

Project 033 (A) Alternative Fuels Test Database Library

University of Dayton Research Institute

Project Lead Investigator

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- P.I.(s): Steven Zabarnick, Division Head
- FAA Award Number: 13-C-AJFE-UD-5
- Period of Performance: February 20, 2015 to January 14, 2016
- Task(s):
 1. Compilation of data from UDRI/AFRL alternative fuel evaluations

Project Funding Level

Funding Level: \$36,624

Cost Share: In-kind academic time of the PI, Software license support from Reaction Design (ANSYS)

Investigation Team

- Linda Shafer, data compilation
- Rhonda Cook, data compilation

Project Overview

This study aims to establish a foundational database of current and newly emerging alternative jet fuels by integrating all pre-existing jet fuel relevant data into a common archive which can provide guidelines for design and certification of new jet fuels in our future as well as steer federal policy. In the near term, the effort will focus on integration and analysis of pre-existing jet fuel data from various government agencies and individual research groups with oversight from both the Federal Aviation Administration (FAA) and the National Institute of Standards and Technology (NIST). In the long run, we hope that the database will act as 'the comprehensive and centralized knowledgebase' shared by the academic, government, and industrial communities in fuels research and policy, possibly facilitated on a cyber-based infrastructure. With prolific diversification of new jet fuels in our future, an effort to integrate dispersed information would be critical in providing the FAA with an overview of the latest developments and to support many other tangential fields of research impacted by integration of new alternative jet fuels.

Task 1 – Development of an Alternative Fuels Test Database

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Objective(s)

The main objective of this study is to establish a *foundational database* of current and newly emerging alternative jet fuels by integrating all pre-existing jet fuel relevant data into a common archive which can provide guidelines for design and certification of new jet fuels in our future as well as steer federal policy. This proposal outlines the year II efforts under this

mandate. The vision is to institute a database that can be utilized for the design and optimization of new propulsion and energy systems including development of next-generation engines, fuel delivery systems, as well as pollution mitigation technologies. Furthermore, it can provide data for screening and certification of newly emerging fuels and thereby impacting legislative measures and national policy. In so doing, the goals of this project are as follows:

- Survey current pre-existing data and analyze information
- Prioritize current data and compile into centralized logical structure
- Analyze the obtained information into chronological order and regroup into relevant group
- Obtain information on detailed test platform and test conditions
- Develop a controlled web portal for access to the information
- Develop and implement a database/web portal infrastructure and methodology
- Integrate data from FAA ASCENT National Jet Fuel Combustion Program (NJFCP)

Research Approach

Development Strategy of a Successful Fuels Test Database

- **Phase I:** Integrate Current Pre-Existing Data: Preliminary survey and integration of all pre-existing database and data (including raw data) on jet fuels from universities, national laboratories, government archives, and private industry (i.e., existing database from Sandia, NIST, DoD Labs, ASTM research reports, government technical reports etc. is part of the year I efforts and will be used to initially seed the basic infrastructure of the fuels database proposed in this study. Year II efforts will continue to assemble information and annex a prioritized set into the web portal/database. In year II, we anticipate a more focused effort in integrating fuel property test data from certification protocols.
- **Phase II:** Analysis of Preliminary Data: Conduct comprehensive analysis of the initial data to categorize all relevant physical and chemical characteristics of the fuels and relevant testing conditions. Effort will be made to determine insufficient areas for further investigation. In year II, we will significantly expand our efforts to the analysis of information into chronological order and in incorporating detailed test platform and test condition data. An effort will be made to re-categorize the data according to different testing groups and performance. A preliminary effort will be made to vet some of the data according to test conditions as required (future efforts will more fully address vetting and analysis of data)
- **Phase III:** Establish Web Portal/Database Infrastructure and Methodology: A basic web portal will be established during the year I efforts. In year II, based on the analysis of pre-existing data, we will work with NIST and other national laboratories to establish a flexible and accessible database structure and data access protocols for both retrieval of current data and integration of new information in the future. This will be integrated into the web portal. We anticipate increased functionality in the web portal to conduct advanced searches and user feedback on each data item (community based vetting system).
- **Phase III-b:** Integration of FAA ASCENT and NJFCP Data: New data generated from both the FAA ASCENT and the NJFCP will be integrated into the database according to the pre-defined infrastructure. This will be coordinated with Area #7 of the NJFCP program.
- **Phase IV:** Integrate with Current and Future Research: Disseminate and integrate new database to relevant research groups in universities, national laboratories, government, and industry. Formulate partnerships for stewardship, preservation, and continued development of the alternative jet fuel database.
- **Phase V:** Continued Development: Continue development of the database after the initial integration and distribution phase into a more widely distributed community based infrastructure (potentially cyber-based). Link and expand the database to encompass pre-existing data from other countries.

Major Accomplishments

Identification of important fuels, publications, and data sets has been performed. This has included initial evaluation of the vast AFRL Fuels Database for data that should be included in our database. Data have been abstracted from the AFRL Database for inclusion in our database. This is a very challenging task due to the large amount of data with various levels of public release classification. The data also needs to be evaluated for its being company proprietary.

Publications

None

Outreach Efforts



None

Awards

None

Student Involvement

None

Plans for Next Period

In year II of the NJFCP, we plan to expand the efforts and integrate as much data as possible into the database. The format of the database should be fully in place and the main challenge is expected to come from dealing with the many different format of data. Eventually, we anticipate three areas that the project should move into. (1) Organization of data that is most relevant to the community, (2) Analysis of the data and statistical analysis, and (3) Development of database into a cyber-based infrastructure.