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## Final Quarterly Technical Progress Report

Quarterly Report  
August 1, 1996 - January 1, 1997

Work Performed Under Contract No.: DE-AC21-93MC29257

For  
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## EXECUTIVE SUMMARY

This quarterly report covers activities on key tasks of the Allison Advanced Turbine Systems contract DE-AC21-93MC29257, for two quarters, from August 1996 to October 1996, and from November 1996 to January 1997, respectively. The reason for combining the two quarterly periods into one report is because of the vastly reduced scope of work remaining on this contract.

Allison continued progress on the following tasks during these two quarters:

- \* Task 5: Market Study
- \* Task 8.07: Ceramic Vane Design and Evaluation
- \* Task 9.0: Program Management

## SUMMARY OF SPECIFIC TASKS

Task 5.0: Market Study -- The objective of the market study is to focus on distributed generation prospects for an industrial ATS, utilizing the Allison ATS family as the primary gas turbine systems. During this quarter, Allison met with representatives of the Electric Power Research Institute and its subsidiary SEPRIL to review the final Statement of Work generated by Allison. The contract was subsequently issued to SEPRIL for \$100,000 in December 1996. The work is expected to be completed approximately 4 months after the contract award.

Details of the status is presented under the specific summary of the task.

Task 8.07: Ceramic Vane Design and Evaluation -- Activities for this task included : thermal and mechanical stress analyses of the vane and mount designs; long term vane life evaluations; evaluation of thermal shock tests for ceramic vanes; and design and drafting for the ceramic vanes and their mounts.

Stress levels and probability of survival values from our analyses have been acceptable. Results show that maximum stresses occur at the trailing edge of the ceramic vane in the region of mid span. The calculated fast fracture probability of survival exceeds 99.99 % for all vanes for the highest stress condition. Subcontractors for the vane have been contacted. Our specifications have been furnished. Preliminary cost estimates and delivery schedules are currently under negotiations.

Task 9.0: Program Management -- The program management activity during the two quarters, August 1996-October 1996, and November 1996-January 1997 was directed toward bringing the schedule and cost in line with the plan. The project is now in compliance with the revised schedule. The cost of the project is reduced due to lack of DOE funding for Task 8.07. Allison was informed of this change by DOE in July, 1996, resulting in a reduction of DOE funding of approximately \$960,000 in the original DOE contract. The cost reduction will likely move the completion of Task 8.07 into Phase 3.

The Milestone Chart in Figure 1 contains the status of each program task.

## **TASK 5: DISTRIBUTED GENERATION MARKET STUDY**

### **Progress Report for August 1996 - January 1997**

A statement of work to conduct distributed generation market study was provided to the Electric Power Research Institute. A meeting was subsequently held at EPRI to review the scope of the study and to assess how this task might be compatible with the current EPRI study on distributed generation. The purpose of the study was to have a market study conducted on the potential application of the Allison ATS type advanced gas turbine in the distributed generation market.

EPRI reviewed the SOW and sent the comments in to Allison. EPRI stated that the SOW was comprehensive and the study should be conducted to include the tasks outlined. However, EPRI mentioned that the cost of the study would be \$100,000 instead of the \$40,000 indicated in the SOW.

A letter of request was sent by Allison to Mr. Leland Paulson, DOE/METC Project Manager, asking for his concurrence to increase the allocated cost for Task 5 from \$40,000 to \$100,000, without increasing the overall cost of the contract. Mr. Paulson provided the go ahead to Allison to increase the funding for Task 5. This approval authorized Allison to adjust the cost of the tasks within the overall contract, without increasing the total contract cost to DOE/METC.

Allison sent a formal request for proposal with the final statement of work to EPRI in July. EPRI notified Allison that their system does not allow EPRI to support the detailed requirements of government contracting regulations and reporting requirements. EPRI expressed willingness to comply with 10 CFR Part 600 - Financial Assistance Rules for Non Profit Organizations. Ms. Manilla of DOE/METC was contacted by Mr. Paul Weber of Allison in August with the EPRI request. DOE informed Allison that it cannot change the terms of the contract. EPRI subsequently contacted Allison and told us that EPRI has a subsidiary, SEPRIL which can meet the DOE requirements.

A meeting with SEPRIL ( a for-profit subsidiary of EPRI) was held on October 1, 1996 to review the final proposal. The proposal draft indicated that SEPRIL will need 4 months after go ahead to complete the task. This revised completion date was reviewed with the DOE/METC Project Manager at the time of the proposal review meeting. The revised date for completion, with no increase in cost, will likely be 4 months after the award of the contract.

SEPRIL submitted the revised proposal in November. A contract was awarded to SEPRIL on December 20, 1996 to conduct the distributed generation market study.

Allison has notified the DOE Project Manager of the extension needed to the end of April, 1997 to complete this task. There will be no additional cost incurred as a result of the schedule extension. This date may have to be extended further due to slow progress on this task. Allison is to provide a definition of the family of ATS engines for the study. Allison has not done that yet.

## **TASK 8.07 CERAMIC VANE DESIGN AND EVALUATION**

### **Quarterly Report for August 1996 - January 1997**

Additional review of the ceramic vane drawings resulted in minor revisions. The metallic mount drawings were approximately 25% complete. Request for quotes were sent out in December, 1996 to Allied Signal and Kyocera. Oak Ridge National Laboratories was contacted to discuss an early start for this program. Since the candidate Allied Signal material for this program is under test, ORNL data on Kyocera material would aid in the selection of the vendor for the ceramic vanes. ORNL will attempt to accelerate the Kyocera ceramic test schedule and provide as much data as possible prior to the Allison vane procurement decision.

Quotes were received in January 1997 from Allied Signal and Kyocera for the production of ceramic vanes. Neither supplier was willing to provide a fixed price quote. Both suppliers indicated exceptions to some manufacturing tolerances of the vanes. Both suppliers significantly increased the vane cost in their quotes over quotes furnished in the last six months.

Available funding no longer permits the original plan to procure vanes from both Allied Signal and Kyocera, and base the final decision on which to use for the demonstration on long term stress rupture tests at ORNL, and the University of Dayton.



## **TASK 9.0 PROGRAM MANAGEMENT**

### **Quarterly Report for August 1996 - January 1997**

Allison continued program management of the ATS during the two quarters, August 1996-October 1996, and November 1996-January 1997. Allison submitted the draft Final Report. This report contained details of the completed tasks and technical accomplishments on the program. Allison then generated the Final Topical Report after being notified by Mr. Leland Paulson, DOE/METC Project Manager, of the acceptance of the draft report. Allison generated the non-proprietary document, EDR 17899A which was submitted to DOE/METC in late October, 1996.

The purchase order for Task 5.0 Market Study was issued by Allison to SEPRIL on December 16, 1996. A teleconference between the DOE/METC Project Officer, Allison and SEPRIL was held in mid January to confirm the activities, scope and schedule. The study will be complete approximately 4 months from the date of the award of the contract.

At a Phase 3 program review meeting, Mr. Paulson asked Allison to submit the current scope of Task 8.7 and the funding requirements in accordance with the current contract. He and Mr. S. Waslo, DOE/EE Program Manager also asked Allison to provide a scope and cost summary for the continuation of the Ceramic Vane Design and Evaluation (Task 8.07) task in Phase 3. This information was submitted to Mr. Waslo per the request.

The overall program is within budget and on revised schedule.