State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 05-25

March 17, 2005

Agenda Item No.: 05-3-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2565-246, entitled "The Collection and the Development of Exhaust Speciation Profiles from Modern Commercial Jet Aircraft Engines", has been submitted by the University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research;

WHEREAS, the staff of Research Division have reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2565-246 entitled "The Collection and the Development of Exhaust Speciation Profiles from Modern Commercial Jet Aircraft Engines", submitted by the University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research, for a total amount not to exceed $259,966.12.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 2565-246 entitled "The Collection and the Development of Exhaust Speciation Profiles from Modern Commercial Jet Aircraft Engines", submitted by the University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research, for a total amount not to exceed $259,966.12.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed $259,966.12.

I hereby certify that the above is a true and correct copy of Resolution 05-25, as adopted by the Air Resources Board.

Lori Andreoni

Lori Andreoni, Clerk of the Board

ATTACHMENT A

"The Collection and the Development of Exhaust Speciation Profiles from Modern Commercial Jet Aircraft Engines"

Background

ARB's current chemical speciation profiles for jet engine exhaust is based, in part, on data collected from military engines back in the 1970s and 1980s. Jet engine technology has evolved tremendously since then and commercial engines are also significantly different from military engines. These profiles are used for estimating the impact of aircraft operation on local and statewide air quality for planning purposes, Environment Impact Report (EIR) purposes, health assessment and other needs. Considering these factors, it is clear that updating the profile to reflect modern commercial engines is desirable.

Objective

The objective of this project is to develop up-to-date chemical speciation profiles for the exhaust from modern commercial jet aircraft engines. The project will sample and analyze the particulate matter (PM) and gaseous exhaust components from the engines of subject aircraft while parked in a stationary position. The data obtained in this project will be used to update ARB's jet engine exhaust emission profile database.

Methods

The principal methodology to be used in this project involves the placement of sampling and measuring equipment at the exhaust exit plane of an engine on the wing of a parked aircraft. The engine will be run at various power levels and both particulate and gaseous samples will be collected at each level, including real time measurements. The collected samples will be analyzed post-test to determine chemical species and concentrations. All resulting project data will be combined into a data set characterizing the engine exhaust profile. Staff expects the project will test a minimum of four engines.

Expected Results

This project is intended to provide updated data to develop improved commercial jet engine exhaust speciation profiles that can be used, primarily, for inventory and planning needs, including EIR development.

Significance to the Board

Airport traffic is expanding but information on the exhaust speciation profiles of either total organic gases (TOG) or PM from modern commercial jet aircraft using current fuels is scarce. The lack of updated chemical source profiles hinders ARB's ability to produce accurate statewide inventories and conduct EIR efforts in regions heavily impacted by commercial jet aircraft. The data to be provided by this project will significantly update and enhance the ability of the Board to estimate or predict the impact of aircraft emissions on local community air quality.

Contractor:
University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research

Contract Period:
12 months

Principal Investigators (PIs):
Professor Philip Whitefield, Ph.D.
Professor Donald Hagen, Ph.D. (Co-Principal Investigator)

Contract Amount:
$259,966.12

Cofunding:
The Federal Aviation Administration is contributing an as-yet-undetermined amount to the cost of this study.

Basis for Indirect Cost Rate:
University of Missouri, Rolla has agreed to honor the ten percent overhead rate currently used in agreements between ARB and the UC system.

Past Experience with this Principal Investigator:
ARB has had no previous contracts with this principal investigator. However, ARB staff are aware of this PI's past work in this field. This PI is highly respected as one of the very few researchers who has conducted jet aircraft engine exhaust sampling and analysis projects at this level of detail.

Prior Research Division Funding to University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research:

Year	2004	2003	2002
Funding	$0	$0	$0

BUDGET SUMMARY

University of Missouri – Rolla Center of Excellence for Aerospace Particulate Emissions Reduction Research

"The Collection and the Development of Exhaust Speciation Profiles from Modern Commercial Jet Aircraft Engines"

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	$	30,060	
2.	Subcontractors	$	180,000[1]	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	16,520[2]	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	2,000	
9.	Analyses	$	0	
10.	Miscellaneous	$	24,113	
	Total Direct Costs			$252,693

INDIRECT COSTS

1.	Overhead	$	7,273	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$7,273

TOTAL PROJECT COSTS **$259,966**

[1] To carry out this project, multiple resources and expertise are needed and thus, the approach is to use multiple teams.

[2] The investigators will make several trips to Oakland, California where the testing will occur.

Attachment 1

SUBCONTRACTOR'S BUDGET SUMMARY

Subcontractor: University of California, Riverside - College of Engineering, Center for Environmental Research & Technology

Description of subcontractor's responsibility: This subcontractor will provide some of the needed sample collection capability and will conduct most of the chemical speciation analysis for the project.

DIRECT COSTS AND BENEFITS		
1. Labor and Employee Fringe Benefits	$ 19,399	
2. Subcontractors	$ 0	
3. Equipment	$ 7,983	
4. Travel and Subsistence	$ 2,400	
5. Electronic Data Processing	$ 0	
6. Reproduction/Publication	$ 0	
7. Mail and Phone	$ 0	
8. Supplies	$ 37	
9. Analyses	$ 40,820	
10. Miscellaneous	$ 13,095	
Total Direct Costs		$83,734
INDIRECT COSTS		
1. Overhead	$ 6,266	
2. General and Administrative Expenses	$ 0	
3. Other Indirect Costs	$ 0	
4. Fee or Profit	$ 0	
Total Indirect Costs		$6,266
TOTAL PROJECT COSTS		**$90,000**

Attachment 2

SUBCONTRACTOR'S BUDGET SUMMARY

Subcontractor: Aerodyne Research Inc.

Description of subcontractor's responsibility: This subcontractor will provide measurement equipment and operating expertise for real-time measurement of particulate matter size distribution and select gaseous compound concentrations.

DIRECT COSTS AND BENEFITS		
1. Labor and Employee Fringe Benefits	$ 20,391	
2. Subcontractors	$ 0	
3. Equipment	$ 0	
4. Travel and Subsistence	$ 15,770	
5. Electronic Data Processing	$ 0	
6. Reproduction/Publication	$ 0	
7. Mail and Phone	$ 0	
8. Supplies	$ 0	
9. Analyses	$ 0	
10. Miscellaneous	$ 7,524	
Total Direct Costs		$43,685
INDIRECT COSTS		
5. Overhead	$ 24,222	
6. General and Administrative Expenses	$ 16,365	
7. Other Indirect Costs	$ 0	
8. Fee or Profit	$ 5,728	
Total Indirect Costs		$46,315
TOTAL PROJECT COSTS		**$90,000**