

# AIAA SAN FRANCISCO SECTION



## IN4M-LETTER

VOLUME XLVI, NUMBER 4  
JANUARY-FEBRUARY 2005

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS SAN FRANCISCO SECTION  
P.O. BOX 1548, MOUNTAIN VIEW, CA 94042 <http://www.aiaa-sf.org>



Above: That's no candle flame! This is a test of paraffin-based fuel at NASA Ames. [Image courtesy NASA]

Thursday, January 27, 2005  
Ramada Inn, Sunnyvale

### High-Regression Rate Hybrid Propulsion

Dr. Arif Karabeyoglu  
Dr. Brian Cantwell  
Dept. of Aeronautics and Astronautics  
Stanford University Stanford, CA

Stanford researchers Brian Cantwell and Arif Karabeyoglu will present their recent research into hybrid rocket fuels that promise significantly higher thrust levels than previously obtained. Hybrid rocket propulsion, which has been neglected commercially in favor of solid and liquid propellants, offers many advantages over its better-known cousins, but has received little attention in the media until a hybrid rocket won the X-Prize: Burt Rutan's SpaceShip One. The Stanford team has built several rockets to test their predictions on the performance of these alternate fuels, and their conclusions, videos, and predicted applications are very exciting!

Conventional rocket fuels are either solids or liquids, but paraffin fuels may be used in a hybrid system combining solid and liquid materials. An oxidizer such as oxygen or nitrous oxide is generally used with all fuel types to aid burning.

Solid fuels include a rubberized material incorporating the oxidizer and other additives such as aluminum or ammonium perchlorate. The fuel-oxidizer composite is dangerous, as it may explode even during shipping and installation. The fuel burns very rapidly in the rocket combustion chamber to generate the rocket

*High-Regression Rate Hybrid Propulsion, continued on page 2*

Thursday, February 17, 2005  
South San Francisco

### United Airlines Maintenance Facility

The AIAA San Francisco Section is arranging for a tour of the United Airlines Maintenance Facility at San Francisco International Airport, followed by dinner in South San Francisco.

How does an airline ensure that its fleet maintains standards of safety and efficiency? This tour will give section members an up-close view of what happens when the airplane is on the ground.

The evening dinner program will elaborate on the afternoon, but will focus lessons learned from the cockpit applied to welding. Over many decades, commercial pilot training programs have evolved to an extremely high level of effectiveness. In spite of less-than-infrequent pilot turnover for a variety of reasons, these programs provide a foundation for commercial aviation's high

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**Below:** United 747 leaves San Francisco, bound for Vietnam.



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**NOTE:** This newsletter and many back issues are available in PDF form at: <http://www.aiaa-sf.org/newsletter>. (Pages 3-4 only available in PDF.)

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propulsion force known as thrust. Once the solid fuel is ignited, the rocket motor cannot be shut off. This is dangerous because there is no chance to ensure adequate thrust build-up before take-off.

Liquid rocket fuels include kerosene and liquefied hydrogen. In these systems, the fuel and oxidizer are held separately in large tanks and then fed into the rocket chamber, where they mix and burn. Valves are used to regulate fuel and oxidizer flow, and increase, decrease or shut off thrust. This allows more control over the launch process than do solid fuels. The system relies on complex and expensive machinery, however, and is subject to catastrophic fires.

Hybrid rocket fuels are considered a safer alternative to traditional solid and liquid fuel systems. In hybrids, the thrust chamber contains only solid fuel. This reduces the potential for devastating fires and explosions. The oxidizer is ignited as it is forced over the fuel surface. Like liquid systems, hybrids can be throttled, but require only one set of valves -- for the liquid oxidizer.

A team of Stanford researchers, led by Dr. Brian Cantwell and Dr. Arif Karabeyoglu, first tested paraffin in a laboratory-scale rocket motor in November 1998 and found that it burned three to four times faster than conventional solid fuels. To date, they have conducted more than 250 laboratory and field tests in collaboration with engineers at NASA Ames Research Center. They have tested rocket motors with 2,500 pounds of thrust, the amount that might be needed for a third stage rocket in a launch system. "Further scale-up tests are needed before paraffin-fueled rockets can be utilized in lower stage rockets requiring thrust levels of 200,000 pounds or more," Dr. Cantwell said.

Dr. Cantwell projects that commercial application of paraffin fuels could become a reality in as few as three years. Stanford has secured a patent on the use of paraffin in rocket fuel applications, and Cantwell and Karabeyoglu have started Space Propulsion Group Inc., a company geared toward commercializing the tech-

nology. A potential application for this hybrid technology is as a replacement for the space shuttle's two solid booster rockets:

"A hybrid rocket equivalent to the space shuttle's solid rockets would be about the same diameter, but would be somewhat longer" Cantwell continues. "One design concept being considered is a new hybrid booster rocket that is able to fly back to the launch site for recharging" he says, which would save considerable cost and time in preparing the boosters for the next launch. However, we won't be seeing paraffin-based shuttle SRBs for many years to come, if ever, Karabeyoglu says. The technology is still in the demonstration phase, and would likely be used for years on smaller rockets before being considered for NASA's flagship launch vehicle.

**Below:** NASA and Stanford scientists and engineers work on the testing rig for the new paraffin-based solid rocket fuel. Pictured are (clockwise from bottom-left): Brian Cantwell, Arif Karabeyoglu, Shane De'Zilwa, Rusty Hunt, Dave Yaste, Kent Shiffer, Greg Zilliac. [Image courtesy NASA.]



*United Airlines Maintenance Facility, continued from page 1*

operational safety record. Much of the success of these programs is due to a keen understanding of human behavior relative to learning, retention of what is learned, the need for practice and the value of experience. Many of the human-factor "lessons learned" from pilot training programs could add value to welder training programs

## About the Speaker

**Byron J. May** is United Airline's Manager of Repair, Process and Materials Engineering. He joined United Airlines in 1989 where he was responsible for implementing the robotic plasma arc welding of turbine blades in their engine repair shop in San Francisco. Since then he has held various positions in engineering at United including; process engineer, process engineering lead, JT8D fleet technical coordinator and CFM56 fleet engineering manager. He has been a member of American Welding Society (AWS) for over 20 years, a Certified Welding Inspector for over 15 years and is an advisory member of the AWS D17 committee on aerospace weld-

ing. He delivered the 2004 AWS Fred L. Plummer Memorial Educational Lecture, entitled "Welder Training: What Can We Learn from the Cockpit?"

## Additional Information

Many of the details are still being worked out. The preferred method for making reservations is on the web at <http://www.aiaa-sf.org/dmtg/05-02.html>. Dinner will be at the Italian restaurant Buon Gusto, 224 Grand Avenue, South San Francisco (650-742-9776). Dinner menu options and price will be posted on-line before the beginning of February.

The tour is limited to AIAA members, with the provision that it will be cancelled if the National Security Alert Level is raised to Orange. Photo ID is required. The AIAA SF section will provide a list of attendees for the tour in advance of the event. (Sorry, no unannounced walk-ins.) The tour is expected to run from 3:30 to 5:30pm, with dinner from 6:30 to 9:00pm.

## Professional Interests Profiles

What is the make-up of the AIAA San Francisco Section? What are the members' professional interests?

To answer these questions, the AIAA SF council looked at data from August 2004, which showed about 1300 membership reporting their interests. The top 10 professional interests were as follows:

Fluid Dynamics	114
Guidance, Navigation & Control	93
Management	78
Applied Aerodynamics	71
Aircraft Design	70
Thermophysics	46
Space Systems	42
Missile Systems	38
Systems Engineering	36
Air Transportation Systems	33

Rounding out the top 15 were: Propellants & Combustion, Astrodynamics, Structural Dynamics, Communication Systems, and Space Transportation; each of these had at least 25 respondents.

Also of note: of 1300 section members, over 100 of them are members of AIAA technical committees (TCs). A few are even on multiple TCs.

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## The IN4M-LETTER in Transition

*Okay, we slipped this time.* As reported in the previously, the award-winning AIAA San Francisco Section IN4M-LETTER is undergoing changes in how it is produced and distributed. Much of the section budget now goes to newsletter printing and postage. If the printed circulation can be reduced, the section can pursue other projects or improve existing ones.

*The plan was* to make the newsletter PDF available on-line as usual, and then let member opt out of the printed version. This called for a little Internet engineering than our volunteers had time for. So, you're still seeing this issue in print.

*What you can do.* We still have a get a lot of bounced e-mail, indicating bad addresses. *If you have an e-mail address*, but haven't been getting regular updates from the San Francisco Section or AIAA headquarters, go to <http://www.aiaa.org/members>, and check your address there. If you or your ISP uses an address-based spam filter, make sure you can receive mail from [aiaa-sf@aiaa-sf.org](mailto:aiaa-sf@aiaa-sf.org); we plan to consistently deliver mail from that address.

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## And We Can Still Use Volunteers

Do you believe you have what it takes to be a project lead? Do you need to prove it to yourself without risking company resources?

The AIAA San Francisco Section is involved in a number of efforts — from nurturing future talent to identifying issues of importance for members to delivering informative programs that stretch the knowledge of its members.

Getting involved in AIAA SF Section activities is a way to build your own growth path while helping others.

## Short Notes

### SVEC Honors 2005 Hall of Fame Inductees

The Silicon Valley Engineering Council (SVEC) proudly presents its 2005 Hall of Fame Banquet on February 23, 2005, just in time for National Engineers Week. The Silicon Valley Engineering Council will honor five outstanding individuals for their remarkable contributions by welcoming them into its Hall of Fame.

The 15th annual Hall of Fame ceremony will recognize local engineers for their outstanding professional achievements, both in engineering and technology-- and for significant contributions to the community.

The five distinguished Hall of Fame inductees will include:

- **Dr. Douglas Engelbart** - Inventor of computer "mouse" and a National Medal of Honor recipient
- **Mr. Ken Levy** - Founder and COB of KLA-Tencor Corp., National Academy of Engineering
- **Dr. Dan Maydan** - President Emeritus, Applied Materials, National Academy of Engineering
- **Dr. David Patterson** - Chair of EE and Computer Science, UCB, National Academy of Engineering
- **Dr. T. J. Rodgers** - Founder, President and CEO Cypress Semiconductor.

In accordance with this year's theme, "Education is the Economy", the Silicon Valley Engineering Council will award five scholarships for academic excellence.

In addition, AIAA member **David Levinson** will talk about the Discover "E" program, which runs from the beginning of National Engineers Week until the end of March.

Additional info:

- February 23, 2005 (Wednesday), 5:30-9pm
- The Westin Santa Clara, 5101 Great American Parkway, Santa Clara, CA 95054
- On-line info: <http://www.svec.org/banquet/index.html>
- On-line reservations: <http://www.acteva.com/booking.cfm?bevaid=79146>

### SVEC Scholarship Applications Deadline Jan. 26

The Silicon Valley Engineering Council is now accepting applications for the 2005 scholarship award program. These awards, valued at \$1000, are given to undergraduate students at local engineering colleges, and local graduating high school students aspiring to engineering colleges. In addition to the monetary award each recipient and their guest are invited to the SVEC banquet to be held February 23, 2005.

The selection of awardees under this program will include consideration of the following factors:

- The applicant is a student member in good standing of a local SVEC member organization.
- The applicant's program of study is directly focused on engineering or technology.

*Short Notes, continued on page 4*

- The student will exhibit strong academic performance as shown by GPA in the major and overall, as well as strong recommendations from faculty advisors.
- The applicant has shown involvement in professional and/or student activities.
- The applicant has shown involvement in community and/or social services activities.
- A brief essay describing the student's academic and professional goals is submitted for evaluation.
- The applicant has not previously won an award from the SVEC.

An application is attached, or may be downloaded from the SVEC website at <http://www.svec.org>. For further questions, please contact Larry Bethel or other members of the SVEC board, as listed at the SVEC website.

### **Burt Rutan Visits Stanford AIAA Student Branch**

**Dr. Burt Rutan**, an AIAA senior member and founder of Scaled Composites (Mojave, CA), designer of a long list of unique aircraft and most recently SpaceShipOne, visited Stanford University on December 1, 2004, one of several stops he made in the Bay area. His Stanford visit was sponsored by the AIAA Student Branch during a special brown bag lunch session. Although basically publicized to Stanford engineering students, word leaked to other AIAA members, who showed up in a jam-packed conference room filling to roughly 150 people.

Rutan discussed the design of SpaceShipOne, showed cut-away diagrams of the craft, and video taken from SpaceShipOne itself and its launch vehicle WhiteKnight. Without giving away too much, he later discussed a bit about SpaceShipTwo, why he believed space tourism was economically feasible, and the impact it would have on other space activities.

(Editor's note: We thought about sending a e-mail out to members that Burt Rutan was in town, but we were pretty sure the conference would not handle the response. With the minimal notice we put out to selected members, the room was already filled to over capacity.)

### **HR5382 Passes Just Before Senate Adjourns**

After objection to subtle language changes in HR 3752, the *Commercial Space Launch Amendments Act* of 2004, the bill was withdrawn, and replaced by HR5382, which carries the same title.

In the final hours of the 108th Congress, the US Senate approved the bill, designed to improve the regulatory environment for commercial spaceflight, including space tourism. Senate approval was unanimous. The bill provides definitions of suborbital vehicles and ensures that such vehicles will be regulated as launch vehicles rather than aircraft. It also an experimental permit provision that will make it easier for commercial vehicle developers to get regulatory approval for test flights of new vehicles.

The bill passed in the House in November, with 269 for and 120 against. Senate approval less than two hours before the Senate adjourned for the year.

### **Numerical Grid Conference in San Jose**

The *9th International Conference on Numerical Grid Generation in Computational Field Simulations* will be held at the Fairmont Hotel, in Jose, on June 11-18, 2005. Extended abstracts were due January 3. The conference is organized by the International Society of Grid Generation (ISGG). Members of AIAA student branch at San Jose State University are helping to coordinate the conference.

### **Symposium on Technologies for Autonomous and Robotic Vehicles - Feb. 24-26**

The San Fernando Valley (SFV) Engineers' Council, with local sections of IEEE, AIAA, SME, and ASM, will present a symposium on autonomous and robotic vehicles. Organized as part of the SFV celebration of Engineers Week, it draws from southern California companies involved in the application of autonomous and robotic vehicles for space, air, land and sea.

Additional information:

- February 24-26, 2005; Sportmen's Lodge, Studio City, CA
- Registration and additional info at:  
<http://www.engineerscouncil.org/TechSymp/index.html>

### **Infotech@Aerospace — Sept. 26-29**

Infotech@Aerospace premieres AIAA's first, full spectrum technical forum devoted to information-enabled aerospace systems, capabilities, applications and technologies. Hosted by DARPA, and supported by several AIAA technical committees, it provides an opportunity for interaction among experts from a wide range of disciplines including intelligent systems, unmanned and robotic platforms and systems of all types, enabling computing technologies -- hardware and software, sensors for situation awareness, advanced communications, digital avionics, network centric environments and operations, enterprise architectures and other contemporary disciplines shaping the future of aerospace.

The conference general co-chairs are: **Michael S. Francis** of DARPA/J-UCAS and **David J. Kormeyer** of NASA Ames Research Center.

The supporting AIAA organizations are:

- AIAA Unmanned Systems Program Committee
- AIAA Intelligent Systems Technical Committee
- AIAA Software Systems Technical Committee
- AIAA Computer Systems Technical Committee

Additional info:

- September 26-29, 2005, Hyatt Regency Crystal City, Arlington, VA
- abstracts due February 7, 2005
- More at: <http://www.aiaa.org/events/infotech@aerospace>

## In Memory: Mamoru Inouye

AIAA Associate Fellow **Mamoru Inouye**, a former chair of the AIAA San Francisco Section, passed away on Sunday, Nov. 14, 2004. He grew up in Los Gatos, received degrees from both Santa Clara University and Stanford University, and became a researcher at the NACA Ames. He was section chair during 1973-74. In the 1990s, he found himself as historian of the World War II internment of Japanese-Americans in relocation camps. Inouye was a researcher in the 1950s at the NACA Ames Aeronautical Laboratory, working on high speed aerodynamics issues. Following the NACA transformation into NASA, he was involved studies of spacecraft reentry and headed a computational fluid dynamics team, and helped organize the AIAA Thermophysics Conferences.

Additional info:

- An extended article on Mamoru Inouye appeared in the *San Jose Mercury News*, Section B, December 3, 2004.

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## Galileo Memorial Scholarship for 2005

The Galileo Memorial Scholarship was established in 1973 by the National Aeronautics and Space Administration's Ames Research Center and the San Francisco Section of the American Institute of Aeronautics and Astronautics. It is a memorial to the men who perished in the Galileo I aircraft accident on April 12, 1973. The Galileo I was a Convair 990, which was operated by Ames as an airborne laboratory for research in aeronautics, astronautics, astronomy, and earth observations.

The scholarship program awards range from \$1,000 to \$2,500. Any high school senior who intends to pursue a career in engineering, mathematics, or physical or natural sciences is eligible to apply. Past finalists have had grade point averages near 4.0, high SAT scores, and involvement in numerous extracurricular activities. Applicants must be either residents of the eight counties comprising the AIAA San Francisco Section (San Francisco, San Mateo, Santa Clara, Santa Cruz, Alameda, Contra Costa, Marin, and Solano) or children of NASA Ames Research Center civil service employees, retirees, or on-site contract employees.

The Selection Committee will determine the winner of the Scholarship on the basis of the following factors:

1. An essay, limited to 1200 words, that describes the career that the applicant intends to pursue and the proposed course of study. The motivation for the choice, any special interests, and expected accomplishments should be stated.
2. Scholastic records in the form of an official high school transcript along with SAT or other college entrance test scores.
3. A listing of achievements, honors, and awards in academic, extracurricular (e.g., sports, music, school clubs), and community service activities.
4. A letter of recommendation from a faculty member who has personal knowledge of the applicant's abilities.
5. An interview of finalists at Ames Research Center.

## New Associate Fellows Honored

The AIAA San Francisco Section congratulates the following members on their election to Associate Fellows:

Glen J. Brown	Leonard F. Kwiatkowski
Malcolm M. Cohen	Nelson Pedreiro
Silvano P. Colombano	Daniel J. Rasky
Jay B. Jeffries	Gregory K. Schmidt
Mark D. Kremenetsky	John Zuk

More than 90 Institute members will be inducted as AIAA Associate Fellows during the AIAA Foundation Associate Fellows Dinner, held at 7:30pm, Monday, January 10, in Reno. Each year, the Institute recognizes exemplary professionals for their accomplishments in engineering or scientific work, outstanding merit and contributions to the arts, sciences, or technology of aeronautics or astronautics.

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## Application Procedure

Complete the application and submit it with the information requested above. Your application must be postmarked no later than February 28, 2005. All materials must be submitted in the same envelope. Be sure to attach sufficient postage. Also, please be sure to include your email address. Finalists will be contacted for interviews in May. The Scholarship winners and their parents will be honored at a dinner meeting of the AIAA San Francisco Section (date to be determined).

## Additional Information

This application can be found on-line at: [http://www.aiaa-sf.org/pco/Galileo/2005/Galileo\\_appl\\_2005.pdf](http://www.aiaa-sf.org/pco/Galileo/2005/Galileo_appl_2005.pdf)

Questions regarding the Galileo Memorial Scholarship program can be sent to: [chair@aiaa-sf.org](mailto:chair@aiaa-sf.org).

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The **AIAA SAN FRANCISCO SECTION IN4M-LETTER** is a publication of the San Francisco Section of the American Institute of Aeronautics and Astronautics, a non-profit society whose primary purpose is to advance the arts, sciences, and technology of aeronautics and astronautics and to foster and promote the professionalism of those engaged in these pursuits.

**Section Officers and Council:** A complete directory of the section council can be found at <http://www.aiaa-sf.org>.

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**Production Notes:** This publication was produced using Adobe FrameMaker 6.0 and converted to PDF by Adobe Acrobat Distiller.

**AIAA SF Communications Committee staff:** Rick Kwan, Corky Lakin, Bruno Geoffrion, Stephanie Gregg. Additional contributions: Eric Mueller.

## Calendar

### AIAA SF Section Events

**Dinner Meetings:** The following are held at the Ramada Inn Silicon Valley, 1217 Wildwood Ave, Sunnyvale, CA [Tel: 408-245-5330]

- Thursday, January 27, 2005, 6:30-9:00pm: Arif Karabeyoglu and Brian Cantwell on *High-Regression Rate Hybrid Propulsion* – (Related article on page 1.)

**Cost:** AIAA members and guests - \$20, students - \$15, non-members - \$25. Cash or check only. **Dinner Meetings Agenda:** No-host cocktails at 6:30pm, dinner & program from 7pm to 9pm.

**Registration:** By Monday preceding dinner. On-line at <http://www.aiaa-sf.org>, or contact Programs Director by e-mail or phone. **Cancellation:** By Wednesday preceding dinner. Please contact Programs Director. (AIAA pays for all reservations, including no-shows.) **More Info, Questions, Comments, Jokes:** Contact our Programs Director at [programs@aiaa-sf.org](mailto:programs@aiaa-sf.org).

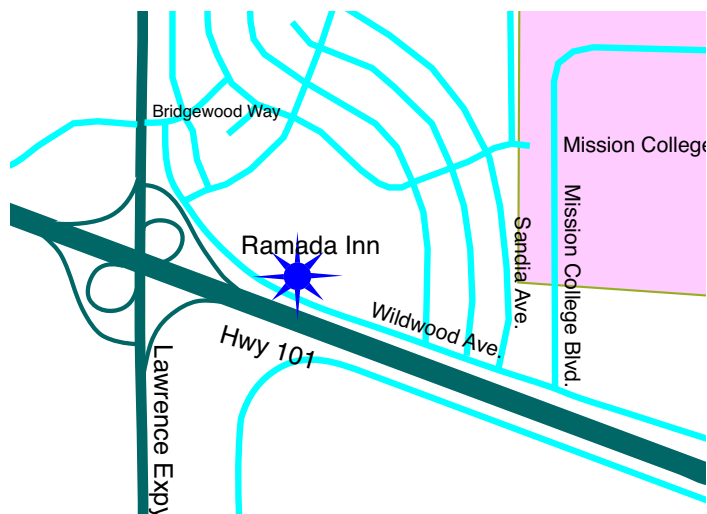
A separate tour and dinner meeting focusing on the United Airlines Maintenance Facility are being arranged in South San Francisco. (Related article on page 1.)

### AIAA National Programs

Below are selected conferences, workshops, and other programs sponsored or organized by AIAA, including upcoming Region VI meetings.

- *43rd AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV — Jan. 10-13, 2005.
- *Space Technology & Applications International Forum 2005 (STAIF 2005)*, Albuquerque, NM — Feb. 14-17, 2005
- *2005 Regional Student Conference (Region VI)*, Cal Poly San Luis Obispo - Mar. 31-Apr. 2, 2005
- *11th AIAA/CEAS Aeroacoustics Conference (26th AIAA Aeroacoustics Conference)*, Monterey, CA - May 23-25, 2005
- *AIAA/AAAF Aircraft Noise and Emissions Reduction Symposium*, Monterey, CA - May 24-26, 2005

Additional details may be found on the national AIAA website at <http://www.aiaa.org/calendar>.



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**Non-Profit Organization  
US Postage Paid  
San Jose, CA  
Permit No. 936**