

# Nebraska Preparation Grant



**Year 2 Report  
May 2000 - May 2001**

**UNOAI Monograph 00-1**

**OVERVIEW  
SMALL AIRCRAFT TRANSPORTATION SYSTEM  
AIRBORNE REMOTE SENSING  
FUEL DROPLET EVAPORATION**

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# OVERVIEW

The NASA Nebraska Preparation Grant was designed to solidify relationships, intensify communication, and launch collaborative initiatives among Nebraska researchers and key contacts at NASA research centers and enterprises. In doing so, Nebraska was successful in laying the groundwork for the foundation for numerous long-term, mutually beneficial collaborations that were subsequently proposed and awarded in the NASA EPSCoR 2000 competition.

The NASA Nebraska EPSCoR Preparation Grant was managed by the same administrative team that oversees Nebraska's NASA Space Grant and EPSCoR programs. An advisory board (later Technical Advisory Committee) made up of voting representatives from all affiliate and partner organizations regularly reviewed grant progress and direction. The University of Nebraska at Omaha's Aviation Institute, the host institution for all three programs, provided additional administrative oversight and program evaluation through established review mechanisms. This structure has served NASA well and has been cited as a model program.

The second year of preparation grant funding served as a significant opportunity for Nebraska to lay the groundwork for the continued elevation and success of its NASA EPSCoR program. In anticipation of the NASA EPSCoR 2000 grant competition, Year 2 funding enabled funded researchers to further broaden and enhance the quality and quantity of collaborations with NASA Field Centers, Codes, and Enterprises. The plan set the stage for long-term research and outreach endeavors that have contributed significantly to the achievement of NASA's strategic objectives; the state of Nebraska's economic and aerospace development efforts; and have advanced Nebraska's aeronautics research efforts to a national leadership level.

The overarching goal of the NASA Nebraska EPSCoR Preparation grant was met by facilitating research endeavors among Nebraska faculty that addressed research and technology priorities of the NASA Field Centers, Codes, and Strategic Enterprises. During the first year of funding, Nebraska established open and frequent lines of communication with university affairs officers and other key personnel at all NASA Centers and Enterprises, and facilitated the development of collaborations between and among junior faculty in the state and NASA researchers. As a result, Nebraska initiated a major research cluster, the Small Aircraft Transportation System – Nebraska Implementation Template.

Year 2 grant funds continued to emphasize the highest level of responsiveness possible to NASA identifying priorities, supporting the initiation of contacts with NASA personnel through seed and travel grants, and expanding existing collaborations between Nebraska faculty and researchers at NASA Centers and Enterprises through cluster and enhancement grants.

The primary focus of Year 2 funding was aeronautics, specifically in the area of Small Aircraft Transportation System (SATS). Year 2 funding also supported two aeronautics-

related research areas, airborne remote sensing and microgravity combustion science. As noted by NASA administrators, Nebraska remained committed to serving underrepresented populations, and expanded its efforts in this regard in Year 2 of the preparation grant by initiating a new Native American outreach initiative, Families United in the Discovery of Science (FUNds).

NASA Nebraska Preparation Grant funds were instrumental in the identification of NASA's research needs and served in the successful development of Nebraska's EPSCoR 2000 proposal. The Aeronautics Education, Research, and Industry Alliance (AERIAL) proposal was funded in full. Over the next three to five years, the following Collaborative Research Teams (CRTs) will be funded: Small Aircraft Transportation System (SATS), Airborne Remote Sensing for Agricultural Research and Commercialization Applications (ARS), and Numerical Simulation of the Combustion of Fuel Droplets: Finite Rate Kinetics and Flame Zone Grid Adaptation (CEFD). It is Nebraska's intention to be every bit as successful in its EPSCoR 2000 funding as it was during the two years of preparation grant funding that preceded it.



## **SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)**

A Collaborative Effort Between  
NASA Nebraska EPSCoR and NASA Langley Research Center

Final Report: SATS Component of the NASA Nebraska EPSCoR  
Preparation Grant  
May 2000-2001

**Year II Outcomes and Proposal  
Copyright and Contact Information**



## **SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)**

### **Year II Outcomes**

- Dr. Brent Bowen - Implementing a National Small Aircraft Transportation System: A Public Infrastructure Challenge
- Dr. John Bartle - A Two Sector Economic Model of Technological Progress in Air Transportation
- Dr. Scott Tarry - Optimizing Airspace Capacity Through a Small Aircraft Transportation System: An Analysis of Economic and Operational Considerations
- Dr. Hank Lehrer - NASA NE Space Grant/EPSCoR Native American Outreach: Tracing a Successful NASA/Tribal Partnership
- Dr. Massoum Moussavi - Inventory of the Potential Small Aircraft Transportation System (SATS) Landing Facilities in Nebraska
- Dr. Larry Carstenson - Involvement of Legal and Regulatory Issues
- Dr. BJ Reed - The Application of the Innovator's Dilemma to State and Local Public Aviation Agencies
- Overview of Nebraska EPSCoR Preparation Grant Outcomes of SATS Year 2
- Nebraska SATS Presentation

### **Year II Proposal**

- Year II Proposal



## **SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)**

### **Copyright and Contact Information**

SATS  
Small Aircraft Transportation System

May 2001  
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Published by:  
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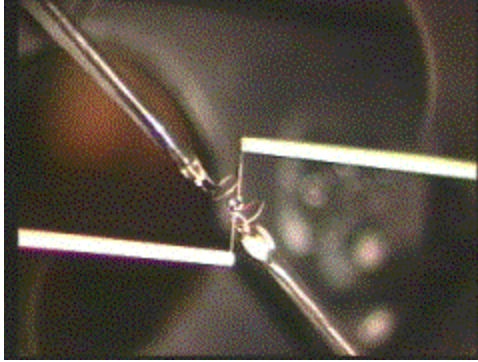
## **Airborne Remote Sensing Facility Development (ARS)**

The primary focus of Airborne Remote Sensing for Agricultural Research and Commercialization Applications will be remote sensing of crop-land agriculture, with an emphasis on defining more clearly the ways in which remote sensing can contribute to the newly developing field known as "precision agriculture." Since remote sensing technology is poised to enter the commercial market during the new millennium, the advantage of such a facility will not only benefit the conduct of high-quality research but also help spawn spin-off companies designing novel low-cost airborne sensor systems.

**Principal Investigator: Dr. Ram Narayanan**

Dependence of Image Information Content on Gray Scale  
Resolution

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## **Validated Models for the Convective Extinction of Fuel Droplets (CEFD)**

The present state of knowledge on convective extinction of fuel droplets mostly derives from experiments conducted under normal gravity conditions. Porous sphere experiments and suspended droplet experiments, employed in the past, offer the capability to vary the diameter significantly and have shown that the extinction velocity varies linearly with diameter. Due to the increase in the extinction velocity with droplet diameter, under extinction conditions natural convection becomes negligible at large "droplet" (porous sphere) diameters and important at smaller droplet diameters. As a result, any data obtained with suspended droplets under normal gravity are grossly affected by gravity. The need to obtain experimental data under microgravity conditions is therefore well justified and addresses one of the goals of NASA's HEDS microgravity combustion experiment.

**Principal Investigator: Dr. George Gogs**

Final Report  
Bibliography

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**Mini-Cluster II: Validated Models for the Convective Extinction of Fuel Droplets (Investigator: G. Gogos). NASA Collaborators: Daniel Dietrich, Vedha Nayagam, NASA Glenn.**

This mini-cluster conducted research to develop new comprehensive models for the convective extinction of fuel droplets and to validate these models using experimental data obtained under microgravity conditions. This critical research area is within the scope of the goals and objectives of NASA's Microgravity Combustion Science Program, sponsored by the Microgravity Research Division (MRD) of the Human Exploration and Development of Space (HEDS) Enterprise. In combustion experiments conducted under normal gravity conditions, buoyancy-induced flows often introduce complexities that mask the fundamentals and turn modeling into a difficult, if not impossible task. Microgravity experiments remove such complexities and make problems tractable for development of validated models, leading to fundamental understanding of flame phenomena. Such validated models and associated understanding play a major role in Aero-Space Technology Enterprise applications, such as the design of combustors for aircraft jet engines. The new code that has been developed includes the following aspects: it is transient with single step chemical kinetics; it allows for grid adaptation in the flame zone (in progress); and it will include multi-step chemical kinetics necessary (future work).

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