to six weeks.

4. United Stirling Test Program
   - United Stirling has requested that their August experiment be a
test of a full Stirling engine with alternator, rather than the previously planned test of only a heater head assembly. This task involves no DOE funds.

5. Tile Council of America Test Program
   - Planning completed in March. Program initiation awaits STTF Users Association funds and authority to proceed.

6. University of Houston Test Program
   - Planning completed in March. Program initiation awaits STTF Users Association funds and authority to proceed.

7. Lawrence Berkeley Laboratories Test Program
   - As a result of planning discussions with Dr. Arlon Hunt of LBL, Georgia Tech offered to produce a series of volume flux maps for LBL's use in its detailed cavity design. The flux scans for the volume flux maps were run on May 22, 1981.

8. High Temperature Materials and Pyrometry Tests
   - Georgia Tech consulted Boeing Engineering and Construction Company to benefit from Boeing's experience in solar and simulated solar tests of insulation materials for high temperature systems. Don Bartlett of Boeing offered to provide materials, instrumentation, and an engineer to assist with a test program at the ACTF. Planning has begun for a joint test program. A kick-off meeting was held May 29, 1981 and attended by representatives of Georgia Tech, Boeing, and Babcock & Wilcox (manufacturer of insulation).
- Preliminary planning has begun for Georgia Tech tests of techniques for bonding quartz for cavity windows.

- Georgia Tech has acquired nominally solar blind pyrometers for use in conjunction with on-going materials tests. The objective is to develop techniques for accurate temperature measurements of surfaces during solar testing.

- Preliminary planning has begun for Georgia Tech test of castable refractory materials to determine their suitability for cavity applications. A test fixture has been fabricated.

- The above referenced programs are being conducted within the normal operation and maintenance budget of the ACTF.

9. Technology Transfer

- Six papers from Georgia Tech/ACTF authors were presented at the 1981 conference of the American Section of the International Solar Energy Society, May 26 through 29, in Philadelphia. H.L. Teague represented the ACTF.
TECHNICAL PROGRESS REPORT
FOR PERIOD JUNE 1-30, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No.: EG-77-C-01-4042, SERI Subcontract No. XP-ø-9003-1 for the month of June, 1981:

1. Improved Tracking Update
   - Installed previously fabricated mirror shape hardware on a new mirror to gather environmental effects data on the prototype hardware.

2. Dynatherm Receiver Update
   - Work continues on the second draft of Georgia Tech's portion of the test report.

3. Man/Material Work Hoist Update
   - Georgia Tech gave general contractor authority to proceed with an August/September 1981 installation of the elevator.

4. United Stirling Test Program
   - C.T. Brown and S.H. Bomar visited United Stirling on June 8, 1981 in Alexandria, Va., to review the proposed program. United Stirling has requested a four week period in August, 1981 for test of a complete engine/alternator assembly.
   - Sten Holgersson and Hans Nelving of United Stirling Sweden visited the ACTF on June 26, 1981 to complete contract negotiations for
United Stirling's test program and to exchange interface data. Test is scheduled for August, 1981. Test objectives are validation of Georgia Tech's analytical code for cavity design and demonstration of the engine's thermal cycling capability.

- Georgia Tech will attempt to fine-tune mirror field focus in an attempt to increase peak flux 20%, in lieu of unfunded implementation of mirror shape improvement hardware. Adjusted mirror field may allow operation of stirling engine to 25 percent of rated output.

5. Tile Council of America Test Program
   - Planning completed in March. Program initiation awaits STTF Users Association funds and authority to proceed.

6. University of Houston Test Program
   - Planning completed in March. Program initiation awaits STTF Users Association funds and authority to proceed.

7. Lawrence Berkeley Laboratories Test Program
   - Completed data reduction of May 22, 1981 volume flux maps; Data forwarded to LBL for use in receiver design (see attached letter summary to LBL).

   - Arlon Hunt informed the ACTF that LBL's program scope has been reduced by the STTF Users Association. The reduced effort will end in December, 1981 with the cavity receiver fabricated and ready for test, but untested. LBL requests a solar test in January or February, 1982.
8. High Temperature Materials and Pyrometry Tests

- Georgia Tech and Boeing Engineering and Construction Company continued planning for the solar testing of insulation materials. Georgia Tech mapped fluxes at the back plane of a dummy cavity and ran the HELIOS code to predict the flux at the cavity aperture. These data have been given to Boeing for use in designing its cavity. The Document of Understanding and Safety Document for the test program have been executed.

- Experimental procedures for solar tests of castable refractory materials are being developed. Trial runs have been conducted to verify the procedures using samples cast from materials which were several years old. Later tests are planned using fresh raw materials. Fabrication of molds has begun.

- A Georgia Tech owned Barnes IT-7 pyrometer was used during the castables trial runs in an attempt to monitor front surface temperatures of the heated samples. The experiment was marginally successful. Further tests are planned.

- A quartz window materials test is tentatively scheduled for the December, 1981 time frame previously reserved for LBL.

- These programs are being conducted within the operations and maintenance budget of the ACTF. Materials and equipment have been lent to the ACTF, and the tests are substitutes for previously scheduled STTF UA experiments which have failed to receive timely funding or authority to proceed from SERI and the STTFUA.
9. Miscellaneous

- Developed software for the on-site generation of flux maps.

- Between tests, rechecked and confirmed accurate calibration of ACTF flux scanner.

- Completed installation of closed circuit video system to monitor tower top experiments from the control building.

- C.T. Brown and S.H. Bomar visited Sunny Cherian in Washington, D.C. to plan FY 82 operation of ACTF. Cherian requested that the ACTF review future experiment proposals to assess technical merit.
June 24, 1981

Dr. Arlon J. Hunt
Solar Energy Program
Energy and Environment Division
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

Dear Arlon:

Here are the flux maps that we ran for you. Included is a description of the mapping set-up and a log of map designations vs. conditions.

You will note that on Run 12, we encountered significant flux spill-over from the outside edge of the shield. This was remedied by covering the spill area with aluminum foil.

The normalizing routine that we use is linear, and therefore is subject to some question as to precision. Please use the normalized plots only as close approximations to what you would expect on a 900 W/m² day at the ACTF.

Please call if we can be of service in interpreting any of this information.

Sincerely,

Hamp Teague
Senior Research Engineer

mde
L.B.L. FLUX MAPPING AT ACTF

A series of flux scans through selected apertures was undertaken on May 22, 1981 in support of the upcoming L.B.L. tests at the ACTF. The basic flux scanning set-up is described below.

A 5-ft diameter, 1-inch thick, water cooled shield was placed with its upper surface located 12 inches below the tower platform upper surface. This shield incorporates an 18-inch diameter opening in its center. The shield was centered in the 8-ft x 8-ft experiment opening in the tower platform.

A B & W 3000 Board aperture plate, with a 9.4-inch diameter circular opening in the center, was fabricated and installed on top of the water-cooled shield as shown. The 9.4-inch aperture edge was beveled at 45° (maximum heliostat view angle) and remained in place throughout the test. In addition, a 3-inch diameter aperture plate was constructed from 3000
Board (beveled edges) and a 12" x 12" quartz window was made available by L.B.L.

Flux Scans

By raising and lowering the scanning calorimeter bar, flux distribution measurements were made at various levels above the apertures mentioned above. In addition, flux scans were completed with and without the quartz window installed above the 9.4-inch diameter aperture. Each scan series (at a particular level) included at least one scan with the 3-inch diameter aperture installed, either at the center of the 9.4-inch opening or at the south edge of the opening.

Typical Scan Distribution (at a given level)

The scanning bar level was typically set at a specified height (recorded) above the aperture to be scanned. The first scan (at a particular height) was made using the 9.4-inch diameter aperture only. The second scan, typically, was of the 9.4-inch diameter aperture with the quartz window placed over the aperture opening:
The third scan was completed with the 3-inch diameter aperture installed and centered on the 9.4-inch diameter hole (see sketch on Page 1) with quartz window removed.

A fourth scan of the series (constant height) was made at only two levels with the 3-inch diameter aperture moved 2 3/4 inches directly south of the centered position mentioned above.

In some cases the particular order of scans was changed in the interest of time; however, it is readily apparent from the log which scan is which.

Note: Whenever the 3-inch diameter aperture was installed, one inch was subtracted from the scanner height above the aperture because the 3-inch aperture plate rested on the 9.4-inch aperture plate. The scanner bar height was not changed.
Aperture Diameter Calculation:

Based on latest flux map (5/13/81) focal zone at 12 inches below deck, assume avg. flux density of 70 W/cm² over area in question and approximately 30 kW desired through aperture, then:

\[
D_{\text{aperture}} = \frac{30 \times 10^3 \times 4}{70 \times 6.45\pi} = 9.2 \text{ inches}
\]

Estimated Flux Distribution at Various Levels Above Aperture:

Based on flux-through-aperture distribution over direction from 8° to 45° from vertical per diagram:
$$A_{in} = \frac{\pi(D_2^2 - D_1^2)}{4} \quad \text{Actual aperture area at 9.4 in dia.} = 69.4 \text{ in}^2$$

$$A_{cm} = A_{in} \times 6.45 = 447.6 \text{ cm}^2$$

$$Q_{act} = 447.6 \times 70 \text{ W/cm}^2 = 31,332 \text{ Watt}$$
<table>
<thead>
<tr>
<th>Scan*</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>05221B-WE 1</td>
<td>3&quot; aperture; scanning bar 5&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 3</td>
<td>9.4&quot; aperture; quartz window; scanning bar 6&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 4</td>
<td>9.4&quot; aperture; scanning bar 6&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 5</td>
<td>9.4&quot; aperture; scanning bar 12&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 6</td>
<td>9.4&quot; aperture; quartz window; 12&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 7</td>
<td>3&quot; aperture; scanning bar 11&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 11</td>
<td>9.4&quot; aperture; scanning bar 18&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 12</td>
<td>9.4&quot; aperture; quartz window; scanning bar 18&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 13</td>
<td>9.4&quot; aperture; quartz window; scanning bar 18&quot; above aperture; aluminum foil shroud in place to stop spillage around water-cooled shield. (On all subsequent scans the shroud was in place.)</td>
</tr>
<tr>
<td>05221B-WE 14</td>
<td>9.4&quot; aperture; scanning bar 24&quot; above aperture</td>
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<td>05221B-WE 15</td>
<td>3&quot; aperture; scanner 23&quot; above aperture</td>
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<td>05221B-WE 16</td>
<td>9.4&quot; aperture; scanner 30&quot; above aperture</td>
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<td>05221B-WE 17</td>
<td>3&quot; aperture; scanner 29&quot; above aperture</td>
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<tr>
<td>05221B-WE 18</td>
<td>3&quot; aperture; scanner 29&quot; above aperture; aperture was moved south of center (approximately 2 3/4&quot;)</td>
</tr>
<tr>
<td>05221C-WE 1</td>
<td>3&quot; aperture; scanner 17&quot; above aperture (3&quot; aperture moved south 2 3/4&quot; of center)</td>
</tr>
</tbody>
</table>

\[26.2.91\]
TECHNICAL PROGRESS REPORT
FOR PERIOD JULY 1-31, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of July, 1981:

1. Improved Tracking Report
   - Nothing to report.

2. Dynatherm Receiver Update
   - Nothing to report.

3. Man/Material Work Hoist Update
   - The general contractor has completed excavation for the elevator base and began the electrical work. The hoist machinery has been delivered. Contract completion is scheduled for late September, 1981.

4. United Stirling Test Program
   - Contract with United Stirling has been executed. This test program involves no DOE funds.
     - The following documents have been drafted and are in review: Document of Understanding; Interface Document; Test Plan; and Test Procedures.
     - Volume flux map data generated and forwarded to United Stirling.
     - Design and construction of mechanical support structure and thermal shielding completed.
- The stirling engine assembly and representatives of United Stirling arrived July 30, 1981.

5. Tile Council of America Test Program
   - At STTFUA request, submitted proposal to determine feasibility of using solar energy to fire ceramic tile. Dr. Ed McNamera of the Tile Council will serve as a consultant on the program.
   - Test scheduled for early October, 1981.

6. University of Houston Test Program
   - This test activity in jeopardy due to extensive ($60K) ACTF support required for the program.

7. Lawrence Berkeley Laboratories Test Program
   - Completed delivery of "beyond aperture" flux map data for LBL receiver design.
   - Test planning awaits ACTF funds and authority to proceed; test scheduled for March, 1981.

8. - Boeing Insulation Test Program
   - A joint program with Boeing Engineering and Construction Company to study lifetime and failure modes of cavity wall insulation materials was completed in July 1981 after approximately 50 hours of sample exposure at temperatures to 2800° F. The program objective was to expose samples of high temperature insulating materials to concentrated solar energy and evaluate the survivability of each by monitoring temperatures, flux levels, direct insolation, and physical appearance. Three of the test specimens were arranged to measure the heat trapping effects
of various width cracks in insulating boards. The fourth test specimen consisted of a typical section of composite insulation and was arranged to simulate a typical back-wall section of the Boeing Bench Model Solar Receiver. The results of this test series will feed into the Boeing/EPRI 1 MW Full System Experiment presently scheduled for the CRTF.

9. Miscellaneous

- No cost extension to December 31, 1981 approved by SERI on June 15, 1981

- The stray mirror locator, developed by Georgia Tech's Physics Department, was used during the July, 1981 Boeing Insulation Test Program to locate mirrors out of tracking tolerance. Follow up realignment activities are underway on selected mirrors.

- Conceptual design of a focal point camera was resumed. Most of the design effort was performed at no cost by a volunteer worker at the ACTF.

- Mr. Bill Kaspar of DOE/SAN visited the ACTF on July 9 for a tour and briefing on facility goals and procedures.
TECHNICAL PROGRESS REPORT
FOR PERIOD AUGUST 1-31, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

SEPTEMBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-0-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of August, 1981:

1. Improved Tracking Report
   - Final draft has been written and is undergoing internal review. Document will be submitted to DOE Oak Ridge for approval as final report for DOE Contract No. DE-AC05-76ET20329.

2. Dynatherm Receiver Update
   - Draft of Georgia Tech portion of the test program has been delivered to Dynatherm for review and integration with its report. Dynatherm will submit combined report to SERI for review and approval.

3. Man/Material Hoist Update
   - Concrete ramps to base of elevator are complete. Construction is on schedule and should be completed in late September, 1981.

4. United Stirling Test Program
   - The United Stirling engine was installed on the tower August 3, 1981.
   - The Operating Procedures were finalized August 6, 1981 and the
engine was first exposed to the solar beam on that date.
- Net power to the utility grid was first produced on August 12, 1981.
- Maximum electrical power delivered to the grid was 7KW.
- The Phase II tests used a standard fossil fuel heater head assembly for the solar receiver. Phase III tests using a cavity receiver designed for solar application are planned for October - November, 1981.
- All test hardware was removed from the tower and packed for storage August 31, 1981.

5. Tile Council of America Test Program
- Nothing to report; waiting on funds and authority to proceed.

6. University of Houston Test Program
- Due to budget limitations, this program has been rescheduled for the White Sands Solar Furnace.

7. Lawrence Berkeley Laboratories Test Program
- Reactor design by LBL progressing; communication with LBL satisfactory.

8. Boeing Insulation Test Program
- Data from materials test mailed to Boeing; this program now complete.
9. Miscellaneous

- Mark Bohn of SERI visited the ACTF August 11, 1981 to discuss a joint SERI/Georgia Tech program of experiments in solar pyrolysis. Solar testing tentatively scheduled for October/November, 1982.

- John Gordon of General Atomic visited the ACTF August 11, 1981 to discuss the cost of conducting experiments at the ACTF to test a method of hydrogen production by water splitting.

- Thirty-five members of the Energy Subcommittee of the National Conference of Legislators toured the ACTF, August 1, 1981.

- Fifty attendees of the Intersociety Energy Conversion Engineering Conference (IECEC) toured the ACTF, August 12, 1981.
TECHNICAL PROGRESS REPORT
FOR PERIOD SEPTEMBER 1-30, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

OCTOBER, 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-0-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of September, 1981.

1. Man/Material Work Hoist Update
   - The general contractor has completed installation of the steel landings and braces for the hoist. Installation of the steel hoist tracks will begin October 1, 1981 and should be completed by mid-October.

2. United Stirling Test Program
   - Phase II solar tests of the stirling engine were completed in August and United Stirling personnel left the ACTF on September 1, 1981.
   - United Stirling is scheduled to conduct Phase III tests from October 26, 1981 to November 15, 1981.

3. Georgia Tech Ceramic Tile Program
   - The STTF Users Association has authorized Georgia Tech to conduct the tile firing experiment.
   - Funding for ACTF test operations is included in the $80,000 proposal which SERI is reviewing but has not yet approved.
   - The kick-off meeting for the program was held September 28, 1981. Solar firing is scheduled for late November, 1981.
4. Lawrence Berkeley Laboratories Test Program
   - LBL reactor design effort continues; solar test is scheduled for March, 1982.
   - Kick-off meeting in Atlanta with Arlan Hunt of LBL is scheduled for Thursday, October 8, 1981.

5. Thermo-Electron Test Program
   - Georgia Tech and Thermo Electron are preparing for a joint experiment to test a single thermionic diode at the ACTF. The test is scheduled for October, 1981 and represents an in-house effort on the part of Georgia Tech and Thermo Electron.

6. LIDAR Test Program
   - Program development is under way in Georgia Tech's Geophysical Sciences department for an experiment to use the ACTF as a portion of a LIDAR system. The large light collecting ability of the ACTF will be used to collect back scattered light from a pulsed laser system. General area of interest is upper atmospheric density gradients and chemical species.

7. Miscellaneous
   - Software development to convert the ACTF data system from the PDP-8 computer to the HP-1000 computer continues at a low level. The PDP-8 failed again September 14 and was repaired September 15.

   - Visitors at the ACTF included nine representatives of the Southern Company (holding company for several southeastern electric utilities) who were given a briefing on September 22, and forty-five faculty members of the University of Georgia who toured the facility on September 1.
TECHNICAL PROGRESS REPORT

FOR PERIOD OCTOBER 1-31, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

NOVEMBER 1981

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of October 1981.

1. Man/Material Work Hoist Update
   - The installation of the new elevator is substantially complete. The elevator was placed in service on October 12, 1981.

2. United Stirling Test Program (sponsored by United Stirling)
   - On October 12 United Stirling requested a two week delay in their scheduled test period. This is due to a delay in their scheduled receipt of the heater head assembly.
   - The test is now scheduled for a three week period beginning with November 9, 1981.

3. Georgia Tech Ceramic Tile Firing Program (sponsored by STTF Users Association)
   - Test phase of the experiment was started on October 26 and is scheduled to run through November 8, 1981.
   - Tower top installation of the experiment started on October 26 and was completed on October 29, 1981.
- The first solar firing of the tile samples occurred on October 30, 1981. Results were encouraging; glaze looked satisfactory, some sample warpage did occur. Demonstrated that cavity temperatures could be controlled with facility shutters.

4. Lawrence Berkeley Laboratories Test Program
   - Kick off meeting for the program occurred at the ACTF on October 8, 1981. Arlon Hunt represented LBL.
   - Topics discussed included reactor design, interface requirements, and test support documentation.
   - Test is scheduled for early spring time frame.

5. Thermionics Test Program (sponsored by Thermo Electron and Georgia Tech)
   - Georgia Tech and Thermo Electron conducted a brief solar test of a Thermo Electron thermionics converter on October 20 and 21, 1981.
   - The device operated as expected and controlled well. Previous concerns with respect to thermal shock proved unfounded.
   - Thermo Electron is in the process of preparing a brief technical report on the test program.

6. LIDAR Test Program
   - Georgia Tech's Geophysical Sciences Department is developing a program to use the ACTF mirror field as a component in an experimental LIDAR system. The mirror field would collect the light scattered back from a pulsed laser, thereby yielding data on upper atmospheric density gradients and chemical species.
- Background light measurements at the ACTF were begun during the night of October 14, 1981. Such measurements are required to establish signal-to-noise and thus sensitivity and range. Further measurements are planned at the conclusion of the United Stirling Test Program.

7. Mirror Shape Improvement Task
- Final design of moment arm underway.
- Mirror shape and stress analysis code presently being implemented to aid in determination of number of moment arms required per mirror.
- Installation of hardware scheduled to start on January 15, 1982.

8. Miscellaneous
- C.T. Brown attended the STTF User's Association Solar Flux Measurement Workshop held October 26 - 27, 1981 at Sandia Laboratories in Albuquerque, New Mexico. C.T. Brown presented a paper describing flux measurements at the ACTF. Marcus Real of Switzerland presented a new technique for flux measurement which is used at Almeria, Spain. Subsequently, Real visited the ACTF on October 29, 1981 to discuss the possibility of employing this technique at the ACTF.
TECHNICAL PROGRESS REPORT
FOR PERIOD NOVEMBER 1-30, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

JANUARY 8, 1982

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of November, 1981.

1. Man/Material Work Hoist Update
   - The installation of the new elevator is complete. The elevator malfunctioned on November 8, 1981. The manufacturer had repairmen on site November 10, 1981 and the elevator was back in full operation on November 10, 1981.

2. United Stirling Test Program (sponsored by United Stirling, Sweden)
   - Representatives of United Stirling arrived on site November 9, 1981. Installation of the experiment was started on that date and completed on November 11, 1981.
   - Testing began on November 11, 1981 and was completed on November 22, 1981. The experiment was removed from the tower on November 24, 1981.
   - Peak power of 18.8 kW_e was delivered to the Utility grid on November 18, 1981. Total energy delivered to the grid during the August and November tests was 175 kilowatt hours.
   - Local ABC affiliate television coverage of the test appeared on the November 26, 1981 evening newscast, and Associated Press articles appeared in newspapers throughout the United States over the Thanksgiving weekend.
3. Georgia Tech Ceramic Tile Firing Program (sponsored by STTF Users Association)
   - The first firing of the tile samples occurred on November 1, 1981.
     The glazed tile had good color, but some sagging did occur during the first tests. These problems were solved by modification of the tile support structure.
   - The experiment was removed from the tower on November 9, 1981.
   - Completion of the test program is scheduled for early December, 1981.

4. LIDAR Test Program
   - Analysis of the background light measurements taken at the ACTF during the night of October 14, 1981 were completed by the Geophysical Sciences Department at Georgia Tech. The analysis indicates that LIDAR operation with the ACTF is feasible. Additional measurements with improved sensitivity instrumentation will be undertaken in December,

5. Mirror Shape Improvement Task
   - Final design of moment arm was completed and bids have been requested for the clips. Bid opening is scheduled for December 2, 1981.
   - Installation of hardware scheduled to start on January 15, 1982.

6. Miscellaneous
   - Preparations have begun for a tour/display of the ACTF site and Stirling Engine experiment for the JPL Parabolic Dish Conference on December 10, 1981.
- A Tour of the ACTF was given to the wives of the Georgia Board of Regents on November 10, 1981.

- Additionally, tours of the ACTF were given during the month of November to visiting Chinese businessmen, a girl scout troop, and two high school classes.
TECHNICAL PROGRESS REPORT
FOR PERIOD DECEMBER 1-31, 1981

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

JANUARY 20, 1982

Work performed under DOE Contract EG-77-C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
DECEMBER, 1981

The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of December, 1981.

1. Man/Material Work Hoist Update
   - The installation of the new elevator is complete and the elevator is in full operation. This activity is complete and will not be reported hereafter.

2. United Stirling Test Program (Sponsored by United Stirling, Sweden)
   - Phase III solar tests of the Stirling engine were completed in November, 1981. Preliminary analysis of the November test data indicates that the efficiency of the receiver/engine/generator system was approximately 22%.
   - The Stirling engine tests received publicity in worldwide newspapers and trade magazines. Follow-up activities have included responding to letters and phone calls requesting additional information.
   - Planning continues for a possible Phase IV testing of a 60-70 kW_e United Stirling engine for Fall, 1982.
3. Georgia Tech Ceramic Tile Firing Program (Sponsored by the STTF Users Association)
   - The last two firings of the tile samples occurred on December 7, 1981.
   - Solar testing was completed on December 7, 1981 and the experiment was removed from the tower that day.

4. LIDAR Test Program
   - Background light measurements were taken during the nights of December 2nd and 7th, 1981. Results indicate a very low level background except for a few mercury vapor lines in the spectrum.
   - A potential background problem may be back scatter caused by the inside of the tower legs. Solutions to this problem are being discussed.

5. Mirror Shape Improvement Task
   - Bid opening for the moment arm devices occurred on December 2, 1981 and a contract was awarded on December 3, 1981. Shipment of the devices is due in early January, 1982.
   - Installation of the hardware is scheduled to start on January 15, 1982.

6. Miscellaneous
   - Dr. C. Thomas Brown gave a presentation at the JPL Parabolic Dish Conference on December 10, 1981 and following that presentation,
the ACTF hosted a tour/display of the facility for 60-70 participants of the conference. The facility was operated against a water-cooled shield, the Stirling engine was on display, and the spiral concentrator was on display.

- On December 1, 1981 the ACTF held a briefing with the Tennessee Valley Authority and Armstrong International. A tour of the facility was given, along with a discussion and slide presentation of the work being done at the ACTF in the field of solar energy research.

- Jerry Braun of DOE visited the ACTF on December 8, 1981.
TECHNICAL PROGRESS REPORT
FOR PERIOD JANUARY 1 - 31, 1982

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

FEBRUARY 24, 1982

Work performed under DOE Contract EG-770C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332.
The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of January, 1982.

1. United Stirling Test Program (sponsored by United Stirling, Sweden)
   - Phase III solar tests of the Stirling Engine were completed in November, 1981.
   - Representatives of United Stirling were on site on January 7, 1982 and the engine and cavity receiver were packed and shipped.
   - Planning continues for a possible Phase IV testing of a 60-70 KWe United Stirling engine for Fall, 1982.

2. Georgia Tech Ceramic Tile Firing Program (sponsored by the STTF Users Association)
   - The last two firings of the tile samples was completed in December and the experiment was completed. This activity is complete and will not be reported again.

3. LIDAR Test Program
   - Background light measurements were taken during the nights of December 2nd and 7th, 1981. Results indicate a very low level background except for a few mercury vapor lines in the spectrum.
   - A potential background problem may be back scatter caused by the inside of the tower legs. Solutions to this problem are being discussed.
4. Mirror Shape Improvement Task
   - Initial and subsequent shipments of the moment arm devices were returned to the manufacturer due to imperfections in the hardware.
   - Installation has been rescheduled to start on February 1, 1982.

5. Miscellaneous
TECHNICAL PROGRESS REPORT
FOR PERIOD FEBRUARY 1 - 28, 1982

FY 80 AND FY 81 OPERATIONS AT THE
UNITED STATES DEPARTMENT OF ENERGY
ADVANCED COMPONENTS TEST FACILITY (ACTF)

GEORGIA TECH PROJECT A-2571

May 4, 1983

Work performed under DOE Contract EG-77C-01-4042
SERI Subcontract XP-Ø-9003-1

Energy and Materials Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
DOE ADVANCED COMPONENTS TEST FACILITY
MONTHLY TECHNICAL PROGRESS REPORT FOR
FEBRUARY, 1982

The following is a summary of work performed at the DOE Advanced Components Test Facility under DOE Contract No. EG-77-C-01-4042, SERI Subcontract No. XP-Ø-9003-1 for the month of February, 1982.

Delivery of mirror moment arm hardware per Georgia Tech design started early in February and continued through two-thirds of the month. Installation of the hardware started on February 1 and was completed on February 23. Hardware was added to all 550 mirror units by a nominal three-to-four man crew.

Volume flux maps characterizing the flux distribution in the vicinity of the system focus were made early in March. Substantial improvement in beam quality was realized; facility peak flux increased from 125 w/m² to 235 w/m² with addition of the new hardware.

The subject contract terminates with this progress report.
**Contract Management Summary Report**

**1. Contract Identification**
FY 80-81 Operations of the U.S. DOE ACTF

**2. Reporting Period**
2/1/82 through 2/28/82

**3. Contract Number**
SERI XP-0-9003-1

**4. Contractor (Name and Address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**5. Contract Start Date**
October 1, 1979

**6. Contract Completion Date**
February 28, 1982

**7. Months**
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<th>D</th>
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**8. FY '81-82**

**9. Cost Status**

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<tr>
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<th>b.</th>
<th>c.</th>
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<td>Actual Costs</td>
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<td>Total Estimated Costs for Contract</td>
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**10. Manpower Status (Direct Labor)**

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**11. Major Milestone Status**

a. -300
b. -301
c. -302
d. -303

**12. Remarks**

*Cost status information includes expenditures plus encumbrances.*

**13. Signature of Contractor's Project Manager and Date**

**14. Signature of Government Technical Representative and Date**
CONTRACT MANAGEMENT SUMMARY REPORT

PURPOSE
A weekly graphic presentation of integrated cost, management, and schedule data to assist management in trend analysis and trend forecasting.

INSTRUCTIONS
Item 1 - Enter the contract/amendment identification, as it appears on the official document establishing the contract or agreement.

Item 2 - Enter the initial start and completion dates for the reporting period for this report.

Item 3 - Enter the contract/amendment number as it appears on the official document establishing the contract.

Item 4 - Enter the name and address including zip code of the contractor, organization, or agency as they appear on the contract/amendment.

Item 5 - Enter the fiscal start date of the original contract/amendment.

Item 6 - Enter the official completion date of the actual contract/amendment.

Item 7 - Enter the fiscal start date of the last fiscal year against which costs were charged.

Item 8 - Enter contract fiscal year.

Item 9 - Enter the amount of revenue in dollars for the current contract year.

Item 10 - Enter the accumulated contract costs by the completion date of the contract.

Item 11 - Enter the total contract amount by the completion date of the contract.

Item 12 - Enter the total contract amount by the completion date of the contract.

Item 13 - Enter the total contract amount by the completion date of the contract.

Item 14 - Enter the total contract amount by the completion date of the contract.

SYMBOLS

A = Actual (Actual Cost)
B = Budgeted (Budgeted Cost)
C = Claimed (Claimed Cost)
D = Estimated Escalation (Estimated Escalation Cost)
E = Forecasted (Forecasted Cost)
F = Forecasted (Forecasted Cost)
G = Generic (Generic Cost)
H = Historical (Historical Cost)
I = Invoiced (Invoiced Cost)
J = Jotted (Jotted Cost)
K = Known (Known Cost)
L = Laid (Laid Cost)
M = Manifested (Manifested Cost)
N = Negotiated (Negotiated Cost)
O = Orphaned (Orphaned Cost)
P = Proposed (Proposed Cost)
Q = Quotated (Quotated Cost)
R = Records (Records Cost)
S = Service (Service Cost)
T = Total (Total Cost)
U = Unpaid (Unpaid Cost)
V = Variances (Variances Cost)
W = Work (Work Cost)
X = X-rated (X-rated Cost)
Y = Yanked (Yanked Cost)
Z = Zapped (Zapped Cost)

EXAMPLES

- A = Actual (Actual Cost)
- B = Budgeted (Budgeted Cost)
- C = Claimed (Claimed Cost)
- D = Estimated Escalation (Estimated Escalation Cost)
- E = Forecasted (Forecasted Cost)
- F = Forecasted (Forecasted Cost)
- G = Generic (Generic Cost)
- H = Historical (Historical Cost)
- I = Invoiced (Invoiced Cost)
- J = Jotted (Jotted Cost)
- K = Known (Known Cost)
- L = Laid (Laid Cost)
- M = Manifested (Manifested Cost)
- N = Negotiated (Negotiated Cost)
- O = Orphaned (Orphaned Cost)
- P = Proposed (Proposed Cost)
- Q = Quotated (Quotated Cost)
- R = Records (Records Cost)
- S = Service (Service Cost)
- T = Total (Total Cost)
- U = Unpaid (Unpaid Cost)
- V = Variances (Variances Cost)
- W = Work (Work Cost)
- X = X-rated (X-rated Cost)
- Y = Yanked (Yanked Cost)
- Z = Zapped (Zapped Cost)
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<th>19. Total Contract Value</th>
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<td>b. Planned: 0</td>
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<td></td>
<td>-211 Dynatherm</td>
<td>a. Actual: 14</td>
<td>b. Planned: 0</td>
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</table>

22. Total: 14,300 14,272 14,300 14,272 13,953 522,063 600,314 600,300 14

23. Remarks: Summary Report; costs include expenditures plus encumbrances.
*Modification of contract has been initiated to cover additional solar receiver test programs.

24. Dollars Expressed In: exact
### U.S. DEPARTMENT OF ENERGY
#### COST MANAGEMENT REPORT

**DOE CONTRACT NO. EG-77-C-01-4042**

1. **Contract Identification**
   - FY 80 Operations of the U. S. DOE Advanced Components Test Facility (ACTF)

4. **Contractor (name and address)**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Cost Plan Date**
   - N/A

6. **Contract Start Date**
   - October 1, 1979

7. **Contract Completion Date**
   - September 30, 1980

8. **Government Funding**
   - N/A

9. **Contractor Funding**
   - N/A

10. **Number of Invoices Billed**
    - N/A

11. **Frequency**
    - N/A

12. **Number of Invoices Paid**
    - N/A

13. **Total Invoice Amounts Billed**
    - N/A

14. **Total Payments Received**
    - N/A

15. **Identification Number**
    - -210

16. **Reporting Category (e.g., contract line item or work breakdown structure element)**
    - Solar Turbines Test

17. **Accrued Costs**
    - Labor: 639, 2,969
    - Overhead: 485, 2,566
    - Retirement: 67, 312
    - Materials & Supplies: 118, 153
    - Equipment: 0, 0
    - Computer: 269, 269
    - Travel: 0, 0

22. **Total**
    - 1,578, 5,959

23. **Remarks**
    - Cost Report by Cost Elements for solar tests conducted at ACTF

24. **Dollars Expressed In:**
    - exact

25. **Signature of Contractor’s Project Manager and Date**
    - 5/19/80

26. **Signature of Contractor’s Authorized Financial Representative and Date**
    - 5/19/80

27. **Signature of Government Technical Representative and Date**
    - 5/19/80
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<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs</th>
<th>18. Estimated Accrued Costs</th>
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<td>Materials &amp; Supplies</td>
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|                       | **Total**                                                                      | **2,310**        | **5,528**                |

Cost Report by cost elements for solar tests conducted at ACTF.

- Remarks

- Dollars Expressed In: exact

- Signature of Contractor's Project Manager and Date: 5/19/80

- Signature of Contractor's Authorized Financial Representative and Date: 5/19/80

- Signature of Government Technical Representative and Date: 5/19/80
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<td>Materials &amp; Supplies</td>
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<td>Travel</td>
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22. Total: 699

23. Remarks:

Cost Report by cost elements for solar tests conducted at ACTF.

24. Dollars Expressed in: exact

26. Signature of Contractor's Authorized Financial Representative and Date: 5/3/80

27. Signature of Government Technical Representative and Date: 5/12/80
## Cost Management Report

**U.S. Department of Energy**

**COST MANAGEMENT REPORT**

**DOE CONTRACT NO. EG-77-C-01-4042**

**PAGE 4 OF 4**

### 1. Contract Identification
FY 80 operations of the U.S. DOE Advanced Components Test Facility (ACTF)

### 2. Reporting Period
Oct. 1, 1979 through Feb. 29, 1980

### 3. Contract Number
SERI Subcontract #XP-0-9003-1

### 4. Contractor (name and address)
Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

### 5. Cost Plan Date
N/A

### 6. Contract Start Date
October 1, 1979

### 7. Contract Completion Date
September 30, 1980

### 8. Government Funding
N/A

### 9. Contractor Funding
N/A

### 10. Number of Invoices Billed
N/A

### 11. Frequency
N/A

### 12. Number of Invoices Paid
N/A

### 13. Total Invoice Amounts Billed
N/A

### 14. Total Payment Received
N/A

### 15. Identification Number
-213

### 16. Reporting Category (e.g., contract line item or work breakdown structure element)
Westinghouse Test

### 17. Accrued Costs

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<td>Travel</td>
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**Total**

|          | 10,970                  | 15,797              |

### 18. Estimated Accrued Costs

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<th>b. Balance of Fiscal Year</th>
<th>c. Total Contract</th>
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</table>

### 19. Total Contract Value

### 20. Variance

### 21. Unfilled Orders Outstanding

### 22. Remarks
Cost Report by cost elements for solar tests conducted at ACTF.

### 23. Signature of Contractor's Project Manager and Date
5/11/1980

### 24. Dollars Expressed In:
Exact

### 25. Signature of Contractor's Authorized Financial Representative and Date
5/11/1980

### 26. Signature of Government Technical Representative and Date

### 27. Signature of Government Technical Representative and Date
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<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Approved Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs During Reporting Period</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>9,041</td>
<td>4,101</td>
<td>94,945</td>
<td>94,945</td>
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<tr>
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<td>368,649</td>
<td>368,649</td>
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<td>729</td>
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<td>57,044</td>
<td>57,044</td>
<td>N/A</td>
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<tr>
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<td>Improved Tracking</td>
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<td>0</td>
<td>0</td>
<td>29,265</td>
<td>29,265</td>
<td>29,265</td>
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<td>686</td>
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<td>0</td>
<td>(503)</td>
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<tr>
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<td>-213 Westinghouse</td>
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</table>

22. Total: 15,855, 13,953, 30,158, 28,276, 17,863, 554,211, 601,503, 600,300

23. Remarks: Summary Report; costs include expenditures plus encumbrances.

*Modification of contract has been initiated to cover additional solar receiver test programs.

24. Dollars Expressed In: exact
### U.S. DEPARTMENT OF ENERGY
### COST MANAGEMENT REPORT

1. **Contract Identification**
   - FY 80 operations of the U.S. DOE Advanced Components Test Facility

2. **Reporting Period**
   - Dec. 1, 1979 through Dec. 31, 1979

3. **Contract Number**
   - SERI Subcontract #XP-Q-9003-1

4. **Contractor Name and Address**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Cost Plan Date**
   - April 5, 1980

6. **Contract Start Date**
   - October 1, 1979

7. **Contract Completion Date**
   - September 30, 1980

#### Government Funding
- **$600,300**

#### Contractor Funding
- **$0**

#### Number of Invoices Billed
- **10**

#### Frequency
- **Monthly**

#### Number of Invoices Paid
- **12**

#### Total Invoice Amounts Billed
- **$601,736**

#### Total Payment Received
- **$600,300**

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<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>Actual</th>
<th>Planned</th>
<th>Cumulative to Date</th>
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<th>Balance of Fiscal Year</th>
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<td>876</td>
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<td>4,033</td>
<td>4,033</td>
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<td>0</td>
<td>54</td>
<td>29,211</td>
<td>29,265</td>
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</table>

#### Other Tasks*
- **Dynatherm**
  - 141
  - 827
  - 827
  - 0
  - (827)

- **Princeton**
  - 10
  - 24
  - 24
  - 0
  - (24)

- **Westinghouse**
  - 82
  - 563
  - 585
  - 0
  - (565)

#### Total
- **15,055**
- **17,863**
- **45,212**
- **46,088**
- **31,242**
- **525,282**
- **601,736**
- **600,300**
- **(1,436)**

#### Summary Report
- Costs include expenditures plus encumbrances.

*Modification of contract has been initiated to cover additional solar receiver test programs.

#### Dollars Expressed In:
- **Exact**

#### Signature of Contractor’s Project Manager and Date: **5/19/80**

#### Signature of Contractor’s Authorized Financial Representative and Date: **5/19/80**

#### Signature of Government Technical Representative and Date: **5/19/80**
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

**DOE CONTRACT #EG-77-C-01-4042**

**1. Contract Identification**
FY 80 operations of the U. S. DOE Advanced Components Test Facility

**4. Contractor (Name and address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**2. Reporting Period**
Jan 1, 1980 through Jan. 31, 1980

**5. Cost Plan Date**
April 5, 1980

**3. Contract Number**
SERI Subcontract #XP-8-9003-1

**6. Contract Start Date**
October 1, 1979

**7. Contract Completion Date**
September 30, 1980

**Government Funding**
$600,300

**6. Reporting Category (e.g., contract line item or work breakdown structure element)**

<table>
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<th>Item Description</th>
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<th>11. Frequency</th>
<th>12. Number of Invoices Paid</th>
<th>13. Total Invoice Amounts Bill</th>
<th>14. Total Payment Received</th>
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**Other Tasks**

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**22. Total**

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**23. Remarks**
Summary report; costs include expenditures plus encumbrances.
*Modification of contract has been initiated to cover additional solar test programs.*

**24. Dollars Expended In:**

**25. Signature of Contractor's Project Manager and Date**
5/19/80

**26. Signature of Contractor's Authorized Financial Representative and Date**
5/19/80

**27. Signature of Government Technical Representative and Date**
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<th>17. Accrued Costs During Reporting Period</th>
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23. Remarks: Summary Report; costs include expenditures plus encumbrances. *Modification of contract has been initiated to cover additional solar test programs.

24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 5/19/80
26. Signature of Contractor's Authorized Financial Representative and Date: 5/19/80
27. Signature of Government Technical Representative and Date: 5/19/80
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<td>2,900</td>
<td>8,428</td>
<td>8,428</td>
<td>0</td>
<td>(8,428)</td>
</tr>
<tr>
<td>Princeton</td>
<td>212</td>
<td>1,230</td>
<td>1,954</td>
<td>1,954</td>
<td>0</td>
<td>(1,954)</td>
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<tr>
<td>Westinghouse</td>
<td>213</td>
<td>17,685</td>
<td>33,482</td>
<td>33,482</td>
<td>0</td>
<td>(33,482)</td>
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</tbody>
</table>

| 22 Total                                        |                         | 54,155           | 180,980                   | 178,355                 | 377,163     | 644,164                       | 600,300                      | 423,864                      |

23 Remarks: Summary Report; Costs include expenditures plus encumbrances. Modification of contract has been initiated to cover additional solar test programs.

24 Dollars Expressed In: exact

25 Signature of Contractor’s Project Manager and Date: 5/25/80

26 Signature of Contractor’s Authorized Financial Representative and Date: 5/25/80

27 Signature of Government Technical Representative and Date: 
<table>
<thead>
<tr>
<th></th>
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<tr>
<td>FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)</td>
<td>March 1, 1980 through March 31, 1980</td>
<td>SERI Subcontract #XP-0-9003-1</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>4. Contractor (Name and address)</th>
<th>5. Cost Plan Date</th>
<th>6. Contract Start Date</th>
<th>7. Contract Completion Date</th>
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<td>Georgia Institute of Technology</td>
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<tr>
<td>Atlanta, Georgia 30332</td>
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<td>N/A</td>
<td>N/A</td>
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<table>
<thead>
<tr>
<th>15. Identification Number</th>
<th>16. Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b. Planned</td>
<td>b. Balance of Fiscal Year</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>c. Actual</td>
<td>c. Total Contract</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>d. Planned</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4,062</td>
<td>7,031</td>
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<tr>
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<td>Overhead</td>
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<tr>
<td></td>
<td>Retirement</td>
<td>402</td>
<td>714</td>
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</tr>
<tr>
<td></td>
<td>Materials &amp; Supplies</td>
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<td>Travel</td>
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</table>

22. Total: 2,784


24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 5/25/80

26. Signature of Contractor's Authorized Financial Representative and Date: 5/25/80

27. Signature of Government Technical Representative and Date: 5/25/80
<table>
<thead>
<tr>
<th>16. Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
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<td>b. Planned</td>
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<td>3,336</td>
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<td>Overhead</td>
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<td>2,536</td>
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<td>261</td>
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<td>Materials &amp; Supplies</td>
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<tr>
<td>Equipment</td>
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<td>0</td>
</tr>
<tr>
<td>Computer</td>
<td>143</td>
<td>1,241</td>
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<tr>
<td>Travel</td>
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<thead>
<tr>
<th>18. Estimated Accrued Costs</th>
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</table>

<table>
<thead>
<tr>
<th>19. Total Contract Value</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>20. Variance</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>21. Unfilled Orders Outstanding</th>
</tr>
</thead>
</table>

22. Total 2,899 8,427

23. Remarks
Cost Report by Cost Elements for Dynatherm Test conducted at ACTF

24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date 2/25/80

26. Signature of Contractor's Authorized Financial Representative and Date 2/25/80

27. Signature of Government Technical Representative and Date
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a. Actual</td>
<td>b. Planned</td>
</tr>
<tr>
<td>-212 Princeton Test</td>
<td>Labor</td>
<td>664</td>
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<td></td>
<td>Overhead</td>
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<tr>
<td></td>
<td>Retirement</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Materials &amp; Supplies</td>
<td>5</td>
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</tr>
<tr>
<td></td>
<td>Equipment</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel</td>
<td>0</td>
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<p>| 22. Total             | 1,228                                                                           | 1,953      |</p>
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<thead>
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<th>Number</th>
<th>Description</th>
<th>Labor</th>
<th>Overhead</th>
<th>Retirement</th>
<th>Materials &amp; Supplies</th>
<th>Equipment</th>
<th>Computer</th>
<th>Travel</th>
<th>Total</th>
<th>Estimated Accrued Costs</th>
<th>Actual</th>
<th>Planned</th>
<th>Actual</th>
<th>Planned</th>
<th>Subsequent Reporting Period</th>
<th>Balance of Fiscal Year</th>
<th>Total Contract</th>
<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
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<tbody>
<tr>
<td>-213</td>
<td>Westinghouse Test</td>
<td>7,947</td>
<td>6,040</td>
<td>833</td>
<td>1,739</td>
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<td>546</td>
<td>17,684</td>
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<td>13,938</td>
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<td>10,593</td>
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</table>

**U.S. DEPARTMENT OF ENERGY**  
**COST MANAGEMENT REPORT**

**DOE Contract #EG-77-C-01-4042**

1. Contract Identification  
FY 80 Operations of the U. S. DOE Advanced Components Test Facility (ACTF)

2. Reporting Period  
April 1, 1980 through April 30, 1980

3. Contract Number  
SERI Subcontract EXP-0-9003-1

4. Contractor (name and address)  
Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

5. Cost Plan Date  
April 5, 1980

6. Contract Start Date  
October 1, 1979

7. Contract Completion Date  
September 30, 1980

8. Government Funding  
$600,300

9. Contractor Funding  
$0

10. Number of Invoices Billied  
month

11. Frequency  
monthly

12. Number of Invoices Paid  

13. Total Invoice Amounts Billied  

14. Total Payment Received  

15. Identification Number  
-200  
-201  
-202  
-210  
-242

16. Reporting Category (e.g., contract line item or work breakdown structure element)  
Administration  
Maintenance & Equipment  
Technology Transfer  
Solar Turbines Test  
Improved Tracking

17. Accrued Costs  
During Reporting Period  
Cumulative to Date  
a. Actual  
b. Planned  
c. Actual  
d. Planned

18. Estimated Accrued Costs  
a. Subsequent Reporting Period  
b. Balance of Fiscal Year  
c. Total Contract  

19. Total Contract Value  

20. Variance  

21. Unfilled Orders Outstanding  

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category</th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
<th>Estimated Accrued Costs</th>
<th>Total Contract Value</th>
<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>-200</td>
<td>Administration</td>
<td>6,120</td>
<td>9,507</td>
<td>35,526</td>
<td>43,991</td>
<td>9,507</td>
<td>49,912</td>
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<tr>
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<td>20,504</td>
<td>115,341</td>
<td>115,656</td>
<td>63,010</td>
<td>190,298</td>
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<tr>
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<td>Technology Transfer</td>
<td>2,306</td>
<td>5,446</td>
<td>12,822</td>
<td>21,208</td>
<td>5,446</td>
<td>32,129</td>
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<tr>
<td>-210</td>
<td>Solar Turbines Test</td>
<td>7,748</td>
<td>15,795</td>
<td>22,215</td>
<td>44,729</td>
<td>7,724</td>
<td>27,105</td>
</tr>
<tr>
<td>-242</td>
<td>Improved Tracking</td>
<td>2,189</td>
<td>3,969</td>
<td>6,453</td>
<td>7,992</td>
<td>3,969</td>
<td>18,843</td>
</tr>
</tbody>
</table>

**Other Tasks**
-211 Dynatherm  
-212 Princeton  
-213 Westinghouse

22. Total  
73,574             55,221           255,553            233,376

23. Remarks  
Summary Report; costs include expenditures and encumbrances.

24. Dollars Expressed In:  
exact

25. Modification of contract has been initiated to cover additional solar test programs.

26. Signature of Contractor's Authorized Financial Representative and Date  
5/25/80

27. Signature of Government Technical Representative and Date  
5/25/80

28. Signature of Contractor's Project Manager and Date  
5/25/80
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>Number of Invoices Billed</th>
<th>Frequency</th>
<th>Number of Invoices Paid</th>
<th>Total Invoice Amounts Billed</th>
<th>Total Payment Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>-210</td>
<td>Solar Turbines Test</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
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<td>4,122</td>
<td>11,153</td>
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<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
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<td>N/A</td>
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<tr>
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<td>Materials &amp; Supplies</td>
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<td></td>
<td>Equipment</td>
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<td>0</td>
<td>N/A</td>
<td>N/A</td>
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<td>Computer</td>
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<td>22,715</td>
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Remarks: Cost Report by Cost Elements for Solar Tests conducted at ACTF.

Dollars Expressed In: exact
<table>
<thead>
<tr>
<th>1. Contract Identification</th>
<th>FY 80 Operation of the U.S. DOE Advanced Components Test Facility (ACTF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Reporting Period</td>
<td>April 1, 1980 through April 30, 1980</td>
</tr>
<tr>
<td>3. Contract Number</td>
<td>SERI Subcontract #XP-B-9003-1</td>
</tr>
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</table>
| 4. Contractor (name and address) | Georgia Tech Research Institute  
Atlanta, Georgia 30332                                                                         |
| 5. Cost Plan Date         | October 1, 1979                                                                                 |
| 6. Contract Start Date    |                                                                                                 |
| 7. Contract Completion Date | September 30, 1980                                                                              |

8. Government Funding: N/A  
9. Contractor Funding: N/A

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<table>
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<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Identification Number</td>
<td>During Reporting Period</td>
<td>Cumulative to Date</td>
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<td></td>
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</tr>
<tr>
<td>-211 Dynatherm Test</td>
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<td>a. Subsequent Reporting Period</td>
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<td>272</td>
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</table>

| 22. Total                                  | 1,153             |                             | 9,579                   |              |                               |

24. Dollars Expressed In: exact

25. Signature of Contractor's Authorized Financial Representative and Date: 5/26/80
26. Signature of Contractor's Project Manager and Date: 5/26/80
27. Signature of Government Technical Representative and Date: 5/26/80
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-212</td>
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<td>Labor</td>
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<td></td>
<td>Equipment</td>
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<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer</td>
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<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Travel</td>
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<td>1,199</td>
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<td>N/A</td>
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<td></td>
<td></td>
<td><strong>Total</strong></td>
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<td><strong>4,374</strong></td>
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</table>

### 23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 5/26/80
26. Signature of Contractor's Authorized Financial Representative and Date: 5/26/80
27. Signature of Government Technical Representative and Date: 5/26/80
<table>
<thead>
<tr>
<th>15. Identification Number</th>
<th>16. Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>18. Estimated Accrued Costs Cumulative to Date</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a. Actual</td>
<td>b. Planned</td>
<td>c. Actual</td>
<td>d. Planned</td>
<td></td>
</tr>
<tr>
<td>-213 Westinghouse Test</td>
<td></td>
<td>6,337</td>
<td>20,275</td>
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<td>Overhead</td>
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</table>

| 22. Total               | 15,750                         | 49,242                         |                        |                  |          |                  |

23. Notes: Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 5/26/80

26. Signature of Contractor's Authorized Financial Representative and Date: 5/26/80

27. Signature of Government Technical Representative and Date:
<table>
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<tr>
<th>Task Description</th>
<th>Actual</th>
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<th>Unfilled Orders Outstanding</th>
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<td>(10,050)</td>
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</table>

Summary Report: costs include expenditures and encumbrances.
*Modification of contract has been initiated to cover additional solar test programs.*

Dollars Expressed in: exact

Signature of Contractor's Project Manager and Date: 7/15/80
Signature of Contractor's Authorized Financial Representative and Date: 7/15/80
Signature of Government Technical Representative and Date: 7/15/80
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<td>Cumulative to Date</td>
<td>Subsequent Reporting Period</td>
<td>Balance of Fiscal Year</td>
<td>Total Contract Value</td>
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<td><strong>Total</strong></td>
<td><strong>3,145</strong></td>
<td><strong>25,360</strong></td>
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</table>

**Remarks:** Cost Report by Cost Elements for Solar Tests conducted at ACTF.

**Dollars Expressed In:** exact

**Signature of Contractor's Project Manager and Date:** 7/15/80

**Signature of Contractor's Authorized Financial Representative and Date:** 7/15/80

**Signature of Government Technical Representative and Date:** 7/15/80
# Cost Management Report

**DOE Contract #EG-77-C-01-4042**

<table>
<thead>
<tr>
<th>4. Contractor (Name and Address)</th>
<th>5. Cost Plan Date</th>
<th>6. Contract Start Date</th>
<th>7. Contract Completion Date</th>
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<td>September 30, 1980</td>
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<tr>
<td>Georgia Institute of Technology</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Atlanta, Georgia 30332</td>
<td></td>
<td></td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
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<td>FY 80 Operations of the U. S. DOE Advanced Components Test Facility (ACTF)</td>
<td>May 1, 1980 through May 31, 1980</td>
<td>SERI Subcontract XP-P-9003-1</td>
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<tbody>
<tr>
<td>-211 Dynatherm Test</td>
<td>a. Actual</td>
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<td>a. Total Contract Value</td>
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<td>b. Planned</td>
<td>b. Balance of Fiscal Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Actual</td>
<td>c. Total Contract</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. Planned</td>
<td></td>
<td></td>
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<tr>
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<tr>
<td>Overhead</td>
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<tr>
<td>Retirement</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Materials &amp; Supplies</td>
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<td>Travel</td>
<td>871</td>
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</table>

| 22. Total                                                     | 470                                      | 10,049                      |                         |             |                               |


24. Dollars Expressed In: exact

25. Signature of Contractor’s Project Manager and Date: 7/18/80

26. Signature of Contractor’s Authorized Financial Representative and Date: 7/18/80

27. Signature of Government Technical Representative and Date: 7/18/80
# Cost Management Report

**DOE Contract #EG-77-C-01-4042**

**Contract Identification**
FY 80 Operation of the U.S. DOE Advanced Components Test Facility (ACTF)

**Contractor Name and Address**
Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

**Government Funding**  
N/A

**Contractor Funding**  
N/A

**Number of Invoices Billed**  
N/A

**Frequency**  
N/A

**Number of Invoices Paid**  
N/A

**Total Invoice Amounts Billed**  
N/A

**Total Payment Received**  
N/A

**Identification Number**
-212 Princeton Test

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<th>During Reporting Period</th>
<th>Cumulative to Date</th>
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<td>Materials &amp; Supplies</td>
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<td>Computer</td>
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<table>
<thead>
<tr>
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<th>b. Planned</th>
<th>c. Actual</th>
<th>d. Planned</th>
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<tr>
<td>Total</td>
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<td>5,673</td>
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**Remarks**
Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Signature of Contractor's Authorized Financial Representative and Date**
7/1/80

**Signature of Government Technical Representative and Date**
7/1/80
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<tr>
<td>-213</td>
<td>Westinghouse Test</td>
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Total: 18,353  67,595

Cost Report by Cost Elements for Solar Tests conducted at ACTF.

Remarks: Cost Report by Cost Elements for Solar Tests conducted at ACTF.

Dollars Expressed In: exact
## General Atomic Test

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<td>Materials &amp; Supplies</td>
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</tr>
<tr>
<td>Equipment</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Travel</td>
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**Total**: 226

**Remarks**: Cost Report by Cost Elements for Solar Tests conducted at ACTF.
<table>
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<th>During Reporting Period</th>
<th>Cumulative to Date</th>
<th>Estimated Accrued Costs</th>
<th>Total Contract Value</th>
<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
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</thead>
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<td></td>
<td></td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
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<td>b</td>
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<td>56,834</td>
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<td>262,304</td>
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23. Remarks: Summary report; costs include expenditures and encumbrances.
   *Modification of contract has been initiated to cover additional solar test programs.

24. Dollars Expressed In: exact
**U.S. DEPARTMENT OF ENERGY**  
**COST MANAGEMENT REPORT**

**DOE Contract #EG-77-C-01-0042**

**GEORGIA TECH RESEARCH INSTITUTE**  
**Georgia Institute of Technology**  
**Atlanta, Georgia 30332**

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<th>SERI Subcontract No.</th>
<th>Contract Number</th>
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<tr>
<td>FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)</td>
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</table>

<table>
<thead>
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<tbody>
<tr>
<td>Georgia Tech Research Institute</td>
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<tr>
<td>Georgia Institute of Technology</td>
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<td>Atlanta, Georgia 30332</td>
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<table>
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| 10. Number of Invoices Billmed | N/A |
| 11. Frequency |
| N/A |

| 12. Number of Invoices Paid |
| N/A |

| 13. Total Invoice Amounts Billmed |
| N/A |

| 14. Total Payment Received |
| N/A |

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</table>

<table>
<thead>
<tr>
<th>17. Accrued Costs During Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
</tr>
<tr>
<td>Overhead</td>
</tr>
<tr>
<td>Retirement</td>
</tr>
<tr>
<td>Materials &amp; Supplies</td>
</tr>
<tr>
<td>Equipment</td>
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<tr>
<td>Computer</td>
</tr>
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<td>Travel</td>
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<table>
<thead>
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<td>c. Total Contract</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19. Total Contract Value</th>
</tr>
</thead>
</table>

| 20. Variance |

<table>
<thead>
<tr>
<th>21. Unfilled Orders Outstanding</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>22. Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,998</td>
</tr>
<tr>
<td>27,358</td>
</tr>
</tbody>
</table>

**Remarks**  
Cost Report by Cost Elements for Solar Tests conducted at ACTF.

**Signature of Contractor's Project Manager and Date**  
8/30/80
# Cost Management Report

**U.S. Department of Energy**  
**Cost Management Report**

**DOE Contract #EG-77-C-01-4042**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>27</td>
<td>3,878</td>
</tr>
<tr>
<td>Overhead</td>
<td>20</td>
<td>2,947</td>
</tr>
<tr>
<td>Retirement</td>
<td>0</td>
<td>277</td>
</tr>
<tr>
<td>Materials &amp; Supplies</td>
<td>1</td>
<td>874</td>
</tr>
<tr>
<td>Equipment</td>
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<td>0</td>
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<tr>
<td>Computer</td>
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<td>1,255</td>
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<tr>
<td>Travel</td>
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<td>871</td>
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</tbody>
</table>

**Cost Report by Cost Elements for Solar Tests conducted at ACTF**

| Total | 53 | 10,102 |

**Remarks:**

Cost Report by Cost Elements for Solar Tests conducted at ACTF

<table>
<thead>
<tr>
<th>Signature of Contractor's Project Manager and Date</th>
<th>Signature of Contractor's Authorized Financial Representative and Date</th>
<th>Signature of Government Technical Representative and Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/30/80</td>
<td>8/30/80</td>
<td></td>
</tr>
</tbody>
</table>

**Contract Number:** SERI Subcontract XP-8-9003-1

**Contract Start Date:** October 1, 1979

**Contract Completion Date:** September 30, 1980
## Cost Management Report

**DOE Contract #:** EG-77-C-01-4042

**Contractor:** Georgia Tech Research Institute  
**Address:** Georgia Institute of Technology  
**City, State, ZIP:** Atlanta, Georgia 30332

### Table - Cost Elements for Solar Tests conducted at ACTF

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>Actual Costs</th>
<th>Planned Costs</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>-212</td>
<td>Labor</td>
<td>3,649</td>
<td>6,053</td>
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<tr>
<td></td>
<td>Overhead</td>
<td>2,773</td>
<td>4,600</td>
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<td></td>
<td>Retirement</td>
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<td>Materials &amp; Supplies</td>
<td>577</td>
<td>623</td>
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<tr>
<td></td>
<td>Computer</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel</td>
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<td>1,159</td>
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<td><strong>Total</strong></td>
<td><strong>7,376</strong></td>
<td><strong>13,049</strong></td>
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**Remarks:** Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Signature of Contractor's Project Manager and Date:** 8/30/80

**Signature of Contractor's Authorized Financial Representative and Date:** 8/30/80

**Signature of Government's Technical Representative and Date:** 8/30/80
<table>
<thead>
<tr>
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<tr>
<td>2. Reporting Period</td>
<td>June 1, 1980 through June 30, 1980</td>
</tr>
<tr>
<td>3. Contract Number</td>
<td>SERI Subcontract #XP-8-9003-1</td>
</tr>
<tr>
<td>4. Contractor Name and Address</td>
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</tr>
<tr>
<td></td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td></td>
<td>Atlanta, Georgia 30332</td>
</tr>
<tr>
<td>5. Cost Plan Date</td>
<td>October 1, 1979</td>
</tr>
<tr>
<td>6. Contract Start Date</td>
<td>September 30, 1980</td>
</tr>
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<td>7. Contract Completion Date</td>
<td>September 30, 1980</td>
</tr>
<tr>
<td>8. Government Funding</td>
<td>N/A</td>
</tr>
<tr>
<td>9. Contractor Funding</td>
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</tr>
<tr>
<td>10. Number of Invoices Billed</td>
<td>N/A</td>
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<tr>
<td>11. Frequency</td>
<td>N/A</td>
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<tr>
<td>12. Number of Invoices Paid</td>
<td>N/A</td>
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<tr>
<td>13. Total Invoice Amounts Billed</td>
<td>N/A</td>
</tr>
<tr>
<td>14. Total Payment Received</td>
<td>N/A</td>
</tr>
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<td>15. Identification Number</td>
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<td>17. Actual Costs During Reporting Period</td>
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<tr>
<td>a. Actual</td>
<td>17.288</td>
</tr>
<tr>
<td>b. Planned</td>
<td>84,883</td>
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<tr>
<td>c. Actual</td>
<td></td>
</tr>
<tr>
<td>d. Planned</td>
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<tr>
<td>18. Estimated Accrued Costs During Reporting Period</td>
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</tr>
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<td>c. Total Contract Value</td>
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<td>19. Variance</td>
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<tr>
<td>20. Unfilled Orders Outstanding</td>
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<tr>
<td>22. Total</td>
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<td>23. Signature of Contractor's Project Manager and Date</td>
<td>8/30/80</td>
</tr>
<tr>
<td>24. Signature of Contractor's Authorized Financial Representative and Date</td>
<td>8/30/80</td>
</tr>
<tr>
<td>25. Signature of Government Technical Representative and Date</td>
<td>8/30/80</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-214</td>
<td>General Atomic Test</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
</tr>
<tr>
<td></td>
<td>Overhead</td>
</tr>
<tr>
<td></td>
<td>Retirement</td>
</tr>
<tr>
<td></td>
<td>Materials &amp; Supplies</td>
</tr>
<tr>
<td></td>
<td>Equipment</td>
</tr>
<tr>
<td></td>
<td>Computer</td>
</tr>
<tr>
<td></td>
<td>Travel</td>
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<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>


23. Notes: N/A

24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 8/30/80

26. Signature of Contractor's Authorized Financial Representative and Date: 8/30/80

27. Signature of Government Technical Representative and Date: N/A
## COST MANAGEMENT REPORT

**DOE Contract #EG-77-C-01-4042**

### 1. Contract Identification
- FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)
- Contractor (name and address): Georgia Tech Research Institute
- Georgia Institute of Technology
- Atlanta, Georgia 30332

### 2. Reporting Period
- July 1, 1980 through July 31, 1980

### 3. Contract Number
- SERI Subcontract #XP-0-9003-1

### 4. Contractor Funding
- $600,300

### 5. Government Funding
- $600,300

### 6. Number of Invoices Billed
- 10

### 7. Frequency
- Monthly

### 8. Number of Invoices Paid
- 10

### 9. Total Invoice Amounts Billed
- 94,945

### 10. Total Payment Received
- N/A

### Reporting Category (e.g., contract line item or work breakdown structure element)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category</th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a. Actual</td>
<td>b. Planned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Actual</td>
<td>d. Planned</td>
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<td>-200 Administration</td>
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<td>10,647</td>
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<td>6,099</td>
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<td>50,397</td>
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<td>396</td>
<td>210</td>
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<td></td>
<td></td>
<td>27,754</td>
<td>57,044</td>
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<td>0</td>
<td>29,290</td>
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<td>57,044</td>
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<td>-242 Improved Tracking Task</td>
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<td>6,672</td>
<td>4,445</td>
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<td>21,036</td>
<td>20,375</td>
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<td>4,445</td>
<td>3,784</td>
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<td>29,265</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Other Tasks*</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

| -211 Dynatherm         |                              | 1,287                   | 11,389             |
|                        |                              | 11,389                  | 0                  |
| -212 Princeton        |                              | 15,734                  | 28,782             |
|                        |                              | 28,782                  | 0                  |
| -213 Westinghouse     |                              | 9,609                   | 94,493             |
|                        |                              | 94,493                  | 0                  |
| -214 General Atomic   |                              | 2,182                   | 3,525              |
|                        |                              | 3,525                   | 0                  |

| Total                  |                              | 103,010                 | 62,616             |
|                        |                              | 487,766                 | 484,237            |
|                        |                              | 71,906                  | 178,817            |
|                        |                              | 738,489                 | 600,300            |

### 23. Remarks
- Summary report; costs include expenditures and encumbrances.
- Modification of contract has been initiated to cover additional solar test programs.

### 24. Dollars Expressed In: exact

### 25. Signature of Contractor's Project Manager and Date
- 9/10/80

### 26. Signature of Contractor's Authorized Financial Representative and Date
- 9/10/80

### 27. Signature of Government Technical Representative and Date
- [Signature]
<table>
<thead>
<tr>
<th>Contract Identification</th>
<th>Reporting Period</th>
<th>3. Contract Number</th>
</tr>
</thead>
</table>

4. Contractor (name and address)  
Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

5. Cost Plan Date  
N/A  
6. Contract Start Date  
October 1, 1979  
7. Contract Completion Date  
September 30, 1980

8. Government Funding  
N/A

9. Contractor Funding  
N/A

10. Number of Invoices Billed  
N/A

11. Frequency  
N/A

12. Number of Invoices Paid  
N/A

13. Total Invoice Amounts Billed  
N/A

14. Total Payment Received  
N/A

15. Identification Number  

16. Reporting Category (e.g., contract line item of work or breakdown structure element)  

17. Accrued Costs  

<table>
<thead>
<tr>
<th>Labor</th>
<th>Overhead</th>
<th>Retirement</th>
<th>Materials &amp; Supplies</th>
<th>Equipment</th>
<th>Computer</th>
<th>Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>91</td>
<td>14</td>
<td>109</td>
<td>0</td>
<td>57</td>
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</tbody>
</table>

18. Estimated Accrued Costs  

<table>
<thead>
<tr>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Actual</td>
<td>c. Actual</td>
</tr>
<tr>
<td>b. Planned</td>
<td>d. Planned</td>
</tr>
</tbody>
</table>

19. Total Contract Value  

20. Variance  

21. Unfilled Orders Outstanding  

22. Total  

23. Remarks  
Cost Report by Cost Elements for Solar Tests conducted at ACTF.

24. Dollars Expressed In:  
exact

25. Signature of Contractor's Project Manager and Date  
9/16/80

26. Signature of Contractor's Authorized Financial Representative and Date  
9/16/80

27. Signature of Government Technical Representative and Date
U.S. DEPARTMENT OF ENERGY
COST MANAGEMENT REPORT

DOE Contract NFE-77-C-01-4042

1. Contract Identification
FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

2. Reporting Period
July 1, 1980 through July 31, 1980

3. Contract Number
SERI Subcontract XP-6-9003-1

4. Contractor (name and address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

5. Cost Plan Date
N/A

6. Contract Start Date
October 1, 1979

7. Contract Completion Date
September 30, 1980

8. Government Funding
N/A

9. Contractor Funding
N/A

10. Number of Invoices Billed
N/A

11. Frequency
N/A

12. Number of Invoices Paid
N/A

13. Total Invoice Amounts Billed
N/A

14. Total Payment Received
N/A

15. Reporting Category (e.g., contract line item or work breakdown structure element)

16. Reporting Category Number
-211

17. Accrued Costs

<table>
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<tr>
<th></th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Actual</td>
<td>b. Planned</td>
</tr>
<tr>
<td>Labor</td>
<td>721</td>
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<tr>
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<td>Materials &amp; Supplies</td>
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<tr>
<td>Equipment</td>
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<tr>
<td>Computer</td>
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<tr>
<td>Travel</td>
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</table>

22. Total
1,286
11,389

23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF.

24. Dollars Expressed In:
exact

25. Signature of Contractor's Project Manager and Date: 9/11/80

26. Signature of Contractor's Authorized Financial Representative and Date: 9/11/80

27. Signature of Government Technical Representative and Date:
**Cost Management Report**

**Project:** FY 80 Operations of the U.S. DOE Advanced Components Test Facility  
**Contractor:** Georgia Tech Research Institute  
**Subcontractor:** SERI Subcontract #XP-0-9003-1  

**Cost Report by Cost Elements for Solar Tests conducted at ACTF.**

<table>
<thead>
<tr>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>Number of Invoices Billed</th>
<th>Number of Invoices Paid</th>
<th>Total Invoice Amounts Billed</th>
<th>Contractor's Project Manager and Date</th>
</tr>
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<tbody>
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<td>N/A</td>
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<tr>
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<td>5,589</td>
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<td>Retirement</td>
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<td>Materials &amp; Supplies</td>
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<tr>
<td>Travel</td>
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**Total:** 15,734  
**Cumulative to Date:** 28,783  

**Remarks:**

- Cost Report by Cost Elements for Solar Tests conducted at ACTF.
<table>
<thead>
<tr>
<th>Category</th>
<th>Actual</th>
<th>Planned</th>
<th>Actual</th>
<th>Planned</th>
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<td>Materials &amp; Supplies</td>
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</tr>
<tr>
<td>Travel</td>
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<td>996</td>
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</table>

**Total**

<table>
<thead>
<tr>
<th>Actual</th>
<th>Planned</th>
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</thead>
<tbody>
<tr>
<td>94,493</td>
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<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------</td>
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<tr>
<td>2. Reporting Period</td>
<td>July 1, 1980 through July 31, 1980</td>
</tr>
<tr>
<td>3. Contract Number</td>
<td>DOE Contract #EG-77-C-01-4042</td>
</tr>
<tr>
<td>4. Contractor Name and Address</td>
<td>Georgia Tech Research Institute Atlanta, Georgia 30332</td>
</tr>
<tr>
<td>5. Cost Plan Date</td>
<td>N/A</td>
</tr>
<tr>
<td>6. Contract Start Date</td>
<td>October 1, 1979</td>
</tr>
<tr>
<td>7. Contract Completion Date</td>
<td>September 30, 1980</td>
</tr>
</tbody>
</table>

| 8. Government Funding     | N/A                                                          |
| 9. Contractor Funding     | N/A                                                          |
| 10. Number of Invoices Billed | N/A                                                        |
| 11. Frequency             | N/A                                                          |
| 12. Number of Invoices Paid | N/A                                                         |
| 13. Total Invoice Amounts Billed | N/A                                                        |
| 14. Total Payment Received | N/A                                                         |

| 15. Identification Number | N/A |
| 16. Reporting Category (e.g., contract line item or work breakdown structure element) | -214 General Atomic Test |
| 17. Accrued Costs         |     |
| a. Actual                  |     |
| b. Planned                 |     |
| c. Actual                  |     |
| d. Planned                 |     |
| 18. Estimated Accrued Costs |     |
| a. Subsequent Reporting Period |     |
| b. Balance of Fiscal Year  |     |
| c. Total Contract Value    |     |
| 19. Total Contract Value   |     |
| 20. Variance               |     |
| 21. Unfilled Orders Outstanding |     |

| Labor                     | 1,085 | 1,389 |
| Overhead                  | 792   | 1,023 |
| Retirement                | 73    | 105   |
| Materials & Supplies      | 233   | 238   |
| Equipment                 | 0     | 0     |
| Computer                  | 0     | 0     |
| Travel                    | 0     | 770   |

| 22. Total                 | 2,183 | 3,525 |


24. Dollars Expressed In: exact

25. Signature of Contractor's Project Manager and Date: 7/1/80
26. Signature of Contractor's Authorized Financial Representative and Date: 7/1/80
27. Signature of Government Technical Representative and Date: 7/1/80
## U.S. Department of Energy
### Cost Management Report

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<td>c. Actual</td>
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Total: 88,986

### Summary Report
- Costs include expenditures and encumbrances
- 12 tasks included in Supplemental Agreement No. 1
- Includes July travel cost of $768 erroneously omitted from July report

### Signature
- Contractor's Project Manager and Date: 8/23/81
- Contractor's Authorized Financial Representative and Date: 8/23/81
- Government Technical Representative and Date: 8/23/81

### Dollars Expended In
- Exact
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

1. **Contract Identification**
   - FY80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

2. **Reporting Period**
   - August 1, 1980 through August 31, 1981

3. **Contract Number**
   - SERI Subcontract #XP-8-9003-1 Mod 1

4. **Contractor Name and Address**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Cost Plan Date**
   - October 1, 1979

6. **Contract Completion Date**
   - January 31, 1981

7. **Government Funding**
   - 8.

8. **Contractor Funding**
   - 9.

9. **Number of Invoices Billed**
   - 10.

10. **Number of Invoices Paid**
    - 12.

11. **Total Invoice Amounts Billed**
    - 13.

12. **Total Payment Received**
    - 4.

13. **Identification Number**
    - 15.

14. **Reporting Category (e.g., contract line item or work breakdown structure element)**
    - 16.

15. **Accrued Costs**
    - 17.

16. **Cumulative to Date**
    - 18.

17. **Accrued Costs During Reporting Period**
    - a. Actual
    - b. Planned
    - c. Actual
    - d. Planned

18. **Estimated Accrued Costs**
    - a. Subsequent Reporting Period
    - b. Balance of Fiscal Year
    - c. Total Contract

19. **Total Contract Value**
    - 19.

20. **Variance**
    - 20.

21. **Unfilled Orders Outstanding**
    - 21.

22. **Total**
    - 22.

23. **Remarks**
    - Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. **Dollars Expressed In:**
    - Exact

25. **Signature of Contractor's Project Manager and Date**
    - 25.

26. **Signature of Contractor's Authorized Financial Representative and Date**
    - 26.

27. **Signature of Government Technical Representative and Date**
    - 27.
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<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
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<td>a Actual</td>
<td>b Planned</td>
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23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In.
exact

25. Signature of Contractor's Project Manager and Date
2/28/81

26. Signature of Contractor's Authorized Financial Representative and Date
5/25/81

27. Signature of Government Technical Representative and Date

28. Contract Number
SERI Subcontract #XP-0-9003-1 Mod 1
<table>
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<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>a Subsequent Reporting Period 10,138</td>
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22. Total 20,664 50,215*

23. Remarks
Incluces July travel cost of $768 omitted from July report. Cost Report by Cost Elements for Solar Tests conducted at ACTF.

24. Dollars Expressed In: Exact

25. Signature of Contractor's Project Manager and Date 8/28/81

26. Signature of Contractor's Authorized Financial Representative and Date 8/28/81

27. Signature of Government Technical Representative and Date
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Cost Report by Cost Elements for Solar Tests conducted at ACTF

Signature of Contractor's Project Manager and Date: 8/28/81
Signature of Contractor's Authorized Financial Representative and Date: 8/25/81
Signature of Government Technical Representative and Date: 8/25/81
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<td>Labor</td>
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24. Dollars Expressed In: exact

Cost Report by Cost Elements for Solar Tests conducted at ACTF
## U.S. Department of Energy

### Cost Management Report

**Contract Identification**
- FY80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

**Contractor (Name and Address)**
- Georgia Tech Research Institute
  - Georgia Institute of Technology
  - Atlanta, Georgia 30332

**Government Funding**
- $882,437

**Number of Invoices Billed**
- 10

**Frequency**
- Monthly

**Cost Plan Date**
- August 1, 1980

**Contract Start Date**
- October 1, 1979

**Contract Completion Date**
- January 31, 1981

### Reporting Period
- September 1, 1980 through September 30, 1980

### Subcontract
- BASERT Subcontract #XP-9-0003-1 Mod

### Estimated Accrued Costs

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### Total

- Total: 882,437

**Remarks**
- Summary report, costs include expenditure and encumbrances
- *Tasks included in Supplemental Agreement No. 1

**Signature of Contractor's Project Manager and Date**
- C
  - 9/3/81

**Signature of Contractor's Authorized Financial Representative and Date**
- 9/3/81

**Signature of Government Technical Representative and Date**
- 9/3/81

**Dollars Expressed In:**
- Exact
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<td>September 1, '80 through September 30, '80</td>
<td>SERI Subcontract #XP-0-9003-1 Mod</td>
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4. Contractor (name and address)

Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

5. Cost Plan Date  
October 1, 1979

6. Contract Start Date  
November 1, 1979

7. Contract Completion Date  
January 31, 1981

8. Government Funding

9. Contractor Funding

10. Number of Invoices Billed

11. Frequency

12. Number of Invoices Paid

13. Total Invoice Amounts Billed

14. Total Payment Received

15. Identification Number

16. Reporting Category (e.g., contract line item or work breakdown structure element)

17. Accrued Costs
   During Reporting Period  
   Cumulative to Date  

   a. Actual  
   b. Planned  
   c. Actual  
   d. Planned

18. Estimated Accrued Costs
   Subsequent Reporting Period  
   Balance of Fiscal Year  
   Total Contract Value

19. Variance  

20. Unfilled Orders Outstanding

-210 Solar Turbines Test

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22. Total

<table>
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<td>1,079</td>
<td>30,232</td>
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</table>

23. Remarks

Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In:  

25. Signature of Contracting Officer's Representative and Date

26. Signature of Contractor's Project Manager and Date

27. Signature of Government Technical Representative and Date
<table>
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22. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

23. Signature of Contractor's Project Manager and Date: 9/3/81
24. Signature of Contractor's Authorized Financial Representative and Date: 9/3/81
25. Signature of Government Technical Representative and Date: 9/3/81
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g. contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>-212</td>
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<td>26,547</td>
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<tr>
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<td>Labor</td>
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23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expended
Exact

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26. Signature of Contractor's Authorized Financial Representative and Date: 9/3/81
27. Signature of Government Technical Representative and Date:
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<tr>
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<td>Overhead</td>
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**Remarks:**
Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Dollars Expressed In:** Exact
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<th>15 Identification Number</th>
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<th>Cumulative to Date</th>
<th>18 Estimated Accrued Costs</th>
<th>19 Total Contract Value</th>
<th>20 Variance</th>
<th>21 Unliquidated Orders Outstanding</th>
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<td>417,893</td>
<td>48,858</td>
<td>409,052</td>
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<tr>
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<td>Dynatherm Test</td>
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<td>32,872</td>
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|                          | Total                                            | 97,378                               | 40,989           | 743,239                   | 810,551                 | 90,511      | 882,437                         | 882,437

Summary report, costs include expenditures and encumbrances

*Tasks included in Supplemental Agreement No. 1

Dollars Expressed In: Exact
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>FY 80 OPERATIONS OF THE U.S. DOE ADVANCED COMPONENTS TEST FACILITY (ACTF)</th>
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<td>Overhead</td>
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<td>Materials &amp; Supplies</td>
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<td>1,050</td>
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<td>Travel</td>
<td>723</td>
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| 22 Total             | 0                                                                                | 30,232                                                                 |

23 Remarks
Cost report by Cost Elements for Solar Tests conducted at ACTF

24 Dollars Expressed In: Exact

25 Signature of Contractor's Project Manager and Date: 9/14/81
26 Signature of Contractor's Authorized Financial Representative and Date: 9/14/81
27 Signature of Government Technical Representative and Date: 9/14/81
<table>
<thead>
<tr>
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<th>Cumulative to Date</th>
<th>Subsequent Reporting Period</th>
<th>Balance of Fiscal Year</th>
<th>Total Contract Value</th>
<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
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<tr>
<td>211</td>
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<td><strong>16,534</strong></td>
<td><strong>32,872</strong></td>
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<td></td>
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</tr>
</tbody>
</table>

23. Remarks

Cost report by Cost Elements for Solar Tests conducted at ACTF

25. Signature of Contractor's Project Manager and Date: 9/4/1981
26. Signature of Contractor's Authorized Financial Representative and Date: 9/4/1981
27. Signature of Government Technical Representative and Date: 9/4/1981

24. Dollars Expressed In: Exact
# U.S. DEPARTMENT OF ENERGY
## COST MANAGEMENT REPORT

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<tbody>
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<td>FY 80 OPERATIONS OF THE U.S. DOE ADVANCED COMPONENTS TEST FACILITY (ACTF)</td>
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<tbody>
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<tr>
<td>Georgia Institute of Technology</td>
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<tr>
<td>Atlanta, Georgia 30332</td>
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<thead>
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<th>Government Funding</th>
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<th>Number of Invoices Billed</th>
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<tr>
<th>14</th>
<th>Total Payment Received</th>
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<th>Accrued Costs During Reporting Period</th>
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<td>Actual</td>
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<tr>
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<td>c</td>
<td>Actual</td>
</tr>
<tr>
<td>d</td>
<td>Planned</td>
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<tr>
<td>b</td>
<td>Total Contract Value</td>
</tr>
<tr>
<td>c</td>
<td>Variance</td>
</tr>
<tr>
<td>d</td>
<td>Unfilled Orders Outstanding</td>
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<th>20</th>
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<thead>
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<th>Remarks</th>
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Cost report by Cost Elements for Solar Tests conducted at ACTF

<table>
<thead>
<tr>
<th>24</th>
<th>Dollars Expressed In:</th>
</tr>
</thead>
</table>

Exact

| 25 | Signature of Contractor's Project Manager and Date |

| 26 | Signature of Contractor's Authorized Financial Representative and Date |

| 27 | Signature of Government Technical Representative and Date |

| 28 | Date |

| 29 | Date |

7/4/81
## Cost Management Report

**U.S. Department of Energy**

**Cost Management Report**

|-----------------------------|---------------------|--------------------|

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<th>4. Contractor (name and address)</th>
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<th>6. Contract Start Date</th>
<th>7. Contract Completion Date</th>
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### Reporting Category

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<th>Estimated Accumulated Cost Supposed Reporting Period</th>
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<td>Westinghouse Test</td>
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| Total | 1,374 | 101,349 |

### Remarks

Cost report by Cost Elements for Solar Tests conducted at ACTF

<table>
<thead>
<tr>
<th>23. Remarks</th>
<th>24. Dollars Expressed In.</th>
<th>25. Signature of Contractor's Project Manager and Date</th>
<th>26. Signature of Contractor's Authorized Financial Representative and Date</th>
<th>27. Signature of Government Technical Representative and Date</th>
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<td>9/4/81</td>
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</table>
## U.S. Department of Energy
### Cost Management Report

**Contract Identification**

FY 80 OPERATIONS OF THE U.S. DOE ADVANCED COMPONENT TEST FACILITY (ACTF)

**Contractor (name and address)**

Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332

**Government Funding**

**Contractor Funding**

**Number of Invoices Billed**

**Frequency**

**Number of Invoices Paid**

**Total Invoice Amounts Billed**

**Total Payment Received**

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<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract item or work breakdown structure element)</th>
<th>During Reporting Period</th>
<th>Cumulative to Date</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a Actual</td>
<td>b Planned</td>
</tr>
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<td>General Atomic Test</td>
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<td></td>
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<td></td>
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<td>36</td>
<td></td>
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<tr>
<td></td>
<td>Retirement</td>
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<tr>
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<td>Materials &amp; Supplies</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer</td>
<td>0</td>
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<tr>
<td></td>
<td>Travel</td>
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</table>

**Total**

| 686 | 11,783 |

**Remarks**

Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Signature of Contractor's Project Manager and Date**

9/1/81

**Signature of Contractor's Authorized Financial Representative and Date**

9/1/81

**Signature of Government Technical Representative and Date**

9/1/81
### U.S. Department of Energy
### COST MANAGEMENT REPORT

#### FORM DOE 532M

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<tr>
<td>FY90 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)</td>
<td>November 1, 1990 to November 30, 1990</td>
<td>SERI Subcontract XP-B-9003-1Mod1</td>
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<tr>
<td>4. Contractor Name and Address</td>
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<td>6. Contract Start Date</td>
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#### Government Funding

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<th>15. Accrued Costs</th>
<th>16. Estimated Accrued Costs</th>
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<td>-201</td>
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<td>12,067</td>
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<td>Dynatherm Test</td>
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<td>-212*</td>
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<td>Westinghouse Test</td>
<td>2,376</td>
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<td>81,299</td>
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<td>Improved Tracking Task</td>
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#### Summary report, costs include expenditure and encumbrances

*Tasks included in Supplemental Agreement No. 1

#### Dollars Expressed In

<table>
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<tr>
<th>23. Remarks</th>
<th>24. Signature of Contractor's Project Manager and Date</th>
<th>25. Signature of Contractor's Authorized Financial Representative and Date</th>
<th>26. Signature of Government Technical Representative and Date</th>
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</thead>
<tbody>
<tr>
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<td>16 Reporting Category</td>
<td>17 Accrued Costs</td>
<td>18 Estimated Accrued Costs</td>
<td>19 Total Contract Value</td>
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<td>17 Accrued Costs</td>
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<tr>
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<tr>
<td>Materials &amp; Supplies</td>
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<td><strong>Total</strong></td>
<td><strong>152</strong></td>
<td><strong>30,384</strong></td>
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Cost report by Cost Elements for Solar Tests conducted at ACTF

Signature of Contractor's Project Manager and Date: 9/12/87

Signature of Contractor's Authorized Financial Representative and Date: 9/12/87

Signature of Government Technical Representative and Date: 9/12/87
## U.S. DEPARTMENT OF ENERGY
### COST MANAGEMENT REPORT

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<th>Identification Number</th>
<th>Reporting Category (e.g., Contract Item or Work Breakdown Structure Element)</th>
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<td>Cumulative to Date</td>
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<td></td>
<td>a Actual</td>
<td>b Planned</td>
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23. Remarks
Cost report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In: Exact

25. Signature of Contractor's Project Manager and Date: 9/18/84

26. Signature of Contractor's Authorized Financial Representative and Date: 9/18/84

27. Signature of Government Technical Representative and Date: 9/18/84
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<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
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| Remarks | | | |
|---------| | | |}

Cost report by Cost Elements for Solar Tests conducted at ACTF
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<th>18. Estimated Accrued Costs of</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>1,332</td>
<td>c: Actual</td>
<td>v: Planned</td>
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<tr>
<td></td>
<td>Labor</td>
<td>b: Planned</td>
<td></td>
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<td>103,525</td>
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Remarks: Cost report by Cost Elements for Solar Tests conducted at ACTF

Dollars Expressed In: Exact

Signature of Contractor's Project Manager and Date: 9/8/81
Signature of Contractor's Authorized Financial Representative and Date: 9/8/81
Signature of Government Technical Representative and Date: 9/8/81
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

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<td>Nov. 1, 1980 through Nov. 30, 1980</td>
<td>SEI Subcontract #XP-0-001-1 Mod 1</td>
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<td>Georgia Institute of Technology</td>
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<td>Atlanta, Georgia 30332</td>
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<th>11. Frequency</th>
<th>12. Number of Invoices Paid</th>
<th>13. Total Invoice Amounts Billed</th>
<th>14. Total Payment Received</th>
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<td>214</td>
<td>General Atomic Test</td>
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<tr>
<td></td>
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<th>18. Estimated Accrued Costs</th>
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<td>General Atomic Test</td>
<td>During Reporting Period</td>
<td>Cumulative to Date</td>
</tr>
<tr>
<td>214</td>
<td>General Atomic Test</td>
<td>During Reporting Period</td>
<td>Cumulative to Date</td>
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| 22 | Total | 125 | 11,908 |

**Remarks:**

Cost report by Cost Elements for Solar Tests conducted at ACTF

<table>
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<th>23 Remarks</th>
<th>24. Dollars Expressed In:</th>
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<table>
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<tr>
<th>25 Signature of Contractor's Project Manager and Date</th>
<th>26 Signature of Contractor's Authorized Financial Representative and Date</th>
<th>27 Signature of Government Technical Representative and Date</th>
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<tr>
<td>-202 Technology Transfer</td>
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<tr>
<td>-210 Solar Turbines Test</td>
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<td></td>
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<tr>
<td>-211* Dynatherm Test</td>
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<td>-212* Princeton Test</td>
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<tr>
<td>-213* Westinghouse Test</td>
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<td>-214* General Atomic Test</td>
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<td>-242 Improved Tracking Task</td>
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</table>

| Total                  |                   |                          |                   | 41,723                              | 19,442            | 833,650                                      | 813,597                                      | 47,936                                       | 851,000                                      | 882,437             | 882,437  |                             |

23 Remarks: Summary report, costs include expenditures and encumbrances

Tasks Included in Supplemental Agreement No. 1

24 Dollars Expressed In: Exact

25 Signature of Contractor's Project Manager and Date: 9/18/81

26 Signature of Contractor's Authorized Financial Representative and Date: 9/18/81

27 Signature of Government Technical Representative and Date: 9/18/81
<table>
<thead>
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<th>Identification Number</th>
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<th>Frequency</th>
<th>Number of Invoices Paid</th>
<th>Total Invoice Amounts Billed</th>
<th>Total Payment Received</th>
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</thead>
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<tr>
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<td></td>
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<td>Labor</td>
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22 Total 0 30,384

23 Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24 Dollars Expressed in
Exact

25 Signature of Contractor's Project Manager and Date: 9/3/81
26 Signature of Contractor's Authorized Financial Representative and Date: 9/3/81
27 Signature of Government Technical Representative and Date: 9/3/81
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<th>17. Accrued Costs During Reporting Period</th>
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<tr>
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<tr>
<td>b) Planned</td>
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</tr>
<tr>
<td>c) Actual</td>
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<tr>
<td>d) Planned</td>
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<tr>
<td>e) Total Contract</td>
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<table>
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<th>22. Remarks</th>
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<td>Cost Report by Cost Elements for Solar Tests conducted at ACTF</td>
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<tr>
<td>24. Dollars Expressed In: Exact</td>
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</table>

| 25. Signature of Contractor's Project Manager and Date |
| 26. Signature of Contractor's Authorized Financial Representative and Date |
| 27. Signature of Government Technical Representative and Date |
### U.S. Department of Energy
#### COST MANAGEMENT REPORT

**Contract Identification**
- FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)
- Georgia Tech Research Institute
  - Georgia Institute of Technology
  - Atlanta, Georgia 30332

**Contract Number**
- SERI Subcontract #XP-0-9003-1 Mod 1

**Reporting Period**

**Cost Plan Date**
- October 1, 1979

**Contract Completion Date**
- January 31, 1981

### Reporting Category

<table>
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<td>- 212 Princeton U. Test</td>
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<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>Computer</td>
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</tr>
<tr>
<td></td>
<td>Travel</td>
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</table>

**22. Total**
- 1,049
- 63,689

---

23. Remarks
- Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In
- Exact

25. Signature of Contractor's Project Manager and Date
- 9/18/81

26. Signature of Contractor's Authorized Financial Representative and Date
- 9/18/81

27. Signature of Government Technical Representative and Date
- 9/18/81
<table>
<thead>
<tr>
<th>Identification Number</th>
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<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs b. Subsequent Reporting Period</th>
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<tbody>
<tr>
<td>213</td>
<td>- Westinghouse Test</td>
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23. Remarks

Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed in: Exact

25. Signature of Contractor's Project Manager and Date: 9/8/81

26. Signature of Contractor's Authorized Financial Representative and Date: 9/8/81

27. Signature of Government Technical Representative and Date:
## FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

**Contractor (name and address):** Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**Reporting Period:** Dec. 1, 1980 through Dec. 31, 1980

**Cost Plan Date:**
- October 1, 1979
- Contract Completion Date: January 31, 1981

**Number of Invoices Billed:**

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<th>Frequency</th>
<th>Number of Invoices Billed</th>
<th>Total Invoice Amounts Billed</th>
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</thead>
<tbody>
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<td>0</td>
<td>$11,908</td>
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<tr>
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**Total**

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<th>Total Invoice Amounts Billed</th>
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<tbody>
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<td>-</td>
<td>214</td>
<td>0</td>
<td>$11,908</td>
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**Remarks:**
Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Dollars Expressed In:**
Exact

**Signature of Contractor's Authorized Financial Representative:**

9/16/81

**Signature of Government Technical Representative:**

9/16/81
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

<table>
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<th>Contractor (name and address)</th>
<th>Cost Plan Date</th>
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<th>Contract Completion Date</th>
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<td>October 1, 1979</td>
<td>January 31, 1981</td>
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<th>12 Number of Invoices Paid</th>
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<table>
<thead>
<tr>
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<th>18. Estimated Actual Costs Subsequent to Reporting Period</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>3,923 b Subsequent Reporting Period: 409,052 c Planed: 409,052</td>
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<td>(141) b Subsequent Reporting Period: 30,244 c Planed: 30,244</td>
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<td>30,244</td>
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<tr>
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<td>3,958 b Subsequent Reporting Period: 39,452 c Planed: 39,452</td>
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<td>39,452</td>
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<td>3,222 b Subsequent Reporting Period: 15,509 c Planed: 15,509</td>
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<td>8,785 b Subsequent Reporting Period: 66,084 c Planed: 66,084</td>
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<td>(7,564)</td>
<td>N/A</td>
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<td>17,640 b Subsequent Reporting Period: 0 c Planed: (17,640)</td>
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<td>(17,640)</td>
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<td>(15,761)</td>
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| 22 Total             | 47,936 b Actual: 40,956 c Actual: 881,586 d Planned: 882,437 | 41,816 b Subsequent Reporting Period: 923,402 c Planed: 882,437 | 882,437 | 882,437 | (40,965) |

23 Remarks: Summary report; costs include expenditures and encumbrances.

*Tasks included in Supplemental Agreement No. 1

**Modification of contract has been initiated to cover FY81 operation.

24 Dollars Expressed In: Exact

25 Signature of Contractor's Project Manager and Date: 9/19/81

26 Signature of Contractor's Authorized Financial Representative and Date: 9/19/81

27 Signature of Government Technical Representative and Date: 9/19/81
<table>
<thead>
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<th>Cumulative to Date</th>
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<tbody>
<tr>
<td>210</td>
<td>Solar Turbines Test</td>
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<td>Material &amp; Supplies</td>
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<td>a. Subsequent Reporting Period</td>
<td>b. Balance of Fiscal Year</td>
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23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expended in:
Exact

25. Signature of Contractor's Project Manager and Date: 9/3/81
26. Signature of Contractor's Authorized Financial Representative and Date: 9/3/81
27. Signature of Government Technical Representative and Date: 9/3/81
<table>
<thead>
<tr>
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<td>Total: 361</td>
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Remarks: Cost Report by Cost Elements for Solar Tests Conducted at ACTF

US Department of Energy
COST MANAGEMENT REPORT

Page 2 of 5
### FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

**Georgia Tech Research Institute**
**Georgia Institute of Technology**
**Atlanta, Georgia 30332**

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category</th>
<th>Number of Invoices Billed</th>
<th>Frequency</th>
<th>Number of Invoices Paid</th>
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| Total                  | 1,991              | 65,679                    |           |                         |                            |                       |

**Cost Report by Cost Elements for Solar Tests Conducted at ACTF**

**Signature of Contractor's Project Manager and Date:**

9/9/81

**Signature of Contractor's Authorized Financial Representative and Date:**

9/9/81

**Signature of Government Technical Representative and Date:**

c
<table>
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<th>15 Identification Number</th>
<th>16 Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17 Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18 Estimated Accrued Costs During Subsequent Reporting Period</th>
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<th>20 Total Contract Value</th>
<th>21 Unfilled Orders Outstanding</th>
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<tr>
<td>213</td>
<td>Westinghouse Test</td>
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<td></td>
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<td></td>
<td>Labor</td>
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23 Remarks: Cost Report by Cost Elements for Solar Tests Conducted at ACTF

24 Dollars Expressed In: Exact

25 Signature of Contractor's Project Manager and Date: 9/2/81

26 Signature of Contractor's Authorized Financial Representative and Date: 9/2/81

27 Signature of Government Technical Representative and Date: 9/2/81
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<td>214</td>
<td>General Atomic Test</td>
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<td>Computer</td>
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<td>Travel</td>
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Remark: Cost Report by Cost Elements for Solar Tests conducted at ACTF

Signature of Contractor's Project Manager and Date: 7/6/81

Signature of Contractor's Authorized Financial Representative and Date: 7/6/81

Signature of Government Technical Representative and Date: 7/6/81
<table>
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<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<td>3,176</td>
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<td>Westinghouse Test</td>
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23. Remarks: Summary report; costs include expenditures and encumbrances.

*Tasks included in Supplemental Agreement No. 1
**Modification of contract has been initiated to cover FY81 operation.

24. Dollars Expressed In: EXACT

25. Signature of Contractor's Project Manager and Date: 1/10/81
26. Signature of Contractor's Authorized Financial Representative and Date: 1/10/81
27. Signature of Government Technical Representative and Date: 1/10/81
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<td>210</td>
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Cost Report by Cost Elements for Solar Tests Conducted at ACTF

<table>
<thead>
<tr>
<th>25. Signature of Contractor's Project Manager and Date</th>
<th>26. Signature of Contractor's Authorized Financial Representative and Date</th>
<th>27. Signature of Government Technical Representative and Date</th>
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<tbody>
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<td>9/10/81</td>
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Dollars Expressed In: Exact
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<th>Number of Invoices Paid</th>
<th>Total Invoice Amounts</th>
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22 Total 782 36,276

Cost Report by Cost Elements for Solar Tests Conducted at ACTF

24 Dollars Expressed In: Exact

25 Signature of Contractor's Project Manager and Date: 9/10/81
26 Signature of Contractor's Authorized Financial Representative and Date: 9/10/81
27 Signature of Government Technical Representative and Date: 9/10/81
<table>
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<tr>
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<td>a Actual</td>
<td>b Planned</td>
<td>c Actual</td>
<td>d Planned</td>
<td>e Subsequent Reporting Period</td>
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</table>

Cost Report by Cost Elements for Solar Tests Conducted at ACTF

Signature of Contractor’s Project Manager and Date: 9/10/81
Signature of Contractor’s Authorized Financial Representative and Date: 9/10/81
Signature of Government Technical Representative and Date: 9/10/81

Dollars Expressed In: Exact
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<td></td>
<td>Labor</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Overhead</td>
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<tr>
<td></td>
<td>Retirement</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Materials &amp; Supplies</td>
<td></td>
<td></td>
<td></td>
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</table>

Cost Report by Cost Elements for Solar Test Conducted at ACTF

**Remarks**

Cost Report by Cost Elements for Solar Test Conducted at ACTF

**Signature of Contractor's Project Manager and Date**

9/10/81

**Signature of Contractor's Authorized Financial Representative and Date**

9/10/81
**Cost Management Report**

**1. Contract Identification**
FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

**2. Reporting Period**

**3. Contract Number**
SERI Subcontract #XP-0-9003-1 MOD 1

**4. Contractor Name and Address**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**5. Cost Plan Date**
October 1, 1979

**6. Contract Start Date**
January 31, 1981

**B. Government Funding**

<table>
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<tr>
<th>Identification Number</th>
<th>16. Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>214</td>
<td>General Atomic Test</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4,183</td>
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<td></td>
<td>Overhead</td>
<td>3,063</td>
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<td>Retirement</td>
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<td>Materials &amp; Supplies</td>
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**23. Remarks**
Cost Report by Cost Elements for Solar Tests Conducted at ACTF

**24. Dollars Expended In**
Exact

**25. Signature of Contractor's Project Manager and Date**
[Signature]
9/10/81

**26. Signature of Contractor's Authorized Financial Representative and Date**
[Signature]
9/10/81

**27. Signature of Government Technical Representative and Date**
[Signature]

## U.S. DEPARTMENT OF ENERGY
### COST MANAGEMENT REPORT

**Contract Identification:**
- FY90 Operations of the U. S. DOE Advanced Components Test Facility (ACTF)

**Contractor Name and Address:**
- Georgia Tech Research Institute
  - Georgia Institute of Technology
  - Atlanta, Georgia 30332

**Government Funding:**
- $882,437

**4. Reporting Period:**
- March 1, 1981, through March 31, 1981

**5. Cost Plan Date:**
- NA

**6. Contract Start Date:**
- October 1, 1979

**7. Contract Completion Date:**
- January 31, 1981

### Table: Accrued Costs

<table>
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<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>10. Number of Invoices Billed</th>
<th>11. Frequency</th>
<th>12. Number of Invoices Paid</th>
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<th>14. Total Payment Received</th>
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<td>1980 Administration</td>
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<td>(6)</td>
<td>91,092</td>
<td>91,092</td>
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### Summary Report:
Summary report; costs include expenditures and encumbrances. Tasks included in Supplemental Agreement No. 1. Modification of contract has been initiated to cover FY91 operation.

**Signature of Contractor's Project Manager and Date:**
- 9/10/81

**Signature of Contractor's Authorized Financial Representative and Date:**
- 7/10/81

**Signature of Government Technical Representative and Date:**
- Exact
## U.S. Department of Energy
### Cost Management Report

**Report Period:**
- **FY 80 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)**
- **Reporting Period:** March 1, 1981, through March 31, 1981
- **Contract Number:** SERI Subcontract W-1-9003-1 MOD 1
- **Cost Plan Date:**
- **Contract Start Date:** October 1, 1979
- **Contract Completion Date:** January 31, 1981

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### Contractor Funding

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<th>Total Payment Received</th>
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### Accrued Costs

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<th>Planned</th>
<th>Cumulative to Date</th>
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<th>Planned</th>
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<tr>
<td>Retirement</td>
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### Remarks
- Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Signature:**
- Contractor's Project Manager and Date: 9/10/81
- Contractor's Authorized Financial Representative and Date: 9/10/81
- Government Technical Representative and Date: 9/10/81

**Dollars Expressed In:** Exact
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<th>Identification Number</th>
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<th>Estimated Accrued Costs</th>
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<th>Variance</th>
<th>Unfilled Orders Outstanding</th>
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22. Total 816 37,092

23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In: Exact

25. Signature of Contractor's Project Manager and Date 9/10/81
26. Signature of Contractor's Authorized Financial Representative and Date 9/10/81
27. Signature of Government Technical Representative and Date
### U.S. Department of Energy

#### COST MANAGEMENT REPORT

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### U.S. Department of Energy
**COST MANAGEMENT REPORT**

**Page 4 of 5**

#### 1. Contract Identification
FY 80 Operations for the U.S. DOE Advanced Components Test Facility (ACTF)

#### 2. Reporting Period
March 1, 1981 through March 31, 1981

#### 3. Contract Number
SERI Subcontract#XP-2-9003-1 MOD 1

#### 4. Contractor (Name and address)
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

#### 5. Cost Plan Date

#### 6. Contract Start Date
October 1, 1979

#### 7. Contract Completion Date
January 31, 1981

#### 8. Government Funding

#### 9. Contractor Funding

#### 10. Number of Invoices Billed

#### 11. Frequency

#### 12. Number of Invoices Paid

#### 13. Total Invoice Amounts Billed

#### 14. Total Payment Received

#### 15. Identification Number

#### 16. Reporting Category (e.g., contract line item or work breakdown structure element)

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<td>b: Planned</td>
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#### 19. Total Contract Value:

#### 20. Variance

#### 21. Unfilled Orders Outstanding

#### 22. Total

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#### 23. Remarks
Cost Report by Cost Elements for Solar Tests Conducted at ACTF

#### 24. Dollars Expressed In:
Exact

#### 25. Signature of Contractor's Project Manager and Date

#### 26. Signature of Contractor's Authorized Financial Representative and Date

#### 27. Signature of Government Technical Representative and Date

1/2/1981
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| Remarks               | Cost Report by Cost Elements for Solar Tests conducted at ACTF                   |

<p>| Dollars Expressed In  | Exact                                                                             |</p>
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Total: 81,901

Summary report; costs include expenditures and encumbrances

* Tasks included in Supplemental Agreement No. 1
** Tasks included in Supplemental Agreement No. 2

Dollars Expressed In: Exact

Signature of Contractor's Project Manager and Date: 9/11/79

Signature of Contractor's Authorized Financial Representative and Date: 9/11/79

Signature of Government Technical Representative and Date: 9/11/79
### U.S. Department of Energy
COST MANAGEMENT REPORT

**1. Contract Identification**
FY 80-81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

**2. Reporting Period**
April 1, 1981 through April 30, 1981

**3. Contract Number**
SEIR Subcontract#XP-9-9003-1 MOD 2

**4. Contractor (name and address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**5. Cost Plan Date**
October 1, 1979

**6. Contract Start Date**
September 30, 1981

**7. Contract Completion Date**

**8. Government Funding**

**9. Contractor Funding**

**10. Number of Invoices Billed**

**11. Frequency**

**12. Number of Invoices Paid**

**13. Total Invoice Amounts Billed**

**14. Total Payment Received**

**15. Identification Number**

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**23. Remarks**
Cost Report by Cost Elements for Solar Tests conducted at ACTF

**24. Dollars Expended In**
Exact

**25. Signature of Contractor's Project Manager and Date**

**26. Signature of Contractor's Authorized Financial Representative and Date**

**27. Signature of Government Technical Representative and Date**
<table>
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<th>19. Total Contract Value</th>
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Cost Report by Cost Elements for Solar Tests conducted at ACTF

25. Signature of Contractor's Project Manager and Date 26. Signature of Contractor's Authorized Financial Representative and Date 27. Signature of Government Technical Representative and Date
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23 Remarks: Cost Report by Cost Elements for Solar Tests Conducted at ACTF
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<td>Reporting Category (e.g., contract line item or work breakdown structure element)</td>
<td>Accrued Costs During Reporting Period</td>
<td>Cumulative to Date</td>
<td>Estimated Accrued Costs</td>
<td>Under Contract Value</td>
<td>Variance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a Actual</td>
<td>b Planned</td>
<td>c Actual</td>
<td>d Planned</td>
<td>a Subsequent Reporting Period</td>
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<tr>
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<td>0</td>
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**Remarks:** Cost Report by Cost Elements for Solar Tests conducted at ACTF
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<th>12. Number of Invoices Billed</th>
<th>13. Number of Invoices Paid</th>
<th>14. Total Invoice Amounts Billed</th>
<th>15. Total Payment Received</th>
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<tbody>
<tr>
<td>214</td>
<td>General Atomic Test</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>4,183</td>
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<td></td>
<td>Overhead</td>
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<td></td>
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<td>Materials &amp; Supplies</td>
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<td></td>
</tr>
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</tr>
<tr>
<td></td>
<td>Travel</td>
<td>1,508</td>
<td></td>
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</tbody>
</table>

|                   | Total               | 0                             | 12,239                      |                                |                           |

**Cost Report by Cost Elements for Solar Tests Conducted at ACTF**

**Signature of Contractor's Project Manager and Date:**

**Signature of Contractor's Authorized Financial Representative and Date:**

**Signature of Government Technical Representative and Date:**
### U.S. Department of Energy

**Cost Management Report**

<table>
<thead>
<tr>
<th>Contract Identification</th>
<th>FY80-81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)</th>
</tr>
</thead>
</table>
| Contractor (Name and Address) | Georgia Tech Research Institute  
Georgia Institute of Technology  
Atlanta, Georgia 30332 |
| Reporting Period | May 1, 1981 through May 31, 1981 |
| Cost Plan Date | May 15, 1981 |
| Contract Number | SERI Subcontract #XP-0-9003-1Mod 2 |
| Contract Start Date | October 1, 1979 |
| Contract Completion Date | September 30, 1981 |

#### 8. Government Funding

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#### 15. Identification Number

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<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs a. Subsequent Reporting Period</th>
<th>b. Balance of Fiscal Year</th>
<th>c. Total Contract Value</th>
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<td>(27)</td>
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<td>30,385</td>
<td>30,385</td>
<td>0</td>
</tr>
<tr>
<td>-211 ** Dynatherm Test</td>
<td>0</td>
<td>0</td>
<td>38,041</td>
<td>39,452</td>
<td>0</td>
</tr>
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<td>67,271</td>
<td>67,157</td>
<td>0</td>
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<td>-213 ** Westinghouse Test</td>
<td>50</td>
<td>0</td>
<td>103,664</td>
<td>103,588</td>
<td>0</td>
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<tr>
<td>-214 ** General Atomic Test</td>
<td>0</td>
<td>0</td>
<td>12,240</td>
<td>12,287</td>
<td>0</td>
</tr>
<tr>
<td>-242 ** Improved Tracking Task</td>
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<td>57,312</td>
<td>57,313</td>
<td>0</td>
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<td>42,957</td>
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<td>19,360</td>
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<td>41,071</td>
<td>39,600</td>
<td>1,128,916</td>
<td>1,086,837</td>
<td>63,083</td>
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</table>

#### Remarks

Summary report, costs include expenditures and encumbrances

* Tasks included in Supplemental Agreement No. 1
** Tasks included in Supplemental Agreement No. 2

Dollars Expressed In

Exact

25. Signature of Contractor's Project Manager and Date

9/15/81

26. Signature of Contractor's Authorized Financial Representative and Date

27. Signature of Government Technical Representative and Date
**Cost Management Report**

**1. Contract Identification**
FY 80 - 81 Operations of U.S. DOE Advanced Components Test Facility (ACTF)

**2. Reporting Period**
May 1, 1981 through May 31, 1981

**3. Contract Number**
SERI Subcontract #XP-89-900301 Mod 2

**4. Contractor (name and address)**
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

**5. Cost Plan Date**
October 1, 1979

**6. Contract Start Date**
September 30, 1981

**B. Government Funding**

<table>
<thead>
<tr>
<th>Number of Invoices Billed</th>
<th>Frequency</th>
<th>Number of Invoices Paid</th>
<th>Total Invoice Amounts Billed</th>
<th>Total Payment Received</th>
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</table>

**6. Contractor Funding**

<table>
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<tr>
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<th>Frequency</th>
<th>Number of Invoices Paid</th>
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</tr>
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<tbody>
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**15. Identification Number**

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<th>Actual Costs</th>
<th>Cumulative Costs</th>
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<td>a. Actual</td>
<td>b. Planned</td>
<td>c. Actual</td>
</tr>
<tr>
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<tr>
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<td>Materials &amp; Supplies</td>
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**22. Total**

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**23. Remarks**
Cost Report by Cost Elements for Solar Tests Conducted at ACTF

**24. Dollars Expended**
Exact

**25. Signature of Contractor's Project Manager and Date**

**26. Signature of Contractor's Authorized Financial Representative and Date**

**27. Signature of Government Technical Representative and Date**
### U.S. Department of Energy
#### Cost Management Report

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>Dynatherm Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Labor
- Actual: $16,547
- Planned: $12,195
- Total: $38,742

#### Overhead
- Actual: $758

#### Materials & Supplies
- Actual: $5,001

#### Equipment
- Actual: $0

#### Computer
- Actual: $2,084

#### Travel
- Actual: $1,457

### Remarks
Cost report by cost elements for solar tests conducted at ACTF.
<table>
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<th>15 Identification Number</th>
<th>16 Accounting Category (ex: concrete, site item or work breakdown structure element)</th>
<th>17 Actual Costs During Reporting Period</th>
<th>18 Estimated Accrued Costs a) Subsequent Reporting Period</th>
<th>19 Total Contract Value</th>
<th>20 Variance</th>
<th>21 Unfunded Balance Outstanding</th>
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</thead>
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23 Remarks
Cost Report by Cost Elements for Solar Tests Conducted at ACTF

24 Dollars Expired In
Exact
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<th>Estimated Accrued Costs</th>
<th>Total Contract Value</th>
<th>Variance</th>
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</thead>
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<td>213</td>
<td>Westinghouse Test</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td>46,994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overhead</td>
<td>35,429</td>
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<tr>
<td></td>
<td>Retirement</td>
<td>4,287</td>
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<td></td>
</tr>
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<td>Materials &amp; Supplies</td>
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<tr>
<td></td>
<td>Computer</td>
<td>1,882</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Travel</td>
<td>996</td>
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<td></td>
<td>Total</td>
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Cost Report by Cost Elements for Solar Tests Conducted at ACTF
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<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>11. Accrued Costs During Reporting Period</th>
<th>12. Cumulative to Date</th>
<th>18. Estimated Accrued Costs</th>
<th>21. Unfunded Orders Outstanding</th>
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<tbody>
<tr>
<td>214</td>
<td>General Atomic Test</td>
<td>Labor</td>
<td>4,183</td>
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<tr>
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</tr>
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25. Signature of Contractor's Project Manager and Date: [Signature]

26. Signature of Contractor's Authorized Financial Representative and Date: [Signature]

27. Signature of Government Technical Representative and Date: [Signature]
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<th>Balance of Fiscal Year</th>
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**Remarks**

Summary report, costs include expenditures and encumbrances

*Tasks included in Supplemental Agreement No. 1
**Tasks included in Supplemental Agreement No. 2

24 Dollars Expressed In: Exact

Signature of Contractor's Project Manager and Date: [Signature]

Signature of Contractor's Authorized Financial Representative and Date: [Signature]

Signature of Government Technical Representative and Date: [Signature]
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### FY 80

- **Operation of the U.S. DOE Advanced Components Test Facility (ACTF)**
- **Georgia Tech Research Institute**
- **Georgia Institute of Technology**
- **Atlanta, Georgia 30332**

### FY 81

- **Reporting Period**: June 1, 1981 through June 30, 1981
- **Contract Number**: SERI Subcontract #XP-8-9003-1 Mod 2
- **Cost Plan Date**: 
- **Contract Start Date**: October 1, 1979
- **Contract Completion Date**: September 30, 1981
- **Government Funding**: 
- **Contractor Funding**: 

### Cost Management Report

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### Cost Report by Cost Elements for Solar Tests conducted at ACTF

- **Total Minutes**: 30,384

### Remarks

- **Cost Report by Cost Elements for Solar Tests conducted at ACTF**

- **Dollars Expensed in**: Exact

### Signatures

- **Signature of Contractor's Project Manager and Date**: [Signature]
- **Signature of Contractor's Authorized Financial Representative and Date**: [Signature]
- **Signature of Government Technical Representative and Date**: [Signature]
### U.S. Department of Energy

**COST MANAGEMENT REPORT**

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<td>FY 80 - 81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)</td>
<td>June 1, 1981 through June 30, 1981</td>
<td>CEBI Subcontract #XP-0-9003-1 Mod 2</td>
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<td>6. Contract Start Date</td>
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<td>7. Contract Completion Date</td>
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<td></td>
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<td>b. Planned:</td>
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<td>c. Actual: 12,195</td>
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<td>d. Planned:</td>
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<td>Computer: 2,084</td>
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<td>Travel: 1,457</td>
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| 22. Total | 0 | 38,042 |

### Remarks

Cost Report by Cost Elements for Solar Tests conducted at ACTF

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<tr>
<th>24. Dollars Expressed In:</th>
<th>Exact</th>
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### Notes

- Signature of Contractor's Project Manager and Date
- Signature of Contractor's Authorized Financial Representative and Date
- Signature of Government Technical Representative and Date
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<th>Item</th>
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<td>6.</td>
<td>Contract Start Date</td>
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<td>7.</td>
<td>Contract Completion Date</td>
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<td>8.</td>
<td>Government Funding</td>
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<td>9.</td>
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<td>10.</td>
<td>Number of Invoices Billed</td>
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<td>11.</td>
<td>Frequency</td>
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</tr>
<tr>
<td>12.</td>
<td>Number of Invoices Paid</td>
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<td>13.</td>
<td>Total Invoice Amounts Billed</td>
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<td>Total Payment Received</td>
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<td>Variance</td>
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<td>23.</td>
<td>Remarks</td>
<td>Cost Report by Cost Element for Solar Tests conducted at ACTF</td>
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<td>24.</td>
<td>Dollars Expressed In</td>
<td>Exact</td>
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<tr>
<td>25.</td>
<td>Signature of Contractor's Project Manager and Date</td>
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<td>26.</td>
<td>Signature of Contractor's Authorized Financial Representative and Date</td>
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<td>27.</td>
<td>Signature of Government Technical Representative and Date</td>
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**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

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| Total                     | 103,644                                         |                  |                             |                        |             |                               |

|---------------------------|----------------------------------------------------------------|

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<tr>
<th>25. Signature of Contractor's Authorized Financial Representative and Date</th>
<th>26. Signature of Government Technical Representative and Date</th>
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<tr>
<td>214</td>
<td>General Atomic Test</td>
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<td>Total</td>
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**Remarks:**

Cost Report by Cost Elements for Solar Tests conducted at ACTF

**Dollars Expressed In:**

Exact
### U.S. Department of Energy

**COST MANAGEMENT REPORT**

**FORM DOE 533M**

1. **Contract Identification**
   - FY 80 - 81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

2. **Reporting Period**
   - July 1, 1981 through July 31, 1981

4. **Contractor (name and address)**
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

5. **Cost Plan Date**
   - May 15, 1981

6. **Contract Start Date**
   - October 1, 1979

7. **Contract Completion Date**
   - December 31, 1981

8. **Government Funding**
   - $1,253,040

9. **Contractor Funding**
   - $0

10. **Number of Invoices Billed**
    - Monthly

11. **Frequency**
    - Monthly

12. **Number of Invoices Paid**

13. **Total Invoice Amounts Billed**

14. **Total Payment Received**

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22. **Total**
   - 28,570.4
   - 30,000.0
   - 1,220,769.1
   - 1,222,800.0
   - 27,276.2
   - 4,994.7
   - 1,253,040.0
   - 1,253,040.0

23. **Remarks**
   - Summary Report; costs include expenditures and encumbrances

24. **Dollars Expressed In:**
   - Exact

25. **Signature of Contractor's Project Manager and Date**

26. **Signature of Contractor's Authorized Financial Representative and Date**

27. **Signature of Government Technical Representative and Date**

9/11/81
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>Labor</th>
<th>Overhead</th>
<th>Retirement</th>
<th>Materials &amp; Supplies</th>
<th>Equipment</th>
<th>Computer</th>
<th>Travel</th>
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<td>11,110</td>
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<td>1,527</td>
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<td>1,059</td>
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22. Total  0  30,394

23. Remarks
Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed in: Exact

25. Signature of Contractor's Project Manager and Date

26. Signature of Contractor's Authorized Financial Representative and Date

27. Signature of Government Technical Representative and Date

2/6/81
**U.S. DEPARTMENT OF ENERGY**
**COST MANAGEMENT REPORT**

1. Contract Identification
   - FY 80 - 81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

4. Contractor (name and address)
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

8. Government Funding
   - 10. Number of Invoices Billed
   - 11. Frequency
   - 12. Number of Invoices Paid
   - 13. Total Invoice Amounts Billed
   - 14. Total Payment Received

15. Identification Number
   - 16. Reporting Category (e.g., contract line item or work breakdown structure element)
   - 17. Accrued Costs During Reporting Period
     - a. Actual
     - b. Planned
     - c. Actual
     - d. Planned

   - 18. Estimated Accrued Costs
     - a. Subsequent Reporting Period
     - b. Balance at Fiscal Year
     - c. Total Contract Value
     - d. Variance
     - e. Unfilled Orders Outstanding

<table>
<thead>
<tr>
<th>211</th>
<th>Dynatherm Test</th>
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</thead>
<tbody>
<tr>
<td>Labor</td>
<td>16,547</td>
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<tr>
<td>Overhead</td>
<td>12,195</td>
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<td>Retirement</td>
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<td>Equipment</td>
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<td>Computer</td>
<td>2,084</td>
</tr>
<tr>
<td>Travel</td>
<td>1,457</td>
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</table>

22. Total
   - 0
   - 38,042

23. Remarks
   - Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed in
   - Exact

25. Signature of Contractor's Project Manager and Date
   - 9/11/81

26. Signature of Contractor's Authorized Financial Representative and Date

27. Signature of Government Technical Representative and Date
<table>
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<th>Reporting Category</th>
<th>Actual</th>
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<th>Cumulative to Date</th>
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<td>Number of Invoices Billed</td>
<td>Frequency</td>
</tr>
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<td>-----------------------</td>
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<td>--------------------------</td>
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<tr>
<td>213</td>
<td>Westinghouse Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labor</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Overhead</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Retirement</td>
<td></td>
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<tr>
<td></td>
<td>Materials &amp; Supplies</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Travel</td>
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<tr>
<td></td>
<td>Total</td>
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</table>

Cost Report by Cost Elements for Solar Tests Conducted at ACTF

24. Dollars Expired In: Exact

25. Signature of Contractor's Project Manager and Date

26. Signature of Contractor's Authorized Financial Representative and Date

27. Signature of Government Technical Representative and Date
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

---

1. Contract Identification
   - FY 80 - 81 of the U.S. DOE Advanced Components Test Facility

4. Contractor Name and Address
   - Georgia Tech Research Institute
   - Georgia Institute of Technology
   - Atlanta, Georgia 30332

8. Government Funding
   - \[ \text{Number} \]

11. Frequency
   - \[ \text{Number} \]

12. Number of Invoices Paid
   - \[ \text{Number} \]

13. Total Invoice Amounts Billed
   - \[ \text{Number} \]

15. Identification Number
   - \[ \text{Number} \]

16. Reporting Category (i.e., contract line item or work breakdown structure element)
   - General Atomic Test

17. Accrued Costs
   - During Reporting Period
     - Labor: 4,183
     - Overhead: 3,063
     - Retirement: 396
     - Materials & Supplies: 3,089
     - Equipment: 0
     - Computer: 0
     - Travel: 1,508

18. Estimated Accrued Costs
   - Subsequent Reporting Period

22. Total
   - \[ \text{Number} \]

23. Remarks
   - Cost Report by Cost Elements for Solar Tests conducted at ACTF

24. Dollars Expressed In:
   - Exact

25. Signature of Contractor’s Project Manager and Date
   - 

26. Signature of Contractor’s Authorized Financial Representative and Date
   - 

27. Signature of Government Technical Representative and Date
   - 

---
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Reporting Category (e.g., contract line item or work breakdown structure element)</th>
<th>17. Accrued Costs During Reporting Period</th>
<th>Cumulative to Date</th>
<th>18. Estimated Accrued Costs</th>
<th>19. Total Contract Value</th>
<th>20. Variance</th>
<th>21. Unfilled Orders Outstanding</th>
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<tr>
<td>-200</td>
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<td>a Actual 0</td>
<td>b. Planned 0</td>
<td>c. Actual 91,087</td>
<td>d. Planned 91,087</td>
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<td>0</td>
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<td>-201</td>
<td>1980 Maintenance &amp; Equip.</td>
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<td>b. Planned 0</td>
<td>c. Actual 409,102</td>
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<td>1980 Technology Transfer</td>
<td>a Actual 0</td>
<td>b. Planned 0</td>
<td>c. Actual 73,293</td>
<td>d. Planned 71,089</td>
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<tr>
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<td>b. Planned 0</td>
<td>c. Actual 30,385</td>
<td>d. Planned 30,385</td>
<td>0</td>
<td>0</td>
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<tr>
<td>-211</td>
<td>Dynatherm Test</td>
<td>a Actual 0</td>
<td>b. Planned 0</td>
<td>c. Actual 38,042</td>
<td>d. Planned 39,452</td>
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<td>-212</td>
<td>Princeton Test</td>
<td>a Actual 0</td>
<td>b. Planned 0</td>
<td>c. Actual 67,271</td>
<td>d. Planned 67,158</td>
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<tr>
<td>-213</td>
<td>Westinghouse Test</td>
<td>a Actual 0</td>
<td>b. Planned 0</td>
<td>c. Actual 103,644</td>
<td>d. Planned 103,588</td>
<td>(56)</td>
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<tr>
<td>-214</td>
<td>General Atomic Test</td>
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<td>b. Planned 0</td>
<td>c. Actual 12,240</td>
<td>d. Planned 12,287</td>
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<td>-242</td>
<td>Improved Tracking</td>
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<td>b. Planned 0</td>
<td>c. Actual 57,313</td>
<td>d. Planned 57,313</td>
<td>0</td>
<td>0</td>
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<td>1981 Administration</td>
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<td>1981 Technology Transfer</td>
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23. Remarks: Summary Report; Costs include expenditures and encumbrances

24. Dollars Expressed In: EXACT
**U.S. DEPARTMENT OF ENERGY**

**COST MANAGEMENT REPORT**

1. **Contract Identification**
   FY 80 - 81 Operations of the U.S. DOE Advanced Components Test Facility (ACTF)

2. **Reporting Period**

3. **Contract Number**
   SERI Subcontract #XP-0-9003-1 Mod 3

4. **Contractor (name and address)**
   Georgia Tech Research Institute
   Georgia Institute of Technology
   Atlanta, Georgia 30332

5. **Cost Plan Date**
   May 15, 1981

6. **Contract Start Date**
   October 1, 1979

7. **Contract Completion Date**
   December 31, 1981

8. **Government Funding**
   1,253,040

9. **Contractor Funding**
   0

10. **Number of Invoices Billed**
    Monthly

11. **Number of Invoices Paid**

12. **Total Invoice Amounts Billed**

13. **Total Payment Received**

14. **Identification Number**

15. **Reporting Category** (e.g., contract line item or work breakdown structure elements)

16. **Accrued Costs**
   During Reporting Period
   Cumulative to Date
   Subsequent Reporting Period
   Balance of Fiscal Year
   Total Contract Value
   Variance
   Unfilled Orders Outstanding

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<td>30,385</td>
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<td>62,466</td>
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**Total**

| Actual | Planned | Actual | Planned | (26,752) | 0 | 1,253,040 | 1,253,040 | N/A |

22. **Remarks**

Summary Report, costs include expenditure and encumbrances. *Includes correction of error in May, 1981 costs

23. **Signature of Contractor's Project Manager and Date**

24. **Dollars Expressed in**:

25. **Signature of Contractor's Authorized Financial Representative and Date**

N/A

26. **Signature of Government Technical Representative Date**

10/12/81
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<td>Georgia Tech Research Institute</td>
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<tr>
<td>University of Georgia Institute of Technology</td>
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<tr>
<td>Atlanta, Georgia 30332</td>
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</table>

| Government Funding | 1,333,899 | Contractor Funding | -0- |

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<tbody>
<tr>
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<td>13. Total Invoice Amounts Billed</td>
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</table>

| Total | 27,457 | 26,600 | 1,307,249 | 1,307,249 | 27,457 | 27,457 | 27,457 |

<table>
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<tr>
<th>22. Remarks</th>
<th>Summary Report - Costs include expenditures &amp; encumbrances</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>25. Signature of Contractor/Project Manager and Date</th>
<th>26. Signature of Contractor's Authorized Financial Representative and Date</th>
<th>27. Signature of Government Technical Representative and Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 24. Dollars Expressed In: | Exact | Exact | Exact |

| 24. Dollars Expressed In: | Exact | Exact | Exact |

| 24. Dollars Expressed In: | Exact | Exact | Exact |
|----------------------------------|---------------------------------------------------------------------------------|
| 3. Contract Number              | SERI Subcontract #XP-0-9003-1 Mod 4                                             |
| 4. Contractor: Name and address | Georgia Tech Research Institute                                                  |
|                                  | Georgia Institute of Technology                                                  |
|                                  | Atlanta, Georgia 30332                                                           |
| 5. Cost Plan Date               | May 15, 1981                                                                      |
| 6. Contract Start Date          | October 1, 1979                                                                  |
| 7. Contract Completion Date      | December 31, 1981                                                                |
| 8. Government Funding            | $1,333,089                                                                        |
| 9. Contractor Funding           | 0                                                                                |
| 10. Number of Invoices Billed   | Monthly                                                                          |
| 11. Frequency                   | Monthly                                                                          |
| 12. Number of Invoices Paid     |                                                                                  |
| 13. Total Invoice Amounts Billed|                                                                                  |
| 14. Total Payment Received      |                                                                                  |
| 15. Reporting Category (e.g., contract line item or work breakdown structure element) |                                      |
| 16. Identification Number       |                                                                                  |
| 17. Accrued Costs               |                                                                                   |
|                                  | During Reporting Period              | Cumulative to Date       | a) Total         | b) Planned         | c) Total         | d) Planned         |
|                                  | a) Actual | b) Planned | c) Actual | d) Planned | a) Actual | b) Planned | c) Actual | d) Planned | a) Actual | b) Planned | c) Actual | d) Planned |
| 200 1980 Administration          | 0 | 0 | 91,087 | 91,087 | 0 | 0 | 91,087 | 91,087 | 0 | 0 | 91,087 | 91,087 |
| 201 1980 Maintenance & Equipment | 420 | 0 | 409,102 | 409,102 | 0 | 0 | 409,102 | 409,102 | 0 | 0 | 409,102 | 409,102 |
| 202 1980 Technology Transfer     | 0 | 0 | 73,599 | 73,599 | 0 | 0 | 73,599 | 73,599 | 0 | 0 | 73,599 | 73,599 |
| 210 Solar Turbines Test          | 0 | 0 | 30,385 | 30,385 | 0 | 0 | 30,385 | 30,385 | 0 | 0 | 30,385 | 30,385 |
| 211 Dynatherm Test                | 0 | 0 | 38,041 | 39,304 | 0 | 0 | 39,304 | 39,304 | 0 | 0 | 39,304 | 39,304 |
| 212 Princeton Test                | 0 | 0 | 67,291 | 67,291 | 0 | 0 | 67,291 | 67,291 | 0 | 0 | 67,291 | 67,291 |
| 213 Westinghouse Test             | 0 | 0 | 103,644 | 103,644 | 0 | 0 | 103,644 | 103,644 | 0 | 0 | 103,644 | 103,644 |
| 214 General Atomic Test           | 0 | 0 | 12,239 | 12,239 | 0 | 0 | 12,239 | 12,239 | 0 | 0 | 12,239 | 12,239 |
| 242 Improved Tracking Task        | 0 | 0 | 57,312 | 57,312 | 0 | 0 | 57,312 | 57,312 | 0 | 0 | 57,312 | 57,312 |
| 300 1981 Administration           | 2,724 | 4,977 | 83,570 | 69,594 | (8,997) | 0 | 74,573 | 74,573 | 0 | 0 | 74,573 | 74,573 |
| 301 1981 Maintenance              | 3,641 | 7,973 | 283,980 | 260,784 | (15,184) | 0 | 268,756 | 268,756 | 0 | 0 | 268,756 | 268,756 |
| 302 1981 Technology Transfer      | 1,998 | 1,430 | 64,202 | 63,570 | (569) | 0 | 63,633 | 63,633 | 0 | 0 | 63,633 | 63,633 |
| 303 Mirror Improvement            | 6,185 | 1,000 | 6,986 | 6,907 | 6,900 | 13,673 | 27,559 | 27,559 | 0 | 0 | 27,559 | 27,559 |
| 310 Ceramic Tile Test             | 2,565 | 5,000 | 2,565 | 12,207 | 11,848 | 0 | 14,413 | 14,413 | 0 | 0 | 14,413 | 14,413 |
| 22 Total                          | 16,693 | 20,374 | 1,323,942 | 1,297,217 | (6,002) | 15,051 | 1,333,089 | 1,333,089 | 0 | 0 | 1,333,089 | 1,333,089 |

23 Remarks: Summary Report - Costs Include Expenditures and Encumbrances

24 Dollars Expressed In: EXACT

25 Signature of Contractor's Project Manager and Date

26 Signature of Contractor's Authorized Financial Representative and Date

27 Signature of Government Technical Representative and Date

1/7/82
<table>
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<td>$91,087</td>
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23. Remarks: Summary Report - Costs include expenditures & encumbrances * No Cost Extension to March 31, 1982 requested

24. Dollars Expressed In: Exact

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| Item | Total | 13 | 7,656 | 1,333,317 | 1,333,089 | 1,332,317 | 1,332,089 |

Includes expenditures and encumbrances

| Remarks | 24. Dollars Expressed in: Exact

| Signature of Contractor's Project Manager and Date | Signature of Contractor's Authorized Financial Representative and Date | Signature of Government Technical Representative and Date
COST MANAGEMENT REPORT

PURPOSE
A periodic report of the status of actual and estimated accrued costs and their variances from the approved Cost Plan in effect for the contract/Agreement. The report will be used by the Government to monitor the status of the contract, verify the reasonableness of the contractor's invoices, report costs incurred during the reporting period, and estimate costs to be incurred during the subsequent reporting periods.

INSTRUCTIONS
Item 1 — Enter the contract/Agreement Identification as it appears in the official document establishing the contract/agreement.
Item 2 — Enter the inclusive start and complete dates for the reporting period for this report.
Item 3 — Enter the contract/Agreement number as it appears in the official establishing document and append the latest contract modification number.
Item 4 — Enter the name and address of the contractor, organization, or agency, as they appear in the contract/Agreement.
Item 5 — Enter the date of the latest negotiated Cost Plan for this contract/Agreement which serves as a baseline for this report. (See Item 17 of Cost Plan.)
Item 6 — Enter the official start date of the original contract/Agreement.
Item 7 — Enter the official completion date, as of the latest official modification to the contract/agreement as of the end of the reporting period.
Item 8 — Enter the total amount of funds obligated by the Government for this contract/Agreement as of the end of the reporting period.
Item 9 — On cost-sharing contracts, enter the total amount of funds contributed by the contractor or others at the end of the reporting period.
Item 10 — Enter the total number of invoices billed as of the end of the reporting period.
Item 11 — Enter the frequency of billings, i.e., monthly, biweekly, etc.
Item 12 — Enter the number of invoices for which the contractor has received payment as of the end of the reporting period.
Item 13 — Enter the total dollar value of invoices billed by the contractor against this contract/agreement and the latest invoice number as of the end of the reporting period.
Item 14 — Enter the total dollar amount of payments received by the contractor for this contract/agreement as of the end of the reporting period.
Item 15 — Enter the identification numbers relating to the contract line items, tasks, products, or work breakdown structure elements in Item 16.
Item 16 — Enter the same contractually specified reporting categories that are on the associated Cost Plan.
Item 17 — All costs as specified in the contract/Agreement shall be reported for each of the categories listed in Item 16. Enter costs accrued for each reporting category. The costs recorded on this report will be used by DOE managers to verify the reasonableness of the contractor's invoices. It is recognized that there may be subject to additional validation by contractors and that invoice amounts may differ. The actuals should ultimately be reconciled to contractor's invoices.
item 18 — Enter the contractor's best estimate of the cost to perform the work remaining on the contract. The estimates may deviate from the baseline Cost Plan. However, these estimates will be used by DOE to forecast funding requirements and therefore should be as accurate as possible.
item 19 — Enter the distribution of the total contract value into the reporting categories. (Refer Item 13 of the associated Cost Plan.)
Item 20 — Subtract the total contract estimated value (Item 18b) from the total contract cost (Item 19) and enter the difference. Show minus amounts in parenthesis. If the variance exceeds the specified threshold, explain in the Project Status Report.
Item 21 — Enter cost amount of orders obligated but not filled.
Item 22 — Enter the total of all costs and fees for each column. If multiform used, enter total on this form.
Item 23 — Enter the type of Cost Management Report, such as Detailed, Summary, or Cost Management Report by Cost Element and enter appropriate remarks considered necessary to report on this report.
Item 24 — Enter the unit measure for dollar amounts shown, such as exact dollars, hundreds, or thousands. Exact dollars will be reported on each R&D number line.
Item 25 — Signature of responsible contractor, agency or organization project manager, or other technical management stating the reasonableness of the information furnished based upon his personal knowledge of the contract's progress and status.
Item 26 — Signature of the contractor's financial representative and date signify the actual knowledge and reliability of the information furnished. Required only on the Cost Management Report, as well as the Summary Cost Management Report. It is recognized that the two forms will reflect differences between these costs and the reported costs.
Item 27 — Signature of DOE Government Technical Representative exists, indicating DOE's reviewed the report and does constitute any agreement with the contents of the report or affirm any action by the Government in any way.

1 October 1979 through 31 March 1982

C. T. Brown
R. A. Cassanova
P. E. Mackie
D. H. Neale
J. J. Owen
H. L. Teague

Georgia Institute of Technology
Atlanta, Georgia 30332

August 1983

Prepared under Subcontract No. XP-0-9003-1

Technical Monitors: J. Leferdo and B. P. Gupta

Solar Energy Research Institute
A Division of Midwest Research Institute
1617 Cole Boulevard
Golden, Colorado 80401

Prepared for the
U.S. Department of Energy
Contract No. EG-77-C-01-4042

GEORGIA INSTITUTE OF TECHNOLOGY
A Unit of the University System of Georgia
Engineering Experiment Station
Atlanta, Georgia 30332
FINAL REPORT

FY 80 Operations of the United States Department of Energy
Advanced Components Test Facility (ACTF)

October 1, 1979 through March 31, 1982

for

Solar Energy Research Institute
Golden, Colorado 80401
Subcontract No. XP-Ø-9003-1

by

C. T. Brown, Ph.D.
R. A. Cassanova, Ph.D.
P.E. Mackie, Ph.D.
D.H. Neale, Ph.D.
J. J. Owen, III
H.L. Teague, P.E.

Energy Materials and Sciences Laboratory
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
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ABSTRACT

The Advanced Components Test Facility (ACTF) is a 325 kWth central receiver solar thermal test facility that has as its primary purpose the encouragement of research and development in the area of high temperature solar technology. This report covers the operation, maintenance, upgrading and testing activities that occurred at the facility from October 1, 1979 through February 28, 1982. Eight major test programs were undertaken and completed during that time frame. The objective of each program was to evaluate the technical viability of the concept of converting concentrated solar energy into some other useful form of energy such as high pressure steam, hot compressed gas, chemical feedstock, grid-connected electrical power, etc. Additionally, several materials development programs were undertaken. Each program involved the operation of a high temperature central receiver heat exchanger device at or near the facility focus.

Several facility improvements are accomplished, the most important being the design and implementation of mirror focusing hardware to double the facility's peak flux.
I. INTRODUCTION

Under contract to the U. S. Department of Energy, the Georgia Institute of Technology's Engineering Experiment Station operates the Advanced Components Test Facility (ACTF) on the campus in Atlanta, Georgia. The primary mission of the ACTF is to encourage research and development in high temperature solar technology by providing an intermediate size facility for use by the scientific community. This report summarizes the activities conducted under SERI subcontract XP-0-9003-1 for the period October 1, 1979 through March 31, 1982.

1.1 Historical Overview

On January 6, 1976 the U. S. Energy Research and Development Administration contracted with the Georgia Tech Engineering Experiment Station for the development, procurement, and installation of a 400 kW$_{th}$ solar thermal steam generating plant and test facility based on existing technology developed in Italy. The Georgia Tech facility was envisioned as an enlarged version of an existing 130 kW$_{th}$ unit designed by Professor Giovanni Francia of the University of Genoa and located at St. Ilario near Genoa, Italy. Using this existing technology and experience, a 400 kW$_{th}$ facility was built on the Georgia Tech campus with a minimum investment of time and money. The major accomplishments at the ACTF are graphically shown in Figure 1 and briefly described in this section.

The Georgia Tech facility was completed and first operated in the fall of 1977 as a solar-powered, superheated steam generator plant. The system was operated at design conditions of 600° C and 120 atmospheres (1100° F and 1700 psi) during characterization runs.
### HISTORICAL SUMMARY OF ACTF ACTIVITIES

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Figure 1. ACTF Historical Summary/Major Accomplishments.
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Figure 1. ACTF Historical Summary/Major Accomplishments (Continued).
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Figure 1. ACTF Historical Summary/Major Accomplishments (Concluded).
The conversion of the Francia steam plant to a general purpose test facility started in December 1977, with the design of a new central tower to replace the articulating tower supplied as part of the Francia solar steam plant. The new tower provided an increased load capability up to 9072 Kg (20,000 lb) and better access to the experimental area. A scanning heat flux calorimeter system was built and has been used in the characterization of the facility and is available for use by the experimenter. A complete description of the facility is given in Appendix A of this report.

A control room was constructed adjoining the existing office area at the Western edge of the site. This building has a raised "computer room" floor to facilitate the installation of user experimental hardware and controls, and houses the collection and processing portion of the facility's data system. Large windows in the east wall of the new control room permit an unobstructed view of the heliostat field and the central tower.

Subsequent to initial operation and in support of conversion of the facility, additional improvements were made. They were:

- Provision of utility services including air, water, drain, electrical power, and LPG to the tower test platform.

- Installation of pneumatically operated safety shutters directly beneath the focal zone and capable of withstanding full heliostat field radiation for short periods of time.

- Construction of a visitor viewing stand (and parking facility) overlooking the facility.
Addition of a number of other facility refinements such as a pyrheliometer and pyrometer insolation data collection system, and radio communications system.

The first test conducted using the converted facility was the evaluation of a 250 kW Brayton cycle receiver system. The experimental equipment was designed and built by Sanders Associates of Nashua, New Hampshire in 1978. This cavity device incorporated a silicon carbide ceramic honeycomb heat exchanger and produced outlet air at temperatures approaching 1093° C (2000° F). The two-month Sanders Associates check-out and test period ended in October 1978.

In the early phases of operating the facility it became increasingly apparent that the heliostat field as originally installed did not produce an optimum peak flux. Also, control of the location of the focal zone (hour angle) was not adequate to permit the system to be used to its fullest extent. Several mirror field improvements were made early in the facility operating program. Among these deficiency corrections was the procurement and installation of redesigned mirror support frames for the entire heliostat field. These frames were supplied by the mirror field manufacturer at no cost to Georgia Tech or the government. Several improvements in heliostat alignment technique were also implemented. These early investigations not only led to improvements in the capability of the facility, but also focused the attention of facility personnel on the problems associated with operation and maintenance of the heliostat field. The ACTF now has a demonstrated ability to accurately position the solar beam on target.
The Advanced Components Test Facility has emerged as a fully characterized, mid-sized solar thermal testing and development installation. Continued upgrading of the data acquisition and analysis system, the central test tower and the heliostat array have contributed to increased desirability of the facility for use in the solar thermal evaluation of equipment and components. Personnel of the ACTF have gained valuable experience in operation and maintenance of high temperature solar equipment as well as insight into the design of solar conversion systems. Complete supporting services are available as needed including analytical chemistry, mechanical design, machine shop, and graphical data display.

1.2 Current Contract Period Program Objectives

The primary objectives of the current contracted program were to continue and complete the actions undertaken for converting the facility to general purpose form, to provide assistance and support to experimenters requiring a high temperature solar test facility, and to conduct basic and applied research directed towards improving the capabilities of the ACTF.

With respect to these objectives, Georgia Tech operated the ACTF and completed the following specific tasks:

Administration of Facility and Operations

- Perform all administrative tasks necessary to manage the ACTF including facility policy generation, program scheduling, budgetary analysis, reporting to SERI, procurement of authorized equipment and related support functions.
Identify and analyze specific situations that require use of the ACTF but are outside the contract scope of work and submit a proposal to SERI to support the additional work.

Maintenance and Conversion of the Facility

- Maintain the facility in an operational state and perform those modifications necessary to maintain and improve the efficiency and usefulness of the ACTF.
- Complete the procurement, installation and maintenance of specialized computerized data acquisition system hardware and software.

Technology Transfer

- Participate in meetings and discussions with potential facility users to determine the suitability of the facility for proposed experiments and estimate the costs to the associated ACTF test program.
- Organize, sponsor and participate in selected high temperature solar thermal workshops and present papers describing the ACTF and its associated capabilities.
II. GENERAL OPERATION, MAINTENANCE, TECHNOLOGY TRANSFER, AND FACILITY IMPROVEMENTS

The general activities associated with the operation of the ACTF are described in this section and include facility administration, facility improvement, assistance and support of experimenters, and technology transfer to potential experimenters.

3.1 Administration, Operation and Maintenance of the Facility

Throughout the contract period of performance, it was necessary to sustain a level of activity to assure the operational readiness of the facility, provide periodic reports to DOE, implement facility improvements, and assure the safety of all activities. Typical maintenance activities included replacement of damaged mirrors, daily adjustment of mirror field declination during test programs, replacement of worn cables, lubrication of tracking mechanisms, provision for freeze protection during winter months, maintenance of the data acquisition system, and general upkeep of facility grounds. Typical administrative tasks included generation of facility policy, scheduling of test programs, budgetary analysis, procurement of authorized equipment and coordination with SERI for specific situations that required use of the facility but were outside the contract scope of work.

3.2 Facility Improvement

The design and installation of the man/material hoist shown in Figure 2 was completed in October 1981. The hoist is capable of safely transporting personnel, instrumentation and materials from the ground level to landings at the scissors lift and the tower top.
Figure 2. Man/Material Hoist as Installed at ACTF in October 1981.
A significant improvement in the ACTF thermal flux level was achieved with the implementation of innovative mirror shape modifications in March 1982. This effort was concerned with the development of a method by which the individual mirrors are contoured to improve the focused image.

ACTF personnel determined analytically and verified experimentally that the original ACTF technique of supporting a round mirror near its periphery and pulling it down in the center yielded a truncated cone shape which was not an acceptable approximation of the desired spherical or parabolic shape. The result was a very poorly concentrated image from the mirror. An analytical and experimental design effort resulted in a cost effective, mirror mounting and focusing scheme which would approximately double the maximum flux at the focal point. A detailed report of the computer model analysis of the mirror mount, a mirror shape measurement experiment, and a laser scan of mirror slope error is included in Appendix A.

In summary, analytical modeling and experimental data demonstrated that the use of moment arms around the edge of each circular mirror would approximately double the peak flux at the system focus and bring the facility to a state-of-the-art condition.

A specifications package and subcontract for 575 units of mirror improvement hardware were generated. A single unit consisted of approximately 32 moment arms, a wire cable and a turn-buckle device. The hardware was installed on all 550 heliostats and the focus was optimized on each mirror.

Sufficient funding was not available at the time to characterize the results of mirror modification under this contract. Characterization of the
mirror field improvement occurred during March, 1982 under DOE contract DE-AC03-82SF11591. A peak flux of 235 W/cm² was realized compared to 125 W/cm² under similar conditions prior to the improvements discussed here.

3.3 Technology Transfer

Georgia Tech performed a limited number of activities to transfer ACTF technical information to the user community, including the following:


- Attended appropriate review meetings sponsored by DOE and meetings sponsored by the Solar Thermal Test Facility Users' Association.

- Presented ACTF briefings to visitors representing the International Energy Agency, Electric Power Research Institute, Solar Energy Research Institute of Western Australia, Tennessee Valley Authority, and numerous political and foreign dignitaries.

- Conducted an "ACTF Users' Workshop" on September 16 and 17, 1980 which was attended by 32 participants (Reference 2).

- Updated and published the "Advanced Components Test Facility Users' Manual" in March 1981 (Reference 3).
III. TEST PROGRAMS

A number of test programs were conducted during the time period October 1, 1979 through March 31, 1982 and are listed in Figure 3. Many of the test programs resulted from research solicitations by the Solar Thermal Test Facilities Users Association (STTFUA) and were funded by the Department of Energy. Georgia Tech provided design and hardware support to the principal experimenter in addition to its expected facility support role. Some experiments were Georgia Tech stand alone efforts. The following subsections summarize the test activities which occurred during the contract time period. Detailed reports are available from the STTFUA, the principal experimenter or the DOE and are referenced in each subsection.

4.1 High Temperature Solar Steam Generator (Reference 4)

Experimenter: Solar Turbines International

In order to enhance the attractiveness of a solar thermal steam power cycle, it was desirable to operate the system at high temperatures and to use high efficiency conversion systems based on Rankine, Brayton or Stirling cycles. This experiment examined the critical design problems associated with a solar thermal central cavity receiver/steam generator combination. The test program objectives were aimed at obtaining critical design data that could be applied to the high temperature, once-through, monotube steam generator concept and included:

(1) characterization of the movement of the dryout zone at various operating outlet steam temperatures, pressures and thermal energy inputs.

(2) characterization of the tube wall temperature variation at various operating pressures, temperature and steam/water zones.
<table>
<thead>
<tr>
<th>Receiver Type</th>
<th>Experimenter</th>
<th>Operating Conditions/Comments</th>
</tr>
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<tbody>
<tr>
<td>Steam Generator</td>
<td>Solar Turbines International</td>
<td>25 kW single-pass-to-superheat, cavity; outlet conditions: 10.3 MPa, 815°C (1500 psig, 1500°F) 32 hours of solar test; 12 startups.</td>
</tr>
<tr>
<td>Fluidized Bed</td>
<td>Westinghouse Electric Company</td>
<td>Direct absorption receiver; low pressure fluidizing air and heat transfer fluid, many bed materials evaluated; 78 hours of operation; outlet temperature to 538°C (1000°F); 89 steady state data points.</td>
</tr>
<tr>
<td>Flash Pyrolysis</td>
<td>Princeton University</td>
<td>Direct absorption by moving biomass in quartz reactor; steam or CO₂ carrier gas; 4 different types of feedstock; chemicals and fuels production demonstrated.</td>
</tr>
<tr>
<td>Sodium Heat Pipe</td>
<td>Dynatherm Corporation</td>
<td>Open cavity array of 7 heat pipes; 970°C (1780°F) operating temperatures; 11.5 kWh per heat pipe; 25 hours of solar operation; 45 steady state data points.</td>
</tr>
<tr>
<td>Non-Cooled Cavity</td>
<td>Georgia Tech</td>
<td>Cavity type kiln operated at 1100°C (2012°F) to fire glazed and unglazed wall tile.</td>
</tr>
<tr>
<td>Non-Cooled Cavity</td>
<td>Boeing Engineering and Construction</td>
<td>Evaluation of ceramic materials and fabrication techniques to 1538°C (2800°F); 50 hours of solar exposure.</td>
</tr>
<tr>
<td>Stirling Engine</td>
<td>Georgia Tech, United Stirling</td>
<td>Cavity receiver and grid connected electrical generator; output power to utility grid of up to 18.8 kWe; helium working gas; 720°C (1328°F) operating temp; 175 kW hrs delivered to grid.</td>
</tr>
<tr>
<td>Thermionic Converter</td>
<td>Georgia Tech, Thermo Electron Corp.</td>
<td>Brief test of single diode; unit performed satisfactorily; start up and thermal shock not a problem.</td>
</tr>
<tr>
<td>ACTF Flux Scanner</td>
<td>Georgia Tech</td>
<td>16 heat flux maps collected behind a water-cooled aperture; data used to design LBL optical cavity receiver.</td>
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Figure 3. List of ACTF Test Programs for the Period October 1, 1979 Through March 31, 1982.
provide data for performance correlation.

A Solar Turbines International 25 kW high temperature, high pressure solar steam generator (Figure 4) tested during March and April 1980 demonstrated that steam could be produced at 771°C and 10.7 MPa (1420°F and 1550 psia) under steady state conditions. The receiver was of a downward facing cavity design and the design concept involved only the indirect solar testing of the fluid-containing Hastelloy tubing heat exchanger. Numerous thermocouples were used to monitor the location of the water/steam interface and to ascertain the circumferential temperature gradient of the boiler tubing. The test program successfully demonstrated that generation of high temperature/high pressure steam in a once-through solar thermal steam generator in the region of 815°C and 10.3 MPa (1500 °F and 1500 psia) is feasible.

4.2 Fluidized Bed Solar Receiver (Reference 5)

Experimenter: Westinghouse Electric Corporation

Essential to the development of solar thermal technology is the need for a simple, versatile, and efficient receiver which can be adapted to a variety of potential applications including process heat, power generation, and synfuels production. The fluidized bed has excellent heat and mass transfer characteristics that make it adaptable to diverse processes such as coal gasification, fossil fuel production and desulfurization, steam generation, and polymer coatings application. The same characteristics offer excellent potential for use of fluidized beds in solar conversion processes. The major objective of the test program was to demonstrate the operability of a fluidized-bed solar receiver on as large a scale as
Figure 4. Flow Schematic for Solar Turbines Steam Generator Experiment
practical so that future scale-up would be more reliable. The receiver was representative of a specific, simple application - the generation of large quantities of heated atmospheric air for industrial process use.

The proof-of-concept demonstration for the application of fluidized bed technology to solar thermal receivers was carried out during May and June, 1980. The basic receiver design, shown schematically in Figure 5, was of Westinghouse origin and consisted of a 30.48 cm (12 inch) diameter by 1.22 meter (4 foot) long transparent quartz tube filled with bed material. Compressed air, fed from below through a plenum, was used to fluidize the bed. The bed, placed at the facility focus, was directly heated by concentrated solar radiation. Bed materials tested during over sixty hours of operation included copper shot, various sizes of sand, silicon carbide, alumina, and mixtures of these materials. Exit gas stream temperatures of 538°C (1000°F) were reached. Figure 6 shows the receiver in operation during solar testing.

Thermally and mechanically, the receiver performed as designed and demonstrated the use of a fluidized bed as a solar thermal receiver. A basis was established by which more efficient designs for specific applications can be devised by standard solar and chemical engineering methods, such as the use of a cavity to enclose the bed.

4.3 Flash Pyrolysis of Biomass (Reference 6)

Experimenter: Princeton University

The flash pyrolysis of biomass requires a source of high quality heat. Solar radiation is an attractive means of rapidly heating the biomass and thereby achieving flash pyrolysis. When used in this fashion the solar heat input is effectively stored in the form of a fluid fuel. The objective of
Figure 5. Westinghouse Fluidized Bed Receiver System Schematic (Drawing supplied by Westinghouse)
Figure 6. Westinghouse Fluidized Bed Receiver
the experiment was to investigate the use of concentrated solar radiant energy for sustaining two characteristic temperatures (gas and solid) in an axially concentric, vertical, window transport reactor.

The reactor (Figures 7 and 8) was a vertically oriented quartz tube fitted with a spherical joint at each end. The reactor system tested at the ACTF included a variable feed rate screw feeder, an electric steam generator, a volatiles condenser system, a gas flow measuring and sampling assembly and five water-cooled radiation shields.

Of particular importance was the measurement of gaseous and liquid product yield as a function of type of biomass, type of carrier gas, solar flux concentration, and biomass feed rate. Biomass material was heated directly by allowing it to fall under gravity through the facility focus. The biomass material and an upward moving carrier/reaction gas were contained in a 2.54 cm (one inch) diameter quartz tube. Gaseous, liquid, and solid samples were collected, analyzed, and used to generate a system mass balance. Four feed stocks were used: wood sawdust, ground corncobs, cellulose, and lignin.

The ACTF experiments provided evidence of the selective production of a hydrocarbon rich synthesis gas from the biomass feed. The ability of the flash pyrolysis reactor to adapt to changing insolation conditions was clearly demonstrated during the tests. The experiments pointed out the need for careful attention to two-phase flow affects in future reactor designs in order to achieve complete pyrolysis and for research to inhibit the devitrification of quartz in a chemically reactive environment at the focus of a solar furnace.
Figure 7. Arrangement of Experimental Apparatus for Princeton-Georgia Institute of Technology Flash Pyrolysis of Biomass Test Program.
Figure 8. Princeton Flash Pyrolysis Reactor as Installed on ACTF Tower.
4.4 Dynatherm Heat Pipe Receiver (Reference 7)

Experiment: Dynatherm Corporation

Heat pipes offer inherent advantages for efficiently transferring concentrated solar thermal energy into gases which may be used for Brayton cycle power generation. Due to their heat transfer characteristics, heat pipes are capable of reducing receiver temperature gradients, minimizing the receiver surface area exposed to the solar flux and providing receiver redundancy.

The overall objective of the test program was to characterize the performance of a representative portion of a heat pipe receiver with actual solar input under conditions which typify the conceivable operating conditions for a full scale receiver.

The heat pipe module was tested at the ACTF in October 1980. The receiver module (Figure 9) consisted of seven full-scale sodium heat pipes arranged in a triangular pattern with adequate shielding and ceramic insulation. The heat output end of each heat pipe was enclosed by a gas-gap calorimeter which provided a convenient means of cooling the pipes as well as measuring heat pipe power throughput. Operating temperatures up to 970° C (1780° F) and output power levels up to 11.5 kWth per heat pipe were realized. The tests demonstrated that:

- heat pipes are capable of meeting the steady state performance requirements of a baseline central receiver gas heater for a Brayton cycle,
- transient performance capabilities of the heat pipes exceed the requirements placed on them by transient receiver operation
Figure 9. Dynatherm Liquid Sodium Heat Pipe Receiver Under Solar Test at ACTF.
during hybrid power plant start-up and cloud induced transients, and

- loss of a single heat pipe in the receiver does not severely degrade the receiver's performance.

4.5 Solar Energy Treatment of Ceramic Tile (Reference 8)

Experimenter: Georgia Institute of Technology

Manufacture of ceramic tile is an energy intensive process requiring temperatures of about 1100° C (2012° F) through part of the firing cycle. Presently, gas and oil fossil fuels provide energy, including the high temperature radiant heat, required for ceramic tile manufacture. The use of solar energy systems to fire ceramic tile could conceivably: (1) reduce consumption of fossil fuels, (2) improve overall energy efficiency, and (3) improve the quality of the product. The objective of this program was to show that solar energy could be used to translate ceramic wall tile from the unreacted raw state to the completely reacted fired state.

A domed-top cylindrical cavity (Figure 10) with a white refractory fiber lining provided diffuse reflection of the concentrated solar beam onto the upper surface of the unfired wall tile. The tile was placed directly on the cavity floor in a circular pattern, centered at 45 degree intervals so that eight tile could be fired at one time.

The experiment identified potential problems using a direct firing configuration such as thermal shock and uneven shrinkage and glaze maturity across individual tiles. Some acceptable tiles were fired that met the flatness standard of the comparable commercially fired tile and some came
Figure 10. Cross-Sectional View of Cavity Used for Solar Firing of Ceramic Wall Tile.
very close to matching the glaze color of the commercial tile. An alternate air heat exchanger system was recommended to fire the tile by convection rather than direct radiation.

4.6 Refractory Insulation Evaluation

Experimenter: Boeing Engineering and Construction Company

A joint program with Boeing Engineering and Construction Company to study lifetime and failure modes of cavity wall insulation materials was completed in July 1981 after approximately 50 hours of sample exposure at temperatures to 1538°C (2800° F). The program objective was to expose samples of high temperature insulating materials to concentrated solar energy and evaluate the survivability of each by monitoring temperatures, flux levels, direct insolation, and physical appearance. Three of the test specimens were arranged to measure the heat trapping effects of various width cracks in insulating boards. The fourth test specimen consisted of a typical section of composite insulation and was arranged to simulate a typical back-wall section of the Boeing Bench Model Solar Receiver. The results of this test series will feed into the Boeing/EPRI 1 MW Full System Experiment presently scheduled for the CRTF.

4.7 Solar Stirling Engine

Experimenter: United Stirling and Georgia Institute of Technology.

Funded by United Stirling of Sweden

The first test program was conducted in August, 1980 using a United Stirling 4-95 engine with an alternator (see Figure 11). The solar receiver for the engine consisted of a standard United Stirling head assembly inside
Figure 11. United Stirling 4-95 Stirling Engine and Solar Receiver Assembly Ready for Test at the ACTF.
a refractory lined cavity of Georgia Tech design. 440 volt, 3 phase power was first supplied to the utility grid on August 12, 1981. Figure 12 shows the Stirling Engine under solar test at ACTF.

The second test program was conducted in November 1981 using a 4-95 power conversion unit and was designed to evaluate various solar cavity heater head assemblies. Testing began on November 11, 1981 and was completed on November 22, 1981. A peak power of 18.8 kWe was delivered to the utility grid on November 18, 1981. Total energy delivered to the grid during the August and November tests was 175 kilowatt hours.

The receiver hardware was subsequently taken to JPL's Edwards test site for further evaluation in a tracking dish geometry.

4.8 Thermionic Converter (Reference 9)

Experimenters: Funded and conducted by Georgia Tech and Thermo Electron Corporation

Georgia Tech and Thermo Electron conducted a brief solar test of a Thermo Electron thermionics converter on October 20 and 21, 1981. The device operated as expected and controlled well. Previous concerns with respect to thermal shock proved unfounded.

4.9 Flux Maps for LBL Small Particle Heat Exchanger Design

Experimenters: Lawrence Berkeley Laboratory

A series of flux scans behind selected apertures was undertaken in May 1981 in support of the anticipated LBL small particle heat exchanger tests at the ACTF. The purpose of the flux scans was to provide LBL with flux
Figure 12. United Stirling 4-95 Engine and Solar Receiver Under Test at the ACTF.
density information required for the thermal/optical design of their cavity receiver. This information was critically important to the project since the cavity walls were to be constructed from non-cooled stainless steel. A detailed report of this activity is included in Appendix B.

4.10 Pretest Support for General Atomic Receiver

Experimenter: General Atomic Company

General Atomic has developed a thermochemical water-splitting cycle which employs the decomposition of $\text{H}_2\text{SO}_4$ as part of the process. General Atomic received a contract from the Solar Thermal Test Facilities Users' Association to design and operate a system for decomposing $\text{H}_2\text{SO}_4$ using solar energy. Georgia Tech participated in pretest planning activities in anticipation of conducting a test program at the ACTF. These activities included attending a program review meeting on June 13 and August 1, 1980, design and fabrication of a water-cooled shield and flux control paddle, and conduct of a preliminary safety review of the sulfuric acid system design. During September 1980 the ACTF was informed that the GA program would be deferred prior to testing at the ACTF; test preparations were terminated in an orderly fashion.
IV. CONCLUSIONS

The Advanced Components Test Facility was operated and maintained in a full state of readiness during the contract period. Additionally, several facility improvements were accomplished, including the design and installation of an experiment tower personnel hoist and the design and installation of important mirror focusing hardware. Facility characterization studies accomplished after the termination of this contract showed that incorporation of the mirror focusing hardware approximately doubled the facility's peak flux.

Eight major solar thermal test programs were planned and accomplished during the contract period. Seven of the eight programs involved an off-site researcher as principal investigator. Six of the eight involved a major industry participant; the remaining two were joint with a university. One of the programs, the test and evaluation of a solar heated Stirling engine, was financed in total by United Stirling, a European industry.

The United Stirling test program accomplished the following firsts:

- first time that a solar heated Stirling engine provided electric power to a utility grid, and
- first time in the United States that a solar central receiver facility provided electric power to a utility grid.

The commercialization of the solar heated Stirling engine concept is being continued by United Stirling and Advanco Corporation.

In addition to the eight test programs, coordination activities were initiated for three other programs (General Atomic, University of New Hampshire, and Lawrence Berkeley Labs). In some cases, hardware support was underway.
Finally, an ACTF User's Workshop was held; proceedings of this workshop are available from Georgia Tech EES/EMSL.

In conclusion, the ACTF served as a valuable, mid-sized solar thermal test facility during the contract period; its primary thrust being in the areas of materials development and receiver component test and evaluation.
APPENDIX A

DESCRIPTION OF THE
ADVANCED COMPONENTS TEST FACILITY
The Advanced Components Test Facility (ACTF) is a tracking mirror solar concentrator system operated by the Georgia Institute of Technology's Engineering Experiment Station (Georgia Tech EES) for the U. S. Department of Energy (DOE). This facility, shown in Figure A1, is located on the campus of Georgia Tech in Atlanta, Georgia. Its primary purpose is to encourage research and development in high temperature solar thermal technology. It is a flexible and convenient test facility accessible to all qualified research and development organizations - large and small, public and private.

The ACTF is particularly well suited for testing:

1. Central receiver components/systems,
2. High temperature insulation and structural materials,
3. High flux direct energy conversion components/systems,
4. High temperature solar chemical reactor components/systems, and
5. Total energy systems using solar energy alone or in combination with fossil fuel energy (hybrid) systems.

Major elements of the facility include a solar concentrating mirror field, a rigid structural steel test tower located at the geometric center of the mirror field, an experiment support platform (tower deck) mounted on top of the tower, an instrument and control building, a computerized data collection system, and a heat rejection system. The mirror field consists of 550 heliostats (tracking mirrors) that reflect and concentrate direct solar radiation to a stationary focal zone centered in the aperture of the elevated tower deck. The maximum solar radiative flux available at the
Figure A1. U.S. Department of Energy Advanced Components Test Facility (ACTF), located on the Georgia Tech Campus, Atlanta, Georgia.
focus is approximately 235 W/cm² (7.44 x 10⁵ Btu/ft²-hr)* representing a total power input of 325 kW (1.11 x 10⁶ Btu/hr)* based on a nominal local insolation of 900 W/m² (285 Btu/ft²-hr).

2.1 Site Location and Layout

The Advanced Components Test Facility occupies approximately 6000 m² (1.5 acres) on the campus of Georgia Tech in Atlanta, Georgia. Major elements of the ACTF include a tracking mirror (heliostat) field, a tower-mounted experiment platform (tower deck), a control building, a heat rejection system, and a computerized data collection system. Figure A2 depicts the facility site plan and shows the locations of all major components as well as overall site dimensions.

2.2 Mirror Field

The mirror field consists of 550 heliostats deployed as shown in Figure A3. The mirrors are individually aimed and focused at the center of a 2.44 m (8 ft) square aperture in the tower deck. Each mirror is fastened to a polar axis mount that permits individual manual declination as well as collective tracking of the sun to maintain a stationary focus in the platform aperture. An east-west section view of the field is also presented in Figure A3 to depict the envelope of focused solar radiation. It should be noted, however, that mirror distribution with respect to the focal zone is not completely symmetric. Potential users seeking to model focal zone radiation patterns should contact the ACTF Director for flux distribution details.

The mirrors are driven in unison with a multiple chain/sprocket/torque tube linkage. This linkage is shown schematically in Figure A4. The system

*Time of day and seasonally dependent.
LEGEND
+ Focus 69.5' (21.2 m) Above Plane of Mirror Field

1 Mirror Field
   Support Structure
   & Outermost Mirrors
2 Tower Deck
3 Control Building
4 Heat Rejection System and Tower Water Supply Pump
5 Mirror Drive Motor
6 Offices
7 Asphalt Pavement
8 Concrete Pad
9 Concrete Access Trench

Figure A2. ACTF Site Plan.
PLAN VIEW OF MIRROR FIELD
(Actual Mirror Distribution)

SECTION A-A (The Envelope of Reflected Rays Which Lie in the East-West Vertical Plane Through the Focus.)

Figure A3. ACTF Mirror Field Physical and Optical Specifications.
Figure A4. ACTF Mirror Field Drive Train.
drivers are two independent electric motors. One motor is used for coarse translation (slewing) of the mirrors to focus the concentrated solar beam on the test object (mounted in the tower deck aperture). The second motor is used for mirror field tracking after the solar beam has been centered. The tracking motor is controlled with an electronic counter. Tracking precision is monitored manually with a lens-target optical bench arrangement mounted on one of the mirror field polar axis mounts.

In an emergency, either of the two electric motors can be used to drive the solar beam away from the test object. In addition to the primary electric motors, an air motor is coupled to the drive train with a pneumatically engaged clutch and provides for translation of the mirror field in the event of an electrical power failure. A volume of air sufficient to move the mirror field to a safe position is stored in this system at all times.

The mirrors are circular, second-surface reflectors, 111 cm (43.7 in.) in diameter, and are made from 3 mm (0.125 in.) thick glass. Each mirror is simply supported on a circular ring near its outer edge and is rigidly fastened to the polar axis mount at its center. Mirror focusing is achieved by a moment producing band assembly on the circumference of each mirror. The polar axis mounts and support structures for the mirrors are shown in Figure A5.

2.3 Test Tower

The central test tower, shown in Figures A1 and A6, is a rigid, guyed, steel structure capable of supporting a 9100 kg (20,000 lb) experimental package. The mirror field aim point is centered in the tower deck aperture 15.2 cm (6 in.) above the deck surface. The 2.44 m (8 ft) square aperture
Figure A5. ACTF Heliostat Detail
Focus is centered in opening. Clear opening in deck grating is 8.0' (2.44 m) sq.

Tower base is 14.0' x 14.0' (4.27 m) measured from column center to column center.

Elevator is mounted on west face of tower.

Isometric View of ACTF Tower Deck

East Elevation of Test Tower

Figure A6. ACTF Test Tower
is bordered by structural steel I-beams with a 10.2 cm (4 in.) width of exposed flange for hardware mounting. Four locating points on 2.73 m (8 ft, 11-3/8 in.) centers at the aperture corners are provided for apparatus positioning. An experiment in the focal region can be alternately exposed to and isolated from the concentrated beam by operating a pair of shutters (Figure A6). The shutters consist of nesting panels which are pneumatically driven and can be operated either from the main control room on the ground or from within the instrumentation building on the tower deck.

Access to the tower platform is provided by a man/material elevator with a load capacity of 454 kg (1000 lb). A 454 kg (1000 lb) capacity hydraulically operated scissors lift provides access to the underside of hardware mounted in the deck opening (Figure A6). Hardware that exceeds the weight or size limitations of the elevator is lifted to the tower deck with a rented mobile crane.

A small instrumentation building is located on the south side of the tower deck (Figures A1 and A6). The building is heated and air conditioned and permanently houses the data collection system analog interface unit, a thermocouple reference oven, two-way radio and closed circuit television equipment, weather monitoring hardware, an electrical distribution panel, and a shutter control panel. Limited additional space is available for housing the necessary tools, hardware, and instrumentation associated with specific tests.

The following service utilities are supplied to the tower platform for use by the experimenter:
1. A potable water source supplied by a 5.08 cm (2 in.) I.D. line
   Capacity: 13.6 m$^3$/hr at 345 kPa gage, 4.5 m$^3$/hr at 552 kPa gage
   (60 gpm at 50 psig, 20 gpm at 80 psig).
2. A gravity drain line with a 10.2 cm (4 in.) I.D.
3. 110 VAC, single-phase, 100 amp service.
4. 208 VAC, three-phase, 150 amp service.
5. 2.54 cm (1 in.) I.D. copper line for fluid transport from
   ground level.
6. 7.62 cm (3 in.) I.D. conduit from tower instrumentation house
   to main control room for user instrumentation wiring.
7. 50-channel hard-wired controls link between main control room
   and tower instrumentation house.
8. Compressed air; 17 m$^3$/hr at 860 kPa gage (10 SCFM at 125 psig).
9. 2-inch, SCH 40 galvanized steel air line with pressure reducing
   regulator and low pressure alarm (for use with ground-based
   rental compressor if additional compressed air is required).

2.4 Control Building

The control building, shown in Figure A7, provides a central location
for ACTF staff and user personnel to monitor and control tests. Work
stations are reserved in this building for the Experiment Operator (user),
the Experiment Director (user), the Test Director (ACTF), the Mirror Field
Operator (ACTF), and the Data System Operator (ACTF). The user's station is
located in the northeast corner of the building and is furnished with
modular desks. All ACTF and user test participants are afforded a clear
view of the test tower and mirror field from their respective stations
through the east windows.
Interior of Control Building Showing ACTF Data Collection System and View Through Window to Test Tower and Mirror Field.

LEGEND:

USER - User station for experiment operation and control.

CONTROL - ACTF station for mirror field and shutter control.

DATA - Mini-computer location (main frame).

DOCK - Loading dock.
Door clearance = 6.7 ft H x 5.5 ft W (2.04m x 1.68m)

+++ Conduit Access in sub-floor (reserved for user cables).

Figure A7. ACTF Control Room.
The control building also houses the ACTF computer data system including various output devices for real-time inspection of test data. In addition, local weather and insolation instrument displays are available along with closed circuit television displays from tower and field mounted cameras. Communications between the control building, the tower deck, and the mirror field are maintained with portable, two-way FM radios.

The control building has a raised steel floor with removable access panels capable of supporting loads up to 1220 kg/m² (250 psf). Total available floor space in the building is 51.3 m² (552 ft²). Cables can be routed through cutouts in the floor panels to underground conduits connecting the sub-floor space with the tower and mirror field. An entry vestibule connects the control building to the main offices and to a loading dock. User equipment can be brought from the loading dock into the control building through double doors measuring 1.68 m x 2.04 m (5 ft, 6 in. x 6 ft, 8 in.) clear. Building temperature and humidity are controlled with a heating/cooling unit rated for computer room duty.

2.5 Data Collection and Reduction System

A computerized data collection system is available at the facility to record, condition, display and reduce user data. This system, shown schematically in Figure A8, consists of two PDP-8/a minicomputers,* a twelve-bit multiplexed A-to-D converter, a graphics terminal to allow real-time display of data, two disk-type mass storage devices, and a hard-copy graphics terminal. The first of the two computers is located in the

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*Digital Equipment Corporation, Maynard, Mass.
Figure A8. ACTF Data Collection System Schematic.
control building and serves as the master control for the system. The second computer, located in the tower deck building, serves as an interface to a Digital Equipment Corporation Industrial Control Subsystem (ICS) and is configured to allow unattended operation. The ICS subsystem is an analog-to-digital and digital-to-analog converter/multiplexer system currently capable of accepting up to 120 channels of analog input. These channels can be scanned at rates up to 200 channels/second, with a single channel capable of being scanned 20 times/second. All scanning routines are under computer software control.

The multiplexed input to the system is fed to a programmable gain amplifier. The output of this amplifier is made available to the A-to-D converter. Thus, each input channel can be operated over a wide range of sensitivities. A full scale input range of from ±10 mV to ±10 V in eight overlapping steps is available for each channel. The single bit resolution of the system is approximately 5 microvolts.

System hardware and software have been designed to be flexible and to address a wide range of experiments. Input to the system can be in the form of analog electrical signals from essentially any type of transducer: strain gage, thermocouple, pressure sensor, flow rate sensor, etc. Signal conditioning equipment presently available at the facility includes a 52-channel thermocouple reference junction and 40 channels of strain gage (Wheatstone) bridge completion circuitry. Standard flow rate, pressure, and fluid level transducers can be accommodated without the need for additional signal conditioning.

Under normal conditions the digitized raw data is stored on high speed magnetic disk for later retrieval. In addition, the data can be converted
to appropriate engineering units and displayed in real-time on the video terminal. A more detailed description of the computerized data collection system is available in the document *Advanced Components Test Facility Real-Time Data Collection System Interface Information* (Ref. 1).

### 2.6 Scanning Flux Calorimeter System

A water-cooled scanning calorimeter system for measuring solar radiation intensities at or near the mirror field focal plane is available at the ACTF (Figures A9 and A10). This device can be mounted at various levels in the tower deck aperture and has been operated to map heat flux distributions in horizontal planes within the test region. The resulting maps are available to potential users.

The scanner houses forty-five Gardon gage calorimeter transducers (Hy-Cal model C-1112-B*) mounted as detailed in Figure A11. A rectilinear matrix of flux values can be measured with scanning rates up to 0.46 m/min (1.5 ft/min) allowing a complete coverage of the 1.83 m (6 ft) square data plane in approximately four minutes.

The ACTF flux scanner is also available for use in conjunction with visiting experimenter's test programs. Specifically, the scanner can be operated to measure flux distribution and total power incident on the user's receiver hardware. Occasionally, a particular experimental configuration has precluded use of the standard scanning calorimeter. For these cases, ACTF personnel have designed, built and operated a number of custom scanning devices. Potential users are encouraged to confer with the ACTF Director during the earliest stages of conceptual design to determine if flux mapping requirements can be met with existing scanning hardware or whether new

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* Hy-Cal Engineering, Santa Fe Springs, California.*

50
Figure A9. ACTF Scanning Calorimeter System

Figure A10. ACTF Scanning Calorimeter System Mounted in Tower Deck Aperture.
· Low Range Calorimeter (~150 watts/cm²)
+ High Range Calorimeter (~250 watts/cm²)

NOTE: Each calorimeter is individually calibrated.

Figure A11. ACTF Heat Flux Scanning Calorimeter Bar Detail.
hardware design should be included in the program. A typical focal zone flux distribution is shown in Figure A12.

2.7 Cooling Tower

Most experiments at the ACTF require modest flows of cooling water. Cooling needs are usually met by the boosted municipal water supply available on the tower and heat is rejected by dumping all heated water to a drain. If higher flows are required, however, a 550 kW (125 ton nominal) water-to-air cooling tower is available at the site (see Figure A1 for site location). The tower is supplied by a 68 m³/hr (300 gpm), 690 kPa gage (100 psig) centrifugal water pump and is equipped with basin heaters to permit operation in cold weather.

2.8 Weather Station

The ACTF is equipped with insolation and weather monitoring instrumentation. Direct and total insolation readings are continuously monitored and recorded. Integrated insolation data for the period January-December, 1981 is shown in Figure A13. In addition, wind speed, wind elevation, wind direction, and local barometric pressure and temperature measurements are available for observation and recording.

2.9 Miscellaneous Instrumentation, Hardware, and Services

The following items are typical of those available at the ACTF for support of tests:

1. Closed circuit, remotely operated television system (black and white). Two tower-mounted cameras, one field-mounted camera with zoom lens.

2. Video tape recording unit(s).

3. Conventional 35 mm camera with system of interchangeable lenses.
Figure A12. Typical ACTF Focal Zone Flux Distribution.
Figure A13. 1981 Insolation Data.
4. Infrared pyrometer system (Barnes IT-7).

5. Infrared television system (AGA Thermovision).

In addition, the ACTF maintains a small inventory of various flow rate, pressure, and temperature sensing devices, voltmeters, strip chart recorders, and other instrumentation commonly employed in experimental work. However, users are normally required to provide all hardware, instrumentation, transducers, and controls necessary to operate their tests.

2.10 Experimenter Support Capabilities

ACTF users may desire to utilize the additional resources available within the Energy and Materials Sciences Laboratory, other laboratories of the Georgia Tech Engineering Experiment Station and other administrative units on the Georgia Tech campus. The Experiment Station has a research staff of over 600 people working in such fields as analytical chemistry, electronics, materials sciences, and nuclear sciences. In addition, schools of Aerospace, Chemical, Ceramic, Civil, Electrical, Mechanical, Nuclear and Textile Engineering are located on the Georgia Tech campus and are administered by the Institute. The Facility Director will assist in establishing contacts within the Georgia Tech community for users requesting such assistance.

The Energy and Materials Sciences Laboratory has broad technical resources for supporting the needs of the experimenter related to analytical chemistry, microstructural analysis of materials, mechanical design and machine shop fabrication.

The analytic capabilities include:

1. Scanning electron microscopy
2. Transmission electron microscopy
3. Optical microscopy and metallography
4. Electron probe microanalysis
5. X-ray diffraction and x-ray spectroscopy.
6. Transmission and reflection electron diffraction
7. Optical spectrochemistry
8. Precision measurement by optical interferometry
9. Liquid chromatography
10. Plasma emission spectroscopy
11. Ratio recording infrared spectrometer
12. Graphite furnace atomic adsorption spectrometer
13. Gas chromatograph/mass spectrometer with computerized data analysis
14. UV and visible range spectrophotometers
15. Elemental analyzers
16. TGA thermal system
17. Surface area-pore volume analyzer

Mechanical design support is also available for experiments which require hardware for interfacing with the ACTF or adaptation to the thermal environment of the focal zone. A machine shop on the campus is well equipped with modern welding, forming and machining equipment and space is available for large assemblies in a high bay area.

A glass fabrication service is also available on the campus and is staffed by professional glass blowers who can fabricate special glassware needed for research projects.
APPENDIX B

DESIGN AND ANALYSIS OF MIRROR
SHAPE HARDWARE
BI. INTRODUCTION

The focal properties of ACTF mirrors were suspected of being in error after substantial improvements in mirror aiming and tracking yielded minimal improvement in peak flux. The peak flux was approximately 125 watts per square centimeter, well below the design flux of 220 W/cm². Initial efforts were directed towards verification of a focus problem and determination of its origin. Based on the work, a new design was developed and tested. The major steps in this program were:

- Shape Analysis
- Shape Measurement
- Mirror Laser Scan
- Optical Analysis
- Preliminary Design
- Experimental Evaluation
- Finite Element Analysis
- Final Design

This sequence is a near chronological reconstruction of the actual course of the project. Each of these steps is described in detail in the remaining chapters of this report.
B2. SHAPE ANALYSES

This step included an analytical determination of the original mirror shape and the effect of support alterations on mirror shape. Prior to initiation of research, it was not known whether the poor performance was caused by incorrect mirror shape or low glass quality. Therefore a parallel effort was undertaken to estimate slope error contained in both drawn and float glass types. This work is documented in Section B3 of the report.

A mathematical model of the original mirror configuration was designed using small displacement structural theory. Several models were considered to achieve the best combination of loads, supports, and boundary conditions. The selected approach utilized a simply supported outer edge, a concentric ring load to represent the support ring, and a central point load to approximate the pull down plate. Mirror weight was explored and found essential to the analysis since the sag due to the weight was almost equal to the total displacement required.

Equations describing mirror displacement were developed for the following loading conditions:

- Distributed
- Concentric
- Central point
- Edge moment
- Buckling

These equations are shown in Exhibits B2-1 through B2-5. The first three were used to approximate the original mirror shape, with superposition utilized to combine results. The computer code developed to facilitate calculations is contained in Exhibit B2-6. Results for the original mirror

60
\[ W = \frac{q(a^2 - r^2)}{6400} \frac{5 + \gamma}{1 + \gamma} a^2 - r^2 \]

where: \( W \) is displacement at radius \( r \)
\( \gamma \) is Poisson's ratio, 0.23
\( a \) is radius, 21.9 inches
\( D = \frac{Eh^3}{12(1 - \gamma^2)} \)
\( E \) is Young's Modulus, 9.8 x 10^6
\( h \) is thickness, 0.125 inches

Substituting for this problem:
\[ W = (978000 - 2520 r^2 + r^4)/978,000 \]

\[ \frac{dw}{dr} = (-5040 r + 4 r^3)/978,000 \]

Assuming \( q = 0.0111 \text{ lb/in}^2 \)
Concentric Load

\[ 0 < r < c \]

\[ W = \frac{p}{8\pi D} \left( a^2 - c^2 \right) \left( 1 + \frac{1}{2} \frac{1 - \gamma}{1 + \gamma} \frac{a^2 - c^2}{a^2} \right) + 2c^2 \ln \frac{c}{a} + \]

\[ \frac{p}{8\pi D} \frac{c^2 - r^2}{(1 + \gamma)} \left( 1 - \gamma \right) \frac{a^2 - c^2}{2a^2} - 1 + \gamma \ln \frac{c}{a} \]

\[ c < r < a \]

\[ W = \frac{p}{8\pi D} \left( a^2 - r^2 \right) \left( 1 + \frac{1}{2} \frac{1 - \gamma}{1 + \gamma} \frac{a^2 - c^2}{a^2} \right) + \left( c^2 + r^2 \right) \ln \frac{r}{a} \]

\[ r = 0 \]

\[ W = \frac{p}{8\pi D} \ c^2 \ln \frac{c}{a} + \left( a^2 - c^2 \right) \left( 1 + \frac{1}{2} \frac{1 - \gamma}{1 + \gamma} \right) \]

Normalizing and substituting

\[ 0 < r < a \]

\[ W = \left( 479.6 - c^2 \right) 1 + \frac{0.313}{479.6} \left( 479.6 - c^2 \right) + 2c^2 \ln \frac{c}{21.9} + \]

\[ \frac{c^2 - r^2}{1.23} \ rac{0.385}{479.6} \left( 479.6 - c^2 \right) - 1.23 \ln \frac{c}{21.9} \]

\[ \frac{dw}{dr} = \frac{-2r}{1.23} \ rac{0.385}{479.6} \left( 479.6 - c^2 \right) - 1.23 \ln \frac{c}{21.9} \]

62
Exhibit B2-2 (continued)

Concentric Load

c < r < a

\[ W = (479.6 - r^2) \cdot 1 + \frac{0.313}{479.6} \cdot (479.6 - c^2) + (c^2 + r^2) \ln \frac{r}{21.9} \]

\[ \frac{dw}{dr} = -2r \cdot 1 + \frac{0.313}{479.6} \cdot (479.6 - c^2) + r + 2r \ln \frac{r}{21.9} \cdot \frac{c^2}{r} \]

Or with this problem and load = P pounds distributed around the ring

0 < r < 19.7

\[ W = -\frac{P}{42474} \cdot 93.93 - 0.1970 \cdot r^2 \]

\[ \frac{dw}{dr} = -\frac{P}{42474} \cdot (-0.3312 \cdot r) \]

19.7 < r < 21.9

\[ W = -\frac{P}{42474} \cdot 513.2 - 1.07 \cdot r^2 + (372.1 + r^2) \ln \frac{r}{21.9} \]

\[ \frac{dw}{dr} = -\frac{P}{42474} \cdot 1.14 \cdot r + \frac{372.1}{r} + 2 \cdot r \ln \frac{r}{21.9} \]
Exhibit B2-3

Central Load

\[ W = \frac{P}{8 \pi D} \left( a^2 - r^2 \right) \left( 1 + \frac{1}{2} \frac{1 - \gamma}{1 + \gamma} \right) + r^2 \ln \frac{r}{a} \]

Substituting:

\[ \frac{dw}{dr} = \frac{P}{84949} \quad 3.252 \ r - 4 \ r \ln \frac{r}{21.9} \]

\[ W = \frac{P}{84949} \quad 1259.5 - 2.626 \ r^2 + 2 \ r^2 \ln \frac{r}{21.9} \]
Exhibit B2-4

Edge Moment

\[ W = \frac{qa^2}{16D(1 + \gamma)}(a^2 - r^2) \]

Substituting:

\[ W = q \left( 479.6 - r^2 \right) / 4157.4 \]

\[ \frac{dw}{dr} = \frac{-2qr}{4147.4} \]
Exhibit B2-5

Buckling Load

\[ \frac{N}{D} = \alpha^2, \ u = \alpha r \]

\[ \frac{dw}{dr} = A_1 J_1 (u) \]

Using the approximation:

\[ J_1 (x) = x^2 - \frac{0.56249985}{9} x^4 + \frac{0.21093573}{3^4} x^4 - \frac{0.03954289}{3^6} x^6 + \]
\[ \frac{0.00443319}{3^8} x^8 - \frac{0.00031761}{3^{10}} x^{10} + \frac{0.00001109}{3^{12}} x^{12} + \cdots + E \]

and integrating gives:

\[ W = A_1 \frac{\alpha}{4} r^2 - \frac{0.56250 \alpha^3}{36} r^4 + \frac{0.21094 \alpha^5}{486} r^6 - \frac{0.03954 \alpha^7}{5832} r^8 + \]
\[ \frac{0.00443 \alpha^9}{65610} r^{10} - \frac{0.00032 \alpha^{11}}{708588} r^{12} + 0.11024 \]

utilizing boundary conditions

\[ A_1 = -0.01261 \]
PROGRAM CALC(INPUT, OUTPUT, TAPE6=OUTPUT)
DIMENSION W(55)
ST=.23
D=9800000*.125**3/(12*(1+ST**2))
B=19.29
RC=0
RE=16.762-RE
BEND=0
WMAX=1
DO 100 I=1,55
R=I/2.54
W1=.0111*(21.9**2-RC**2)*((5+ST)*(21.9**2)/(1+ST)-RC**2)/(64).
W2C=-RE*((B**2)*ALOG(B/21.9)+(21.9**2-B**2)*((3+ST)
1*21.9**2-(1-ST)*RC**2)/(2*(1+ST)*21.9**2))/(8*3.1416*D)
W2E=-RE*((21.9**2-RC**2)*((1+(1+ST)*(21.9**2-B**2))/(2*(1+ST)*
121.9**2))+((B**2+RC**2)*ALOG(R/21.9))/(8*3.1416*D)
W3=-RC*((3+ST)*(21.9**2-RC**2)/(1+ST)+2*RC**2*ALOG(R/21.9))/
1(16*3.1416*D)
W4=BEND*(21.9**2-RC**2)/(2*D*(1+ST))
IF(R.L.E.B)GO TO 50
W(I)=(W1+W2E+W3+W4)/WMAX
GO TO 100
50 W(P)=(W1+W2C+W3+W4)/WMAX
100 CONTINUE
WRITE(6,400) (I,W(I),I=1,55)
400 FORMAT(I2,F20.3)
END

shape are shown in the upper curve of Exhibit B2-7. Also illustrated are the ideal spherical shape and the shape resulting from a pure distributed load. Obviously, the original shape left much to be desired, bearing more resemblance to a cone with a rounded apex.

Subsequent calculations were used to investigate alternative approaches to forming the spherical geometry. Exhibit B2-8 contains the results for a series of concentric loads at various radii. As the load approaches the support edge, the shape became more spherical. Since the effect was similar to applying an edge moment, attention was directed toward that option. A uniform bending moment would produce the desired shape, but matters were complicated by the weight of the mirror. A first attempt at combined weight, bending, and support loads is shown in Exhibit B2-9. Not great, but promising! The figure also contains a plot of radial edge loading to buckle the mirror. Results resembled the original condition.

The forces used with the bending moment were adjusted to achieve a better balance between the mirror weight, central support, concentric ring support, and the moment. Results are shown as Curve B in Exhibit B2-10. The dashed line is a spherical shape with present geometry shown as Curve A. The shape is greatly improved with the bending moment combination, particularly in the outer regions of the curve where most of the mirror area is located.

In conjunction with this work the shape measurement, mirror laser scan, and optical analysis were being performed. The shape measurement task is described in the next section.
Load Distribution for Theoretical Model of Original ACTF Mirror (Small Displacements)

Exhibit B2-7. Original ACTF Mirror Profile Model Calculated by Computer.
Exhibit B2-8. Results for a Series of Concentric Loads at Various Radii.
Exhibit B2-10. Variation of Mirror Profile with Concentrated Loads.
B3. SHAPE MEASUREMENT

A special apparatus was constructed to mechanically measure the actual mirror deformation. The mirror support ring was placed on a stable base in the horizontal position. A metal guide bar was suspended over the mirror and a dial indicator attached to a dolly that could traverse the bar. The resulting mechanism could take a series of vertical position readings along any radial line through the mirror. Raw data is shown in Exhibit B3-1. These numbers were corrected to level the two mirror edges and remove error associated with a lack of scanner bar straightness.

The first mirror inspected did not agree very well with the theoretical prediction. Exhibit B3-2 shows those measurements, illustrated with triangles, in comparison with the theoretical solid curve and the ideal dashed spherical curve. An extended measurement program with several mirrors was launched to investigate this discrepancy. Float and drawn glass mirrors were used, and a float glass mirror with no pull down plate and an unsilvered glass disk were included. All except the original mirror showed excellent agreement with the theoretical prediction. When measurements across one diameter of the odd mirror were plotted on the same radial graph, the lines were quite different, as shown in Exhibit B3-3. This mirror deformed to a non-symmetric shape, later attributed to non-uniform thickness. The average of the two lines was calculated and it agreed with theoretical expectations. The conclusion was made that the shape of this particular mirror was probably slewed due to observable thickness variations. Other mirrors matched the theoretical behavior very well as illustrated in Exhibit B3-4.
Mirror Test Numbers Before $\theta=60^\circ$

Date 10/14/80

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<th>DEFLECTION (mm)</th>
<th>POSITION (cm)</th>
<th>DEFLECTION (mm)</th>
<th>POSITION (cm)</th>
<th>DEFLECTION (mm)</th>
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Exhibit B3-1. Raw Data From Vertical Position Readings Along Mirror Diameter.
(Upper) Mirror without pulldown plate - float glass - weighted
(Lower) Plain float glass - weighted
○ Mirror with pulldown plate - weighted - float glass
□ Mirror with pulldown plate - float glass
△△ Mirror with pulldown plate - drawn glass (non-uniform thickness)
--- Theoretical shape
--- Spherical shape

Exhibit B3-2. Measured Mirror Profiles Compared to Theoretical Model and Sphere.
Deviation from Symmetry Encountered in First Mirror Measured (Attributed to Non-Uniform Thickness). Profile Comparison Across One Diameter (Opposite Radii Superimposed).

Exhibit B3-3. Slewed Profile of Mirror with Non-Uniform Thickness.
Exhibit B3-4. Comparison of Measured Mirror Shape to Theoretical Shape.
B4. MIRROR LASER SCAN

Mirror slope error was determined by the use of a reflected laser beam. The setup is shown in Exhibit B4-1. The mirror to be tested was placed on two sturdy guide rails and manually transported along the rails. A laser beam was reflected off the mirror onto a wall mounted chart. The beam position was marked on the chart and the mirror translated a short distance and the beam recorded again. This procedure was repeated for approximately 25 positions on each of two mirrors. A copy of the chart is shown in Exhibit B4-2. Since the geometry was known, it was relatively easy to calculate slope errors for the mirrors. These results are presented in Exhibit B4-3.

Even though the drawn glass contained much more inherent slope error than the float glass, neither was bad enough to cause the loss of expected performance at the ACTF. However, the decrease in performance of the drawn glass is probably greater than any gains from the low iron content of the glass.
Exhibit B4-1. Experiment to Measure Mirror Slope Error.
Exhibit B4-2. Scatter Plot of Reflected Laser Beam for Float and Drawn Glass Mirrors.

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Exhibit B4-3. Slope Error of Drawn vs Float Glass.
B5. OPTICAL ANALYSIS

Computer simulation was used to perform an optical analysis of current and proposed mirror shapes. The model accepted the slope equations derived in Section B3, divided the mirror surface into 2000 facets, and traced rays from points on a sun model to each facet and reflected them to a target where they were recorded. The sun model approximated the true behavior of a real sun disk. Slope error was statistically introduced at each facet to provide the desired overall slope error. Rays were recorded at the target in concentric rings one centimeter wide, and reported as flux at a particular radius. Typical output data for this model is reproduced in Exhibit B5-1.

Flux patterns for some of the shapes considered are shown in Exhibit B5-2. No slope error was included in the data. The concentric load located near the edge produced a good flux pattern, and as expected, approached that of an edge bending moment as the load radius increased.

Exhibit B5-3 compares the flux patterns of original mirrors with that expected from mirrors with the edge bending moment. The improved glass notation indicates performance changes that could be achieved by changing from drawn glass to float glass and significantly reducing the slope error. As shown in the illustration, increased slope error degrades a good mirror shape more than a bad one. These plots were based on an assumption that all of the performance degradation of original mirrors was due to inherent slope error. The experiments performed with the laser and the actual shape measurements changed this outlook. The slope error of drawn glass, while much more than float glass, was much too low to affect performance drastically. The real culprit appears to be a variation in drawn glass thickness that
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0.0 KILOWATTS OF FLUX HAS MISSED THE ENTRANCE APERTURE.

**Exhibit B5-1. Typical Output Data From Mirror Shape Optical Analysis Code.**
Exhibit B5-2. Flux Patterns for Various Mirror Shaping Schemes.
FLUX PATTERN

Exhibit B5-3. Simulated Flux Pattern for Original Shape vs Moment-Shaped Mirrors; With and Without Float Glass.
results in non-uniform stiffness across a single mirror. The thick areas tended to be directional, introduce skew into the shape, and adversely affect the flux pattern. Mirror replacement was added to the list of desirable improvements.

The optical model was able to shed some light on another problem of the original mirror design: difficulty of focusing. There was no precise point of focus. The flux pattern appeared to brighten and then fade as the pulldown was varied, but the optimum was not sharp or well defined. The outer edge of the spot might have been brightest at one pulldown, while the interior was brighter at another, and the smallest spot size was produced at a third setting. None of these effects was very distinct. The pattern exhibited little pulldown sensitivity, and varied gradually from one setting to another.

The optical model was used to make a series of runs at different pulldowns, or axial deflections. The results are plotted in Exhibit B5-4. At each deflection, the flux was calculated for several radii at the target. Each line of the graph represents the flux variation with pulldown at a particular radius from the center of the target. As can be seen in the plot, flux varied modestly with pulldown, and showed almost no effect outside 15 centimeters.

The same plot for the new mirror design is portrayed in Exhibit B5-5. The effect of pulldown is much more pronounced, both in peak flux and spot size. By observing intercepts along the x-axis for zero flux, the radius decreases from over 40 centimeters to almost 15 centimeters. In the previous plot, the variation was from 45 centimeter to almost 30 centimeters. After careful study of the material it can be concluded that the new design should display much crisper focusing properties, with the point of optimal focus easily identified.
Flux at 5 cm radius on target as a function of mirror "pull down".

Axial Deflection of Mirror - cm

Flux at 5 cm radius on target as a function of mirror "pulldown"

B6. PRELIMINARY DESIGN

After selecting the edge moment as the preferred alternative for mirror focusing, several methods of applying this moment were investigated. The final choice for experimental evaluation was a series of moment arms around the edge of the mirror projecting upward, with a wire strung around them to apply the force, as shown in Exhibit B6-1. Based on an intuitive feel for what should work, 32 moment arms were used. The wire was braided stainless steel aircraft control cable, adjusted by a screw type automotive hose clamp. A drawing of the prototype moment arm is included in Exhibit B6-2.

The reasons for selecting this approach were:

  . Simplicity
  . Low cost
  . Ease of manufacture
  . Ease of installation
  . Durability

Moment arms for the experimental evaluation were made by machining aluminum bar stock. The quality and consistency of the parts left much to be desired, but it was decided to proceed with the evaluation, then find a better manufacturing method if the tests were successful.
Exhibit B6-1. Installation of Moment Arms and Cable to Impose Bending Moment on Mirror Edge.
Exhibit B6-2. Design of Prototype Moment Arm Used in Experimental Evaluation.
B7. EXPERIMENTAL EVALUATION

The purpose of the experimental evaluation was to compare the new and old mirror shapes while installed at the ACTF. As a preliminary test of performance, several mirrors were chosen at the extreme north end of the mirror field, and focused onto the closed tower shutters. Two drawn glass mirrors were used, one with the original pulldown plate and the other with the moment arms. The original shape mirror was focused by adjusting the pulldown mechanism until a good image was obtained. The new design required adjusting the tension in the wire and the central pulldown. The old configuration was difficult to focus. The new mirror focused precisely and quickly, with a much smaller spot size. The two images are shown in Exhibit B7-1.

The next step was to measure the flux levels of individual mirrors to quantify the results. A small Gardner gage type calorimeter array was assembled and integrated into the computer data acquisition system. Results for three mirrors are summarized in Exhibit B7-2. Mirror one was of float glass; the other two were of drawn glass. The first mirror is typical of the float glass results, with slightly over 50 percent improvement in peak flux. The other two represent the range of values found in drawn glass mirrors with 0 to 400 percent improvement in peak flux. Average improvement for the mirrors observed would be approximately 100 percent. An interesting observation was that any mirror, regardless of glass type or previous performance, could be brought into a very narrow range of good performance by using the moment arms. From this, it was concluded that the variation in
Exhibit B7-1. Single-mirror images on shutter of ACTF. Improved image is on the left; Original single-mirror image is on the right.
### ACTF MIRROR IMPROVEMENT

**ORIGINAL AND IMPROVED MIRROR SHAPE**

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Exhibit D7-2. Original and Improved Mirror Shape Performance Data for Three Randomly Selected ACTF Mirrors.
thickness of the glass degraded performance with the original approach, but had little impact on results with the new moment arms. Returning to Exhibit B5-3, the effect was the same as going from the original situation curve to the improved glass and shape curve with only the shape improvement being made. Consequently, plans to replace all the mirrors have been shelved pending installation of the moment arms and characterization of the results.
B8. FINITE ELEMENT ANALYSIS

A finite element analysis was performed to determine three things:

- Number of moment arms to use
- Stress levels in the mirror
- Mirror sag between moment arms

A model was generated for one-eighth of an ACTF mirror utilizing the GTSTRUDL structural analysis code. The model is illustrated in Exhibit B8-1. Computer simulation runs were made on the VAX 11/780 computer for 8, 16 and 32 moment arm geometries. The 8 arm arrangement did not provide adequate curvature between arms. The 16 arm design allowed approximately 1 milliradian of average slope error between the arms and primarily outside the support ring. When 32 moment arms were used there was no noticeable deviation between moment arms. Stress levels with 32 arms reached a maximum of 800 psi in the glass while 16 arms produced a maximum of 1200 psi. Both of these are well below the failure level of 15,000 to 20,000 psi for glass. While this analysis furnished additional information and eliminated the 8 arm option, no clear choice between 16 and 32 arms was indicated.

The data sets for each run consisted of about 200 pages of printout and are on file in the Energy and Materials Sciences Laboratory, EES. None of the shape data is reproduced here, since taken out of context, it has little meaning.
3.6241 Horizontal in units per inch
3.6241 Vertical in units per inch

Exhibit B8-1. Finite Element Model of 1/8 of ACTF Mirror Utilizing the GTSTRUDL Structural Analysis Code.
B9. FINAL DESIGN

In the final design stage it was decided to tighten one of the mirrors equipped with 32 moment arms to determine the mode of failure. The mirror was placed in the measuring fixture and fitted with two dial indicators, one over the support ring and one near a moment arm at the edge of the mirror. These measurements would allow calculation of the edge slope at failure, and hence, rough correlation with computer determined loads. The wire was tightened until the glass broke. Several minutes prior to failure, small cracks were heard. Inspection after failure revealed chips and small fractures on the edge of the mirror where the arms pressed against it. The deflections indicated a failure load of 3 to 4 times normal working loads, which was well below critical stresses due to bending.

Therefore, it was assumed that the failure originated from small chips caused by edge or corner pressure inside the moment arm. To minimize this threat, the 32 arm design was chosen, and a notch cut in the lower inside corner of the moment arms to help reduce corner stress buildup.

A careful review of previous tests and manufacturing methods led to the conclusion that the present moment arm design, with slight modifications, manufactured from die cast aluminum was a satisfactory solution. The next problem to address was the moment arm slot size. Experimental work had revealed substantial variation in mirror thickness, to the point where some moment arms wouldn't fit, or scraped off the plating when forced onto the mirror. Since a loose arm increases the likelihood of edge chipping, the objective was to use the smallest slot that would fit virtually all the mirrors. Two separate sets of field data were taken. One located the
thickest point on the edge of a mirror and recorded this value. The second set consisted of six random measurements around the edge of each mirror, as shown in Exhibit B9-1. The measurements were subjected to statistical analyses, shown in Exhibits B9-2 through B9-4, for the maximum thickness, random thickness, and random thickness of float glass mirrors, respectively.

If a slot size of 0.356 mm (0.140 inches) was used, the analyses predicted that only 0.07 percent of the mirrors would have a spot of maximum thickness greater than this. The random thickness sample predicted that 0.0006 percent of the moment arms would hit a spot thicker than 0.140 inches. For float glass the random figure dropped to 0.00000003 percent. A slot size of 0.140 inches was specified.

One other consideration in the number of arms to use per mirror might be weight, so this was checked. The difference between 16 and 32 arms amounted to less than 1/2 pound per mirror, compared to a mirror assembly weight of 22 pounds. It was decided that the extra safety of 32 arms was worth the small weight penalty.

After negotiating with a die casting company, the final design of the moment arm was set. It is illustrated in Exhibit B9-5.

The last major factor in the final design was the selection of the wire. It was required that it possess sufficient strength, survive the outdoor environment, and closely match the thermal expansion coefficient of glass. The calculated load was only 15 to 20 pounds, so a sample of 0.030 inches Inconel 625 was obtained for testing. Unfortunately, the wire was not as strong as appearances would suggest, and failed under 30 pounds of load. Calculations agreed with this figure, so the diameter was increased
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</tr>
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<td>7</td>
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<td>9</td>
<td>38N</td>
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<tr>
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<td>26</td>
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<td>27</td>
<td>29N</td>
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</tr>
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<td>28M</td>
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</tr>
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<td>29</td>
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<tr>
<td>34</td>
<td>25M</td>
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</tr>
<tr>
<td>35</td>
<td>25N</td>
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<tr>
<td>36</td>
<td>24M</td>
<td>0.135, 0.136, 0.137, 0.138, 0.139, 0.140, ...</td>
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Exhibit B9-1. Thickness Variation of Mirror Edge for Randomly Selected ACTF Mirrors.
**VARIABLE: MAXIMUM MIRROR THICKNESS**  
**SAMPLE SIZE (N) = 66**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>SAMPLE STATISTICS</strong></td>
<td></td>
<td><strong>Mean</strong> = 0.130571</td>
<td><strong>Range</strong> = 0.01</td>
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<tr>
<td></td>
<td></td>
<td><strong>Variance</strong> = 9.02498E-06</td>
<td><strong>Minimum</strong> = 0.126</td>
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<tr>
<td></td>
<td></td>
<td><strong>Std. Dev.</strong> = 3.00416E-03</td>
<td><strong>Maximum</strong> = 0.136</td>
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<tr>
<td><strong>UNBIASED ESTIMATES OF</strong></td>
<td></td>
<td><strong>Variance</strong> = 9.35924E-06</td>
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<tr>
<td><strong>POPULATION PARAMETERS</strong></td>
<td></td>
<td><strong>Std. Dev.</strong> = 3.05929E-03</td>
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<tr>
<td><strong>DATA DISTRIBUTION</strong></td>
<td></td>
<td><strong>Skewness</strong> = 0.2967856</td>
<td></td>
</tr>
<tr>
<td><strong>COEFFICIENTS</strong></td>
<td></td>
<td><strong>Kurtosis</strong> = -0.688058</td>
<td></td>
</tr>
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</table>


**VARIABLE: RANDOM MIRROR THICKNESS**  
**SAMPLE SIZE (N) = 432**

<p>| | | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Mean</strong> = 0.124396</td>
<td></td>
<td><strong>Range</strong> = 0.027</td>
<td></td>
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<tr>
<td><strong>Variance</strong> = 1.09661E-05</td>
<td></td>
<td><strong>Minimum</strong> = 0.115</td>
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<tr>
<td><strong>Std. Dev.</strong> = 3.31152E-03</td>
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<td><strong>Maximum</strong> = 0.142</td>
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<td><strong>Variance</strong> = 1.099163-05</td>
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</tr>
<tr>
<td><strong>POPULATION PARAMETERS</strong></td>
<td></td>
<td><strong>Std. Dev.</strong> = 3.31536E-03</td>
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<tr>
<td><strong>DATA DISTRIBUTION</strong></td>
<td></td>
<td><strong>Skewness</strong> = 9.930848</td>
<td></td>
</tr>
<tr>
<td><strong>COEFFICIENTS</strong></td>
<td></td>
<td><strong>Kurtosis</strong> = 3.44334</td>
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</table>

VARIABLE: FLOAT GLASS RANDOM MIRROR THICKNESS

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<tr>
<th>Statistic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Mean</td>
<td>0.120924</td>
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<tr>
<td>Variance</td>
<td>6.91363E-06</td>
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<tr>
<td>Std. Dev.</td>
<td>2.62938E-03</td>
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<tr>
<td>Range</td>
<td>0.012</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.115</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.127</td>
</tr>
</tbody>
</table>

UNBIASED ESTIMATES OF
POPULATION PARAMETERS

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<th>Statistic</th>
<th>Value</th>
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</thead>
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<tr>
<td>Variance</td>
<td>7.02E-06</td>
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<tr>
<td>Std. Dev.</td>
<td>2.64953E-03</td>
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DATA DISTRIBUTION

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<td>Skewness</td>
<td>0.0476701</td>
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<tr>
<td>Kurtosis</td>
<td>-1.149659</td>
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</table>

Exhibit B9-5. Final Design for Die Cast Aluminum Moment Arm.
to 0.045 inches, which had an ultimate strength of 200 pounds of load, yet was still sufficiently flexible to wrap around the moment arms.

All alloys near the expansion coefficient of glass have a high nickel or chrome content, so corrosion was not a serious problem. The expansion coefficient of ACTF mirrors is:

- Drawn Glass $86.6 \times 10^{-7}/\degree C$
- Float Glass $87.045 \times 10^{-7}/\degree C$

The closest alloy to this was Inconel 625 with an expansion coefficient of $99 \times 10^{-7}/\degree C$. Analytical investigations with the optical model indicated that for a maximum temperature variation of 40° F the peak flux available at the ACTF would vary less than 10 percent due to thermal mismatch between the glass and the wire.

In conclusion, it was decided to implement this mirror modification, with the expectation that peak flux available at the facility could be increased 50 to 100 percent. This represented an increase from 125 W/cm² to the 190-250 W/cm² range; a substantial improvement.

Author's Note: Characterization of the mirror field improvement occurred during March, 1982 under DOE Contract DE-AC03-82SF11591. A peak flux of 235 W/cm² was realized.
APPENDIX C

SUMMARY OF "BEHIND THE APERTURE" FLUX MAP DATA
SUPPLIED TO LBL FOR DESIGN OF THEIR RECEIVER
Dr. Arlon J. Hunt
Solar Energy Program
Energy and Environment Division
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

Dear Arlon:

Here are the flux maps that we ran for you. Included is a description of the mapping set-up and a log of map designations vs. conditions.

You will note that on Run 12, we encountered significant flux spill-over from the outside edge of the shield. This was remedied by covering the spill area with aluminum foil.

The normalizing routine that we use is linear, and therefore is subject to some question as to precision. Please use the normalized plots only as close approximations to what you would expect on a 900 W/m² day at the ACTF.

Please call if we can be of service in interpreting any of this information.

Sincerely,

Hamp Teague
Senior Research Engineer

mde
A series of flux scans through selected apertures was undertaken on May 22, 1981 in support of the upcoming L.B.L. tests at the ACTF. The basic flux scanning set-up is described below.

A 5-ft diameter, 1-inch thick, water cooled shield was placed with its upper surface located 12 inches below the tower platform upper surface. This shield incorporates an 18-inch diameter opening in its center. The shield was centered in the 8-ft x 8-ft experiment opening in the tower platform.

A B & W 3000 Board aperture plate, with a 9.4-inch diameter circular opening in the center, was fabricated and installed on top of the water-cooled shield as shown. The 9.4-inch aperture edge was beveled at 45° (maximum heliostat view angle) and remained in place throughout the test. In addition, a 3-inch diameter aperture plate was constructed from 3000
Board (beveled edges) and a 12" x 12" quartz window was made available by L.B.L.

**Flux Scans**

By raising and lowering the scanning calorimeter bar, flux distribution measurements were made at various levels above the apertures mentioned above. In addition, flux scans were completed with and without the quartz window installed above the 9.4-inch diameter aperture. Each scan series (at a particular level) included at least one scan with the 3-inch diameter aperture installed, either at the center of the 9.4-inch opening or at the south edge of the opening.

**Typical Scan Distribution** (at a given level)

The scanning bar level was typically set at a specified height (recorded) above the aperture to be scanned. The first scan (at a particular height) was made using the 9.4-inch diameter aperture only. The second scan, typically, was of the 9.4-inch diameter aperture with the quartz window placed over the aperture opening:
The third scan was completed with the 3-inch diameter aperture installed and centered on the 9.4-inch diameter hole (see sketch on Page 1) with quartz window removed.

A fourth scan of the series (constant height) was made at only two levels with the 3-inch diameter aperture moved 2 3/4 inches directly south of the centered position mentioned above.

In some cases the particular order of scans was changed in the interest of time; however, it is readily apparent from the log which scan is which.

Note: Whenever the 3-inch diameter aperture was installed, one inch was subtracted from the scanner height above the aperture because the 3-inch aperture plate rested on the 9.4-inch aperture plate. The scanner bar height was not changed.
L.B.L. FLUX MAPPING
TEST PREPARATION

Aperture Diameter Calculation:

Based on latest flux map (5/13/81) focal zone at 12 inches below
deck, assume avg. flux density of 70 W/cm² over area in question and
approximately 30 kW desired through aperture, then:

\[ D_{\text{aperture}} = \frac{30 \times 10^3 \times 4}{70 \times 6.45\pi} = 9.2 \text{ inches} \]

Estimated Flux Distribution at Various Levels Above Aperture:

Based on flux-through-aperture distribution over direction from 8°
to 45° from vertical per diagram:

\[ \theta = \frac{47}{\tan 8°} = 33.4'' \]

\[ \therefore \text{shadow zone shown in fig. 1 starts at 33.4'' above aperture} \]
\[ A_{in} = \frac{\pi (D_2^2 - D_1^2)}{4} \quad \text{Actual aperture area at 9.4 in dia.} = 69.4 \text{ in}^2 \]

\[ A_{cm} = A_{in} \times 6.45 \quad = 447.6 \text{ cm}^2 \]

\[ Q_{act} = 447.6 \times 70 \text{ W/cm}^2 = 31,332 \text{ Watt} \]
<table>
<thead>
<tr>
<th>Scan*</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>05221B-WE 1</td>
<td>3&quot; aperture; scanning bar 5&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 3</td>
<td>9.4&quot; aperture; quartz window; scanning bar 6&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 4</td>
<td>9.4&quot; aperture; scanning bar 6' above aperture</td>
</tr>
<tr>
<td>05221B-WE 5</td>
<td>9.4&quot; aperture; scanning bar 12&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 6</td>
<td>9.4&quot; aperture; quartz window; 12&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 7</td>
<td>3&quot; aperture; scanning bar 11&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 11</td>
<td>9.4&quot; aperture; scanning bar 18&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 12</td>
<td>9.4&quot; aperture; quartz window; scanning bar 18&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 13</td>
<td>9.4&quot; aperture; quartz window; scanning bar 18&quot; above aperture; aluminum</td>
</tr>
<tr>
<td></td>
<td>foil shroud in place to stop spillage around water-cooled shield. (On all</td>
</tr>
<tr>
<td></td>
<td>subsequent scans the shroud was in place.)</td>
</tr>
<tr>
<td>05221B-WE 14</td>
<td>9.4&quot; aperture; scanning bar 24&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 15</td>
<td>3&quot; aperture; scanner 23&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 16</td>
<td>9.4&quot; aperture; scanner 30&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 17</td>
<td>3&quot; aperture; scanner 29&quot; above aperture</td>
</tr>
<tr>
<td>05221B-WE 18</td>
<td>3&quot; aperture; scanner 29&quot; above aperture; aperture</td>
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<tr>
<td></td>
<td>was moved south of center (approximately 2 3/4&quot;)</td>
</tr>
<tr>
<td>05221C-WE 1</td>
<td>3&quot; aperture; scanner 17&quot; above aperture (3&quot; aperture moved south 2 3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>of center)</td>
</tr>
<tr>
<td>05221C-WE 2</td>
<td>3&quot; aperture; scanner 17&quot; above aperture</td>
</tr>
</tbody>
</table>

*Key:*

05221B - WE 1 - 11:23:30-to-11:26:39

Scan Number

Type Scan (West to East)

Scan Series

Year (1981)

Day

Month

Start-Stop Time (EDST)
05221B-WE 1  11:23:30 to 11:26:39
Norm. to 900 W/M2
05221B-WE 3  11:38:40 to 11:41:10
Norm. to 900 W/M2
05221B-WE 4  11:44:15 to 11:47:50

Norm. to 900 W/M2
05221B-WE 5  11:53:30 to 12:00:30

Norm. to 900 W/M2
05221B-WE 6  12:03:50 to 12:09:00

Norm. to 900 W/M2
05221B-WE 7  12:12:09 to 12:15:56

Norm. to 900 W/MB
05221B-WE 11  12:44:00 to 12:52:30

Norm. to 900 W/M²
05221B-WE 12   12:55:20 to 13:04:20
Norm. to 900 W/M2
05221B-WE 13  13:17:18 to 13:25:30
Norm. to 900 W/M2
05221B-WE 14  13:31:15 to 13:38:22

Norm. to 900 W/M2
05221B-WE 15  13:40:30 to 13:48:15
Norm. to 900 W/M2
05221B-WE 16  13:54:40 to 14:05:20
Norm. to 900 W/M2
05221B-WE 17  14:12:00 to 14:21:30

Norm. to 900 W/M2
05221B-WE 18 14:25:10 (Stop Time Not Available)

Norm. to 900 W/M2
05221C-WE 1  15:57:42 to 16:05:07

Norm. to 900 W/M2
05221C-WE 2  16:07:48 (Stop Time Not Available)

Norm. to 900 W/M2
REFERENCES

1. "Advanced Components Test Facility Real-Time Data Collection System Interface". Available from the Georgia Institute of Technology, Engineering Experiment Station.


