
PROPULSION DIRECTORATE

Monthly Accomplishment Report April 2004



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STRUCTURAL ENGINE DEMONSTRATOR COMPLETES HCF TESTING: The joint Navy/Air Force sponsored General Electric (GE) Structural Engine Demonstrator (XTE77/SE1) successfully completed High Cycle Fatigue (HCF) model validation testing at GE's test facility in Lynn, Massachusetts. This demonstrator engine is based on the GE F414 configuration (F/A-18 re-engine program) and includes several advanced technologies. HCF problems in the field are caused by the cyclic content of the turbine engine environment and the uncertainty in predicting the stresses that result from minor damage due to field operation. The consequence of HCF is an unacceptably high rate of failures for advanced military gas turbine engines. Data derived from testing this highly instrumented engine will validate key elements of the HCF Test Protocol, which was developed under the Integrated High Performance Turbine Engine Technology (IHPTET) Program. The success of this test will result in the F414 engine having a significantly lower risk of experiencing HCF related issues. Also, the results of this test will contribute to a significantly more robust HCF design system, which will lower the risk of experiencing HCF related issues in the F136 engine for the F-35. (Ms. R. Newman, AFRL/PRTP, (937) 255-7507)



The XTE77/SE1 Structural Engine Demonstrator recently completed High Cycle Fatigue testing at General Electric's test facility in Lynn, Massachusetts

PULSED DETONATION POWERED AIRCRAFT MOVES CLOSER TO FIRST FLIGHT: The Pulsed Detonation Flight Program recently commenced ground testing at [Scaled Composites, Inc.](#) in Mojave, California. On the first day of hot-fire testing, thrust and acoustics were successfully checked out. Acoustic levels in front of the aircraft, including the cockpit area, were significantly less than those measured in the laboratory at Wright-Patterson AFB, Ohio. Acoustic levels behind the aircraft were as previously predicted. Ground testing was audible at distances exceeding five miles from the airport runway. Following successful ground

testing, taxi tests were performed, culminating in high-speed taxi tests. AFRL's Propulsion and Air Vehicles Directorates have jointly funded this program with technical support from the Human Effectiveness and Materials and Manufacturing Directorates. The goal of this program is to demonstrate the viability of revolutionary pulsed detonation propulsion technology on a manned aircraft. The team will return to Mojave shortly to resume preparations for flight testing. (2Lt P. Litke, Mr. J. Stutrud, and Dr. F. Schauer, AFRL/PRTC, (937) 255-6462)



Scaled Composites Test Pilot Mike Melville evaluates acoustic levels while Dr. Fred Schauer (AFRL/PR) checks static thrust during hot-fire testing at the Mojave Airport in California



The PDE-powered LongEZ during a high speed taxi test



Witnesses to the first PDE hot-fire testing in Mojave, California [from L to R: Jim (Scaled Composites Electrician), Tom Presdorf (AFRL/VA Program Manager), Terry (Scaled Composites Fabricator), Rich Aldrich (Scaled Composites Crew Chief), Jeff Stutrud (AFRL/PR remote data systems), Mike Melville (Scaled Composites Test Pilot). To the right of the tail pipes stand three AFRL/PR engine developers: Dr. Fred Schauer, Dr. John Hoke, and 2nd Lt Paul Litke; Right foreground AFRL/VA acoustics experts: Travis and Leonard Shaw. In the background over Lt Litke's shoulder: Mojave airport fire fighters. Not pictured: Bill McCuddy (AFRL cameraman)].

ANNUAL AWARDS CELEBRATION RECOGNIZES PR'S BEST: On 4 May 2004, the Propulsion Directorate held its 6th Annual Awards Celebration to honor the achievements of the past year. This year's ceremony was held at Edwards AFB, California, with about 150 people in attendance. The following table lists the awards that were presented and the winning individuals/teams:

Award	Winner(s)
NCO of the Year	TSgt Robert V. Shah
David A. Hawkins CGO of the Year	Capt David A. Pfahler
Program Management Award	Mr. James S. Lynge
Betty Siferd Support Award	SBIR Team (Ms. Laureen Regazzi, Ms. Deborah Spotts, and Ms. Rosa Ritter)
E. C. Simpson Award	In-House Scramjet Research Team (Dr. Mark Gruber, Dr. Dean Eklund, Dr. Jeffrey Donbar, 1Lt Adam Fink, Capt John Francolini, and Mr. Bob Behdadnia)
S. D. Heron Award	Dr. James Kenyon and Dr. Charles Cross
Don Ross Award	Dr. Tommy Hawkins and Dr. Gregory Drake
Director's Trophy	BAO Kit Team (Capt David Pfahler, Mr. Steven Vukson, Dr. Joseph Fellner, Dr. Thomas Reitz, Dr. Kirk Yerkes, Mr. Gary Loeber, Dr. Russell Spyker, and Mr. Cameron Riepenhoff)



Capt David Pfahler was named the David A. Hawkins CGO of the Year



Mr. James Lynge received PR's Program Management Award

As part of the ceremony, Col Heil also presented Director's Special Recognition certificates to the following individuals:

Recipients of Director's Special Recognition Certificates
Mr. Thanh Chu
Ms. Deb Fuller
Mr. Mike Schumacher
Mr. Bob Behdadnia
1Lt Ephane DuBose
2Lt Jamie Johnson
Mr. Curt Kessler
Ms. Sharon Steltz
Dr. Ray Moszee
Mr. Jamie Malak



Ms. Laurie Regazzi led the SBIR Team that won the Betty Siferd Support Award. Not pictured are Ms. Deborah Spotts and Ms. Rosa Ritter.

Congratulations to all the winners and nominees. (J. Pearce, AFRL/PRO (UTC), (937) 255-5015)



AFRL/PRA's In-House Scramjet Research Team won the E.C. Simpson Award (pictured, from L to R, are Dr. Jeffrey Donbar, Dr. Dean Eklund, 1Lt Adam Fink, Mr. Bob Behdadnia, Capt John Francolini, and Dr. Mark Gruber)



Dr. James Kenyon (L) and Dr. Charles Cross (R) won the S.D. Heron Award



Dr. Tommy Hawkins (L) and Dr. Gregory Drake (R) won the Don Ross Award



The BAO Kit Team won the Director's Trophy (pictured, from L to R, are Dr. Kirk Yerkes, Mr. Steven Vukson, Capt David Pfahler, Mr. Gary Loeber, Dr. Thomas Reitz, Mr. Cameron Riepenhoff, and Dr. Joseph Fellner). Not pictured: Dr. Russ Spyker.

UNIQUE HYPERSONIC PROPULSION TEST FACILITY UPGRADED: The Propulsion Directorate recently completed a 20-week project to upgrade Scramjet Research Cell 22 at Wright-Patterson AFB, Ohio. The upgrade culminated in a successful operational check run on 20 April 2004. PR's 1Lt Adam Fink led the project to upgrade various research article components and facility systems in this world-unique facility. The upgrade features highly accurate venturi flow meters and new isolation valves to ensure that no un-metered air enters the test rig. The resulting threefold increase in the accuracy of air flow measurements will substantially improve the ability to calculate critical scramjet engine performance parameters, such as engine efficiency. Beginning with the first data run on 22 April 2004, PR will experimentally examine an alternate piloting ignition configuration that promises to improve the performance and operability of the baseline scramjet flow path. (1Lt A. Fink, AFRL/PRAS, (937) 255-7328)



PR's Scramjet Research Cell 22 was recently upgraded to improved the fidelity of experimental measurements of scramjet performance

DRS. GORD AND HANCOCK HIT THE TOP 40: The *Dayton Business Journal* recently selected the Propulsion Directorate's Drs. James R. Gord and Robert D. Hancock as recipients of the seventh annual 40 Under 40 Awards. The 40 Under 40 Awards were established in 1998 to honor Dayton's rising young business, political, and civic leaders. Nominees for the award are judged on business and community leadership as well as their career path. Dr. Gord is a principal research chemist and the Director of the Combustion and Laser Diagnostics Research Complex at Wright-Patterson AFB, Ohio. He designs, develops, and operates state-of-the-art facilities used to study combustion and fuel. Dr. Gord is also active in his community, participating in numerous technical societies, committees, family church activities, and youth sports programs. Dr. Hancock

is Chief of PR's Combustion Branch where he oversees the activities of 59 people and directs a research program involving combustors, afterburners, pulsed detonation engines, laser diagnostics, and emissions. He is actively involved in his community, contributing his free time as a Boy Scout leader and a church youth leader. He also previously served as the Chairman of the Beavercreek Advisory Council for the Gifted. The 40 Under 40 Award winners were recognized at a banquet held in Dayton, Ohio, on 22 April 2004, and they were also featured in a special report of the *Dayton Business Journal*. (Col M. Heil, AFRL/PR, (937) 255-2520)

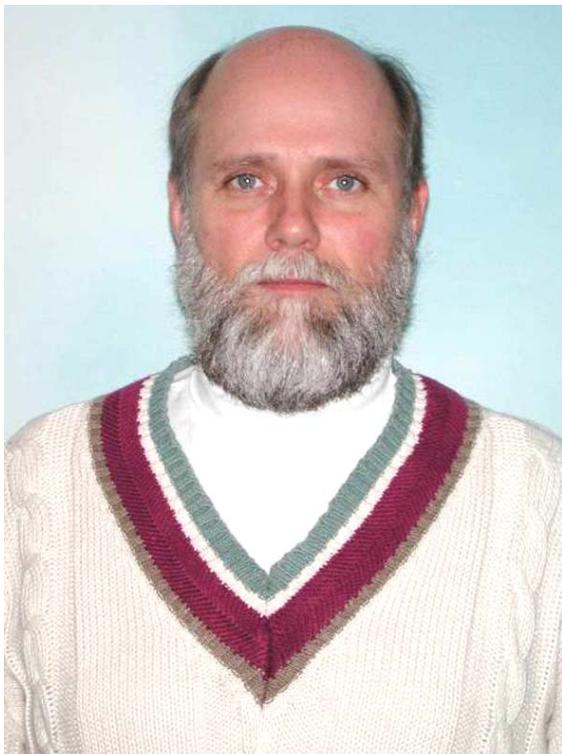


Dr. James Gord (L) and Dr. Robert Hancock (R) were recently selected by the *Dayton Business Journal* for the 40 Under 40 Award

INVENTION PROMISES HIGHER-POWER/LONGER-LIFE OPERATION FOR LASERS:

The Propulsion Directorate's Drs. Susan Heidger and Shlomo Rotter (on-site contractor with [UES, Inc.](#)) recently invented a device known as the Integrated Diamond Carrier (IDC). The IDC is a freestanding diamond base plate with arrays of mesa structures for mounting solid state (e.g., GaAs*) laser bars and integrated mirrors for steering the laser light. The IDC will enable lasers to be operated at higher powers, provide a more uniform temperature field for laser bars, and extend lifetimes because of the greatly improved cooling efficiency. Drs. Heidger and Rotter are currently working with the Sensors Directorate (AFRL/SN) on a series of experiments designed to demonstrate mounting, beam steering, and performance improvements of diode lasers using the IDC. These experiments will be followed up with cooling experiments with PR's Dr. Kirk Yerkes. Industry partners are currently being identified for technology transition. Drs. Heidger and Rotter have applied for a provisional patent (Application #US 60/557,451) on the Integrated Diamond Carrier (IDC), and a full patent is anticipated. (Dr. S. Heidger, AFRL/PRPE, (937) 255-6932)

* GaAs = Gallium Arsenide



Dr. James Scofield was recently selected to receive the Meritorious Civilian Service Award

DR. SCOFIELD RECOGNIZED FOR ADVANCING SiC POWER TECHNOLOGY:

The Propulsion Directorate's Dr. James D. Scofield was recently selected to receive the Meritorious Civilian Service Award. This award recognizes Dr. Scofield for his distinguished performance as a member of PR's Electrical Technology & Plasma Physics Branch (AFRL/PRPE) from 1995 to 2003. During this time, Dr. Scofield demonstrated outstanding leadership, management skill, and technical expertise as he spearheaded the nation's premier Silicon Carbide (SiC) power semiconductor research and development center. In 1995, SiC power semiconductor technology was in its infancy and there were no commercial products available, but now SiC products are available for numerous military and commercial applications. SiC power semiconductors offer many benefits over existing technology, such as reduced weight and volume, high temperature operation, and radiation tolerance. As a result of Dr. Scofield's efforts, SiC power devices can now be used to

meet the efficiency and temperature demands of tomorrow's high performance subsystems, such as electric flight control actuators, variable speed electric pumps, and radar and avionic power supplies. (Mr. J. Weimer, AFRL/PRPE, (937) 255-6236)

RESEARCHER WINS INAUGURAL POSTDOCTORAL AWARD: The University of Southern California (USC) recently awarded the first Arthur Adamson Postdoctoral Recognition Award to Dr. Ralf Haiges. This newly established award will be given annually to an outstanding postdoctoral fellow in honor of the late USC Emeritus Professor of Chemistry, Arthur W. Adamson. Dr. Haiges works with Dr. Karl Christe, who leads research groups at USC working on the PR program on polynitrogen and high-nitrogen High Energy Density Matter (HEDM) chemistry. During the past year, Dr. Haiges made outstanding contributions to polyazide and N₅⁺ chemistry. His work was published in leading journals such as *Angewandte Chemie* (regarded as the most prestigious chemistry journal in the world) and *Chemical & Engineering News* and was also featured on the cover of *Chemistry - A European Journal*. *Angewandte Chemie* also recently accepted two more papers from Dr. Haiges, identifying one of these papers as a VIP (very important paper). Dr. Haiges was honored at a banquet held at USC on 14 April 2004. (Dr. K. Christe, AFRL/PRSP, (661) 275-5194)

Want more information?

- ❖ A USC release on the award ceremony is available here:
http://www.usc.edu/schools/college/news/stauffer_32.html



Dr. Ralf Haiges (L) receives the inaugural Arthur Adamson Postdoctoral Recognition Award from Prof. Hanna Reisler, Chairman of the USC Chemistry Department