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Developing a New Modeling Method for Liquid Piston Stirling Engines Using Thermal-hydraulic Code Sep 03 2021

A Collection of Technical Papers Mar 29 2021

NASA Lewis Stirling Engine Computer Code Evaluation Jul 13 2022 In support of the U.S. Department of Energy's Stirling Engine Highway Vehicle Systems program, the NASA Lewis Stirling engine performance code was evaluated by comparing code predictions without engine-specific calibration factors to GPU-3, P-40, and RE-1000 Stirling engine test data. The error in predicting power output was -11 percent for the P-40 and 12 percent for the Re-1000 at design conditions and 16 percent for the GPU-3 at near-design conditions (2000 rpm engine speed versus 3000 rpm at design). The efficiency and heat input predictions showed better agreement with engine test data than did the power predictions. Concerning all data points, the error in predicting the GPU-3 brake power was significantly larger than for the other

engines and was mainly a result of inaccuracy in predicting the pressure phase angle. Analysis into this pressure phase angle prediction error suggested that improvements to the cylinder hysteresis loss model could have a significant effect on overall Stirling engine performance predictions. Sullivan, Timothy J. Unspecified Center NAS3-24105; DE-AI01-85CE-50112; RTOP 778-35-13...

California. Court of Appeal (1st Appellate District). Records and Briefs Apr 29 2021

Development of a Stirling System Dynamic Model with Enhanced Thermodynamics Sep 22 2020 The Stirling Convertor System Dynamic Model developed at NASA Glenn Research Center is a software model developed from first principles that includes the mechanical and mounting dynamics, the thermodynamics, the linear alternator, and the controller of a free-piston Stirling power convertor, along with the end user load. As such it represents the first detailed modeling tool for fully integrated Stirling convertor-based power systems. The thermodynamics of the model were originally a form of the isothermal Stirling cycle. In some situations it may be desirable to improve the accuracy of the Stirling cycle

portion of the model. An option under consideration is to enhance the SDM thermodynamics by coupling the model with Gedeon Associates Sage simulation code. The result will be a model that gives a more accurate prediction of the performance and dynamics of the free-piston Stirling convertor. A method of integrating the Sage simulation code with the System Dynamic Model is described. Results of SDM and Sage simulation are compared to test data. Model parameter estimation and model validation are discussed. Regan, Timothy F. and Lewandowski, Edward J. Glenn Research Center NASA/CR-2005-214018, E-15333

Proceedings of the 24th Intersociety Energy Conversion Engineering Conference: Systems, cycles, and engines May 31 2021

The Journal of the Assembly During the ... Session of the Legislature of the State of California Feb 25 2021

Comparison of GLIMPS and HFAST Stirling Engine Code Predictions with Experimental Data Jun 12 2022 Predictions from GLIMPS and HFAST design codes are compared with experimental data for the RE-1000 and SPRE free-piston Stirling engines. Engine performance and available power loss predictions are compared. Differences exist

between GLIMPS and HFAST loss predictions. Both codes require engine-specific calibration to bring predictions and experimental data into agreement.

OVERVIEW OF NASA MULTI-DIMENSIONAL STIRLING CONVERTER CODE DEVELOPMENT AND VALIDATION..., NASA/TM--2002-211997... NATIONAL AERONAUTICS AND S Nov 17 2022

Experimental and Computational Analysis of Unidirectional Flow Through Stirling Engine Heater Head Dec 26 2020 A high efficiency Stirling Radioisotope Generator (SRG) is being developed for possible use in long-duration space science missions. NASA s advanced technology goals for next generation Stirling convertors include increasing the Carnot efficiency and percent of Carnot efficiency. To help achieve these goals, a multi-dimensional Computational Fluid Dynamics (CFD) code is being developed to numerically model unsteady fluid flow and heat transfer phenomena of the oscillating working gas inside Stirling convertors. In the absence of transient pressure drop data for the zero mean oscillating multi-dimensional flows present in the Technology Demonstration Convertors on test at NASA Glenn Research Center, unidirectional flow pressure drop test data is used to compare

against 2D and 3D computational solutions. This study focuses on tracking pressure drop and mass flow rate data for unidirectional flow though a Stirling heater head using a commercial CFD code (CFD-ACE). The commercial CFD code uses a porous-media model which is dependent on permeability and the inertial coefficient present in the linear and nonlinear terms of the Darcy-Forchheimer equation. Permeability and inertial coefficient were calculated from unidirectional flow test data. CFD simulations of the unidirectional flow test were validated using the porous-media model input parameters which increased simulation accuracy by 14 percent on average. Wilson, Scott D. and Dyson, Rodger W. and Tew, Roy C. and Demko, Rikako Glenn Research Center NASA/TM-2006-214246, AIAA Paper 2005-5539, E-15491

Validation of Multi-Dimensional Stirling Engine Design Codes Oct 16 2022 The work to be presented herein was motivated largely by a desire to improve the understanding of oscillatory fluid mechanics inside a Stirling engine. To this end, a CFD project was undertaken at Cleveland State University with the goal of accurately predicting the fluid dynamics within an engine or engine

component. Along with the CFD efforts, a code validation project was undertaken at the University of Minnesota. The material covered herein consists of four main parts. In section 1, an experimental investigation of a small aspect ratio impinging jet is discussed. Included in this discussion is a description of the test facilities and instrumentation. A presentation of the collected data is given and comments are made. Next, in section 2, a parallel experimental investigation is presented in which the same geometry as that of section 1 is used, but the flow conditions are changed from steady unidirectional flow to sinusoidally oscillating flow. In section Two, collected data are presented and comments are made. In section 3, a comparison is made between the results of sections 1 and 2, namely, sinusoidally oscillating flow results are compared to steady, unidirectional flow results from the same geometry. Finally, in section 4, a comparison is made between experimentally collected data (the main subject of this work) and CFD generated results. Furthermore, in appendix A, an introductory description of the primary measurement tool used in the experimental process the hot

wire anemometer is given for the unfamiliar. The anemometer calibration procedure is described in appendix B. A portfolio of data reduction and data processing codes is provided in appendix C and lastly, a DVD and a roadmap of its contents is provided in an appendix D. 1.0 Unidirectional Flow Investigations 1.1 Introduction This unidirectional experimental program was undertaken to complement an oscillatory flow investigation conducted at the University of Minnesota. The oscillatory investigation

Space Technology and Applications International Forum - STAIF 2005 Oct 12 2019 3rd Symposium on Space Colonization. 2nd Symposium on New Frontiers and Future Concepts, Albuquerque, New Mexico, 13-17 February 2005

"Energy for the Marketplace" Mar 17 2020

Validation of Multi-Dimensional Stirling Engine Design Codes Apr 10 2022 The NASA Technical Reports Servcr (NTRS) houses half a million publications that are a valuable means of information to researchers, teachers, students, and the general public. These documents are all aerospace related with much scientific and technical information created or funded by NASA. Some types of documents include conference

papers, research reports, meeting papers, journal articles and more. This is one of those documents.

Federal School Code List Feb 08 2022

Journal of the Assembly, Legislature of the State of California Oct 04 2021

Lindsey Stirling - Christmas Collection Jan 07 2022 (Violin Play-Along). The Violin Play-Along series will help you play your favorite songs quickly and easily. Just follow the music, listen to the audio to hear how the violin should sound, and then play along using the separate backing tracks. With the melody and lyrics included in the book, you may also choose to sing along. The online audio is accessed using the unique code provided with each book. Includes: Dance of the Sugar Plum Fairy, Op. 71a * Hallelujah * (There's No Place Like) Home for the Holidays * I Wonder As I Wander * Mary, Did You Know? * Santa Baby * Shchedryk (Carol of the Bells) * Somewhere in My Memory.

Code Sep 15 2022 A decades-old skeleton with a bullet in its skull, and a natural disaster give Port Stirling, Oregon, police chief Matt Horning all he can handle. Contemporary problems and an ugly story in Oregon's history make this a riveting read.

NASA Lewis Stirling Engine Computer Code Evaluation Dec 18 2022 In support of the U.S. Department of Energy's Stirling Engine Highway Vehicle Systems program, the NASA Lewis Stirling engine performance code was evaluated by comparing code predictions without engine-specific calibration factors to GPU-3, P-40, and RE-1000 Stirling engine test data. The error in predicting power output was -11 percent for the P-40 and 12 percent for the Re-1000 at design conditions and 16 percent for the GPU-3 at near-design conditions (2000 rpm engine speed versus 3000 rpm at design). The efficiency and heat input predictions showed better agreement with engine test data than did the power predictions. Concerning all data points, the error in predicting the GPU-3 brake power was significantly larger than for the other engines and was mainly a result of inaccuracy in predicting the pressure phase angle. Analysis into this pressure phase angle prediction error suggested that improvements to the cylinder hysteresis loss model could have a significant effect on overall Stirling engine performance predictions. Sullivan, Timothy J. Unspecified Center NAS3-24105; DE-AI01-85CE-50112; RTOP 778-35-13...

Assembly Final History Jan 15 2020

SEAMOPT Aug 14 2022

Scientific and Technical Aerospace Reports May 19 2020 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

Development of Free-Piston Stirling Engine Performance and Optimization Codes Based on Martini Simulation Technique May 11 2022 A FORTRAN computer code is described that could be used to design and optimize a free-displacer, free-piston Stirling engine similar to the RE-1000 engine made by Sunpower. The code contains options for specifying displacer and power piston motion or for allowing these motions to be calculated by a force balance. The engine load may be a dashpot, inertial compressor, hydraulic pump or linear alternator. Cycle analysis may be done by isothermal analysis or adiabatic analysis. Adiabatic analysis may be done using the Martini moving gas node analysis or the Rios second-order Runge-Kutta analysis. Flow loss and heat loss equations are included. Graphical display of engine motions and pressures and

temperatures are included. Programming for optimizing up to 15 independent dimensions is included. Sample performance results are shown for both specified and unconstrained piston motions; these results are shown as generated by each of the two Martini analyses. Two sample optimization searches are shown using specified piston motion isothermal analysis. One is for three adjustable input and one is for four. Also, two optimization searches for calculated piston motion are presented for three and for four adjustable inputs. The effect of leakage is evaluated. Suggestions for further work are given. Martini, William R. Unspecified Center NASA-CR-182210, NAS 1.26:182210 NAS3-22256; RTOP 586-01-11...

Combat Codes Jun 19 2020 The authors of 'Combat Codes' have painstakingly researched the codes used by the RAF to replace unit markings during World War II in order to attempt to confuse the enemy.

Proceedings of the 28th Intersociety Energy Conversion Engineering Conference Jul 21 2020

Senate Final History Feb 14 2020

"Advanced Energy Systems--their Role in Our Future" Dec 14 2019

Introduction to the Theory of Error-

Correcting Codes Nov 05 2021 A complete introduction to the many mathematical tools used tosolve practical problems in coding. Mathematicians have been fascinated with the theory oferror-correcting codes since the publication of Shannon's classicpapers fifty years ago. With the proliferation of communicationssystems, computers, and digital audio devices that employerror-correcting codes, the theory has taken on practicalimportance in the solution of coding problems. This solutionprocess requires the use of a wide variety of mathematical toolsand an understanding of how to find mathematical techniques tosolve applied problems. Introduction to the Theory of Error-Correcting Codes, Third Editiondemonstrates this process and prepares students to cope with codingproblems. Like its predecessor, which was awarded a three-starrating by the Mathematical Association of America, this updated andexpanded edition gives readers a firm grasp of the timelessfundamentals of coding as well as the latest theoretical advances.This new edition features: * A greater emphasis on nonlinear binary codes * An exciting new discussion on the relationship between codes andcombinatorial

games * Updated and expanded sections on the Vashamov-Gilbert bound, vanLint-Wilson bound, BCH codes, and Reed-Muller codes * Expanded and updated problem sets. Introduction to the Theory of Error-Correcting Codes, Third Editionis the ideal textbook for senior-undergraduate and first-yeargraduate courses on error-correcting codes in mathematics, computerscience, and electrical engineering.

CFD Modeling of Free-Piston Stirling Engines Dec 06 2021

Monthly Catalogue, United States Public Documents Nov 24 2020

Evaluation of a Stirling Engine Heater Bypass with the NASA Lewis Nodal-analysis Performance Code Aug 22 2020

Monthly Catalog of United States Government Publications Oct 24 2020

Advanced Technology Development for Stirling Convertors Aug 02 2021 A high-efficiency Stirling Radioisotope Generator (SRG) for use on potential NASA Space Science missions is being developed by the Department of Energy, Lockheed Martin, Stirling Technology Company, and NASA Glenn Research Center (GRC). These missions may include providing spacecraft onboard electric power for deep space missions or

power for unmanned Mars rovers. GRC is also developing advanced technology for Stirling convertors, aimed at substantially improving the specific power and efficiency of the convertor and the overall power system. Performance and mass improvement goals have been established for second- and thirdgeneration Stirling radioisotope power systems. Multiple efforts are underway to achieve these goals, both in-house at GRC and under various grants and contracts. The status and results to date for these efforts will be discussed in this paper. Cleveland State University (CSU) is developing a multi-dimensional Stirling computational fluid dynamics code, capable of modeling complete convertors. A 2-D version of the code is now operational, and validation efforts at both CSU and the University of Minnesota are complementing the code development. A screening of advanced superalloy, refractory metal alloy, and ceramic materials has been completed, and materials have been selected for creep and joining characterization as part of developing a high-temperature heater head. A breadboard characterization is underway for an advanced controller using power electronics for active power factor control with a goal of eliminating the heavy

tuning capacitors that are typically needed to achieve near unity power factors. Key Stirling developments just initiated under recent NRA (NASA Research Announcement) awards will also be discussed. These include a lightweight convertor to be developed by Sunpower Inc. and an advanced microfabricated regenerator to be done by CSU. Thieme, Lanny G. and Schreiber, Jeffrey G. Glenn Research Center
NASA/TM-2004-213186, E-14685

Assembly Bill Jan 27 2021

Stirling Technology Development at NASA Grc. Revised Nov 12 2019 The Department of Energy, Stirling Technology Company (STC), and NASA Glenn Research Center (NASA Glenn) are developing a free-piston Stirling convertor for a high-efficiency Stirling Radioisotope Generator (SRG) for NASA Space Science missions. The SRG is being developed for multimission use, including providing electric power for unmanned Mars rovers and deep space missions. NASA Glenn is conducting an in-house technology project to assist in developing the convertor for space qualification and mission implementation. Recent testing, of 55-We Technology Demonstration Convertors (TDC's) built by STC includes mapping, of a second pair of

TDC's, single TDC testing, and TDC electromagnetic interference and electromagnetic compatibility characterization on a nonmagnetic test stand. Launch environment tests of a single TDC without its pressure vessel to better understand the convertor internal structural dynamics and of dual-opposed TDC's with several engineering mounting structures with different natural frequencies have recently been completed. A preliminary life assessment has been completed for the TDC heater head, and creep testing of the IN718 material to be used for the flight convertors is underway. Long-term magnet aging tests are continuing to characterize any potential aging in the strength or demagnetization resistance of the magnets used in the linear alternator (LA). Evaluations are now beginning on key organic materials used in the LA and piston/rod surface coatings. NASA Glenn is also conducting finite element analyses for the LA, in part to look at the demagnetization margin on the permanent magnets. The world's first known integrated test of a dynamic power system with electric propulsion was achieved at NASA Glenn when a Hall-effect thruster was successfully operated with a

free-piston Stirling power source. Cleveland State University is developing a multidimensional Stirling computational fluid dynamics code to significantly improve Stirling loss pre

Thermodynamic Analysis of a Stirling Engine Using Second Order Isothermal and Adiabatic Models for Application in Micropower Generation System Apr 17 2020 This work models and analyzes a Stirling cycle with a code written on Matlab platform that can be used to design an engine

Overview of NASA Multi-dimensional Stirling Convertor Code Development and Validation Effort Jan 19 2023

NASA Lewis Stirling Engine Computer Code Evaluation Feb 20 2023

Energy Research Abstracts Mar 09 2022

Cryocoolers 10 Jul 01 2021 Cryocoolers 10 is the premier archival publication of the latest advances and performance of small cryogenic refrigerators designed to provide localized cooling for military, space, semi-conductor, medical, computing, and high-temperature superconductor cryogenic applications in the 2-200 K temperature range. Composed of papers written by leading engineers and scientists in the field, Cryocoolers 10 reports the most recent

advances in cryocooler development, contains extensive performance test results and comparisons, and relates the latest experience in integrating cryocoolers into advanced applications.

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- SEAMOPT
- NASA Lewis Stirling Engine Computer Code Evaluation

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- Space Technology And Applications International Forum STAIF 2005