Horizons

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Jon S. Berndt
Editor

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Cover: SPACEHAB Apex. Image courtesy of SPACEHAB.

Galveston Bay sunrise image at top by Cheryl Empey, Seabrook.

From the Editor

JON S. BERNDT

"*... when I talk about "human presence" - I really mean "settlement" of the solar system. And I want to pause on that word - "settlement" because that's what we are truly embarking upon and that's the really exciting part of what we are about. Now these are the key questions then: How do we sustain the vision for space exploration to lead us to settlement? How do we afford it? How do we nurture it? My answer - and I think a lot of yours' - is the private sector.*"

Are these the words of a "space frontier" spokesperson? How about these words:

"*We are on the verge of incorporating the Solar System into mankind's economic sphere, in a way that will vastly expand the economic opportunities provided for all people. Most obviously, the sheer tonnage that we will need to put in orbit invites and necessitates the development of a truly commercial space industry. There are many things needing to be done that NASA could purchase from an exploration-enabled space industry, including in-space fuel delivery, lunar resource prospecting...*"

The latter, recent, comment is from NASA Administrator Mike Griffin. The first quote is from the newly appointed NASA Ames Research Center director, Simon P. "Pete" Worden, in a statement made just days ago at the International Space Development Conference. [from www.spaceref.com] That "space settlement" and "space commercialization" are being talked about at this high level may not be something terribly new or unheard of. That real money is in play to increase incentive for private firms to demonstrate provision of services that NASA could purchase ... perhaps that *is* something new.

Days ago, six contractors were chosen as finalists for consideration for COTS (Commercial Orbital Transportation Services) contracts. The six finalists are (according to several space news web sites): Rocketplane/Kistler, Andrews Space, Transformational Space Corporation (t/Space), Space Exploration Technologies (SpaceX), SpaceDev, and SPACEHAB.

One of the earliest and most successful commercial space ventures is of course SPACEHAB, based right here in the Clear Lake area. SPACEHAB describes their Apex system (now under development) in this issue.

There have been some concerns raised about the COTS program, within space circles. Some think that the total amount of money said to be allocated for the program (about $500 million) is not enough to accomplish anything. According to NASA, the COTS program goals are to:

- *Implement U.S. Space Exploration policy with an investment to stimulate commercial enterprises in space,*
- *Facilitate U.S. private industry demonstration of cargo and crew space transportation capabilities with the goal of achieving reliable, cost effective access to low-Earth orbit,*
- *Create a market environment in which commercial space transportation services are available to Government and private sector customers.*

As seen above, one of the COTS goals is to *facilitate*—not to fully fund development of anything. SpaceX has already demonstrated the ability to build and launch a rocket. Granted, the flight was a short one, but by all accounts I have read, SpaceX is very committed to making Falcon work. I believe they will succeed.

Transformational Space Corporation (t/Space) is a company which has key partnerships with other growing space-related companies including Scaled Composites, AirLaunch. t/Space also crafted a creative exploration strategy as part of a NASA funded study on innovative exploration strategies. As part of that strategy, t/Space proposed some concepts to maximize commercial involvement:

Use CEV program to spur passenger travel to LEO:

- *If NASA "invents" a competitive passenger market through its contracting strategy, it will reap huge economies of scale.*
- *Economies make human-assisted, in-orbit assembly cost-effective.*
- *Commercial market will rapidly overtake dollar volume of NASA ETO spending, shifting development cost to the private sector.*

SpaceDev built the engine that powered SpaceShipOne to its X-Prize victory.

When considering the current state — and the potential — of commercial space companies today, I have to agree with Pete Worden's words (Worden participated in the first President Bush's Space Exploration Initiative): "We are off to a much better start now than we were in 1989."

— JSB

Chair's Corner

STEVE KING, AIAA HOUSTON CHAIR

"All Hail Columbia!" was the toast of the day a quarter century ago as STS-1 took flight. While the Shuttle is still a magnificent flying machine; its high operational cost, limited crew escape options, and other vulnerabilities justify the need for its retirement in 2010.

On the brighter side, the Shuttle Program does provide the engineers and planners of our next generation of human spacecraft with a tremendous treasure trove of lessons learned. Many of them were excellently presented by Bo Bejmuk, Boeing's Orbiter Program Director, at the Houston Section dinner meeting on April 5th. A few of these that stood out to me involved:

• Not allowing operations and maintenance to take the back seat to satisfying performance requirements. It is felt that this added up to $40B to Shuttle operations over its history. Excessive operational cost also contributed to the ending of the Apollo program even when most of the hardware for three additional flights to the moon was already built.

• Having sufficient margin (or conservatism) in your design to cover environment and analysis uncertainties. Performance needs drove a lot of Shuttle hardware, which does have appropriate factors of safety applied, to have very limit margin. Even today the Shuttle experiences redesign and repair to correct hardware negative margins resulting from refined analysis, additional testing, and flight experience. Often these changes create a domino effect resulting in added cost, excessive turnaround maintenance periods, and exposure of other subsystems to damage during repairs.

• A need for a strong, vocal integration organization which it not the first to be reduced when budgets get tight.

• Test, test, test...

Visit the Houston Section website to view Mr. Bejmuk's entire presentation. Too often we have all seen organizations reinventing the proverbial wheel and end up stepping on the same mines. One of Bo's messages was that development of the Constellation elements will have their share of challenges, so there is no need to revisit the scares and minefields of Shuttle.

But don't limit yourself to just the Shuttle, there is a rich history of valuable lessons learned from Mercury through Skylab, the Russian human space program, commercial satellites, interplanetary probes, dissimilar industries, etc. Look to the AIAA's extensive electronic libraries as a key resource at your finger tips to explore our aerospace history, why things were done a certain way, and what things would be done differently if they had a chance.

Let's continue the journey...

SPACEHAB Apex

ELAINA POLSEN, SPACEHAB, INC

Feature Article

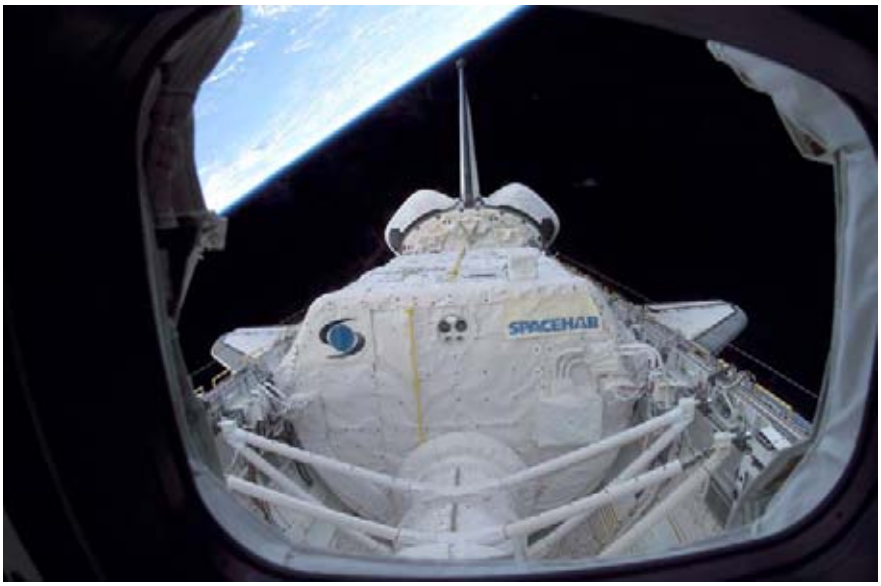
While attention is focused on NASA's return to flight and the Agency's new Crew Exploration Vehicle, there is another notable project underway; one that both NASA and aerospace companies believe will unlock the door to a robust, sustainable commercial space market. Despite past efforts from both government and private entities, profitable space commercialization is an accomplishment that has yet to be fully realized. That is all about to change according to SPACEHAB, Inc.

The Webster, Texas-based company is developing a family of unmanned spacecraft, known as Apex, to provide a safe, frequent, affordable, end-to-end service to and from space. "The applications and implications that Apex will have on the space faring community, as well as those who only wished they could afford to go to space, are wide-ranging," says Michael Kearney, SPACEHAB President and Chief Executive Officer. "Pre-Apex, we would contract our customers' payload aboard either the space shuttle or a foreign vehicle, all subject to significant schedule slips, manifest limitations, and high costs. With the Apex service, we can configure our vehicle to fit the needs of a small or large mission, price the service accordingly, and get to space and back on a reliable schedule." One of the additional unique features of Apex is its ability to be sized to launch from many commercially available rockets. In other words, a smaller Apex spacecraft can launch aboard a comparable size rocket.

Speaking of customers, NASA recently sent out a solicitation for a Commercial Orbital Transportation (COTS) service. Under the COTS initiative NASA has dedicated $500 million over the next five years for companies selected to demonstrate by 2010 a vehicle's capability to ferry cargo to the International Space Station, rendezvous with the orbiting platform, and safely return payload to earth. NASA's goals are to make an investment to stimulate commercial enterprises in space; support private industry in developing reliable, cost effective access to low-earth orbit; and create a market environment in which commercial space transportation services are available to Government and private sector customers. NASA has said it plans to purchase a cargo service if successfully demonstrated and competitively priced.

The timing of the COTS announcement could not have been better for SPACEHAB. "The Apex program has been in the works for two years, well before the NASA COTS opportunity was announced. But, knowing that NASA is committed to purchasing an Apex-like service validates we were and continue to be on the right track," states Mike Bain, SPACEHAB Chief Operating Officer. While hopeful NASA will become an Apex customer, SPACEHAB plans to move forward with the commercial program to serve its established customers, new customers, and others eagerly seeking access to space.

While NASA is one of the more notable customers SPACEHAB is seeking for the Apex service, the company has seen significant interest from various and diverse market sectors. "Space is not just for government agencies. In fact, we have supported amazing technological and medical advances that have taken place in space to only later benefit those of us on earth," says Kimberly Campbell, Vice President Corporate Communications and Marketing. "Whether it is getting an experiment to the International Space Station and bringing it back or providing a "free flyer" for a multitude of science and technology demonstration payloads, Apex will serve biotech, pharmaceutical and research institutions, telecommunications customers, and a host of commercial companies for years to come."



A recently growing market is the satellite industry; not only in the sense of launching the spacecraft, but servicing and repairing them. "In this day and age, space communications play a vital role in everything we do from talking on the cell phone, watching satellite TV, to using the GPS in our cars," claims Bob Swanson, Director of Business Development. "We are actively working with satellite companies to offer Apex as a cost-effective orbital platform service to ensure and extend the lifetime of

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American Institute of Aeronautics and Astronautics

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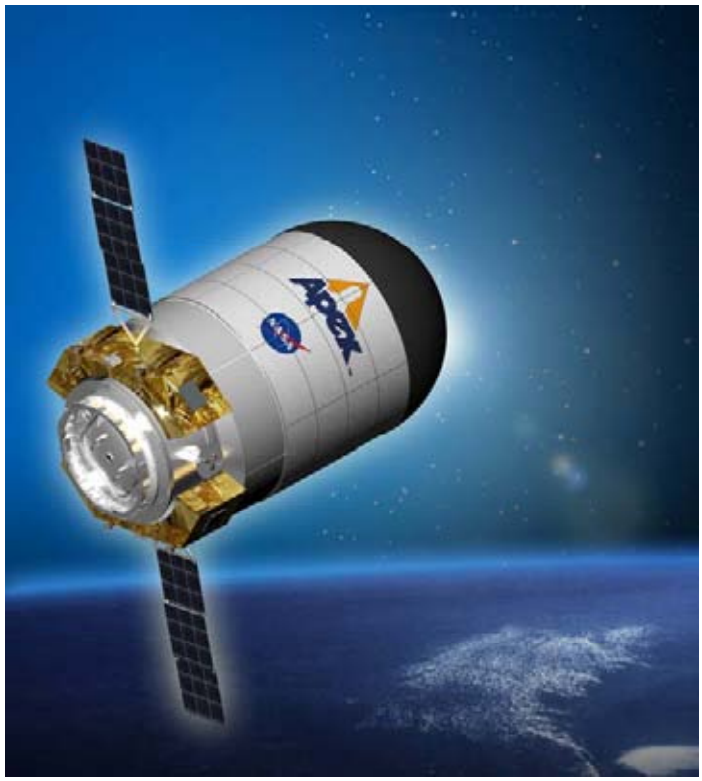
their costly spacecraft." Apex can be used to support spacecraft repair operations or refuel and relocate existing or aging satellites for other purposes.

From a technical perspective, the core of the Apex program is low risk. The vehicle is derived from existing, off-the-shelf, proven flight hardware components. For instance, the genesis of the carrier design and cargo capabilities is from SPACEHAB's module and cargo carriers flown on 19 shuttle missions. "Our current modules and external cargo carriers fit within the shuttle cargo bay, greatly expanding the research and cargo capacity for the crew," says Mike Chewning, Senior Vice President SPACEHAB Flight Services. "We know what it takes for humans to safely work in space, and we are applying that expertise when developing Apex."

SPACEHAB is using Ball Aerospace & Technologies Corporation's proven commercial satellite bus. "This spacecraft service module has been widely flown by NASA and satellite companies around the world," says Jim Baker, Vice President Space Commerce Development. "The vehicle's automated rendezvous and proximity operations utilize McDonald Dettwiler's International Space Station Autopilot Kit, designed to ensure safe docking where a trip to the ISS is needed." Launched in April 2005 as part of the US Air Force XSS-11 demonstration mission, the autopilot system has successfully exhibited on-orbit autonomous rendezvous capability.

From the programmatic viewpoint the Apex ground processing infrastructure is prepared to support integration and operations activities with existing commercial operations in Houston and Florida. SPACEHAB's Astrotech Space Operations Titusville campus includes a sprawling 50-thousand square foot state-of-the-art spacecraft processing facility, recently upgraded to support five-meter class fairings of larger launch vehicles such as Lockheed's Atlas V and Boeing's Delta IV. It is here where Apex will be integrated with the launch fairing and delivered to the pad. Also in Florida SPACEHAB operates a payload processing facility which currently supports the processing of NASA and commercial hardware onto SPACEHAB's flight assets for both the shuttle and ISS programs. "One of the distinctive attributes of Apex is the very fact that we have existing, operational facilities to support a commercial cargo service," says Rick Fitts, Apex COTS Program Manager. Mission operations will be conducted at or near SPACEHAB headquarters, located just a few miles from Johnson Space Center.

As far as when we can see the first Apex flight, SPACEHAB is already talking with potential customers to fly payloads on a mission scheduled for June 2009. NASA is expected to enter into Space Act Agreements with one or more aerospace companies this summer to fulfill their ISS logistics requirements.



Nanobacteria – The Discovery of a New Life Form

Neva Ciftcioglu, PhD, Nanobac Life Sciences, Inc.

A Lunch and Learn Summary Report

The AIAA Houston Section Life Sciences, Space Processes, and Human Factors Technical Committee hosted a Lunch and Learn seminar on March 24, 2006 at JSC Bldg 16. Dr. Neva Çiftçioğlu, Director of Science at Nanobac Life Sciences Inc., attracted a crowd of 42 to hear the intriguing story about the discovery of a new life form – Nanobacteria. Including humans, many multicellular organisms produce similar biomineralization products such as bones, teeth, shells, skeletal units, and spicules. We do not fully understand the control mechanism of biomineralization either in primitive or in developed organisms. The mineral phase of hard tissue is sometimes called biological apatite, i.e. a non-stochiometric hydroxyl-apatite. We know that when apatite is found in soft tissue, it is considered to be pathological calcification. Causes of apatite-deposit formations in soft tissue have been discussed for decades, but still remain speculative. Mineralogists explain that all that is needed for crystal formation/biomineralization to start is nidi (nucleus) and an environment of available dissolved components at or near saturation concentrations, along with the absence of inhibitors for crystal formation[1]. Bacteria or other agents producing such nidi, if present in blood and in urine, are very likely candidates to launch and accelerate pathologic calcification *in vivo*[2]. This is clinically important since blood contains phosphate near its saturation level.

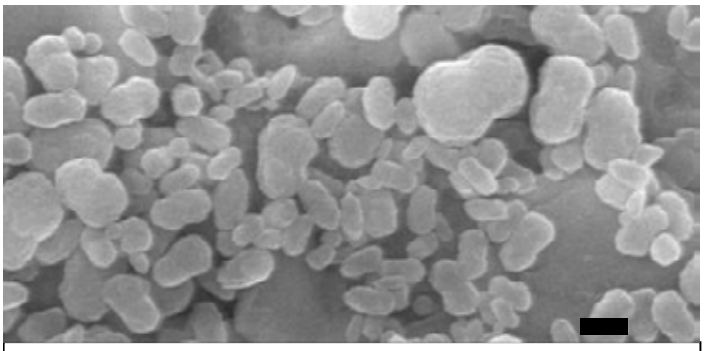


Figure 1. Scanning Electron Microscopic (SEM) image of cultured NB. Bar; 100nm.

There exists a poorly known, blood-born agent (discovered and tentatively termed "nanobacteria" (NB) by our team)[3] that behaves as a microbe and appears to show a correlation with such diverse calcification-related health problems as arterial heart disease[4,5], Alzheimer's disease[6], kidney stone formation[7-11], polycystic kidney disease (PKD)[12,13], gall stones and gallbladder inflammation[14], prostatitis[15,16], calciphylaxis[17,18], and cancer[19,20]. Furthermore, this agent has unique properties including an extremely small size (0.1-0.5 μm) as seen in Fig.1. Although the biological characterization of NB is yet to be fully understood, the precipitation and growth of calcium phosphate readily occurs in systems containing trace amounts of NB, but not in identical control systems lacking NB[3]. The exact mechanism(s) by which apatite is nucleated and formed around NB is unknown. When the serum concentration in the medium is reduced (£ 5%) in the NB culture conditions, NB start to mineralize and grow bigger in size due to calcium and phosphate deposition on their surface (Fig. 2). Our results indicate that the NB calcium phosphate phase can be formed at pH 7.4 consistent with human physiological phosphate and calcium concentrations. NB-induced apatitic biofilm formation is dependent on the presence of oxygen, and can be prevented with several antibiotics and anti-metabolites, and by high gamma irradiation at sterilizing doses[21]. The apatite produced by NB is biogenic because it is formed in a carbon-containing biomatrix, forms small spherical units of apatite in nanoscale crystal size, and can be formed at non-saturating concentrations of calcium and phosphate. Such spherical units were identified in most human kidney stones examined[22] (see Fig. 3).

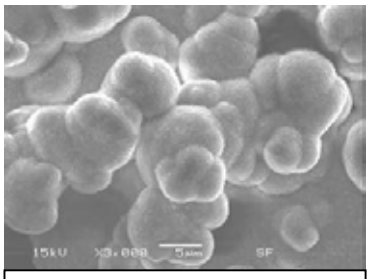


Figure 2. SEM image of extensively calcified NB. Bar: 5μm

In our earlier studies, we examined NB cultures in High Aspect Rotating Vessels (HARVs) designed at the NASA's Johnson Space Center, which are designed to simulate some aspects of microgravity[23]. NB cultured in HARVs multiplied 4.6 times faster than under stationary conditions and 3.2 times faster than in shaker flask incubation. Interestingly,

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the results demonstrated that the degree of apatite crystal formation on NB (biomineralization) and the properties of the apatite are strongly affected by the gravity and other specific culture conditions used. Although some researchers believe that microgravity does not affect crystal formation and biomineralization[24], it has been shown that long periods in a microgravity environment does cause loss of bone, and enhance kidney stone formation-like biomineralization disorders in astronauts[25].

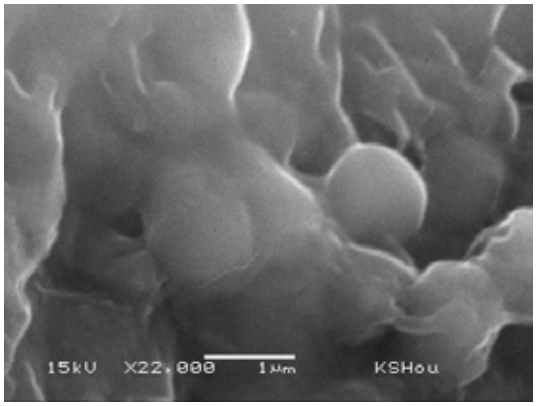


Figure 3. SEM image of spherical apatite formations in an apatite kidney stone. Bar: 1µm.

The first debate about NB revolved around whether these minute particles are alive or not. To this day, critics argue that a particle just 50 to 200 nanometers in diameter can't possibly harbor the components necessary to sustain life. Maniloff's work suggests that to contain the DNA and proteins needed to function, a cell must be at least 140 nanometers across[26]. However, recently it has been shown that a genome constructed to encode 387 protein-coding and 43 structural RNA genes could sustain a viable synthetic cell, a *Mycoplasma laboratorium* which can shrink its size below that limitation[27]. NB are also incredibly resistant to heat and other methods that would normally kill bacteria, which makes some scientists wonder if they might be an unusual form of crystal rather than organisms. Cisar et al, presented an alternative theory for the experimental findings of NB scientist. They stated that biomineralization previously attributed to NB may be initiated by nonliving macromolecules and transferred on "subculture" by self-propagating microcrystalline apatite[28].

Methods to diagnose NB in biologicals, cells, tissues, blood and urine include immunodetection with NB-specific monoclonal antibodies, electron microscopy and culture techniques. Replication can be measured by particle counting and optical density at 650 nm. It has been also shown that growth of the NB could be detected by specific methods, such as ELISA, turbidity, SDS-PAGE or methionine and uridine incorporation., Susceptibility tests can be used to test effects of antibiotics and other chemotherapeutics. Growth could be prevented with tetracycline, high doses of aminoglycoside antibiotics, EDTA, cytosine arabinoside, 5-FU and gamma-irradiation[29].

In a small study, Garcia Cuerpo et al found that translumbar, percutaneous intrarenal injection of NB (isolated from kidney stones) into rats resulted in kidney stone formation[30]. Additionally, Shiekh et al has examined NB's role in biocrystallization and *in vivo* effects on kidney pathology. Calcium oxalate monohydrate assay (COM) was carried out in the presence of NB to study biocrystallization. Wistar rats were given an intravenous injection of NB and the kidneys were examined for pathological changes. The COM assay showed accelerated biocrystallization of (14)C-oxalate in the presence of NB, indicating them to be efficient candidates for biomineralization. Histopathological studies revealed bacteria induced renal tubular calcifications and various manifestations of infection[11]. Their studies confirm that NB may be involved in the pathogenesis of renal tubular calcification. Such findings are required to prove Koch's postulates linking NB to other pathological calcification related diseases.

Whether NB themselves serve as the nucleus for crystal formation, or whether the NB are simply able to lower the activation energy barrier and thus allow precipitation and growth of crystals under much lower supersaturation conditions is yet to be determined. However, it is immaterial whether or not they are bacteria, viruses, or other living or nonliving forms; their properties of promoting ready crystallization and growth of Ca minerals are well established. These self-replicating particles may induce calcification and stone formation *in vivo* because: NB a) have been detected in human blood, b) are transported from blood into urine and bile as living organisms, c) are renotropic, d) cause apoptotic cell death, e) are present in human stone-isolates, and tissues with calcification, f) cause kidney stone formation in rats within one month when injected in an intra-renal route.

While the controversy of whether they are living or nonliving entities will continue until new definitive data is collected, this controversy should not overshadow the critical medical importance of understanding the already demonstrated effects of NB on pathologic calcification in the human body and on research into countermeasures to reverse or eliminate these effects.

Finite State Dynamic Modeling and Uncertainty Methodologies Related to Orbiter Reentry Survivability and ISS Safe Haven Concerns

A Lunch and Learn Summary Report

TIM PROPP, VICE-CHAIR, TECHNICAL

The AIAA Houston Technical Committees hosted a Lunch and Learn seminar on March 23, 2006, in JSC Bldg. 16. Dr. Allan Benjamin, Principal Scientist and Manager of Advanced Concepts, ARES Corporation, attracted a crowd of 31 to learn about finite state dynamic modeling and uncertainty methodologies related to Orbiter reentry survivability and ISS safe haven concerns. The break-up during reentry of the Space Shuttle Columbia in February 2003 prompted a thorough examination of precautions that could be taken to prevent such an incident from happening again. Safety provisions implemented prior to Return to Flight (RTF) in July 2005 included both significant design changes to the shuttle Orbiter and the external tank (ET), and scrupulous planning for unforeseen contingencies occurring during ascent or orbit. Principal among these provisions were: (1) redesign of the foam insulation on the ET to inhibit releases of large foam pieces, (2) addition of a heating element to reduce the build-up of ice on the ET prior to launch, (3) addition of scanning techniques to enable observation prior to reentry of any significant damage occurring to the Orbiter external surface as a result of debris impacts, and (4) provision for the International Space Station (ISS) to be used as a safe haven for the crew of the shuttle in the event of a need to abort reentry (i.e., the Contingency Shuttle Crew Support, or CSCS, option). In order to evaluate the effectiveness of these provisions, it was necessary to construct a set of tools capable of addressing the degree to which these modifications reduced the risk from particulate impact to the orbiter, and the capability of the ISS to support life in the event it had to be used for CSCS. For decisions to be made in real time, it was necessary for these tools to be able to evaluate uncertainties and confidence intervals associated with each prediction.

Two basic types of tools were developed to address these concerns. First, statistical models were formulated to assess the damage that could occur to the Orbiter windows, leading edges, and thermal protective tiles from particle impacts. Second, a dynamic simulation tool based on the use of Petri nets was developed to track the state of consumables aboard the ISS in the event of CSCS. The second tool is now being applied to evaluation of spare provisioning for the ISS. Both types of tools were integrated into a Monte Carlo sampling framework to evaluate the uncertainties associated with both random occurrences and systemic lack of knowledge.

Below is a summary of the results of the analyses and the value to NASA:

Question Addressed by RTF Analyses	Results of the Analyses and Value to NASA
Do the Orbiter windows need to be replaced by thicker panes to provide increased protection against impacts from particulate matter generated during ascent?	Analysis showed the answer to be yes for the two side windows. Was a factor in NASA's decision to replace those windows before flight STS-114.
Is there significant probability that particulate debris could cause damage to the orbiter wing leading edges that is large enough to be critical but not large enough to be detected?	Analysis showed that ice or an ice-frost mixture emanating from the forward portions of the external tank might have a relatively high probability of causing critical damage that cannot be detected. Was a factor in NASA's decision to provide additional protection against ice formation.
Are the current kinetic energy thresholds for critical tile damage excessively conservative because of worst-case assumptions about particle orientation?	Analysis showed that not accounting for random particle orientation causes the thresholds to be evaluated much too conservatively, by a factor of more than two for ice debris. Was a factor in NASA's decision to proceed with STS-114.
What is the confidence level accompanying the decision about whether the orbiter can safely endure reentry following damage to the tile, based on predictions by the best available suite of computer codes?	Created a tool for calculating the uncertainty distributions surrounding the computed safety margins for reentry. The tool has increased NASA's ability to make informed, real-time judgments about the likelihood that reentry will be successful.
What is the probability distribution for the amount of time available, if the shuttle crew has to take refuge on the ISS, before consumables run out or toxic levels become excessively high?	Created a finite state computer tool to analyze this problem. Results showed that there is a high enough probability that sufficient time is available to warrant the return to flight.

Public Policy

Congressional Visits Day Report

BRETT ANDERSON

On April 4th, our fearless and peerless Public Policy leader, Nicole Smith, went forth to Washington D.C. with her band of Merry Men (and Elizabeth, too!) to discuss issues of great import with the Texas Members of the 109th Congress, 2nd Session, 2006. This intrepid group included (left to right, see picture):

Dr. Michael Lembeck
Brett Anderson, P.E.
Elizabeth Blome
Wayne Rast
Nicole Smith (Team Texas Lead)
Chris Taylor

The team met the afternoon of the 4th with AIAA Public Policy experts and Staff to get the instructions by AIAA and to do any last minute strategizing. Fortunately the team had met several times at Double Dave's in Clear Lake to hammer out their presentation and strategy , so there were no last minute changes or revisions.

Before this intrepid group hit the Hill, they took heed of the wisdom passed on by the more experienced and had a very relaxing and productive evening at Sam and Harry's. (A wonderful steakhouse not far from their hotel) This team dinner is an annual event and the atmosphere and dining experience was enjoyed by all.

The message from the team to our representatives this year was focused on the Nation's Vision for Space Exploration. The key tenants of this years message was that AIAA strongly supports the vision for Space Exploration based on the following key activities:

- Return the Space Shuttle to operational flight
- Meet our international commitments and complete the International Space Station (ISS)
- Develop the Crew Exploration Vehicle (CEV) and Crew Launch Vehicle (CLV)
- Train the next generation of scientists and engineers

The focus of the team was to really work on communicating the benefits derived from space exploration. It was quickly apparent to our team that though we as engineers and scientist recognize and appreciate those benefits, we have a difficult time getting them across to both our representatives and the general public.

At the end of each meeting the team stressed the benefits from exploration justified the discretionary funding priority to meet the goals and objectives of the Nation's Vision for Space Exploration and that continued Congressional support was vital. Individuals on the team emphasized that transitioning the workforce was of strategic importance to the US economic, scientific and security needs. Further, that these capabilities were the key enablers to developing commercial opportunities in space.

A favorite quote from the team (outside of the references to Lembeck's MoonPub) was that "infrastructure leads to science and discovery, which leads to commerce." Or simpler, the trade routes and outposts of our history led to individuals communicating and developing the wilderness which led to commercial opportunities and the economy we have today. Investing in exploration is investing in science and commercialization!

The very last message the team left with everyone they met with was that AIAA wanted to help and that our members are an available resource to both the Representatives and their staff.

Wayne Rast put together a schedule that allowed the team to meet with over a dozen of the Texas delegates Staffers and/or representatives on May 5th. These meetings included:

Lindsey Dickinson, Legislative Counsel to Senator Kay Bailey Hutchison
Katherine Coughlin, Counsel and Sara Smith, Legislative Correspondent to Senator John Cornyn
Ellie Essalih, Legislative Director to Congressman John Culberson
Jessica Swafford, Senior Legal Assistant to Congressman Al Green
Chad Creech, Legislative Assistant to Congressman Michael T. McCaul
Norman Singleton, Legislative Director for Congressman Ron Paul, M.D. (Ron Paul also stepped out to meet with constituent Brett Anderson)
Vince Jesaitis, Legislative Assistant for Congressman Gene Green
Stoney Cooks, Adminstrative Assistant for Congresswoman Sheila Jackson Lee
David Lively, Legislative Assistant for Congressman Judge Ted Poe

The planned meeting with Tom DeLay's legislative assistant was overcome by events due to Mr. DeLay's announcement of his resignation the night before CVD! Because of this, Nicole and Wayne were also able to make unscheduled visits to Kay Granger and John Carter's offices. Nicole also made sure to visit the office of Sherrod Brown (13th - OH), where she grew up and her family still lives.

AIAA's annual post-CVD reception was very well attended by the CVD participants and a great number of the Legislative Staff. This provided another opportunity for getting our message across to the individuals responsible for shaping and influencing the views of our congressional leaders on the issues and policies of interest to AIAA.

Next major Public Policy event: Home Visits Week (August 2006), a.k.a. CVD in your own backyard! For more information, email publicpolicy@aiaa-houston.org.

Saving Saturn V: Conservation of the Apollo Era

A Dinner Lecture Summary Report

DOUGLAS YAZELL, COUNCILOR

The large crowd appreciated our dinner speaker on Thursday, March 16, 2006, Jee Skavdahl of Conservation Solutions, Inc., one of the people responsible for the work done to conserve the Saturn V on display at NASA/JSC. This was a joint dinner meeting with the NASA Alumni League, who heard a related speech from someone else approximately two years ago as Conservation Solutions began this work. A few notes from the recent dinner's publicity flier are supplied in the following paragraphs.

Jee Skavdahl joined Conservation Solutions, Inc. in December 2003 as a Conservation Technician and now serves the firm as a Project Manager for the Saturn V Rocket Restoration project at the Johnson Space Center in Houston, Texas. She has been closely involved in the management of both the treatment of the Saturn V and in the construction of the temperature and humidity-controlled building which currently houses and protects the Saturn V during the preservation process. Jee Skavdahl holds a Bachelor of Science in Physiological Science from the University of California, Los Angeles, California.

Within the next decade our space program will "Return to the Moon". Space vehicles and support equipment from our first "Race to the Moon" are currently being displayed as museum artifacts. In addition to being beacons to the past the significance of these artifacts is magnified as they are once again goals for our future. The Saturn V Rocket currently on display at the Johnson Space Center in Houston, Texas is one of three remaining in existence and the only one assembled from flight-ready components. Laid to rest in Rocket Park the late 1970s, the Saturn V has spent the past 30 years weathering the adverse Houston climate. High humidity, temperatures, ozone concentrations, pollution and the salt air have left the Saturn V Rocket deteriorated and in need of repair. The preservation treatments currently in progress are the next step in a series of collaborative efforts that began in 2003 to halt the deterioration and preserve the Saturn V Rocket for long term display.

This presentation will highlight the course of treatments undertaken; from the construction of a climate-controlled facility to hands-on repairs of the metal surfaces. Each section will note the unique challenges presented when applying museum quality conservation standards to an industrial artifact of this scale and complexity.

A Lunch and Learn Summary Report

Capability Maturity Model Integrated (CMMI)

ROBERT VICKROY, CMMI AUTHORIZED LEAD APPRAISER AND INSTRUCTOR

On January 27th a lunch and learn session was held with approximately 40 people in attendance. The topic given was the Capability Maturity Model Integrated (CMMI). A summary of CMMI is listed below followed by a brief outline of the discussion held at the LNL.

CMMI Overview

The CMMI will transition from version 1.1 to 1.2 in August of this year. The CMMI was created by the Software Engineering Institute of Carnegie Mellon University in Pittsburgh, Pa. The CMMI is the follow-on to the CMM, which was retired December 2005.

The CMM is a maturity model used to gauge the progress in improvement a company makes through process areas defined by the model. Maturity ratings from 1-5 are assigned to reflect the progression to full implementation of all process areas. The basis for the CMM/CMMI is that controlling processes are the best way to control the quality of a software product.

The CMMI model can be found at the SEI web site www.sei.cmu.edu - search the site for the CMMI model. The maturity levels represent the implementation of groups of processes. The levels may be loosely defined by (level 1) business as is; (level 2) Requirements Management, Project Planning, Project Monitoring and Control, Supplier Agreement Management, Configuration Management and Process, and Product Quality Assurance; (level 3) adds on Requirements Development, Technical Solutions, Product Integration, Verification, Validation, Organizational Process Focus, Organizational Training, Organizational Product Development, Risk Management, Decision Analysis and Resolution; (level 4) adds Organizational Process Performance and Quantitative Project Management; and level 5) brings Organizational Innovation, Deployment, Corrective Action and Resolution.

The CMMI model has broadened the scope of the industries to which it is applied. It has gone beyond simply software (as in the old CMM), to systems (replacing the Electronic Industry Alliance EIA 731 and 632), product integration, and even supplier sourcing. In the future servicing, manufacturing and other areas will be incorporated as well.

Discussion held at the LNL

Currently there are several versions of the model for SW (Software), SE (systems), IPPD (Integrated Product & Process Development), and SS (Supplier sourcing). In version 1.2 there will only be a single version of the model (SW/SE) with IPPD and SS being merged into other process areas.

Other changes will simplify the model and the appraisal process. New rules for sampling will broaden the number of projects that will be required to be sampled from four projects to evidence selected from across the entire organization. Additional CMMI version 1.2 information can be found on the SEI web site. There is also a follow-on "constellation" concept, which will be implemented as an addition to the model that will incorporate the Acquisition Model (for program acquisitions) and process areas for Service Management.

To gain the services of an SEI authorized instructor for Intro to CMMI classes or to arrange an appraisal go to the SEI web site and search on SEI Partners, which will provide a list of companies that have contracts with the SEI that are authorized to provide services for the SEI.

Texas Space Authority Act

A Meeting to Establish a Texas Space Authority (TSA) will be held at the University of Texas at Austin on Thursday, May 11, 2006.

The TSA will work collaboratively and competitively with similar U. S. state authorities and foreign nation space organizations to advance the establishment of a vibrant, global, commercial and privatized industry in which Texas space enterprise stakeholders constructively and actively participate. The TSA promises to be a Texas version of the organizations that today are proactively growing California's and Florida's space enterprise communities:

The California Space Authority and The Florida Space Authority. As a stakeholder in Texas's role in the exploration of space and the establishment of a Texas treasure of a vibrant commercial space industry, you are invited to attend. Please click on the following link to register for the event: www.TexasSpaceAuthority.org.

Take this opportunity to contribute your voice and views to the establishment of TSA's Vision, Mission, Objectives & Strategic Plans.

We look forward to your participation!

William N. Hulsey III, Esq.
Principal, HULSEYIP Intellectual Property Lawyers, P.C.
Attorneys & Counselors in IP Matters
Senior Research Fellow, IC2 Institute, University of Texas, Austin
Bill.Hulsey@HULSEYIPLaw.com

Call for Award Nominations

Recognize the achievements of your colleagues by nominating them for an AIAA Award!! AIAA is currently accepting nominations for the following awards. All nominations must reach AIAA no later than 1 July.

A nomination form can be downloaded from www.aiaa.org and must be used to submit the nomination. AIAA members may submit nominations online by visiting www.aiaa.org and logging into "MY AIAA."

Aerospace Software Engineering Award is presented for outstanding technical and/or management contributions to aeronautical or astronautical software engineering. (Presented odd-years)

Children's Literature Award is presented for an outstanding, significant, and original contribution in aeronautics and astronautics. (Presented odd-years)

Digital Avionics Award is presented to recognize outstanding achievement in technical management and/or implementation of digital avionics in space or aeronautical systems, including system analysis, design, development or application. (Presented odd-years)

Elmer Sperry Award commemorates the achievements of Dr. Sperry by seeking to encourage progress in the engineering of transportation. This joint society award, sponsored by AIAA, IEEE, ASME, SNAME, SAE, and ASCE, is given in recognition of a distinguished engineering contribution, which through application proved in actual service has advanced the art of transportation whether by land, sea, or air.

Excellence in Aerospace Standardization Award is presented to recognize contributions by individuals that advance the health of the aerospace community by enabling cooperation, competition, and growth through the standardization process.

F. E. Newbold V/STOL Award is presented to recognize outstanding creative contributions to the advancement and realization of powered lift flight in one or more of the following areas: initiation, definition and/or management of key V/STOL programs; development of enabling technologies including critical methodology; program engineering and design; and/or other relevant related activities or combinations thereof which have advanced the science of powered lift flight.

Faculty Advisor Award is presented to the faculty advisor of a chartered AIAA Student Branch, who in the opinion of student branch members, and the AIAA Student Activities Committee, has made outstanding contributions as a student branch faculty advisor, as evidenced by the record of his/her student branch in local, regional, and national activities.

Gardner-Lasser History Literature Award is presented for the best original contribution to the field of aeronautical or astronautical historical non-fiction literature published in the last five years dealing with the science, technology, and/or impact of aeronautics and astronautics on society.

History Manuscript Award is presented for the best historical manuscript dealing with the science, technology, and/or impact or aeronautics and astronautics on society.

Information Systems Award is presented for technical and/or management contributions in space and aeronautics computer and sensing aspects of information technology and science. (Presented odd years)

Lawrence Sperry Award is presented for a notable contribution made by a young person to the advancement of aeronautics or astronautics. *The nominee must be under 35 years of age on December 31 of the year preceding the presentation.*

Losey Atmospheric Sciences Award is presented for recognition of outstanding contributions to the atmospheric sciences as applied to the advancement of aeronautics and astronautics.

Pendray Aerospace Literature Award is presented for an outstanding contribution or contributions to aeronautical and astronautical literature in the relatively recent past. The emphasis should be upon the high quality or major influence of the piece rather than, for example, the importance of the underlying technological contribution. The award is an incentive for aerospace professionals to write eloquently and persuasively about their field and should encompass editorials as well as papers or books.

Space Processing Award is presented for significant contributions in space processing or in furthering the use of microgravity for space processing, (Presented even years)

Summerfield Book Award is named in honor of Dr. Martin Summerfield, founder and initial editor of the Progress in Astronautics and Aeronautics Series of books published by the AIAA. The award is presented to the author of the best book recently published by AIAA. Criteria for the selection include quality and professional acceptance as evidenced by impact on the field, citations, classroom adoptions and sales.

James Van Allen Space Environments Award is presented to recognize outstanding contributions to space and planetary environment knowledge and interactions as applied to the advancement of aeronautics and astronautics. The award honors Prof. James A. Van Allen, an outstanding internationally recognized scientist, who is credited with the early discovery of the Earth's "Van Allen Radiation Belts." (Presented even years)

Wright Brothers Memorial Trophy Award, sponsored by the Aero Club of Washington, is presented for significant public service of enduring value to aviation in the United States and was established to honor the Wright Brothers annually.

If you need further information, please contact Carol Stewart, Manager, AIAA Honors & Awards Program, at carols@aiaa.org or at 703/264-7623.

SPACEHAB Picked as COTS Finalist

SPACEHAB, Inc.

Houston, Texas, May 10, 2006 – SPACEHAB, Incorporated (NASDAQ: SPAB), a leading provider of commercial space services, announced today that the Company has been selected by NASA as a finalist for the Agency's Commercial Orbital Transportation Service (COTS) Demonstrations solicitation. The purpose of this initiative is to prove the capability for providing commercial cargo transportation services to and from the International Space Station while supplying space access to customers worldwide.

"We are elated that NASA appreciates our technical solution and business approach for developing an achievable and sustainable commercial space services program," said Michael E. Kearney, SPACEHAB President and Chief Executive Officer. "Our plan is to stimulate commercial enterprise in space; develop reliable, cost effective access to low earth orbit; and create a market environment in which commercial space services are available to the Government and private sector customers alike."

SPACEHAB's program includes the provision of a non-shuttle-based, end-to-end space access capability, known as Apex, and the associated integration, operations, and mission management services that the Company is renowned for on NASA's space shuttle and International Space Station programs. "We believe that this confirms NASA's confidence in SPACEHAB's ability to meet their transportation requirements while stimulating emerging space markets," states Mike Bain, SPACEHAB Chief Operating Officer.

"Contemporary with the changing studies in Washington, the Saturn launch vehicle evolved rapidly in Huntsville, going from a C-3 version in June to a C-5 in December. Plans for the C-3 were barely under way when Marshall Space Flight Center initiated studies of a larger C-4. The C-4, incorporating four F-1 engines in the booster and five J-2 engines in the second stage, at first seemed large enough to power a lunar landing mission via either lunar-orbital or earth-orbital rendezvous. As spacecraft weight estimates continued upward, Marshall officials began to question this assumption. Von Braun's proposal to add a fifth F-1 engine, making the C-4 a C-5, was approved in November when Milton Rosen, NASA Director of Launch Vehicles and Propulsion, made another launch vehicle study."

From "Moonport"

Fredericksburg High School Rocket Program Update

I recently asked Brett Williams about their progress with the Rocketry programs at Fredericksburg High School (see our September/October 2005 issue). Here is his reply:

We are finishing up a $90K research grant, getting ready to submit a proposal for next year's work, and analyzing data for reports to be presented at AIAA JPC conference this summer. Also finalizing the development of the Redbird11-H for Stanford - looks like we will be testing May 19 at WSMR. We have also been meeting with Austin - Gov Perry and State Senator Troy Frazier about the statewide replication of the program. I'm also scheduled the last week of April to be in DC to meet with industry and several politicians and committees.

Staying Informed

COMPILED BY THE EDITOR

This column points out useful web sites, documents, policy papers, periodicals, etc.

Moonport: A History of Apollo Launch Facilities and Operations
http://history.nasa.gov/SP-4204/cover.html

Commercial Opportunities in the Vision for Space Exploration
www.hq.nasa.gov/office/oer/nac/NACPresentations/Feb%20_08_09_06/Commercial%20Presentation%20Final.pdf

The Vision for Space Exploration: New Opportunities - NASA ARC Director Simon P. Worden
http://www.spaceref.com/news/viewnews.html?id=1119

Remarks for the U.S. Space Foundation, National Space Symposium, Colorado Springs, CO, 6 April 2006
http://www.nasa.gov/pdf/146291main_NationalSpaceSymposium_new.pdf

Interactive Mars Habitat
http://www.exploremarsnow.org/

The Apollo Spacecraft: A Chronology
http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm

New Members

ELIZABETH BLOME, MEMBERSHIP

The Houston Section has many new members. If you see one of these folks at the next section event, please welcome them:

We had a great month! If you see one of the folks at the next section event, please make them feel welcome.

David Barb
Robert Bayt
Sophia Bright
Sean Classen
Michael Coats
Jon-Paul Eisenring
Jennifer Furgerson
Madhurya Gupta
Shalom Johnson
Tapan Kulkarni
Hisashi Kumazawa
Natasha Lagoudas
Zhiling Li
Jacqueline Martin
Justin Mclellan
Javad Mohammadpour
Biran Owens
Kyle Richardson
Cheryl Stoy
Katherine Thompson
Christy Tucker
James Werpy

Important notes:

- *Not a member? See the end page.*

Looking for Lost Members

ELIZABETH BLOME, MEMBERSHIP

We do not have current contact information for the following members, which means that either their email or mail addresses are no longer valid. If you know where they are, please either ask them to update their information on www.aiaa.org or send their new information to elizabeth.c.blome@nasa.gov.

Nick Baker
Sarah Bibeau
Marshall Cloyd
Jeff Cheek
Yuanyuan Ding
Joseph Kwasnieski

Help AIAA Help You - Update Your Membership Records

ELIZABETH BLOME, MEMBERSHIP

It is often said that the aerospace industry is the only place where you can have the same job for five years and work for five different companies. That is especially true given the industry wide consolidation that has happened in the last few years. As companies have changed so have the building signs and the business cards. Additionally, our environment provides most people with the ability to move from one company to another as we try to expand our occupational horizons.
With all of these potential changes have you verified if your AIAA member record is up to date? Knowing where our members are working is vital to the Houston Section in obtaining corporate support for local AIAA activities (such as our monthly dinner meeting, workshops, etc.). Please take a few minutes and visit the AIAA website at http://www.aiaa.org/ to update your member information or call customer service at 1-800-NEW-AIAA (639-2422). Feel free to also contact me at 281-244-7121 or by email at elizabeth.c.blome@nasa.gov.

Membership Q & A

Q: How can I become a member of one of the AIAA Standing Committees?

A: You may nominate yourself or be nominated by another member for membership on an AIAA Standing Committee. You can also nominate other members. A description of the scope and volunteer contact for each of AIAA's Committees is located on the Standing Committees page. If you are interested in participating on a Standing Committee, please complete the online Standing Committee Nomination Form found on the Forms page at the AIAA web site.

Q: How do I become a member of an AIAA Technical Committee?

A: Any AIAA member is welcome to apply for membership on a technical committee. Technical Committee membership is generally for three consecutive one-year terms. Nominations open 1 August and close 1 November, although midyear placement on a Technical Committee is possible. For more information or to obtain a nomination form, go to the Technical Committee page at the AIAA web site.

Annual Technical Symposium Agenda

TIM PROPP, VICE-CHAIR, OPERATIONS

Paradigm Shifts "Ripples in Space", Beatriz Kelly-Serrato, Jacobs Sverdrup

Deciphering the Mysterious "Hypersurface" for Translunar Targeting, R. Leroy McHenry, Boeing

UWB Technology and Applications on Space Exploration, David Ni, NASA/National Research Council, Dickey Arndt, NASA/EV4

UWB Tracking Algorithms - AOA and TDOA, David Ni, NASA/National Research Council, Melinda Refford, USA

UWB Tracking Software Development, David Ni, NASA/National Research Council, Julia Gross, NASA/EV4

UWB Two-Cluster AOA Tracking Prototype System Design, David Ni, NASA/National Research Council, Phong Ngo, NASA/EV4

Performance Evaluation of a UWB-RFID System for Potential Space Applications, David Ni, NASA/National Research Council, Chau Phan, NASA/EV4

Mach-Lorentz Thrusters, Paul March, Barrios

Conceptual Design of a Shuttle-Derived Reusable Exploration Vehicle, Mike Engle, NASA/OM2

The Lunar Reconnaissance Orbiter - Instrument Suite and Measurements, John Keller, NASA/GSFC

The Lunar Reconnaissance Orbiter - Spacecraft and Objectives, Craig Tooley, NASA/GSFC

Descent and Landing Trajectory Guidance for Lunar Missions, Ron Sostaric, NASA/EG5

Reliability - An Essential Key to Extended Manned Space Mission Success, James Mulberry, USA

Abort Options for Human Lunar Missions Between Earth Orbit and Lunar Vicinity, Gerald Condon, NASA/EG5

Strategic Capabilities Assessment for Retirement of the Space Shuttle Program: Defining and Documenting the Path for NASA's Human Spaceflight Transition, Doug Sander, NASA/MD

Robot Motion Planning System for Robot-Human Proximity Operation, Vladimir Lumelsky, NASA/GSFC

Revisiting Apollo - Earth Entry, John Burton, USA

Inflatable Structures: Test Results and Development Progress since Transhab, Christopher Johnson, NASA/ES5

Space Vehicle Propellant Savings Technique, Tatiana Dobrinskaya, USA

Revisiting Apollo - Lunar Landing Guidance, Scott Nemeth, USA

ISS Internal Active Thermal Control System Anomalies, Remediation Efforts, and Implications for Future Manned Space Flight Projects, Robert Daugherty, Boeing

Obstacles to Cohesive Space Operations, Russ Strachan, Self Employed

Proven Avionics Architectural Principles and Non-Deterministic Algorithms, Randall Black, Honeywell

On-board Simulation and Training System, Rolando Garza, Self Employed

EVA Operations and Integration Activities as Performed by MOD EVA, Zane Ney, USA

Software Verification Facility Start Script, Lloyd Johnson, Boeing

Revisiting Apollo - Translunar and Lunar Orbit Navigation, Samuel Welsh, USA

Extracting and Classifying Failure Modes from Text, David Throop, Boeing

MDM Dump Tool, Lionel Molina, Boeing

The Next Step in the Vision for Space Exploration: Shuttle Program Transition and Retirement, Debra Boyd, Boeing

Revisiting Apollo - Trans Lunar Injection (TLI) Guided Burn to the Moon, Earle Bentley, USA

Value of Automated Code Analysis Tools in Human Space Flight Programs, Warren Badgley, GB Tech

Launch Vehicle Economics, Worked Examples, Chris Taylor, Jupiter Research & Development

Centrifuge Rotor Models - A Comparison of the Euler-Lagrange and the Bond Graph Modeling Approaches, Jose Granda, California State University

The Future of Manned Robotics Missions, Mathew Hart, USA

A Pseudospectral Method for Space Trajectory Optimization, Jeremy Rea, NASA

Space Shuttle Integration Lessons Learned - An Insider's View

A Dinner Lecture Summary Report

DOUGLAS YAZELL, COUNCILOR

A large and enthusiastic audience welcomed Mr. Bo Bejmuk, Program Director, Space Shuttle Orbiter, Space Exploration, The Boeing Company, as the speaker for our dinner meeting Wednesday, April 5, 2006, in the Gilruth Center. Mr. Bejmuk has enjoyed an extensive career on the Space Shuttle program holding several key positions in Shuttle Integration during the development phase and transition to operations. He was also the Boeing executive responsible for design, construction, and integration of the Sea Launch Company System (a joint venture between Boeing, the Russian company Energia, the Ukranian companies Yuzhnoye and Yuzhmash, and the Norwegian company Kraerner). In 1998 he was named Vice President and General Manager of Sea Launch Home Port, responsible for the ground processing and Pacific Ocean launch operations. Bo has twice received the NASA Public Service Award. He was honored with the Chairman's Award as well as the Lloyd V. Berkner Award for outstanding contributions to commercial use of space technology and recently became an inductee to the International Academy of Astronautics. He is a recipient of the Aviation Week and Space Technology 1999 Laurels Award for his major contributions in the field of international aerospace.

A few topics and details are listed here from his slides that he is generously allowing us to display on our section's web site.

- System Integration Approach
- Lifoff and Ascent Aerodynamics (includes an overall factor of 5 reduction for primary solid rocket booster ignition overpressure prior to STS-2)
- Structures
- Day-of-Launch I-Loads Evolution
- Lightning (lesson: "starting with a fair-weather vehicle may be a cost effective approach", with some additional notes)
- Risk Management
- Operational Cost Drivers (includes two pictures: 1- artist's painting of initial naïve concept of operations, a shuttle orbiter parked in a nearly empty hangar with about 20 people working on or near it, and 2- an actual photograph of the reality: the orbiter is nearly invisible since the supporting scaffolding looks like a three-story building: photo KSC-79PC-500)
- Margin Management
- Significance of Lessons Learned
- Other Applicable Lessons Learned- Zenit Derived Launch System- Sea Launch
- The Big Lesson (part of which says, "We were not as smart as we thought we were!")

Please see the Chair's Corner on page 4 for some additional reporting on this excellent dinner speech.

Local Industry News and Announcements

SPACEHAB BEGINS WORK ON NEW NASA BUSINESS
More Commercial Hardware to Become Permanent Feature on International Space Station

Houston, Texas, May 3, 2005 – SPACEHAB, Incorporated (NASDAQ: SPAB), a leading provider of commercial space services, announced today that the Company has received contract authority to proceed with mission integration services for a new stowage platform that will be flown on the STS-118 space shuttle flight and permanently mounted to the International Space Station.

The STS-118 mission originally called for SPACEHAB's Logistics Single Module and a standard Integrated Cargo Carrier. In February 2005 NASA decided to convert the cargo carrier to a deployable platform to be transferred to the International Space Station for storage of on-orbit spares. While initial engineering work to configure the carrier for use as a stowage platform has been completed, the majority of the effort has been on hold, until now, due to delays in the shuttle flight schedule.

"We are excited about the initiation of this work, providing an efficient and proven cargo carrying solution that meets NASA's space station needs for transporting and storing spare parts," said Michael E. Kearney, SPACEHAB President and Chief Executive Officer. Known as the External Stowage Platform 3 (ESP3), this modified version of SPACEHAB's existing Integrated Cargo Carrier will be launched aboard NASA's twenty-second space station flight, currently scheduled for June 2007. This will be the ninth flight of this commercial unpressurized pallet resource.

The integration and operations work will be performed through subcontract to Lockheed Martin Corporation (NYSE: LMT), NASA's Cargo Mission Contract prime contractor. Although negotiations for this change have not been finalized, the contract value is expected to be on the order of $13 million.

SPACEHAB provided a similar cargo carrier for NASA's return to flight mission, STS-114, that launched in July 2005. The External Stowage Platform 2 (ESP2), which was deployed from the space shuttle's cargo bay via the robotic arm and permanently mounted to the space station, serves as the largest commercially provided component of NASA's ISS program.

[Source: SPACEHAB]

SPACEHAB SEEKS NEW GOVERNMENT BUSINESS
Company Unites With Team Vying for NASA Configuration Management Contract

Houston, Texas, April 19, 2006 – SPACEHAB, Incorporated (NASDAQ: SPAB), a leading provider of commercial space services, announced today the completion of a subcontracting agreement with ReDe/Critique, a joint venture, seeking a $17 million, five-year NASA resource management contract.

"This business opportunity is right up our alley. We have been providing configuration management services to NASA's International Space Station since 1997," says Richard Fitts, Vice President SPACEHAB Government Services. "As a subcontractor to ReDe/Critique, we look forward to potentially expanding our configuration management operations in support of NASA's Engineering Directorate while forging a strong teaming relationship for future opportunities."

NASA's Engineering Directorate is responsible for providing engineering design, development, and test support for space flight programs. The Agency released a request for proposals, due in May, to support this indefinite-delivery, indefinite-quantity (ID/IQ) contract initiative with an expected award date in September.

"We are thrilled to have SPACEHAB on our team," says Dr. Hubert Glover, President of the ReDe/Critique joint venture. "Our team capabilities have been enhanced by SPACEHAB's expertise and exceptional record in configuration management at Johnson Space Center."

Last performance period, SPACEHAB, as a member of NASA's Program Integration and Control contract for the space station, was awarded a 100% award fee evaluation score from the Agency's Performance Evaluation Board. This rating is seldom achieved in government contract determinations.

[Source: SPACEHAB]

NASA NAMES MORE AMBASSADORS OF EXPLORATION

Christopher Kraft and Eugene Kranz have been named to the list of NASA's first generation of explorers honored as Ambassadors of Exploration. Kraft is considered the architect of Mission Control, designing systems from the ground up. Kranz will be forever linked to the phrase "Failure is not an option," NASA said, noting he is also remembered for his flat-top hairstyle and relentless dedication to mission success. NASA's Ambassadors of Exploration are presented with a moon rock to recognize the sacrifices and dedication of the astronauts and others who were part of the Mercury, Gemini and Apollo programs. "The early years of our nation's space program had 400,000 heroes, not just the astronauts who took the first tentative steps into space," said NASA Administrator Michael Griffin. "And no one in those early years carried this responsibility more visibly, or with more grace and fortitude, than did 'Red Flight' Chris Kraft and 'White Flight' Gene Kranz. "And no two people are more deserving of the title 'Ambassador of Exploration' than these men," said Griffin. "I have been privileged to know them, and to confer this recognition upon them." (Source: UPI)

Spirit of Apollo Scholarship

AIAA Houston Section Scholarship Program, 2006-2007

The Houston Section of the AIAA is pleased to announce the Spirit of Apollo Scholarship for the 2006-2007 school year in the amount of $1000. The first half ($500) will be available for the Fall Semester. The second half ($500) will be available for the Spring Semester. Eligibility requirements must be met for both the Fall and Spring semesters.

OBJECTIVE

The AIAA encourages original research, furthers dissemination of new knowledge, fosters the professional development of those engaged in scientific and engineering activities, improves public understanding of the profession and its contributions, fosters education in engineering and science, promotes communication among engineers and scientists and with other professional groups, and stimulates outstanding professional accomplishments.

ELIGIBILITY

The following eligibility requirements shall be met by the applicants for the AIAA/Houston Section Scholarship award:

1. Applicant must have **completed at least one academic year** of full-time college work at the time of receiving the scholarship.

2. Applicant must have a college **grade point average** of not less than 3.0 on a 4.0 scale.

3. Applicant shall be enrolled in an accredited college or school **in Texas**.

4. Applicant shall be pursuing a course of study in any field of **engineering, math, or science** (i.e., physical science, physics, or computer science) that is pertinent to the technical activities of the AIAA.

5. Applicant shall **not have**, or subsequently receive, **any other scholarship** award which, combined with the AIAA award, would provide a stipend greater than the tuition plus direct educational expenses (such as books, lab fees, etc.) estimated by the educational institution he or she plans to attend.

6. Students who receive an award are eligible to reapply in succeeding years. It should be stressed that regardless of GPA, **renewal is not automatic**. To apply for renewal, an individual must follow the application procedure indicated below.

7. Applicants must be either **U.S. citizens** or **permanent residents** of the U.S.

SELECTION CRITERIA

The recipients of the scholarship awards will be selected using the following criteria, which are listed in order of importance:

1. Scholarship
This criterion will be evaluated on the basis of the applicant's grade point average or equivalent. A grade point average of not less than 3.0 (B) is required.

2. Personal Assessment of Career Goals
This criterion will be evaluated through a 500-1000 word typewritten essay. The essay should specify the career objectives of the applicant and should outline the academic program required to achieve those career objectives.

3. Recommendations
Each applicant will be judged on personal and academic merit, based on letters of recommendation.

4. Extra-curricular Activities
Each applicant's high school, college, and community activities, offices, awards, and work experience will receive due consideration.

APPLICATION PROCESS

Each applicant will provide the following information:

1. A completed application form.

2. A current college transcript.

3. Each new applicant must include three typewritten letters of recommendation. Individuals seeking renewal need only supply two letters. Recommendations from relatives will not be accepted. The letters of recommendation may be attached to the application if sealed by the writer or sent under separate cover to the address indicated below. Recommendations must be postmarked no later than the due date of the application.

4. A 500-1000 word typewritten essay as described in selection criteria.

The Applications (including transcripts, essays, etc.) for the next academic year must be postmarked no later than 1 June 2006.

Applications and related materials should be addressed to:

Dr. Douglas Schwaab
Scholarship Committee Chair
AIAA-Houston Section
American Institute of Aeronautics and Astronautics
P.O. Box 57524
Webster, TX 77598

ADMINISTRATION OF THE SCHOLARSHIP PROGRAM

The AIAA-Houston Section's Scholarship Committee will be responsible for selecting the recipients of the awards.

SELECTION OF THE SCHOLARSHIP RECIPIENTS

The decisions of the AIAA Scholarship committee are considered to be final and the winner for the next academic year will be advised of the outcome by 15 June 2006.
See: http://www.aiaa-houston.org/scholarship/

Outreach and Education

The objective of the American Institute of Aeronautics and Astronautics (AIAA) is to advance the arts, sciences, and technology of aeronautics and astronautics.

CALENDAR

Dates, events, and times are subject to change. See the AIAA Houston web site for more information at: www.aiaa-houston.org

May

1 Executive Council Meeting (ARES Corp.)
2-3 Physics Day Challenge (Space Center Houston)
5 "Space Day" Event
5 Texas A&M University Student Branch Banquet (College Station)
16 Documentary film "The Red Files: Secret Soviet Moon Mission" viewing (UH Clear Lake)
19 YP Outing: Houston Astros (Minute Maid Park)
19 Annual Technical Symposium (Gilruth)

June

5 Executive Council Meeting (ARES Corp.)
21 AIAA Aerospace Historical Site Dedication at JSC
22 Annual Honors & Awards Banquet: "SR-71 Blackbird – An Engineering Marvel" by Col. R. Graham/USAF Retired & AIAA Distinguished Lecturer (Gilruth)

Contact chair@aiaa-houston.org or events@aiaa-houston.org for further details.

Cranium Cruncher

BILL MILLER, SENIOR MEMBER

Last month's beer can puzzle is from Martin Gardner's Wheels, Life, and other Mathematical Amusements (1983). It's the fourth problem in Chapter 16.

The solution given by Gardner makes a simplification - that the ends of the can are removed and their mass distributed over the cylindrical surface of the can. He then considers the can in the desired state with the center of gravity at its lowest spot. If the can (with the liquid "frozen") is then balanced horizontally, the moment of force on the "air" side of the can is proportional to the weight of an empty can multiplied by the square of the length of the empty side, and the moment on the "liquid" side of the can is similarly proportional to the weight of a full can multiplied by the square of the length of the liquid-filled side. Since the can is balanced, these moments must be equal. So $a^2E = b^2F$ if

a = length of the "air" side when the center of gravity is at the lowest point
b = length of the "liquid" side when the center of gravity is at the lowest point
F = the can's weight when full
E = the can's weight when empty

With F = 384 and E = 44, a/b comes out to ~2.95. Since a+b=20, solving for b gives ~5 centimeters. Since there was some discussion in the article about whether the assumption of removing the ends was valid, I took anything close to 5 as correct.

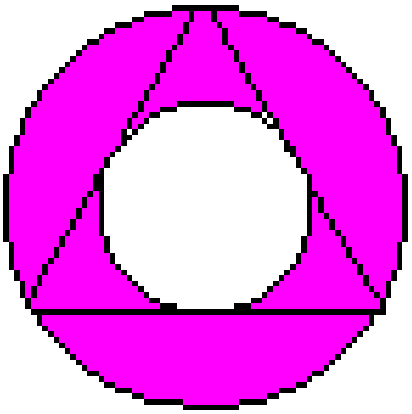
Correct solutions were received from the following:

Frank Baiamonte
Glenn Jenkinson
Danny Wait

Thanks to all who participated.

Here's this issue's puzzle:

The figure shows an equilateral triangle inscribed in a circle, with a smaller circle inscribed inside the triangle. What is the ratio between the areas of the two circles?



Send solutions to Bill Miller at wbmiller3@houston.rr.com. The answer, along with credits, references, and names of the solvers, will be provided next time.

Odds and Ends

SPECIAL EVENTS, PICTORIALS, ETC.

The ISS Expedition 13 crew of cosmonaut Pavel Vinogradov and astronaut Jeff Williams, as well as Brazilian astronaut Marcos Pontes, ascended into orbit in the evening of March 29, Houston time, from Baikonur Cosmodrome, in Kazakhstan. According to Starsem—the Russian/European company that markets the Soyuz—this was the 1706th launch of a Soyuz vehicle. For more information on the Soyuz, see the Soyuz User's Guide at:

www.starsem.com/services/images/soyuz_users_manual_190401.pdf

These wonderful photographs courtesy of NASA/ Bill Ingalls.

Worldwide Aeros Corporation near Los Angeles, is building a prototype of a large heavier-than-air vehicle. With a rigid body, and an outer skin made of carbon composites, it's not a blimp. The lifting gas, helium, provides about two-thirds of the lifting force. The rest is provided by thrust from turboprop engines, and from the lifting body shape of the craft.

The concept has been likened to an airborne cruise ship. One of these craft could carry many people, at a speed of up to 150 knots or more. Among the design highlights are:

- Rigid Panel Truss Structure Lifting Body Shape
- Electrical Secondary Propulsion
- Blow Thrusters Control System
- Air Cushion Takeoff/Landing System
- Fly-by-Wire Systems Control
- Fiber Optic Command/Data System
- Digital Flight Management System
- Pneumatic/Hydraulic Network

Large cargo versions could carry over a million pounds payload. An entire store could be stocked at once, with an Aeroscraft vehicle landing directly in the parking lot.

Worldwide Aeros Corporation is led by founder and CEO, Igor Pasternak, who was born in what is now Kazakhstan. He immigrated to the U.S. in the early 1990's.

For more information see:

www.aerosml.com

There have been a lot of strange flying machines seen on the Internet. In past months, some wild radio-controlled aircraft designs have been making the rounds. In one of these, a styrofoam model of a Star Wars X-Wing fighter has been built and flown:

http://media.idf-mod.de/public/joeydee/div/xwing.wmv

Upcoming Conference Presentations by Houston Section Members

COMPILED BY THE EDITOR FROM AIAA AGENDAS

Information here is taken from preliminary AIAA conference agendas. As such, it is subject to change.

47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference
14th AIAA/ASME/AHS Adaptive Structures Conference
7th AIAA Gossamer Spacecraft Forum
2nd AIAA Multidisciplinary Design Optimization Specialist Conference
8th AIAA Non-Deterministic Approaches Conference
1 - 4 May 2006 Hyatt Regency Newport, Rhode Island

Nonlinear Aeroelastic Response of the Flexible Wing in Trim
C. Nichkawde and T. Strganac, Texas A&M University, College Station, TX; P. Beran, U.S. Air Force Research Laboratory, Dayton, OH

Effect of Material System on Non-Linearity in 2x2 Biaxial Braided Composites
D. Goyal and J. Whitcomb, Texas A&M University, College Station, TX; A. Kelkar, North Carolina A&T State University, Greensboro, NC; J. Tate, Texas State University, San Marcos, TX

Multiscale Analysis of Delamination of Carbon Fiber Textile Composites with Carbon Nanotubes
J. Riddick, U.S. Army Research Laboratory, Hampton, VA; S. Frankland and J. Ratcliffe, National Institute of Aerospace, Hampton, VA; T. Gates, NASA Langley Research Center, Hampton, VA; D. Lagoudas, Texas A&M University, College Station, TX; E. Barrera, Rice University, Houston, TX; and J. Zhu, NanoRidge Materials, Inc., Houston, TX

Modeling of Interface Behavior in Carbon Nanotube Composites
A. Awasthi, Texas A&M University, College Station, TX

(Student Paper) Micromechanics Modeling of Functionally Graded Interphase Regions in Carbon Nanotube-Polymer Composites
G. Seidel and D. Lagoudas, Texas A&M University, College Station, TX; S. Frankland, National Institute of Aerospace, Hampton, VA; T. Gates, NASA Langley Research Center, Hampton, VA

(Student Paper) Development, Structure, and Application of MAST: A Generic Mission Architecture Sizing Tool
J. Lafleur, C. Restrepo and M. Grant, NASA Johnson Space Center, Houston, TX

Component Effective Modal Mass
A. Majed and E. Henkel, Applied Structural Dynamics Inc., Houston, TX

Using Microelectrodes to Pattern Particles in Liquid Polymers: An Experimental and Computational Study
J. Boyd and J. Lee, Texas A&M University, College Station, TX

Modeling of the Hysteretic Strain and Magnetization Response in MSMA
B. Kiefer and D. Lagoudas, Texas A&M University, College Station, TX

Processing of Light-Weight Shape Memory Alloys Using Spark Plasma Sintering
G. Majkic, T. Raizada and Y. Chen, University of Houston, Houston, TX

Dynamic Behavior of Ferromagnetic Shape Memory Alloys
S. Scoby and Y. Chen, University of Houston, Houston, TX

Effect of Single Wall Carbon Nanotubes (SWNTs) on the Electromechanical Response of Polymer Nanocomposites
Z. Ounaies, S. Deshmukh and S. Banda, Texas A&M University, College Station, TX

Thermal Protection System (TPS) Impact Experiments
D. Grosch, Southwest Research Institute, San Antonio, TX; F. Bertrand, Jacobs Sverdrup, Houston, TX

Suppression of Limit Cycle Oscillations with a Nonlinear Energy Sink: Experimental Results
W. Hill, T. Strganac and C. Nichkawde, Texas A&M University, College Station, TX; Y. Lee, G. Kerschen and D. McFarland, University of Illinois at Urbana-Champaign, Urbana, IL

Processing and Characterization of Epoxy/SWCNT/Woven Fabric Composites
P. Thakre and D. Lagoudas, Texas A&M University, College Station, TX; J. Zhu and E. Barrera, Rice University, Houston, TX; and T. Gates, NASA Langley Research Center, Hampton, VA

An Experimental Investigation of the Effect of Thermal Shock on Damage in Cryogenic Composite Laminates
B. Oh, Y. Kawatsuji, V. Kinra and D. Lagoudas, Texas A&M University, College Station, TX

Fracture Toughness of Space Shuttle External Tank Insulation Foam
A. Ganpatye and V. Kinra, Texas A&M University, College Station, TX

Parallel Algorithm for Fully Nonlinear Aeroelastic Analysis
J. Gargoloff, P. Cizmas and T. Strganac, Texas A&M University, College Station, TX; P. Beran, U.S. Air Force Research Laboratory, Wright-Patterson AFB, OH

Multiscale Analysis of Failure of Closed Cell Foams
J. Sue and J. Whitcomb, Texas A&M University, College Station, TX

Alternative Techniques for Developing Dynamic Analysis Computer Models of The International Space Station, Space Shuttle and Orbiter Repair Maneuvers
J. Granda, California State University Sacramento, Sacramaento, CA; L. Nguyen, NASA Johnson Space Center, Houston, TX

Particle Impact Damping in the Horizontal Plane
V. Kinra and B. Witt, Texas A&M University, College Station, TX

AIAA Local Section News

Assistant Newsletter Editor Sought

An assistant newsletter editor is being sought. Interested parties should contact the newsletter editor at editor@aiaa-houston.org.

AIAA Career Center Launched

AIAA is pleased to provide members with a new Career Center – the most comprehensive career and recruiting site for the aerospace industry. The Career Center will offer extensive resume and position databases, powerful and user-friendly searching capabilities, which allow you to find the job or candidate you're looking for!

Employers
- Post your job to the largest exclusive audience of aerospace industry professionals.
- Online management of job postings, including activity reports.
- Access to a searchable resume database.
- Competitive job posting pricing.

Job Seekers
- AIAA Career Center is dedicated exclusively to the Aerospace Industry and it's free.
- Receive automatic notification of new jobs matching your criteria.
- Post your resume – confidentially, if preferred – so employers can actively search for you

AIAA cares about your career development. Lifelong learning is a prerequisite to any successful career - and AIAA is committed to providing resources to help our members grow. Visit http://careercenter.aiaa.org and start using the AIAA Career Center to make YOUR career connections.

Ask-An-Engineer Program Volunteers Sought

Ask-An-Engineer is a program of the Precollege Outreach Committee. We get many questions from students and the general public about engineering questions and the field of aerospace engineering. The questions are usually not difficult, but we need people to answer them. If you are interested in fielding these questions, please contact Lisa Bacon at lisab@aiaa.org.

"Thank You for Choosing Engineering" Party

In celebration of National Engineers Week, the Houston Section hosted an inaugural Engineer Appreciation Social at Clear Lake's colorful astronaut hangout, the Outpost Tavern, on February 24th. The gathering was filled with lively conversation, tasty snacks, an ample supply of adult malt beverages, and door prizes ranging for Starbucks gift cards to Section mugs. We intend to carry on this event as an annual recognition of the many dedicated and talented engineers in the JSC community that support America's human spaceflight program. Thanks goes to Laura Slovey, Young Professionals Chair, for her help in organizing the event. Next year pizza is planned.

Merri Sanchez Elected to AIAA Board of Directors

Johnson Space Center's Merri Sanchez has been elected to the AIAA Board of Directors as the VP for Education. Merri will chair the Educational Activities Committee. This committee develops and recommends policies and procedures relating to educational matters. It is the oversight committee for the Academic Affairs, Professional Member Education, Precollege Outreach, and Student Activities committees.

A note from Mary Ellen Shook

Dear Section Chairs:

As we all have noted over the past few years, one of the areas that we seem to have a poor retention rate is in the 2nd year of our Professional. Members who have been upgraded from Student status. To address this issue, we have begun the process of contacting the Students near the start of their graduation (calendar) year via email to ascertain current contact information and to determine if their graduation date has changed and/or they are planning to continue on to graduate school. Following this initial contact, we also attempt to contact the students via telephone again to update information and to encourage them to take advantage of continuing their AIAA connection by upgrading to professional membership with one free year.

We also have informed the Faculty Advisors that we have been contacting the students and requested that they encourage their students to keep their contact information and graduation dates current.

Students in this group can upgrade themselves following their Graduation via the AIAA Web site, call AIAA Customer Service and request an upgrade or simply wait until October when those who have not changed their graduation date or indicated that they will be continuing as students will be automatically upgraded to professional membership. We will keep in contact with our Professional upgrade members through their first years of membership to keep them informed of the many benefits of AIAA Membership.

We hope to find that this process will have resulted in improvement in the data we have for our graduating students, lessen returned mail and lost members in the out years.

Please assist us in this process by also letting your Student members know to keep their record current and to take advantage of our offer of one free year of Professional membership (2nd year 1/2 price) by opting for the upgrade. As they transition into Professional Members encourage them to become active in AIAA at the Section, Regional & National levels and to take advantage of all the benefits AIAA has to offer.

Feel free to contact me if you have any questions.

Thank you,
Mary Ellen Shook
AIAA
Manager, Region & Section Programs

Houston Section
P.O. Box 57524
Webster, TX 77598

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AIAA Mission

Advance the arts, sciences, and technology of aerospace, and nurture and promote the professionalism of those engaged in these pursuits. AIAA seeks to meet the professional needs and interests of its members, as well as to improve the public understanding of the profession and its contributions.

American Institute of Aeronautics and Astronautics

Become a Member of AIAA

Are you interested in becoming a member of AIAA, or renewing your membership? You can fill out your membership application online at the AIAA national web site:

www.aiaa.org

Select the AIAA membership option.