README for Aircraft Air Quality and Bleed Air Contamination Detection: Engine Stand Tests, Sensor Technologies and Chemical Sampling (Phase 2, Volume 1) [supporting dataset]

William J. Hughes Technical Center, Federal Aviation Administration (FAA), U.S. Department of Transportation (USDOT)
2024-05-13

Links to Dataset

Dataset Archive Link: https://doi.org/10.21949/1528260
Report Archive Link: https://doi.org/10.21949/1528259

Summary of Dataset

The purpose of this project was to provide a data-driven process to identify sensing technology with good potential for detecting bleed air contamination from engine oil, hydraulic fluid, or deicing fluid. An on-wing test was conducted in February 2022. A test on an engine test bed was conducted in May 2022. Sensors and instruments were identified, and a test plan was developed. Testing was conducted over a period of approximately one week. Results from this test with respect to sensor ability to detect bleed air contaminants was used on-wing tests performed in 2023. Data analysis for the testing in 2023 is ongoing and will appear in a separate report. Key objectives of the project are to identify sensors and sensor technology with the potential to detect one or more of the three aforementioned bleed air contaminants. The total size of the zip file is 67.938 MB. The Portable Document Format (PDF) file format was developed by Adobe Systems and represents two-dimensional documents in a device-independent and resolution-independent format. There are PDF readers available on many platforms, such as Xpdf, Foxit, and Adobe's own Adobe Acrobat Reader. PDF readers/viewers or online services for basic functions are generally free (for more information on .pdf files and software, please visit https://www.file-extensions.org/pdf-file-extension). The .xlsx and .xls file types are Microsoft Excel files, which can be opened with Excel, and other free available spreadsheet software,

such as OpenRefine. The .csv, Comma Separated Value, file is a simple format that is designed for a database table and supported by many applications. The .csv file is often used for moving tabular data between two different computer programs, due to its open format. The most common software used to open .csv files are Microsoft Excel and RecordEditor, (for more information on .csv files and software, please visit https://www.file-extensions.org/csv-file-extension). File extension .json is associated to JavaScript Object Notation file format, a lightweight, text-based, language-independent data interchange format. JSON defines a small set of formatting rules for the portable representation of structured data. It is used by various applications as alternative option to XML file format. The data in a json file are stored in simple text file format and the content is viewable in any simple text editor (for more information on .json files and software, please visit https://www.file-extensions.org/json-file-extension). The file extension .md is among others related to texts and source codes in Markdown markup language. Markdown is a lightweight markup language, to write using an easy-to-read, easy-to-write plain text format, then convert it to structurally valid XHTML (or HTML) (for more information on .md files and software, please visit https://www.file-extensions.org/md-file-extension).

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A. General Information

Title of Dataset: Aircraft Air Quality and Bleed Air Contamination Detection: Engine Stand Tests, Sensor Technologies and Chemical Sampling (Phase 2, Volume 1) [supporting dataset]

Description of the Dataset: The purpose of this project was to provide a data-driven process to identify sensing technology with good potential for detecting bleed air contamination from engine oil, hydraulic fluid, or deicing fluid. An on-wing test was conducted in February 2022. A test on an engine test bed was conducted in May 2022. Sensors and instruments were identified, and a test plan was developed. Testing was conducted over a period of approximately one week. Results from this test

with respect to sensor ability to detect bleed air contaminants was used on-wing tests performed in 2023. Data analysis for the testing in 2023 is ongoing and will appear in a separate report. Key objectives of the project are to identify sensors and sensor technology with the potential to detect one or more of the three aforementioned bleed air contaminants. The total size of the zip file is 67.938 MB. The Portable Document Format (PDF) file format was developed by Adobe Systems and represents two-dimensional documents in a device-independent and resolution-independent format. There are PDF readers available on many platforms, such as Xpdf, Foxit, and Adobe's own Adobe Acrobat Reader. PDF readers/viewers or online services for basic functions are generally free (for more information on .pdf files and software, please visit https://www.file-extensions.org/pdf-file-extension). The .xlsx and .xls file types are Microsoft Excel files, which can be opened with Excel, and other free available spreadsheet software, such as OpenRefine. The .csv, Comma Separated Value, file is a simple format that is designed for a database table and supported by many applications. The .csv file is often used for moving tabular data between two different computer programs, due to its open format. The most common software used to open .csv files are Microsoft Excel and RecordEditor, (for more information on .csv files and software, please visit https://www.file-extensions.org/csv-file-extension). File extension .json is associated to JavaScript Object Notation file format, a lightweight, text-based, language-independent data interchange format. JSON defines a small set of formatting rules for the portable representation of structured data. It is used by various applications as alternative option to XML file format. The data in a json file are stored in simple text file format and the content is viewable in any simple text editor (for more information on .json files and software, please visit https://www.file-extensions.org/json-file-extension). The file extension .md is among others related to texts and source codes in Markdown markup language. Markdown is a lightweight markup language, to write using an easy-to-read, easy-to-write plain text format, then convert it to structurally valid XHTML (or HTML) (for more information on .md files and software, please visit https://www.file-extensions.org/md-file-extension).

Dataset Archive Link: https://doi.org/10.21949/1528260

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Date of data collection and update interval: February through May 2022

Geographic location of data collection: United States

Information about funding sources that supported the collection of the data: This project was funded by the Department of Transportation through the Federal Aviation Administration. The Grant/Contract number of this project is: 693KA9-21-C-00010.

B. Sharing/Access and Policies Information

Recommended citation for the data:

> William J. Hughes Technical Center, Federal Aviation Administration (FAA), U.S. Department of Transportation (USDOT) (2024). *Aircraft Air Quality and Bleed Air Contamination Detection: Engine Stand Tests, Sensor Technologies and Chemical Sampling (Phase 2, Volume 1) [supporting dataset]*. https://doi.org/10.21949/1528260

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Was data derived from another source?: No

This document was created to meet the requirements enumerated in the U.S. Department of Transportation's Plan to Increase Public Access to the Results of Federally-Funded Scientific Research Version 1.1 and Guidelines Suggested by the DOT Public Access website, in effect and current as of December 03, 2020.

C. Data and Related Files Overview

File List for the Dataset

1. Filename: 221095-TO15-EDD.xlsx
2. Filename: 221106-TO15-EDD.xlsx

3. Filename: 221134-TO15-EDD.xlsx
4. Filename: 221141-EPA TO-11-EDD.xlsx
5. Filename: KSU 221095-TO-15.pdf
6. Filename: KSU 221106- TO-15.pdf
7. Filename: KSU 221134R1.pdf
8. Filename: KSU 221141.pdf
9. Filename: W205131 EDD.xlsx
10. Filename: W205131_Final Report TO-13.pdf
11. Filename: W205177 EDD.xlsx
12. Filename: W205177_Final Report TO-13.pdf
13. Filename: W205178 EDD.xlsx
14. Filename: W205178 Final Report TO-13 Filters.pdf
15. Filename: W205179 Chromatograms.pdf
16. Filename: W205179 Sample EDD.xlsx
17. Filename: W205179_Final Report_TO-17.pdf
18. Filename: 97106.json
    Short Description: This is the metadata file for this project.
19. Filename: README.md
    Short Description: This is the README file you are currently viewing.

D. Methodological Information

Description of methods used for collection/generation of data: The test methods developed enable evaluation of a range of instrumentation. In addition, the laboratory chemical sampling process enabled evaluation of carbonyls, organophosphates, polyaromatic hydrocarbons, and volatile organic compounds (VOCs). The sampling plan was updated daily as sample media was delivered. Some shortages were encountered for the semi-volatile PUF cartridges. However, quartz filters were still obtained for all the test conditions where sample tube shortages existed. There were also insufficient

media to acquire engine inlet samples for every bleed air sample. In those cases, a baseline sample was determined to be the next best alternative for evaluating background contamination in the sample media. Prior experience led to the requirement that all data would be saved daily. Some instruments write over the data daily; therefore, daily capture is the only way to ensure least loss of data. Other systems presented challenges for saving data. One lesson learned is that it is better to turn an analyzer on and record events, rather than create new log files. Another lesson has been that it is better not to switch an analyzer between test locations during a test, as it can be difficult to track the change of location, and to manipulate the data post-test.

Instrument or software-specific information needed to interpret the data: For best viewing of the reports, please view the .PDF copies. The .XSLX files are the same reports in tabular form. Both are accessible to the public.

E. Data-Specific Information

Due to the lengthy nature of these reports and tabular data sheets, in-depth description of each table will not be made at this time.

F. Update Log

This README.txt file was originally created on 2024-03-07 by Peyton Tvrdy (0000-0002-9720-4725), Data Management and Data Curation Fellow, National Transportation Library peyton.tvrdy.ctr@dot.gov

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