

Section Web Site: www.sae-arizona.org - Sign up for your newsletter on our website.

HIGHLIGHTS...

- **Orbital Launch Vehicles**
- **Coffee Talk**
- **Message from the Chair**
- **Recap of April Meeting**
- **SAE Alternate Refrigerants**
- **Officers Elections**
- **Formula SAE Event**
- **Career Day AWIM**

Dinner Presentation...

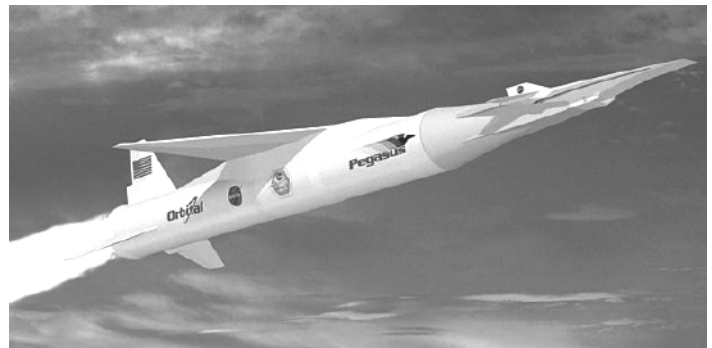
Orbital Launch Vehicles by Mark Ogren

At this month's meeting, Mark Ogren will be presenting the Orbital Sciences history of Booster Development. Orbital's space launch vehicles are the industry standard for boosting small payloads to orbit. Their innovative Pegasus® rocket is launched from the company's "Stargazer" L-1011 carrier aircraft and has proven to be the industry's small space launch workhorse, having conducted 35 missions from six different launch sites worldwide since 1990. Their Taurus® and Minotaur ground-launched rockets combine Pegasus upper stages with either government-supplied or commercially available first-stage rocket motors to boost larger payloads to orbit. Minotaur IV is the newest addition to their line of space boost-



Target Launch Vehicle (TLV) in silo.

ers and combines decommissioned Peacekeeper rocket motors with proven Orbital avionics and fairings to provide increased lifting capacity for government-sponsored payloads.



Artist rendering of Orbital's Hyper-X in flight

Mark J. Ogren

Mark Ogren has twenty-three years of engineering experience in the design of complex systems. He manages the preliminary design and proposal preparation of all new missile programs. He managed Orbital's successful capture and technical efforts for the Kinetic Energy Interceptor (KEI) Program. Ogren initiated Orbital's Ground-Based Midcourse Defense GMD booster efforts. His technical accomplishments have included the first flight of a maneuvering re-entry vehicle with differential GPS/IMU guidance accomplishing earth penetrator impacts up to mach 4. He managed studies for Orbital's Surgical Strike Vehicle and the Navy's Low Cost Cruise Missile. He has broad management and technical experience with customer interface, payload interface, subcontractor management, and payload integration.

Coffee Talk

This month's coffee talk will be about Arizona State University entering in SAE's Formula Car competition.



Orbital's DART integrated with the Pegasus launch vehicle

DATE	TIME	LOCATION	COST	With Dinner	Presentation Only
May 18	Social	- 6:00 pm	Crowne Plaza Hotel (Holiday Inn)	Members - \$20	\$10
	Dinner	- 6:30 pm	44th St. & Washington	Guests - \$25	\$10
	Presentation	- 7:30 pm	602-273-7778	Students - \$10	no charge
RSVP by 2:00 pm Monday May 15.			Call Mindy Erway: 602-364-7122		

Message from the Chair

The April 20 Section meeting featured David Hermance from Toyota who spoke about the new Camry hybrid vehicle. This presentation was very timely as the hybrid Camrys had not even been delivered to the dealers at the time of our meeting. In addition, as the price of gasoline has risen from about two and a half to about three dollars per gallon in just a few weeks, the reduced fuel consumption of hybrid vehicles seems even more appealing. Further, as time goes by and the Toyota hybrid vehicles like the Prius continue to perform well for their owners, concerns about the risks of owning this newly developed technology seem less significant. Special thanks go to David for his presentation to about 50 attendees, which was both entertaining and informative. Thanks also go to Professor Brad Rogers from Arizona State University who told us about the Automotive Engineering program that he is developing for the students at ASU Polytechnic.



Allan Watts, Section Chair.

Also at the April dinner meeting, the slate of section officers for the next fiscal year was announced. David Vasquez was nominated to Chair the section, Bill Gest was nominated to be Vice Chair, Joshua Rudin was nominated to serve as the Secretary, and John Lester was nominated to continue as Treasurer. Thanks go to immediate past chair Kevin Wilson and Doug Culy for heading the nominating committee. We will vote on these positions at the upcoming dinner meeting on May 18. As is customary, the next dinner meeting after the May meeting will be in September.

The Section also has a need for a few other people on the Governing Board. Specifically, John Lester would like to step down from the Treasurer position within a year or so, and would like to train someone to take over the position so that the next Treasurer does not have to learn it all on his or her own. In addition, Paul Curry would like to step down from his position of Vice Chair of accommodations. The responsibilities of this position are to negotiate arrangements with the hotel, and then act as an interface with the hotel to make sure they fulfill the needs for our dinner meetings. Further, as Joshua Rudin takes on responsibilities as secretary, he would like to turn over some or all of the responsibilities for A World in Motion (AWIM) to someone else. This involves organizing and making presentations to school children about engineering so that they will consider engineering as a career option. I have found serving on the Board of SAE to be a very rewarding experience, and I encourage you to take advantage of the opportunity to be a part of the leadership of this fine organization.

SAE is not just for the automobile industry and field, but also for other mobility related technologies. For our dinner meeting on May 18, Mark Ogren from Orbital Sciences

will speak about Orbital launch vehicles including a new launch vehicle that Orbital is introducing. It should be very interesting to get Mark's perspective on this fascinating area of technology. In addition, Joshua Rudin will take a few minutes to tell us about what has been going on in Arizona with AWIM, and students from the ASU student section will tell us about their formula car. I look forward to seeing you at the meeting in May.

Allan Watts
Section Chair

Recap of April Meeting

Recap of Coffee Talk by Brad Rogers

ASU at the Polytechnic campus has initiated the development of automotive engineering programs. Approval was granted this year to offer an automotive concentration within the ABET accredited Mechanical Engineering Technology program. The vision is for this program to evolve into a degree in Automotive Engineering, followed by the development of graduate programs and research centers. Members of SAE have been involved in the process of development of courses that will form the core of the curriculum, and the results of these consultations were discussed.

Recap of Meeting by Max Rumbaugh

A large crowd of members, students and guests received an in-depth technical report on the new 2007 Toyota Camry Hybrid. David Hermance, Executive Engineer, Advance Technology Vehicles, Toyota, reported that this newest Toyota hybrid will be produced in Japan starting in May and in the USA later in the year.

The hybrid power train will be an option on the new 2007 Toyota Camry. Enthusiasts wishing to spot the hybrid version will need a sharp eye, for the only external differences between the hybrid-electric and gasoline-only powered vehicle are the hybrid logo and a chrome plated grill on cars having the hybrid option.

The starting battery is smaller and is placed in the rear of the vehicle. The main vehicle (nickel metal hydride) battery is also in the back, over the rear wheel. Thus, the under carriage of the hybrid version has added airflow aerodynamics to provide cooling and vehicle efficiency.

The hybrid gasoline engine is a 2AZ-FXE Atkinson 2.4 liter, 4 cylinder engine. The Atkinson engine provides better efficiency than the standard gasoline engine, about half way between the efficiencies of Otto cycle and diesel engines.

The hybrid transaxle is approximately the same size and shape as the transmission on the gasoline-only powered Camry. However, the interior of the transaxle is anything but the same. It has two planetary gears. For those who enjoy the beauty of fine machining and good mechanical design these planetary gears are a work-of-art.

The hybrid has two motor/generators. One is connected to the internal combustion engine and acts primarily

as a generator. It also serves as a motor for speed control and for engine starting. Using 3-phase current with up to 650 VAC, it can reach 13,000 rpm. The second motor/generator connects directly to the final drive, serving primarily as a motor. However it has the important fuel saving function as being a generator during regenerative braking. It, too, uses 3-phase current with up to 650 VAC but has a peak speed of 14,400 rpm. There are no clutches, bands, valves or hydraulics.

Major changes have been made to the new inverter in the Camry hybrid. It sets under the hood on the driver's side. It is more compact and lighter than the Prius or SUV inverter with volume about 40% and mass of about 60% less the earlier versions. The inverter converts DC into 3-phase AC to drive both motor/generators. A boost converter raises the 244VDC to up to 650VDC.

The battery pack contains 34 Nickel Metal Hydride modules. Dave noted that this battery operates best when charging and discharging is confined to the mid-range of the battery capacity. Battery life is guaranteed for 10 years, and accelerated testing has proven it to be very highly reliable.

The new hybrid has a Toyota-tested, 0-60 mph acceleration of one second better than six cylinder standard version Camry. At least one car enthusiast magazine editor has report even better acceleration than achieved by Toyota. The acceleration response or feel of the hybrid is very different than of the gasoline-only engine. The hybrid start has less hesitation in the beginning but continues more smoothly and reaches 60 mph sooner.

The hybrid version of the 2007 Camry has several additional features not standard on the conventional version. However, Dave reported that the comparably equipped hybrid would have an equivalent price of \$3,200 higher than its sister vehicle.

The Arizona/Nevada SAE Section was proud to have Dave as its speaker in April and to provide its members with such an outstanding program containing vehicle state-of-the-art technology.

SAE Automotive Alternate Refrigerant Systems Symposium

by: Max Rumbaugh

In response to concerns about the emissions of man-made greenhouse gases (GHG) into the atmosphere, the mobile air conditioning industry has been investigating ways to reduce GHG emissions. Also, with the advent of new vehicle concepts including hybrid, electric and fuel cell vehicles; mobile air conditioning systems require new concepts to provide passenger compartment heating and cooling. Since vehicle air conditioning systems must provide total vehicle occupant comfort and safety, the 2006 SAE Automotive Alternate Refrigerant Systems Symposium will focus on new

technologies as well as environmental issues.

The organizer of the symposium is Arizona/Nevada SAE Section member Ward Atkinson who also serves as the standards committee chair for automotive air condition systems. Section members will remember his excellent presentation to the section last year.

Valley of the Sun SAE members have an opportunity to attend this conference without incurring lodging expense and with limited travel expense. The Symposium is being held June 27 - 29, 2006 at the Resort Suites Hotel in Scottsdale, Arizona. Go to <http://www.sae.org/events/aars/> for more information on this outstanding symposium.

Arizona Section SAE Officer Nominations

The following are the nominees for the SAE Officer positions:

Chair -- Dave Vasquez
Vice Chair -- Bill Gest
Secretary -- Josh Rudin
Treasurer -- John Lester

The Formula SAE Event

The Formula SAE® competition is for SAE student members to conceive, design, fabricate, and compete with small formula-style racing cars. The restrictions on the car frame and engine are limited so that the knowledge, creativity, and imagination of the students are challenged. The cars are built with a team effort over a period of about one year and are taken to the annual competition for judging and comparison with approximately 120 other vehicles from colleges and universities throughout the world. The end result is a great experience for young engineers in a meaningful engineering project as well as the opportunity of working in a dedicated team effort.

Career Day: A World in Motion

Engineers are needed for a career day at Kenilworth School in downtown Phoenix on 5/18, 1-3 pm. Expect to answer questions from the 7th & 8th grade students as well as take pictures of the event. Kenilworth is located at 1210 N 5th Ave, in Phoenix, 602-257-3889.

AWIM has had considerable demand this year due to a revised format that allows presenters from the community to appear at many schools throughout the Valley. Currently there exists a need for next year's AWIM coordinator to continue making presentations as well as tailor the presentation to your liking. Please contact Joshua Rudin if you are interested.

THE UNIVERSITY OF ARIZONA ANNOUNCES:

The 32nd Annual Applied Reliability Testing Institute provides coverage of how to implement and manage the Design-for-Reliability process through testing; how to implement an integrated Reliability & Maintainability Engineering management strategy; a practical approach to attain the high Reliability goals demanded nowadays; how to improve our worldwide competitive posture by creating more Reliable products through testing; solder joint durability and their useful life estimation; the determination of the time-to-failure distributions, failure rates, mean lives, reliabilities, and their confidence limits at desired high confidence levels; small-sample-size, high reliability, short-duration, efficient tests; nonparametric testing; test duration, sample size, and number of failures determination; HALT and HAST; burn-in testing, Qualification and Reliability Demonstration Testing; failure analysis technologies; product assurance techniques for becoming more competitive in today's markets; development cycle time reduction; productivity improvement techniques to achieve U. S. leadership in world markets; all types of goodness-of-fit test; determination of the confidence limits of the actual Reliability, Mean life and Failure Rate of all types of components, products and systems at high confidence levels; Customer Satisfaction Strategies to provide the tools required to design, test and manufacture products which are highly reliable with a minimum if any product recalls, easy to maintain, safe and less costly to operate, and sold at globally competitive prices; plus much more! Numerous practical applications of these methodologies are presented. This Institute will also prepare and help participants pass their ASQ Certified Reliability Engineer (CRE) Examination. Consultation Workshops, plus much more.

The 44th Annual Applied Reliability Engineering and Management Institute provides all engineers, and particularly Reliability Managers and Engineers, and Product Assurance Managers and Engineers in government and Industry a working knowledge of Reliability Engineering Theory and Practice; Mechanical Reliability Prediction; Reliability Testing and Demonstration; Accelerated Testing; Failure Analysis Techniques; Complete Industry Product Assurance Techniques; Maintainability; Customer Satisfaction, Strategies to provide the tools required to design, test and manufacture products which are highly reliable with minimum if any product recalls, easy to maintain, safe and less costly to operate, and sold at globally competitive prices, plus many more! Numerous practical applications of these methodologies are presented. This Institute will also prepare and help participants pass their ASQ Certified Reliability Engineer (CRE) Examination.

THE 32nd ANNUAL APPLIED RELIABILITY TESTING INSTITUTE
May 8-11, 2006

THE 44th ANNUAL APPLIED RELIABILITY ENGINEERING
AND MANAGEMENT INSTITUTE
November 13-16, 2006

Clarion Hotel, Tucson Airport
6801 S. Tucson Blvd.
Tucson, Arizona 85706
520-746-3932 or 800-526-0550

Registration Fee: \$1500 Proceedings Cost: \$50

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Meeting Schedule

May	- Orbital Launch Vehicles
June - August	- Summer Hiatus

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